

User Manual

AR28 Series RS485 Communication Isolated Closed-Loop Stepper Motor (Differential 5V IO)

Supports Modbus-RTU Communication

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I. Product Introduction

1. Overview

The AR28 series is a highly integrated closed-loop stepper motor product that supports the RS485 communication protocol, enabling direct connection with PLCs, industrial computers, and other host computers. Through built-in motion control instructions, up to 31-axis motion platforms can be networked.

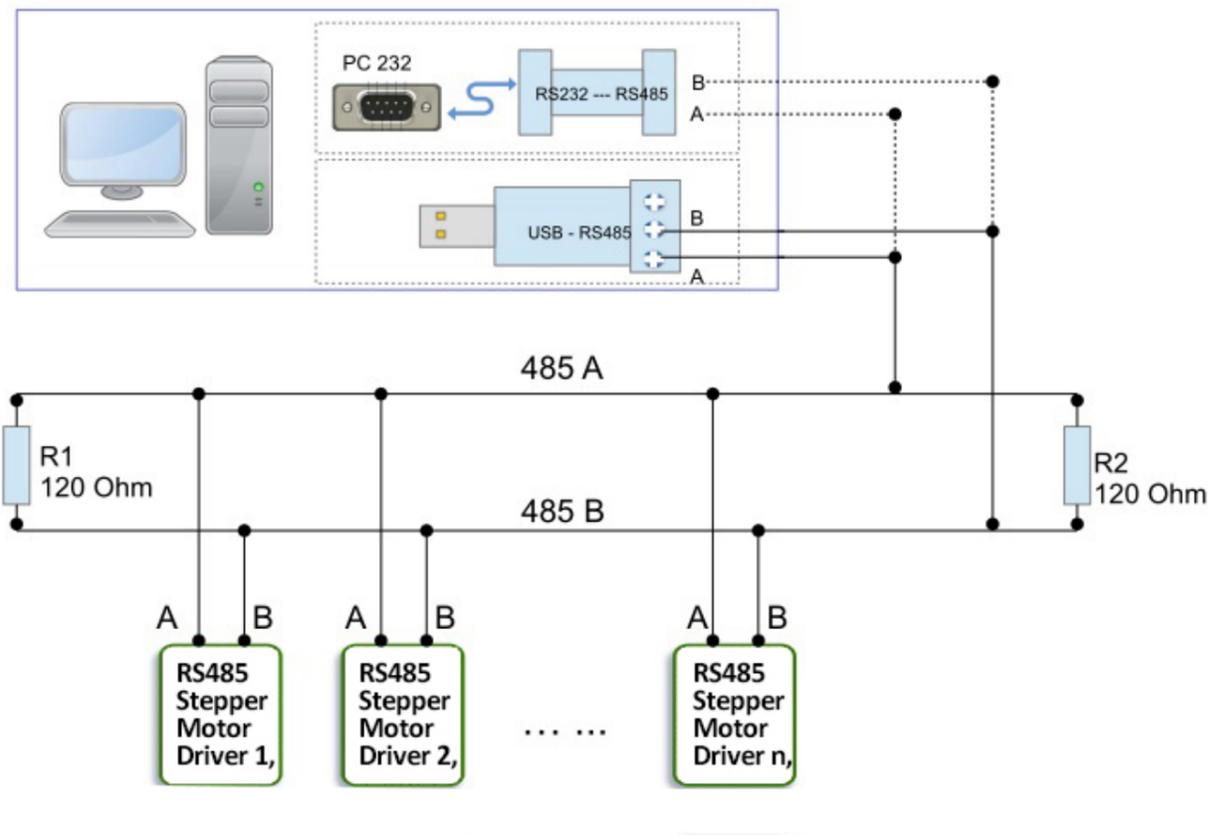
The AR28 drive unit has dimensions of 28×28mm and can be integrated with 28/35 specification stepper motors. The drive unit adopts DSP digital processing technology, built-in vibration suppression, low heat generation, and other new control algorithms, ensuring smooth motor operation, low noise, and controllable temperature. Built-in 1000-line magnetic encoder component provides higher speed output and operating precision compared to open-loop specifications.

Compared with similar integrated stepper products, the AR28 closed-loop integrated motor drive unit has two significant features:

- A.** Built-in communication isolation module effectively improves communication anti-interference ability, ensuring long-term stability of multi-site networking.

B. Using DSP digital processing technology, advanced drive control algorithms, and variable current and variable frequency technology, ensuring smooth motor operation at both low and high speeds, low noise, and controllable temperature.

The AR28 series provides integrated motor products with 28 and 35 flanges, with holding torque covering 0.06Nm-0.35Nm. Select the appropriate specification product according to actual needs.



