



Version 1.9

Smart SY-01B Syrinngge 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 the RUNZE protocol of the infusion pump. If you are unsure of the protocol currently used by the pump, please first refer to P26 [Query and Switch Protocol].

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Chapter 1: Overview and Precautions

1.1 Company Overview

Nanjing Runze Fluid Control Equipment Co., Ltd., established in 2014, is a high-tech enterprise specializing in the development and manufacturing of fluid accessories, and a supplier of analytical instrument components. Our product range includes syringe pumps, switching valves, high-pressure valves, gas-tight samplers, peristaltic pumps, and tubing connectors. We offer comprehensive services covering the entire industry chain—from product customization, design and R&D, manufacturing, sales, to after-sales support—providing high-quality products and services for fields such as environmental monitoring, biopharmaceuticals, medical equipment, industrial automation, and laboratory instruments.

Since its founding, Runze has obtained ISO9001 certification and has been recognized as a “National High-Tech Enterprise” and a “Private Technology Enterprise in Jiangsu Province.” It has also been rated a 5A credit customer by Bank of Nanjing. Through continuous investment in high technology and years of R&D efforts, the company has acquired 48 patents and several software copyrights in the fluid control field, including 8 invention patents, 17 utility model patents, 13 design patents, and 2 software copyrights.

1.2 Product Overview

Thank you for purchasing the Smart SY-01B Syringe Pump from our company. This pump is a fully programmable, open-frame precision liquid delivery module designed for applications ranging from 25 μL to 5 mL. Controlled by an external computer or microprocessor, it supports automated fluid aspiration, dilution, and dispensing. Various distribution valves and syringes can be optionally configured to meet most users' high-precision liquid handling needs. Multiple pumps can also be connected in series for simultaneous use.

The Smart SY-01B Syringe Pump delivers outstanding performance, providing strong support for users' research and applications, and helping them achieve expected results.

1.3 Precautions

The Smart SY-01B Syringe Pump is specifically designed for aspiration and dispensing of liquids within the range of 25 μL to 5 mL. Any other usage is considered improper operation and may cause damage to the pump and affect measurement accuracy.

To enhance user safety awareness, this manual outlines the following warnings:

1.3.1 Notifications and Symbols



- **Toxic Substances**

Chemical or biological hazards may be associated with the substances used or the samples processed by the SY-01B. Always be aware of the potential risks related to such materials.



- **Explosion and Fire Hazards**

Do **not** use the SY-01B to handle flammable or explosive liquids.



- **Mechanical Hazards**

Caution! Keep fingers away from the syringe slot while the pump is operating to avoid injury.

- **Usage Precautions**

1. The device must be powered on and reset using the /1ZR command before any further instructions can be executed. If any abnormal condition occurs during operation, please reset the device with the /1ZR command.
2. The [z] command simulates piston initialization, but no mechanical action is triggered. This command is useful after an unexpected power outage to regain pump control. After recovery, use [z] to set the current position as the home (zero) position. Pump operation can resume after using [z], but to protect the device, it is recommended to reset the true home position using initialization commands Z<N1,N2,N3> or Y<N1,N2,N3>.
3. Ensure the voltage supplied matches the rated voltage of the device.
4. Use only the original serial cable and power adapter provided with this product.
5. This product supports three communication modes (RS232, RS485, and CAN bus), all of which are non-isolated.
6. If there are any unused ports, seal them tightly using the provided plugs and gaskets to prevent contamination or airflow into the valve, which may affect normal operation.
7. Do not disassemble any product components. Warranty is void if the tamper-proof label is broken.
8. Follow the software operation instructions and communication protocol when operating via software. Do not input unauthorized or fabricated data.
9. When discarding the instrument, please follow relevant regulations for equipment disposal. Waste produced during or after use should be handled in compliance with national environmental protection standards. Do not discard arbitrarily.
10. **Warning:** Improper use of the SY-01B can pose risks to users, property, and the

environment. To ensure safe and correct operation, follow these guidelines:

- Ensure that liquid flows **between the syringe and the valve**; otherwise, the sealing surface may be damaged.
- Power off the device before connecting or disconnecting the pump.

11. When using different syringe models, it is necessary to set different stall current values for proper reset. Refer to the table below for suggested values. *Note: These are reference values only. If the reset fails due to high internal pressure, increase the current value incrementally (+1) as needed.*

Syringe Reset Stall Current Setting		
0x1D	25μl Injector	4
	50μl~1.25mL Injector	5
	2.5mL、5mL Injector	6

1.3.2 Precautions for Electrostatic Discharge

SY-01B is an electronic device sensitive to Electrostatic Discharge (ESD). Its components are prone to damage from ESD generated by fabrics or other fixing devices. To prevent failure of the pump components, effective electrostatic protection measures must be taken during operation. The following are incomplete examples:

- Use wrist or ankle straps.
- Use anti-static mats or anti-static workbenches.
- Apply anti-static wax on the floor.

Chapter 2: Key Technologies and Functions

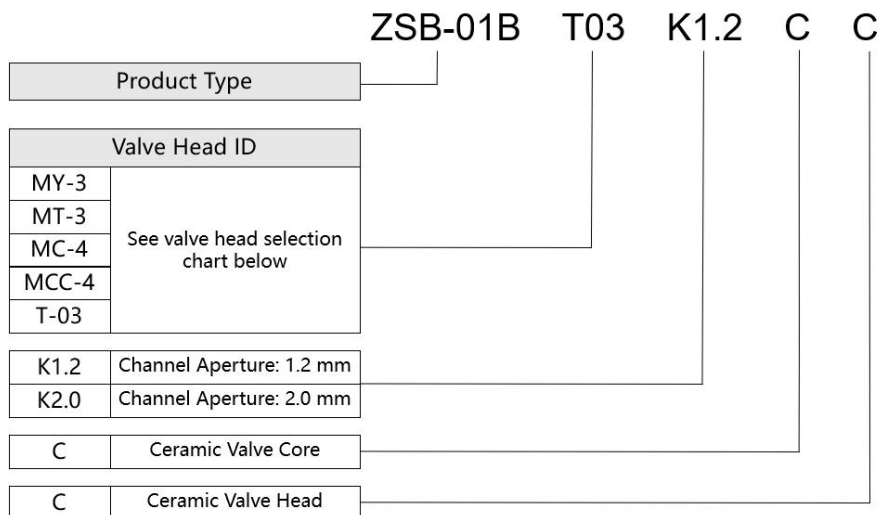
2.1 Product Features

- Upgraded syringe mounting fits Runze K/ILS-series syringes interchangeably.
- Integrated encoder system for feedback regulation, improving accuracy
- Enhanced EMC performance: power circuitry includes common-mode interference suppression, self-resetting fuses, and transient voltage suppression diodes, improving overall surge protection
- New rotary DIP switch for address configuration based on switch settings
- New optical encoder disc system for valve positioning, offering three key benefits:
 - ① Enhanced resistance to input signal interference
 - ② Improved and simplified internal structure and manufacturing process
 - ③ Improved error correction during rotational movement
- Ceramic valve core offers excellent wear resistance, high temperature tolerance, corrosion resistance, superior sealing, low friction, and long service life