2. Features

- ✓ Uses standard RS485 communication protocol, compatible with Modbus-RTU protocol, built-in motion control instructions
- ✓ Built-in communication isolation module effectively improves communication anti-interference ability, ensuring long-term stability of multi-site networking
- ✓ DC input voltage 15VDC~28VDC, recommended operating voltage 24V
- ✓ Drive circuit maximum output peak current 1.5A
- ✓ Integrated design, built-in magnetic encoder chip component, provides 28 and 35 specification closed-loop integrated motors
- ✓ Can be set to open-loop specification via software
- ✓ DSP technology ensures smooth output at low and high speeds, motor low vibration, low noise, smooth operation, low heat
- ✓ Advanced drive control algorithms and variable current and variable frequency technology, motor runs smoothly at both low and high speeds
- ✓ Programmable 1-256 subdivision, motor step distance uniform; can still output stably at 1 rpm/12 minutes
- ✓ 3 channels of 5V differential input signal ports (2 limit switches, 1 stop), 1 OC output port (peak 100mA)

3. Application Fields

Particularly suitable for various automation equipment and instruments with small volume, small space, and high anti-interference requirements, such as: electronic processing equipment, electronic assembly equipment, laser equipment, automatic grabbing equipment, packaging equipment, and robots. Excellent application effects on equipment where users expect high smoothness and low noise.

II. Electrical, Mechanical and Environmental Specifications

1. Electrical Specifications

Parameter	AR28 (5V IO)			Unit
	Min	Typical	Max	
Continuous Output Current	0	—	1.5	A
Power Supply Voltage (DC)	+15	+24	+28	VDC
Control Signal Input Current	6	10	16	mA
Overvoltage Protection Voltage	—	32	—	VDC
Insulation Resistance	100	—	—	MΩ

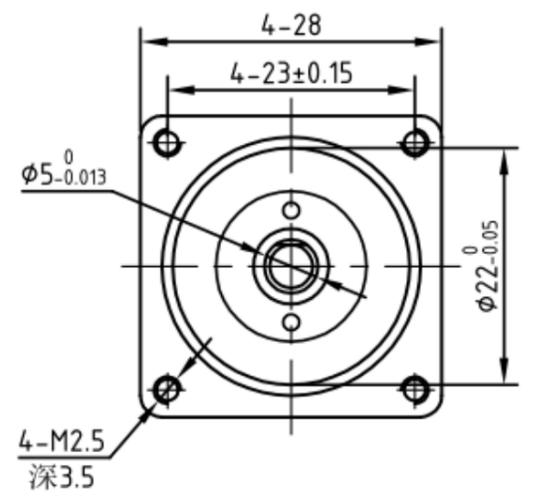
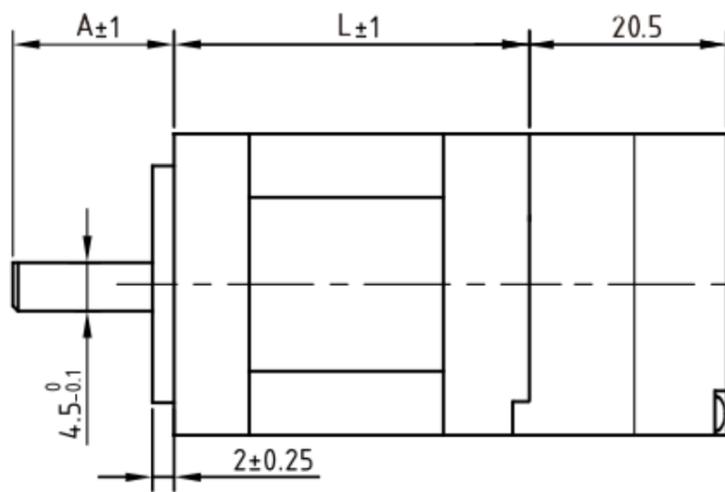
2. Operating Environment and Parameters

Parameter	Specification
Cooling Method	Natural cooling or forced air cooling
Operating Environment - Location	Cannot be placed near other heating equipment; avoid dust, oil mist, corrosive gases, high humidity, and strong vibration areas; flammable gases and conductive dust prohibited
Operating Environment - Temperature	-5°C ~ +45°C
Operating Environment - Humidity	40 ~ 90% RH
Operating Environment - Vibration	10 ~ 55Hz/0.15mm
Storage Temperature	-20°C ~ +65°C
Operating Altitude	≤1000m
Weight	Driver section approx. 50g (excluding motor)