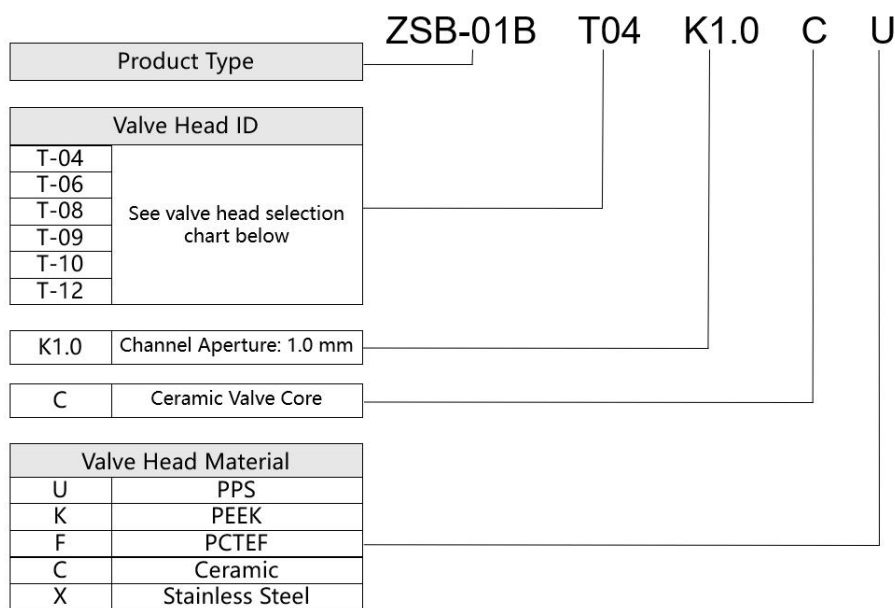
2.2 Model Naming Rules and Selection Guide

2.2.1 Model Parameters

- Valve head with channel aperture sizes: **1.2 mm / 2.0 mm**



- Valve head with channel aperture sizes: **1.0 mm**



Example: For a syringe pump configured with a T04 valve head, 1.0 mm flow path aperture, ceramic valve core, and PPS valve head material, the model should be designated as: ZSB-SY01B-T04-K1.0-C-U

Notes:

- Ceramic Valve Head Naming Rules:
- Non-distribution valves are uniformly prefixed with “M” , followed by the number of channels (including the C port) based on flow path configuration.
- Distribution valves are prefixed with “T” , followed by the number of channels (excluding the C port).
- Aperture Specifications:
- Models T-04 / T-06 / T-08 / T-10 / T-12 / (T09) are only available with 1.0 mm through-hole diameters.
- Models MY-3 / MT-3 / MC-4 / MCC-4 / T-03 support selectable through-hole diameters of 1.2 mm or 2.0 mm.
- Material Limitations:
- For the five compact valve heads: MY-3 / MT-3 / MC-4 / MCC-4 / T-03, the valve heads use an integrated ceramic structure and cannot be customized with alternative housing materials.
- 2.2.2 Optional Syringe Models
- Compatible with Runze K30 series syringes (30 mm stroke length).

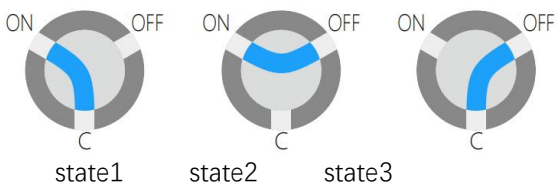
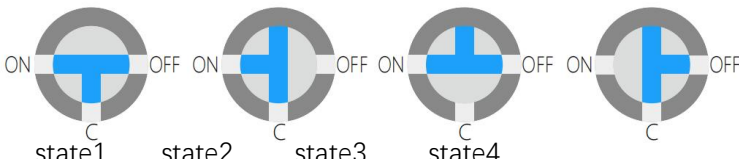
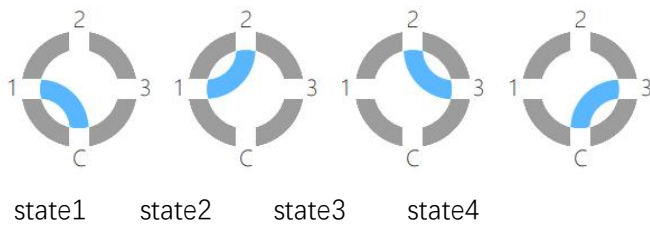
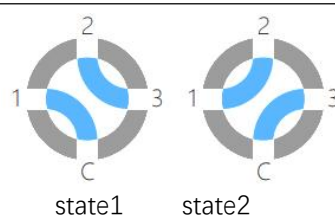
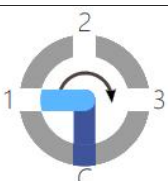
2.2.2 SYRINGE SPECIFICATION

RUNZE K30 (Stroke 30mm)

SPECIFICATION

25ul	50ul	125ul	250ul	500μl	1.25ml	2.5ml	5ml
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2.2.3 Valve Head

 state1 state2 state3		Valve Model: MY-3 Flow Path Control: Non-distribution Valve – Y-type Flow Path Flow Path States: • C–ON Connected • ON–OFF Connected • C–OFF Connected	
 state1 state2 state3 state4		Valve Model: MT-3 Flow Path Control: Non-distribution Valve – T-type Flow Path Flow Path States: • C–ON–OFF Connected • C–ON Connected • ON–OFF Connected • C–OFF Connected	
 state1 state2 state3 state4		Valve Model: MC-4 Flow Path Control: Non-distribution Valve – Single Selection Flow Path Flow Path States: • C–1 Connected • 1–2 Connected • 2–3 Connected • C–3 Connected	
 state1 state2		Valve Model: MCC-4 Flow Path Control: Non-distribution Valve – Dual Selection Flow Path Flow Path States: • C–1 and 2–3 Connected • C–3 and 1–2 Connected	
	Valve Model: T-03 Flow Path Control: 3-Port Distribution Type Flow Path (C port selectively connected to ports 1–3)		Valve Model: T-04 Flow Path Control: 4-Port Distribution Type Flow Path (C port selectively connected to ports 1–4)
	Valve Model: T-06 Flow Path Control: 6-Port Distribution Type Flow Path (C port selectively connected to ports 1–6)		Valve Model: T-08 Flow Path Control: 8-Port Distribution Type Flow Path (C port selectively connected to ports 1–8)
	Valve Model: T-10 Flow Path Control: 10-Port Distribution Type Flow Path (C port selectively connected to ports 1–10)		Valve Model: T-12 Flow Path Control: 12-Port Distribution Type Flow Path (C port selectively connected to ports 1–12)