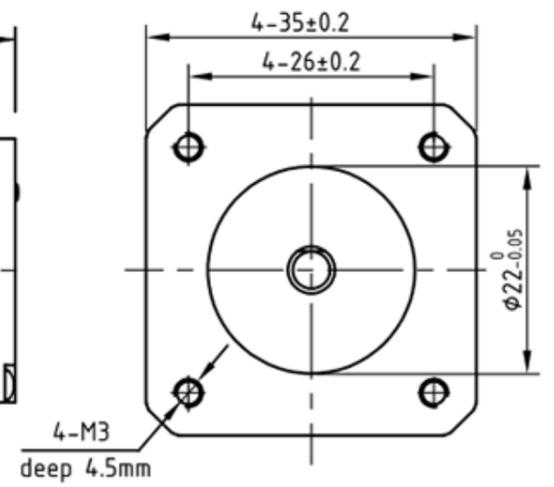
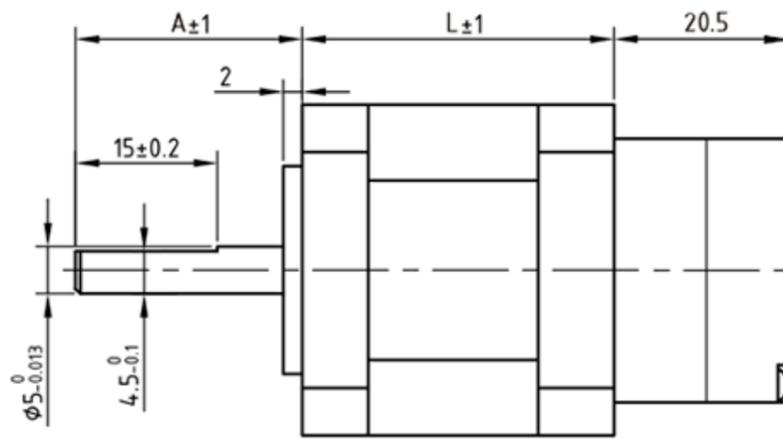
3. Product Dimensions and Motor Matching

AR28 series closed-loop integrated motor basic parameters:

Product Model	Motor Holding Torque	Shaft Length L	Motor Length L	Motor Specification
AR28-006IE	0.06 Nm	20mm	32mm	NEMA11
AR28-012IE	0.12 Nm	20mm	51mm	NEMA11
AR28-015IE	0.15 Nm	24mm	34mm	NEMA14
AR28-025IE	0.25 Nm	24mm	47mm	NEMA14



AR28-0061E / AR28-0121E Dimension Drawing (Refer to NEMA11 diagrams)



AR28-0151E / AR28-0251E Dimension Drawing (Refer to NEMA14 diagrams)

4. Heat Dissipation Precautions

The reliable operating ambient temperature for closed-loop integrated motors is typically within $-5^{\circ}\text{C} \sim 45^{\circ}\text{C}$. Normal operating temperature is $50\text{-}80^{\circ}\text{C}$. If exceeding 80°C , it is necessary to evaluate whether the operating conditions and integrated motor selection are appropriate. If necessary, install a fan near the driver for forced cooling to ensure the driver operates within the reliable working temperature range.

III. Driver Interface and Wiring Introduction



1. Host Computer Control Signal Port

Uses 12-pin 2.0mm pitch terminal.

Pin No.	Definition	Wire Color	Description
1	VDC	Red	Power supply positive input: DC voltage 15-28Vdc
2	GND	Black	Power supply negative input: DC voltage GND
3	RX	Yellow-Green	RS485 RX
4	TX	Pink	RS485 TX
5	LIM1+	Green	Forward limit signal / forward homing signal port: rising edge valid, high level 5V, low level 0~0.5V
6	LIM1-	Orange	Differential pair for LIM1
7	LIM2+	Brown	Reverse limit signal / reverse homing signal port: rising edge valid, high level 5V, low level 0~0.5V
8	LIM2-	Purple	Differential pair for LIM2
9	LIM3+	Gray	IO port 3: rising edge valid, high level 5V, low level 0~0.5V. Motor stops when port triggered
10	LIM3-	Yellow	Differential pair for LIM3
11	OUT+	White	Alarm / arrival / brake control signal output port, OC circuit, maximum 24V voltage. Instantaneous output current 100mA, continuous output current 50mA
12	OUT-	Blue	Differential pair for OUT

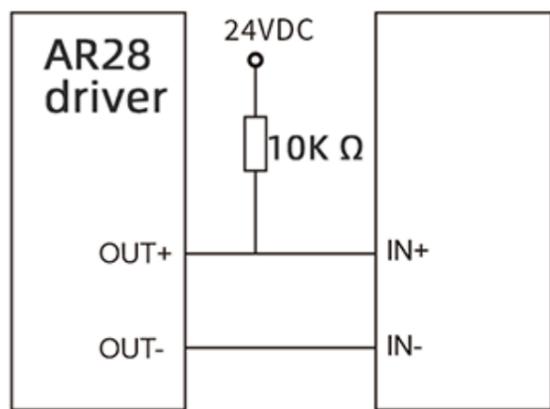
Notes:

1. This specification input signal port defaults to receiving 5V signals.
2. When the output port is connected to brakes, solenoid valves, relays, etc., freewheeling diodes must be connected across the devices to prevent port damage.