Valve Model: (Custom) T-09

Flow Path Control: 9-Port Distribution Type Flow Path
 (C port selectively connected to ports 1–9)

2.3 Technical Specifications

Item	Parameter	
Liquid Volume Accuracy	Error $\leq$ 1% (rated stroke)	
Liquid Volume Precision	Repeatability error 0.3%–0.5% (rated stroke)	
Rated Stroke (Control Steps)	30mm (6000 steps)	
Linear Speed	450rpm	
Rated Stroke Operation Time	300rpm	
Control Resolution / Minimum Dispensing Precision	0.0333 mm/s-15mm/s	
Drive Mechanism	2s-900s	
Max Piston Drive Force	0.005mm/1 步	
Secondary Piston Drive Force	Trapezoidal screw (lead 2 mm)	
Syringe Options (Optional)	$\geq$ 80N	
Valve Head Types (Optional)	$\geq$ 40N	
Valve Orifice Diameter	25 μ l、50 μ l、125 μ l、250 μ l、500 μ l、1.25ml、2.5ml、5ml	
Valve Switching Time	MY-3、MT-3、MC-4、MCC-4、T-03	T-04、T-06、T-08、T-10、T-09、T12
Wetted Material	1.2mm、2.0mm	1.0mm
Max Reference Liquid Pressure	$\leq$ 640 ms (between adjacent ports)	
Tubing Interface	Alumina ceramic	
Syringe Interface	0.6 MPa	
Communication Interfaces	1/4-28 UNF internal thread	
Communication Baud Rates	1/4-28 UNF internal thread	
Item	RS232 / RS485 / CAN bus	
Liquid Volume Accuracy	RS232/ RS485: 9600bps/19200bps/38400bps/57600bps/115200bps CAN: 100kbps/200kbps/500kbps/1Mbps	
Device Address and Parameter Settings	Communication interface	
Applicable Power Supply	DC24V/3A	
Operating Ambient Temperature	5°C-55°C	
Operating Relative Humidity	<80%	
Dimensions (L × W × H)	142.7*127*45mm	
Weight	1.5kg	

2.4 Injection Accuracy and Volume Calculation of the Syringe Pump

Example 1: Using a 5 mL syringe (with a 30 mm stroke), the resolution per step is calculated as follows:

- 5 mL = 5000 μ L
- 30 mm = 12,000 steps
- $5000 \mu\text{L} / 12000 \text{ steps} = 0.4167 \mu\text{L/step}$

$$0.4167 \mu\text{L/step} = \frac{5000 \mu\text{L}}{12000 \text{ steps}} = 0.4167 \mu\text{L/step}$$

Note: Each step of the syringe pump corresponds to a volume of 0.4167 μ L, which is the **minimum resolution** for a 5 mL syringe.

Example 2: To dispense 3.8 mL of liquid using the syringe pump, calculate the required steps:

- 3.8 mL = 3800 μ L
- $3800 \mu\text{L} / 0.4167 \mu\text{L/step} \approx 9119$

steps (rounded)

- Therefore, to dispense 3.8 mL, set the syringe pump to **9119 steps**
- **Hexadecimal value:** 9119 (decimal) = **239F** (hexadecimal)

Note: All calculations above are in **decimal**. However, when using debugging tools or writing control code, parameters must be input in **hexadecimal** format.

Chapter 3 Hardware Setting

3.1 Component Installation

3.1.1 Valve Installation

The SY-01B does not support user-replacement of the valve head assembly. If the valve head needs to be replaced, please contact customer service.

3.1.2 Syringe Installation

To install the syringe, follow these steps:

Remove the hand-tightened screw

Follow the steps below as shown in

Figure 3-1-2 to install the syringe:

a. Align the syringe's threaded port with the installation port and screw it into the valve

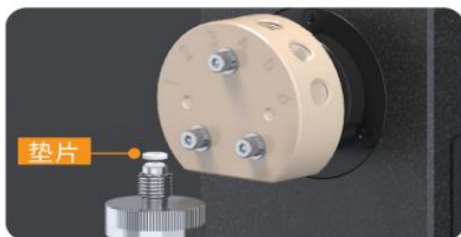
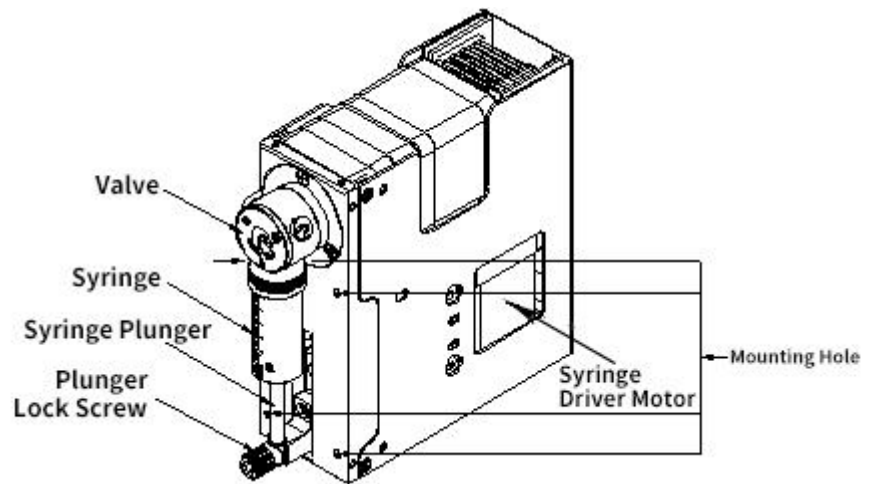
b. Keep the plunger bracket and plunger aligned horizontally, then pull the plunger downward

c. Insert the syringe plunger rod through the hole in the plunger bracket

d. Once the holes are aligned, secure them with a screw

Note: 1. Ensure the hand-tightened screw is fastened securely and the plunger can move freely.

2. For valve heads T-04/T-06/T-08/T-09/T-10/T-12, a gasket must be added to the common port.



3.1.3 Pump Installation

For ease of installation, please refer to Figure 2-4, which shows the dimensions and positions of key mounting holes on the SY-01B outline diagram.

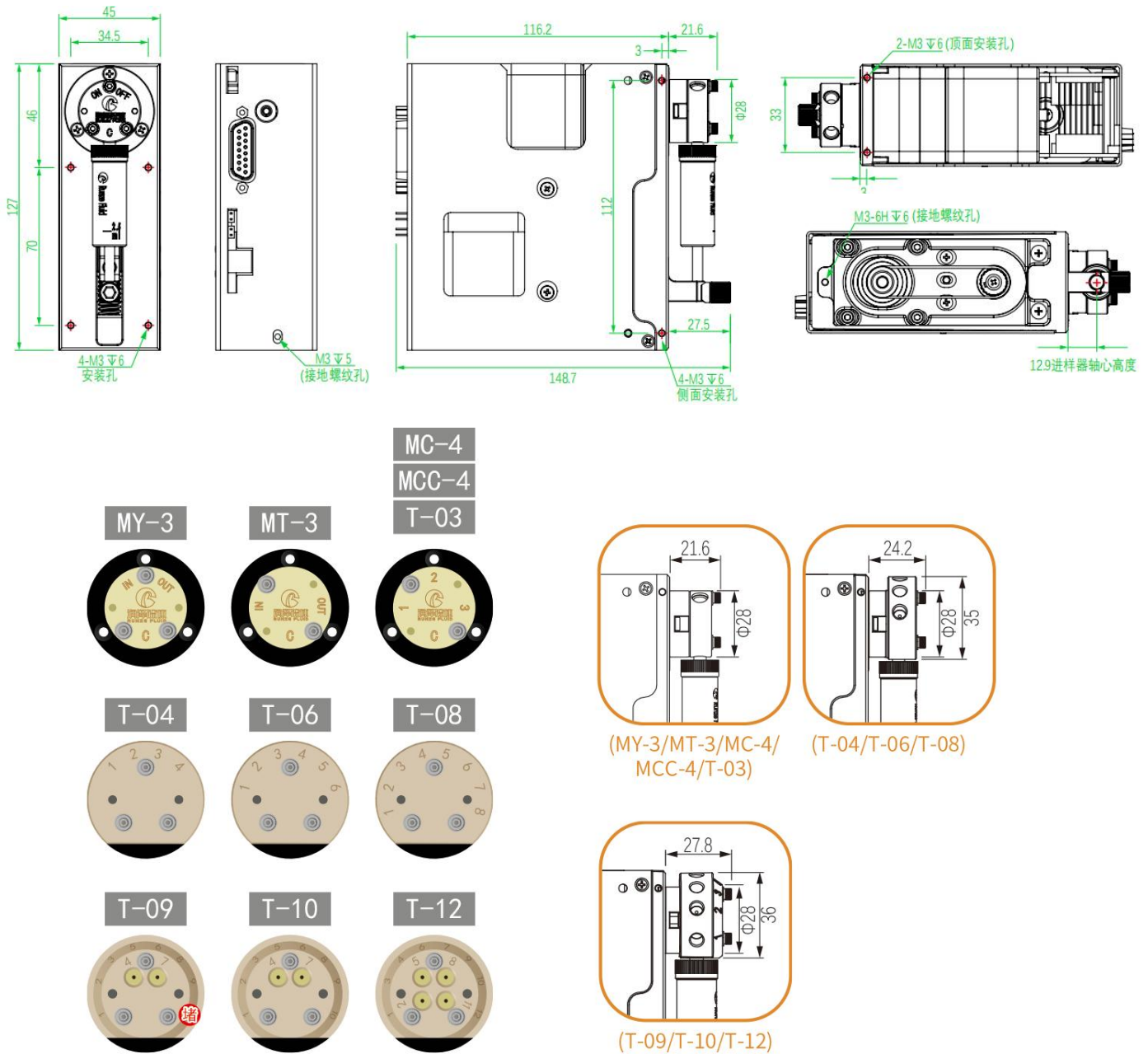


图 3-1-3 SY-01B 外形缩略图

3.2 Power and Electrical Considerations

SY-01B requires a 24V DC power supply providing at least 1.5A via a DB15 connector. It is recommended to use one power cable for every two pumps to enhance noise resistance — avoid daisy-chaining more than two pumps on a single power line.

3.2.1 Power Supply Selection

A single SY-01B 24V DC power supply must meet the following basic requirements:

- **Output Voltage:** Rated at 24V.

- **Stability:** A high-performance and stable power source is recommended, as voltages below 24V may affect pump performance.
- **Current Rating:** At least 1.5A.
- **Compliance:** Must meet safety standards and EMI/RFI specifications.

3.2.2 Integrated Power Supply

When the power supply serves multiple SY-01B units or other devices, it must meet the total peak current demand of all connected equipment. The power supply and filtering capacitors must collectively support the total peak input current.

If not all pumps are operated simultaneously, the rated power requirement can be reduced accordingly, with the **minimum current rating based on actual testing**.

Inadequate bypass capacitance can lead to voltage fluctuations, transient currents, and reduced component lifespan. Additionally, insufficient filtering capacitance may destabilize otherwise stable power sources, causing load stress, vibration, or component failure. Using a well-designed commercial power supply can effectively prevent these issues.

Wiring Considerations:

- Wiring for SY-01B and its accessories should be as short as possible, with sufficient current capacity.
- Use no less than 20AWG wire unless safety demands otherwise.
- With proper wiring and power, SY-01B units can be daisy-chained.
- For daisy-chaining six units, use 18AWG twisted pairs connected head-to-tail.

For more details on multi-pump systems, refer to Section 2.2 “Cabling” .

To control power to the SY-01B, avoid using relays or contact switches to connect the 24V DC supply directly — the injection pump must not be powered directly from a DC source.

3.2.3 Switching Power Supplies

Carefully verify the minimum load requirements of your switching power supply.

Typically, such supplies require a minimum load of 10% of their rated output current.

Note: SY-01B's idle current is less than 10% of its full-load current.

For example, in a daisy-chained system where only one SY-01B runs at low motor speed and others remain in a low-power state, a 24V 5A switching power supply with a minimum load requirement of 50mA may fail to deliver sufficient current. If SY-01B is the only load, the converter's minimum load spec should be $\leq 50\text{mA}$. Alternatively, an appropriate external power resistor may be used to meet the minimum load requirement.

3.3 Cable

A single cable can provide both power and communication for one SY-01B unit. Each pump module has a unique address identifier. For more information, refer to the “Address Switch Settings” section later in this chapter. Also see Chapter 3, “Software Communication” .

Power requirements are described in Section 3.1, “Power and Electrical Considerations.”