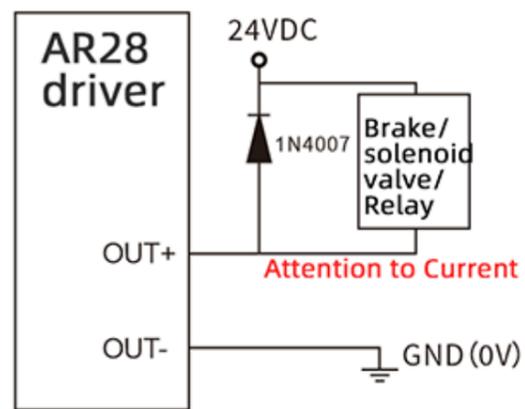
2. OUT Output Port Wiring Diagram

OUT+/OUT- ports are differential output ports, allowing maximum voltage of 24V. Port instantaneous output current is 100mA, continuous output current is 50mA.

To protect the port, when connecting external brakes, solenoid valves, relays, etc., freewheeling diodes must be connected across the devices to prevent port damage.



Alarm/Position Singnal Output



Brake/Solenoid valve/Realy Output

3. LED Status Indicator

The red LED serves as both power indicator and fault display. When the driver is powered on, the LED is constantly on; when the driver is powered off, the LED is off. When a fault occurs, the indicator flashes in a 5-second cycle; when the fault is cleared by the user, the LED remains constantly on. The number of flashes within 5 seconds represents different fault information, as shown in the following table:

No.	Flash Count	Fault Description
1	1	Overcurrent or inter-phase short circuit fault
2	2	Overvoltage fault
3	3	Undervoltage alarm
4	7	Position deviation alarm (excessive error)
5	9	Driver error, requires maintenance
6	4	Network congestion fault, requires power cycle (flashes 4 times, does not cycle)

When a fault occurs, the driver will stop and display the corresponding fault code (item 3 network congestion has no code). The user must re-enable the driver or power cycle to clear the fault. When the driver detects a fault, it saves the latest fault to the EEPROM in a queue format. The driver can save up to 10 latest historical faults.

IV. Basic Parameter Settings and Connection Instructions

AR28 default address is site 1, baud rate 38400, 8 data bits, no parity, 1 stop bit.

After connecting to the host computer, basic parameters such as subdivision, current, and baud rate can be set through commands. After setting, write 1 to address 90# to save to EEPROM, and restart to take effect.

For specific command settings, please refer to Chapter 5 - Register Address Definition List.

V. Communication Functions

The driver has a built-in trapezoidal acceleration/deceleration curve generator, which can set trapezoidal acceleration/deceleration (acceleration and deceleration values must be the same). Through communication commands, fixed-length operation, continuous operation, deceleration stop, and immediate stop can be achieved.

Internal operation supports absolute position mode and relative position mode control, with built-in common homing functions to simplify development. The internal pulse generator uses 32-bit speed, acceleration, and travel, enabling a wide range of trajectory generation.

1. Communication Protocol

Communication uses standard MODBUS protocol, supporting 0x03 (read register), 0x06 (write single register), 0x10 (16) (write multiple registers). Serial communication format: baud rate 9600~115200, 8 data bits, no parity, 1 stop bit.

2. MODBUS Register Address Definition

Address	Parameter Name	Attribute	Default	Value Range	Register Description
0	Peak Current	R	1050	1~1500	Unit: mA, related to #26
1	Subdivision Pulse Count	R/W/S	6000	200~51200	Subdivision × 200, number of pulses required for one motor revolution
2	Standby Time	R/W/S	300	100~10000	Time for driver to enter standby, unit: ms
3	Standby Current Percentage	R/W/S	50	0~100	Unit: %, applicable to both open-loop and closed-loop
4	DIP Switch Status	R	—	0~5600	Read only (bit operation)
5	Reserved	—	—	—	—
6	Enable Level & Fault Clear	R/W/S	0	0~1	0: High level enable; 1: Low level enable. Clear fault: write 0 then write 1
7	Motor Action When Disabled	R/W/S	0	0~1	0: Motor unlocked; 1: Motor shaft locked
9	FIR Filter Enable	R	0	0~1	0-Disable; 1-Enable
10	Filter Time	R/W/S	4000	50~25600	Set filter time: μs
11	Encoder Feedback Position	R	—	0~65535	Read only, valid for closed-loop, single-turn count only
12	Power-on Current Soft Start Time	R/W/S	4000	0~65535	To reduce rotor vibration during motor power-on and enable. Unit: 50μs
13	Open-loop Current Loop Auto-tuning Enable	R/W/S	1	0/1	Current loop PI power-on auto-tuning: 0-Disable; 1-Enable
14	Hybrid Servo Mode View	R	—	0~10	Read only
15	Current Loop Kp	R/W/S	1000	10~32767	Read only when auto-tuning is enabled; user writable when disabled
16	Current Loop Ki	R/W/S	200	0~32767	Read only when auto-tuning is enabled; user writable when disabled

Address	Parameter Name	Attribute	Default	Value Range	Register Description
24	Reserved	R	—	—	—
18	Baud Rate Setting	R/W/S	96	0~65535	96 = 9600; 384 = 38400
19	Bandwidth Setting	—	0	0~500	KHz (0: do not set bandwidth)
20	Motor Resistance	—	—	0~32767	ohm
21	Motor Inductance	—	—	0~32767	mH
17	Hybrid Servo Open/Closed-loop Control Selection	S	2	0~2	1: Open-loop mode; 2: Closed-loop mode
25	Hybrid Servo Control Mode	S	0	0~10	0: DIP switch selection; 1: Lead; 2: PM; 3: FOC (valid for closed-loop)
26	Hybrid Servo Operating Current Percentage	R/W	70	0~100	% (driver actual output current)
27	Hybrid Servo Current Loop Gain Adjustment	R/W	50	0~100	%
28	Hybrid Servo Encoder Bandwidth	R/W	0	0~500	KHz (0: do not set bandwidth)
29	Hybrid Servo Encoder Line Count	R/W	1000	200~65535	According to actual encoder line count
30	Position Deviation Alarm Threshold	R/W	2000	—	1000 represents 90°
31	Device ID	R	—	0~100	Communication address
35	Hybrid Servo FOC Position Loop Kp	R	—	0~32766	—
36	Hybrid Servo FOC Position Loop Ki	R	—	0~32766	—
37	Hybrid Servo FOC Position Loop Stiffness	R	—	0~32766	—
38	Hybrid Servo FOC Position Loop Kaff	R	—	0~32766	—
39	Total Pulse Count L	R	—	0~65535	External pulse count received, lower 16 bits
40	Total Pulse Count H	R	—	0~65535	External pulse count received, upper 16 bits. Open-loop: write 1 to clear; Closed-loop: cannot clear
41	Encoder Count Value Low 16 Bits	R/W	—	0~65535	When homing is complete and address #71 is status 4, current encoder count is 0

Address	Parameter Name	Attribute	Default	Value Range	Register Description
42	Encoder Count Value High 16 Bits	R/W	—	0~65535	—
43	Encoder Z-phase Status	R	0	0/1	1: Z signal triggered; 0: Not triggered. Only readable when encoder has Z signal
44	Hybrid Servo Velocity Loop Kaff	R	—	0~32766	Valid for closed-loop
46	Hybrid Servo Velocity Loop Kp	R	—	0~32766	Valid for closed-loop
47	Hybrid Servo Velocity Loop Ki	R	—	0~32766	Valid for closed-loop
48	Bus Voltage	R	—	—	10 represents 1V. Returns bus voltage (0.1V)
49	Single/Double Pulse Selection	R	0	0/1	0: Pulse + direction; 1: Double pulse
50	Pulse Edge Selection	R/W	0	0/1	0: Rising edge; 1: Falling edge
51	Motor Running Direction	R/W/S	1	0/1	0: CW; 1: CCW. Closed-loop: set via external DIP switch SW9
56	Fault Detection Selection	R/W	—	0~65535	Bit operation: bit0 - overcurrent detection mask; bit1 - overvoltage detection mask; bit2 - undervoltage detection mask; bit7 - position deviation detection mask; bit11 - op-amp fault detection mask
57	Enable Signal Fault Clear Selection	R/W	1	0/1	0: Not allowed; 1: Allowed
58	Enable Signal Current Soft Start Time	R/W	6000	0~65535	Unit: 1 represents 50μs
59	Motor Type Selection	R	0	0~65535	None
60	Alarm Read	R	0	—	0=No fault; 1=Overcurrent; 2=Overvoltage; 3=Undervoltage; 7=Position deviation; 11=Op-amp fault, return to factory
62	Deceleration Low 16 Bits	R/W/S	10176	0~65535	Unit: pulse/s ²
63	Deceleration High 16 Bits	R/W/S	9	0~65535	Unit: pulse/s ²
64	Running Speed Low 16 Bits	R/W/S	6000	0~65535	Unit: pulse/s
65	Running Speed High 16 Bits	R/W/S	0	0~65535	Unit: pulse/s
66	Acceleration Low 16 Bits	R/W/S	10176	0~65535	Unit: pulse/s ²
67	Acceleration High 16 Bits	R/W/S	9	0~65535	Unit: pulse/s ²
68	Travel Low 16 Bits	R/W/S	6000	0~65535	Unit: pulse