Pin	Function	Remarks
1	24vDC	
2	RS-232TxD	Output data
3	RS-232RxD	Input data
4	Reserved	
5	CAN H	CAN H
6	CAN L	CAN L
7	Auxiliary Input #1	TTL Voltage
8	Auxiliary Input #2	TTL Voltage
9	GND	Power and Logic Ground
10	GND	Power and Logic Ground
11	RS-485 A	Data+
12	RS-485 B	Data-
13	Auxiliary Input #1	TTL Voltage
14	Auxiliary Input #2	TTL Voltage
15	Auxiliary Input #3	TTL Voltage

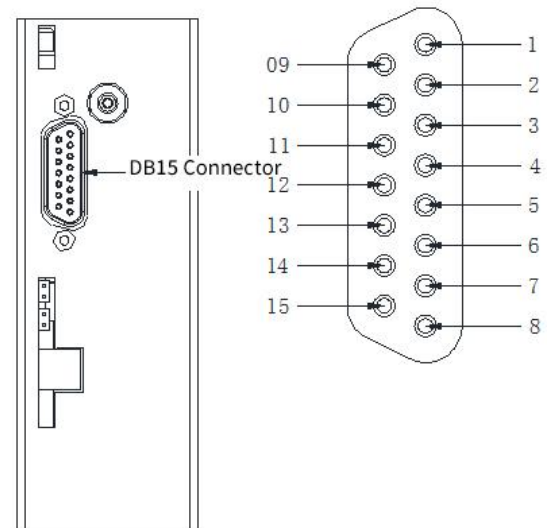


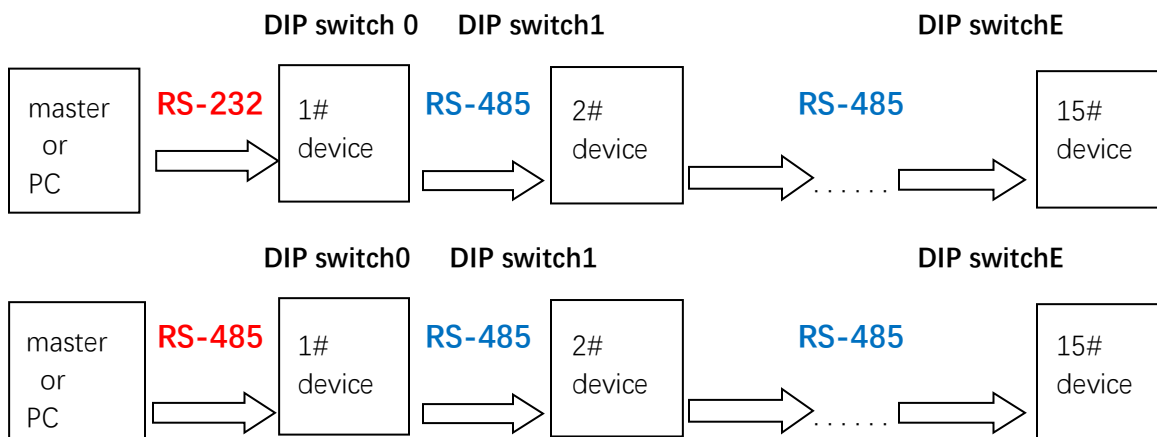
Fig 3-3 DB-15 Connector Pins

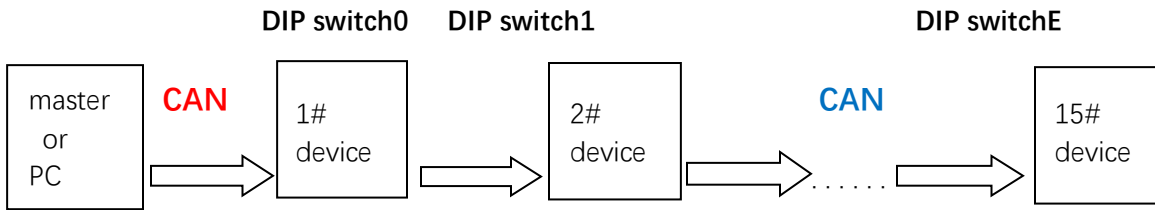
Table 3-3 DB-15 Connector Pin Assignment

The diagram shows the pin configuration of the DB-15 connector on the integrated circuit module. This is a male connector and requires a corresponding female connector to mate with it.

3.4 Communication Interface

The computer or controller connects to the SY-01B via RS-232, RS-485, or CAN interface. The SY-01B can automatically detect the communication interface. An example of the wiring connection is shown in the diagram below.





3.4.1 RS232/RS485 Interface

To facilitate connection of devices on the SY-01B RS-485 communication bus, the RS-232 can automatically convert the protocol to RS-485 (commonly referred to as a "multi-point" device).

Note: The RS-232 port lacks hardware handshaking and needs only three wires: receive data, transmit data, and signal ground. In multi-point setups, one controller can manage up to 15 pumps on the same bus. Always verify RS-485 A/B wiring via the diagrams, which also illustrate RS-232/RS-485 connections and external termination setups.