Address	Parameter Name	Attribute	Default	Value Range	Register Description
69	Travel High 16 Bits	R/W/S	0	0~65535	Unit: pulse
70	Motion Command	R/W	0	0~5	Triggers corresponding motion, then becomes 6. 0=Deceleration stop & exit homing; 1=Forward fixed-length motion; 2=Reverse fixed-length motion; 3=Forward continuous motion; 4=Reverse continuous motion; 5=Immediate stop; 6=Default, meaningless
71	Homing Command	R/W	0	0~2	1: Home using forward limit signal as zero point; 2: Home using reverse limit signal as zero point; 4: Homing complete
72	Fixed-length Motion Mode	R/W	0	0/1	0: Incremental mode; 1: Absolute mode
73	Input Port Trigger Mode	R/W/S	67	—	bit0-LIM1 port setting; bit1-LIM2 port setting; bit6-LIM3 port setting. 0=Normally closed mode, high level trigger; 1=Normally open mode, low level trigger. See 2.1 description
74	Input Port Trigger Polarity Read	R	0	0~1	0=Invalid; 1=Valid
75	Device Status Register	R	—	bitX	bit0=Overcurrent; bit1=Overvoltage; bit2=Arrival signal; bit4=Forward limit valid; bit5=Reverse limit valid; bit7=Internal pulse transmission complete flag. See 2.2 description
76	Output Port Function Selection	R/W/S	0	0~3	0=Alarm output; 1=Arrival output; 2=Brake control; 3=Free configuration
77	Output Port Polarity Setting	R/W/S	0	0~1	Valid only for #76 alarm and arrival output. 0=Normally open; 1=Normally closed
78	Output Port High/Low Level Setting	R/W	0	0~1	Valid only for #76 free configuration. 0=Low level, open; 1=High level, conductive
82	Homing First Speed L	R/W/S	12000	0~65535	After homing command is issued, this speed is executed before first triggering the zero point switch
83	Homing First Speed H	R/W/S	0	0~65535	—
84	Homing Second Speed L	R/W/S	1000	0~65535	During homing, this speed is executed after first triggering the zero point switch
85	Homing Second Speed H	R/W/S	0	0~65535	—
86	Homing Acceleration L	R/W/S	3200	0~65535	Unit: pulse/s ²
87	Homing Acceleration H	R/W/S	9	0~65535	Unit: pulse/s ²
88	Homing Limit Filter Time	R/W/S	10	0~65535	1 represents 50μs
90	Save Parameters	R/W	0	0/1	Write 1 to save current configuration, will run with saved values after power-on
91	Restore Factory Default Parameters	R/W	0	0/1	Write 1 to start clearing. Read this address: Return 0=Clearing incomplete; Return 1=Clearing complete

Address	Parameter Name	Attribute	Default	Value Range	Register Description
94~150	Reserved	R	—	—	Reserved

2.1 Definition of Input Port Trigger Mode (#73)

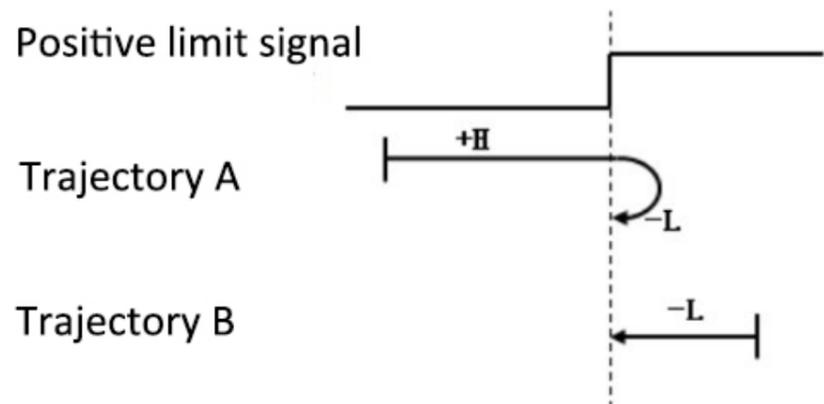
Bit Definition	Name	Default	Description
7~15	Reserved	0	0
6	LIM3 Status	1	1 = Normally open mode, low level trigger; 0 = Normally closed mode, high level trigger
2~5	Reserved	0	0
1	LIM2 Status	1	1 = Normally open mode, low level trigger; 0 = Normally closed mode, high level trigger
0	LIM1 Status	1	1 = Normally open mode, low level trigger; 0 = Normally closed mode, high level trigger