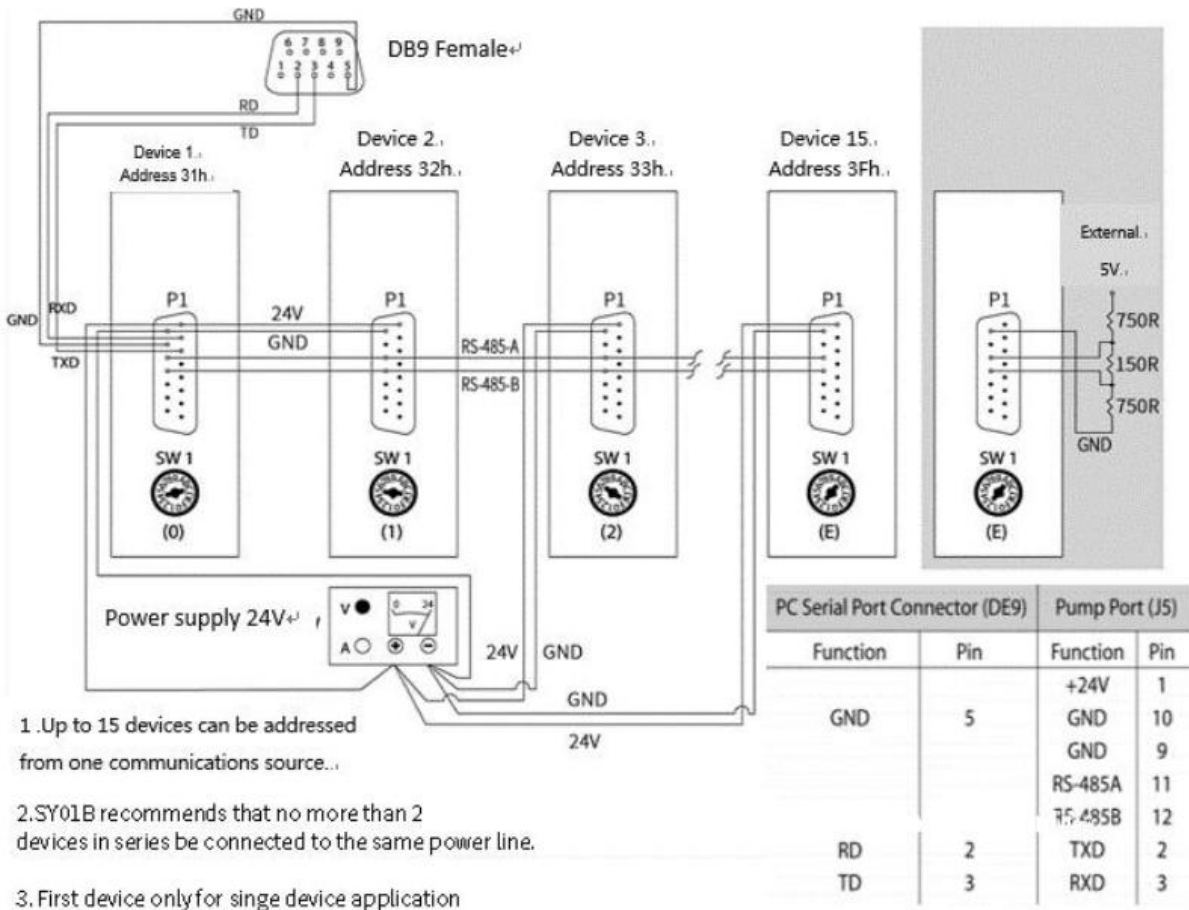


Figure 2-2 RS232 to RS485 Cabling

3.4.2 CAN Interface

The CAN interface is a two-wire serial system. The bus is driven in a manner similar to RS485. The main difference lies in the protocol.

3.5 Settings and Options

3.5.1 Configuration Commands

The SY-01B firmware allows users to configure the pump in different modes during operation. The **U command** (refer to Chapter 3 "Software Communication") is used to write configuration information to read-only memory and control the following options:

- **Baud Rate:** For RS-232/RS-485, supported communication baud rates are 9600 (default) and 38400.

For CAN, the default is 100K; also supports 125K, 250K, 500K, and 1M baud rates.

- **ROM Auto Mode:** Enables the pump to run command strings stored in ROM.
- **Stall Current:** Allows the pump to set a reset stall current based on syringe size.

3.5.2 Address Switch Settings

The address switch is located near the bottom of the SY-01B circuit board. It is used to assign a unique or specific address to each SY-01B unit in multi-pump configurations, allowing the user to issue commands to a particular pump.

The switch has **16 positions (0 to F)**, with **15 positions (addresses 0 to E)** being valid for pump addressing.

To set the address switch:

Use a small flat-head screwdriver to rotate the switch to the desired address.

Note: Set the address switch *after* powering on the pump. For details on addressing schemes for multi-pump configurations, refer to Chapter 3 "Software Communication".

3.5.3 Self-Test

The **"F"** address switch position activates the SY-01B self-test. The self-test initializes the SY-01B and repeatedly runs reciprocating plunger movements. The self-test cycles through speed codes from 5 to 40 in steps of 5. If an error is detected, the pump stops.

To run a self-test:

Set the address switch to position **"F"**, then power on the pump.

Warning: Keep liquid flow between syringe and valve; failure may damage both.

3.5.4 Input/Output

The SY-01B provides **two auxiliary inputs** and **three auxiliary outputs** via the DB-15 connector. These are TTL-level signals.

Outputs are controlled using the **J command**.

The auxiliary inputs (pins 7 and 8) can be read using the **?13 and ?14** commands. External triggers can be received via the **[H] command**. These commands are further described in Chapter 3 "Software Communication".

Chapter 4 Syringe Pump Control Code Instruction

4.1 Overview

The data transmission between the syringe pump and the host computer (computer, single chip microcomputer, PLC, etc.) adopts serial communication (RS232, RS485, CAN bus). The following describes the communication format: the communication adopts asynchronous serial communication, the command and data frame adopt sum check, and the sum check is two bytes (2 Byte). Commands and data in communication are in hexadecimal format, shown as 0x00~0xFF or 0x0000~0xFFFF, and the parameters are stored in little-endian mode.

Communication Interface: RS-232, RS-485, CAN bus;

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

RS232/RS485 Baud Rate: 9600bps, 19200bps, 38400bps, 57600bps, 115200bps;

CAN Baud Rate: 100Kbps, 200Kbps, 500Kbps, 1Mbps;

Data Bits: 8 bits;

Parity: No parity check.

4.2 Installation and Debugging

1. Install the debugging tools, see 《Instructions for Debugging Tools》 for details
2. Instructions for use, see 《SY-01B Quick Use Guide》 for details.

4.3 Command Format Instruction

4.3.1 Control Command Format

a: Pump & Valve Parameter Setting Command (Factory Command)

B: Pump & Valve Parameter Query Command (Common Command)

C: Pump & Valve Action Command (Common Command)

Table 2-3-1 Send Command (Common Command)

Description of 0xXX: 0x means hexadecimal, and XX is a hexadecimal number with two digits. The input values in the tool software are all XX. The message frame of "Send Command" message is eight bytes, and the complete format is as follows:

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

The 1st byte STX : Frame header (0xCC)

The 2nd byte ADDR : Slave address (0x00~0xFF)

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

Table 2-3-2 Send Command (Factory Command)

FH (frame header)	Address code	Function code	Code	Status parameters				EOF (end of frame)	Sum check	
B0	B1	B2	B3, B4, B5, B6	B7	B8	B9	B10	B11	B12	B13
STX	ADDR	FUNC	PWD	Bit 1-8	Bit 9-16	Bit 17-24	Bit 25-32	ETX	Low byte	High byte

Table 2-3-2 Respond Command

FH (frame header)	Address code	Function code	Parameter		EOF (end of frame)	Sum check	
B0	B1	B2	B3	B4	B5	B6	B7
STX	ADDR	STATUS	Bit 1-8	Bit 9-16	ETX	Low byte	High byte

Note: The format of the send command and response command of the common command is the same, and all response command message frames are eight bytes.

4.3.2 Command Format Description

Definition of frame header and end of frame B0, B5(B11)

Name	Code	Remarks
Frame header B0	0xCC	
End of frame B5 (B11)	0xDD	

Note: The sending command and response command of the common command are the same. The header and the end of packet are B0 and B5 respectively. In particular, the end of the factory command is B11.