2.2 Definition of Device Status Register (#75)

Bit Definition	Name	Default	Description
8~15	Reserved	—	Reserved
7	Motion Complete	1	1 = Internal pulse transmission complete; 0 = Internal pulse transmission incomplete
6	Reserved	0	0
5	Reverse Limit	0	0 = No reverse limit signal; 1 = Reverse limit signal present
4	Forward Limit	0	0 = No forward limit signal; 1 = Forward limit signal present
3	Reserved	—	—
2	Arrival Signal	0	0 = Not arrived; 1 = Arrival complete
1	Overvoltage	0	0 = No overvoltage; 1 = Overvoltage occurred
0	Overcurrent	0	0 = No overcurrent; 1 = Overcurrent occurred

2.3 Homing Function

2.3.1 Homing Using Forward Limit Signal as Zero Point



After writing "1" to register address 71 (homing command), the homing process is as follows:

Trajectory A: When the homing command is issued and the forward limit switch is not triggered

Step 1: Move forward to the forward limit at the first homing speed set in addresses 82-83 and the acceleration set in addresses 86-87.

Step 2: After detecting the forward limit signal, decelerate and reverse direction.

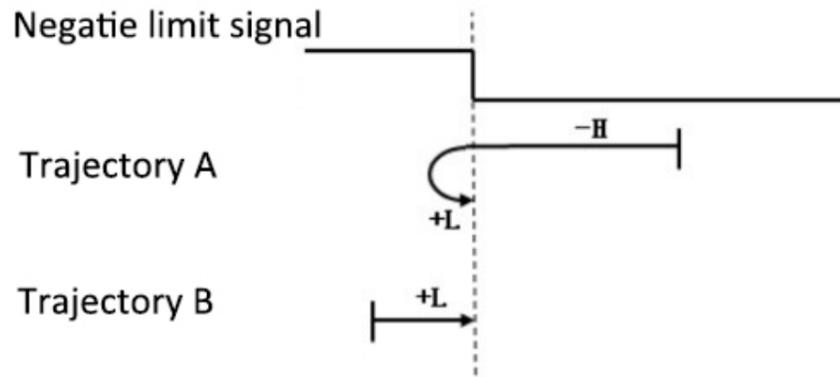
Step 3: Move in the reverse direction at the second homing speed set in addresses 84-85. When the falling edge of the forward limit signal is detected, the motor stops. Homing is complete.

Trajectory B: When the homing command is issued and the forward limit switch is already triggered

When homing starts, the motor moves in the reverse direction at the speed set in addresses 84-85. When the falling edge of the forward limit signal is detected, the motor stops. Homing is complete.

2.3.2 Homing Using Reverse Limit Signal as Zero Point

After writing "2" to register address 71 (homing command), the homing process is as follows:



Trajectory A: When the homing command is issued and the reverse limit switch is not triggered

Step 1: Move in the reverse direction to the reverse limit at the first homing speed set in addresses 82-83 and the acceleration set in addresses 86-87.

Step 2: After detecting the reverse limit signal, decelerate and reverse direction.

Step 3: Move in the forward direction at the second homing speed set in addresses 84-85. When the falling edge of the reverse limit signal is detected, the motor stops. Homing is complete.

Trajectory B: When the homing command is issued and the reverse limit switch is already triggered

When homing starts, the motor moves in the forward direction at the speed set in addresses 84-85. When the falling edge of the reverse limit signal is detected, the motor stops. Homing is complete.

2.3.3 Exit Homing

After writing "0" to register address 70 (motion command), the driver exits the homing process and decelerates to stop.

Attention:

In closed-loop control mode, the pulse counter cannot be cleared by writing 1 to register address 40, as this will cause an error in the motor electrical angle.

2.4 Common MODBUS Function Codes

2.4.1 Read Holding Register Command 0x03

Host → Slave Data:

Device Address	Function Code	Register Address		Register Count		CRC Check	
01	03	00	00	00	01	84	0A

Slave → Host Data:

Device Address	Function Code	Byte Count	Register Data		CRC Check	
01	03	02	0A	8C	BF	41

Slave returns current value (register address 00) as 2700mA.

2.4.2 Write Single Register Command 0x06

Host → Slave Data:

Device Address	Function Code	Register Address		Write Data		CRC Check	
01	06	00	40	06	40	8A	4E

Slave → Host Data:

Device Address	Function Code	Register Address		Write Data		CRC Check	
01	06	00	40	06	40	8A	4E

Write 1600 pulse/s to the slave's speed low 16 bits (register address 64).

2.4.3 Write Multiple Registers Command 0x10

Host → Slave Data:

Device Address	Function Code	Start Address		Register Count		Byte Count	Write Data 1		Write Data 2		CRC Check	
01	10	00	44	00	02	04	38	80	00	01	3B	24

Write 14464 to the slave's travel low 16 bits (register address 68) and 1 to travel high 16 bits (register address 69), for a total travel of 80000 pulses.