Description of Address code bit B1:

Name	Abbreviation	Code B1	Remarks
Address bit	Address	0xFF	

Note: 1. Sending command is the same as responding command

2. XX in "0xFF" indicates that the value can be set. The default value is 0x00. The parameter value range is 0x00~0xFF

Table 4-3-4 Control Code Description (B2~B10)
a: Pump & Valve Parameter Setting Command (Factory Command) (B2~B10)

Code B2	Abbreviation	Code B3 B4 B5 B6	Parameter Description B7 B8 B9 B10
0x00	Set device address	B3=0xFF B4=0xEE B5=0xBB B6=0xAA	B7=0xXX (B8=0x00 B9=0x00 B10=0x00) where the value range of XX is 00~ 7F, the default value is 00
0x01	Set RS232 baud rate		There are five baud rates: the factory default is 9600bps (B8=0x00 B9=0x00 B10=0x00) The baud rate corresponds to B7=0x00 is 9600bps The baud rate corresponds to B7=0x01 is 19200bps The baud rate corresponds to B7=0x02 is 38400bps The baud rate corresponds to B7=0x03 is 57600bps The baud rate corresponds to B7=0x04 is 115200bps
0x02	Set RS485 baud rate		There are four baud rates: the factory default is 100K (B8=0x00 B9=0x00 B10=0x00) The baud rate corresponds to B7=0x00 is 100Kbps The baud rate corresponds to B7=0x01 is 200Kbps The baud rate corresponds to B7=0x02 is 500Kbps The baud rate corresponds to B7=0x03 is 1Mbps
0x03	Set CAN baud rate		B7=0xXX (B8=0x00 B9=0x00 B10=0x00) Where the value range of XX is 0x 00 to 0xFF, and the default value is 00
0x10	Set CAN destination address		B7=0xXX (B8=0x00 B9=0x00 B10=0x00) Where the value range of XX is 0x80 to 0xFE, and the default value is 00
0x50	Set the address of multicast channel 1		B7=0xXX (B8=0x00 B9=0x00 B10=0x00) Where the value range of XX is 0x80 to 0xFE, and the default value is 00
0x51	Set the address of multicast channel 2		B7=0xXX (B8=0x00 B9=0x00 B10=0x00) Where the value range of XX is 0x80 to 0xFE, and the default value is 00
0x52	Set the address of multicast channel 3		B7=0xXX (B8=0x00 B9=0x00 B10=0x00) Where the value range of XX is 0x80 to 0xFE, and the default value is 00
0x53	Set the address of multicast channel 4		B7=0xXX (B8=0x00 B9=0x00 B10=0x00) Where the value range of XX is 0x80 to 0xFE, and the default value is 00
0xFC	Parameter Lock		All parameters are 0x00
0xFF	Restore factory setting		All parameters are 0x00

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

Use three RUNZE SY01B syringe pumps with the same software version. In RS485 communication mode,

set their addresses into 00, 01, 02 and make a mark. Firstly, for the multicast channel 1 address of SY01B whose address is 00, set the parameter 0x81 into 81 by command 0x50; for the multicast channel 3 , the parameter 0x83 is set into 83 by the command 0x52; Secondly, for the multicast channel 1 address of SY01B whose address is 01, set the parameter 0x81 into 81 by command 0x50, for the multicast channel 2 , the parameter 0x82 is set into 82 by the command 0x51; Finally, for the multicast channel 2 address of SY01B whose address is 02, set the parameter 0x82 into 82 by the command 0x51; for the multicast channel 3, the parameter 0x83 is set into 83 by the command 0x52 (See the table)

Device Items	Device1 (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 debugging tool, and use RUNZE debugging tool software MotorTest V0.8 to debug. Set the address into 0x81, the command into 0x44, and the parameter into 0x01. Click to send and then observe that the action of switching valve port is carried out on device 1 & device 2. Set the address into 0x82, the command into 0x44, and the parameter into 0x03. Click to send and then observe that the action of switching valve port is carried out on device 2 & device3. Set the address into 0x83, the command into 0x44, and the parameter into 0x05. Click to send and then observe that the action of switching valve port is carried out on device 1 & device3. Set the address into 0xFF, the command into 0x44, and the parameter into 0x03. Click to send and then observe that the action of switching valve port is carried out on all the devices.

The newly added command to set the multicast address greatly meets the needs of customer groups, making it easier and more convenient for customers. You can choose the device you want to control so that you can complete your work more efficiently and quickly during usage.

b: Pump & Valve parameter query command (common command) (B2~B4)

Code B2	Abbreviation	Parameter Description B3 B4
0x20	Query address	B3=0x00 B4=0x00
0x21	Query RS232 baud rate	B3=0x00 B4=0x00
0x22	Query RS485 baud rate	B3=0x00 B4=0x00
0x23	Query CAN baud rate	B3=0x00 B4=0x00
0x2E	Query Automatic reset when power on	B3=0x00 B4=0x00
0x30	Query CAN destination address	B3=0x00 B4=0x00

0x70	Query address of multicast channel 1	B3=0x00 B4=0x00
0x71	Query address of multicast channel 2	B3=0x00 B4=0x00
0x72	Query address of multicast channel 3	B3=0x00 B4=0x00
0x73	Query address of multicast channel 4	B3=0x00 B4=0x00
0xAE	Query current channel address	B3=0x00 B4=0x00
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	Query valve status	B3=0x00 B4=0x00

C: Pump & Valve Action Command (Common Command) (B2~B4)

Gen Cmd (B2)	Command Instruction	Rsp Frame (B2) Status Def	Parameter Instruction (B3, B4)
0x42	CW rotation until reset optocoupler triggered, then halts.	B2=0x00 Normal state B2=0x01 Frame error B2=0x02 Parameter error B2=0x03 Optocoupler error B2=0x04 Motor busy B2=0x05 Motor stalling B2=0x06 Unknown locations B2=0x07 Command rejected B2=0x08 Illegal location B2=0xfe Task execution B2=0xff Unknown error	B3B4 Range: 0x0001 - 0x1770 If steps > max steps: Motor halts, returns B3=08, B4=00. If steps ≤ max steps: Motor runs as set.
0x43	CCW rotation until lower limit optocoupler triggered, then halts.		B3B4 Range: 0x0001 - 0x1770 If steps > max: Motor halts; returns B3=08, B4=00. If steps ≤ max: Motor runs per set value.
0x44	Valve rotates via code disc to auto-select optimal path.		Determined by the actual number of channels/ports of the switching valve. Example: For a 10-channel valve, set B3=0xXX B4=0x00 (XX = 01 - 0A).
0x4C	Valve reset		B3=0x00 B4=0x00 The switching valve runs to the reset optocoupler and stops
0x45	Reset of syringe pump		B3=0x00 B4=0x00 → Home & halt. 0x45 reset cmd: 1st power-on: Speed = 0x07 (max), ignores 0x4B. To override, run 0x43 first to enable 0x4B.
0x4F	Forced reset of syringe pump		B3=0x00 B4=0x00 → Home & halt. Forced reset: Resets blocking step to top, then retracts plunger by offset distance to create clearance, extending seal lifespan. Note: Command 0x4F forces reset and ignores 0x4B dynamic speed.

0x49	Forced stop (pump & valve)	B3=0x00 B4=0x00
0x4B	Set dynamic speed	B3B4: 0x0001 - 0x03E8 → Speed: 1 - 1000 Set per product specifications.
0x4E	Syringe runs to absolute position	B3B4 ranges from 0x0000~0x1770, which is optional position in the syringe stroke
0x66	Query syringe pump address	B3=0x00 B4=0x00 After pump operation, query motor position via command to display steps from home.
0x67	Synchronize the position of the syringe pump.	B3=0x00 B4=0x00 On power failure, position is memorized. Use 0x66 to sync position before moving plunger.

Table 4-3-3

Example: 0xA4: Switch hole positions according to the required direction

0xB4: Switch to the middle of the hole position in the desired direction (switching direction is consistent with the usage of 0xA4)

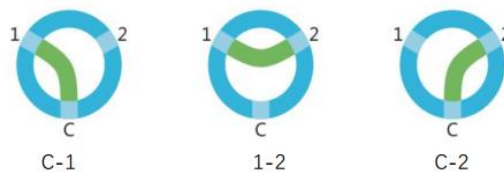
M01

If the current valve is in C-1 communication state

Goal: To reach the C-2 communication state in a clockwise direction

Command: 0xA4 Parameter: 0x0203,

The valve head will rotate clockwise and pass through 1-2 phases to reach C-2 phase, as shown in the following figure

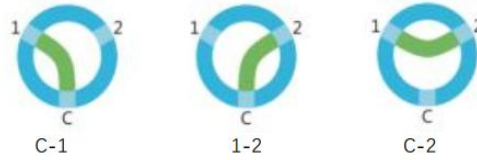


If the current valve is in C-1 communication state

Objective: To reach a 1-2 communication state in a counterclockwise direction

Command: 0xA4 Parameter: 0x0302,

The valve will rotate counterclockwise and pass through C-2 to reach 1-2, as shown in the following figure



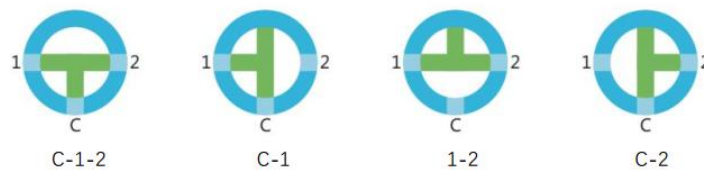
M02

If the current valve is in the C-1-2 communication state

Goal: To reach the C-2 communication state in a clockwise direction

Command: 0xA4 Parameter: 0x0304,

The valve will rotate clockwise through C-1.1-2 to reach the C-2 state, as shown in the following figure



If the current valve is in C-1 communication state

Objective: To reach a 1-2 communication state in a counterclockwise direction

Command: 0xA4 Parameter: 0x0403,

The valve will rotate clockwise through C-1-2 C-2 reaches 1-2 states, as shown in the following figure



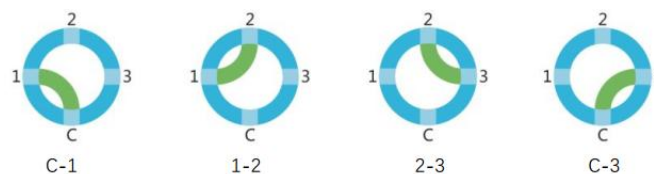
M04

If the current valve is in C-1 communication state

Goal: To reach the C-3 communication state in a clockwise direction

Command: 0xA4 Parameter: 0x0304,

The valve will rotate clockwise through 1-2.2-3 to reach the C-3 state, as shown in the following figure

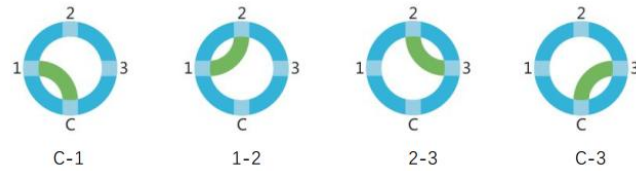


If the current valve is in C-1 communication state

Objective: To achieve 2-3 communication states in a counterclockwise direction

Command: 0xA4 Parameter: 0x0403,

The valve will rotate clockwise through C-3 to reach the 2-3 state, as shown in the following figure



M06-M12

Taking M06 as an example

If the current valve is in hole 1

Goal: To reach hole 5 in a clockwise direction

Command: 0xA4 Parameter: 0x0405,

The valve will rotate clockwise through hole 2,3 to hole 5, as shown in the following figure



If the current valve is in hole 1

Goal: To reach hole 5 in a counterclockwise direction

Command: 0xA4 Parameter: 0x0605,

The valve will rotate clockwise through hole 6 to hole 5, as shown in the following figure



Chapter 5 Simple troubleshooting

Fault	Reason	Exclusion method
Power on does not work	The working voltage is not within the qualified range.	Check if there is a deviation between the actual pin voltage and the rated voltage
	Loose or broken wiring	Manually check for good contact, or use a multimeter to check the wiring
Not aspirating liquid	Is it blocked by particulate matter	Remove the pump tube and eliminate foreign objects

Chapter 6 Quick Command

A Quick Commands

Code B2	Abbreviation	Parameter Description B3 B4
0x20	Query address	Address ranging from: 0x0000~0x007F, default 00
0xAE	Query valve position	B3=0x00 B4=0x00
0x3F	Query current version	B3=0x01 B4=0x09 (example) If response matches, version is V1.9. Check label for exact version.
0x4A	Query motor status	B3=0x00 B4=0x00
0x4D	Aspirate liquid	If B3 B4 steps > max, motor halts; returns B3=08, B4=00. If B3 B4 steps ≤ max, motor runs as set.
0x43	Discharge liquid	B3 B4 Step Limit Check: If > max steps: Motor halts; returns B3=08, B4=00. If ≤ max steps: Motor runs per B3B4 value.
0x44	Valve rotates via coding disc to auto-select optimal path.	According to the actual number of channels of the switching valve, for example, for a 10 channel switching valve, B3=0xXX B4=0x00, where XX has a value range of 01-0A
0x4C	Valve reset	B3=0x00 B4=0x00 Switching valve stops at the reset optocoupler position
0x45	Reset	B3=0x00 B4=0x00 Power-on reset = 0x4F: Resets to zero. Other resets: Direct zero-point return. 0x45 Reset Command: 1st power-on: Speed = 0x07 (max), ignores 0x4B. To override, run 0x43 once to enable 0x4B dynamic speed.
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

1. SY01B 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)

- Burn-in Protocol
- 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

2. parameter definition: 02 stands for RUZNE

- 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

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

switching)

- 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

- 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	
V1.2	Updated cover page	2022.6.24
V1.3	Added version notes and updated technical support contact information	2022.6.27
V1.4	Added hexadecimal quick reference table	2022.8.18
V1.5	Changed "TTL level" to "Voltage"	2023.6.16
V1.6	Merged command 0x45 with 0x4F	2024.4.2
V1.7	Added stall current parameter values for different syringes	2024.10.23
V1.8	Modified the query command for the syringe pump	2025.3.15
V1.9	Added notes on RS485 and CAN termination resistors	2025.4.16

Chapter 8 Technical Services

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