2.5 CRC Check Example Code

The following example calculates CRC in C language:

```

Uint16 Funct_CRC16(unsigned char * puchMsg, Uint16 DataLen)
{
    Uint16 i, j, tmp;
    Uint16 crcdata = 0xFFFF;
    for(i = 0; i < DataLen; i++)
    {
        crcdata = (*puchMsg) ^ crcdata;
        puchMsg++;
        for(j = 0; j < 8; j++)
        {
            tmp = crcdata & 0x0001;
            crcdata = crcdata >> 1;
            if(tmp)
            {
                crcdata = crcdata ^ 0xA001;
            }
        }
    }
    return crcdata;
}

```

2.6 Communication Exception Codes

Four situations may occur during communication:

1. Communication is normal, the driver can normally receive and return information.
2. Due to communication errors, the driver cannot normally receive information from the host, and the host times out.
3. The driver received data but detected an error (such as CRC error, frame length error), the driver does not return information, and the host times out.
4. The driver received a normal MODBUS frame but cannot process it correctly (such as unsupported function code, unsupported register address, etc.). In this case, the driver returns the corresponding fault information.

Fault information return format: Slave address + Function (0x80 + function code) + Fault code + CRC low + CRC high.

Fault Code	Name	Description
01	Illegal Function Code	This driver only supports function codes 0x03, 0x06, 0x10
02	Illegal Register Address	The written register address is out of range. In addition to the listed registers, some addresses are reserved for testing. Customers should not operate other registers.
03	Illegal Data	For example, when using function 03 to read more than 100 data at a time, the driver reports this fault. The driver has restrictions on the data range of some registers. Please follow the instructions for operation.

VI. Power Supply Selection

As long as the power supply voltage is within the specified range, the closed-loop integrated motor can work normally. AR28 integrated motors are best powered by regulated DC power supplies or switching power supplies. When using regulated switching power supplies, note that the output current range should be set to maximum.

Please note:

- 1) When wiring, ensure the positive and negative poles of the power supply are not reversed;
- 2) When using switching power supplies, the output current should be greater than or equal to the driver's operating current;
- 3) To reduce costs, multiple drivers can share one power supply, but ensure the power supply has sufficient capacity.

VII. Motor Selection

When the AR28 closed-loop integrated motor driver section is used as a standalone driver, it can drive 4-wire, 6-wire, and 8-wire 14, 20, 28, 35, and 39 two-phase hybrid stepper motors by setting address 24# to open-loop mode via host computer software. Both 1.8° and 0.9° stepper motors are supported.

Motor selection is mainly determined by motor torque and rated current. Torque is mainly determined by motor body length; longer motors have greater torque. Current is mainly related to inductance; low inductance motors have better high-speed performance but higher rated current.

VIII. Protection Functions

1) Overvoltage Protection

When the input voltage exceeds 32Vdc, the driver will stop working. The fault must be eliminated and the driver must be power cycled to reset.

2) Undervoltage Protection

When the input voltage falls below 10Vdc, the driver will stop working. The fault must be eliminated and the driver must be power cycled to reset.

3) Overcurrent Protection

When an overcurrent fault occurs, the driver will stop working. The fault must be eliminated and the driver must be power cycled to reset.

IX. Common Problems

1. Common Problems in Application and Solutions

Phenomenon	Possible Problem	Common Solutions	
Motor does not rotate	Power LED not lit	Check power circuit, ensure normal power supply	
	Motor shaft not enabled	Check if enabled, or if there is a fault alarm	
	Subdivision too small	Set reasonable subdivision	
	Driver has triggered protection	Power cycle	
	Motor output torque too low	Check if driver output current matches motor rated current	
	Motor phase missing	Check and correct motor wiring	
	Voltage too high or too low	Check power output	
	Motor or driver damaged	Replace motor or driver	
	Communication fault	Check host computer port, wiring, driver	
			Signal interference
Shielding ground not connected or poorly connected		Ensure reliable grounding	
Motor wire open circuit	Position inaccurate	Check and correct motor wiring	
Subdivision error		Set correct subdivision	
Motor stalls during acceleration		Acceleration time too short	Increase acceleration time / decrease acceleration rate
	Motor torque too small	Select motor with larger torque	
	Voltage too low	Appropriately increase voltage	

2. Driver FAQ for Users

Q: What are the advantages of microstepping drivers?

A:

- ✓ Improves step uniformity, thus improving control precision
- ✓ Reduces motor vibration
- ✓ Effectively reduces torque ripple and increases output torque

Q: Why does my motor only rotate in one direction?

A:

- ✓ Possible wiring polarity error
- ✓ Driver firmware error, requires re-flashing firmware

If other problems occur, please contact our application engineers.

Product Warranty Terms

1. One-Year Warranty Period

Our company provides a one-year warranty from the date of shipment for material and workmanship defects in our products. During the warranty period, we provide free repair services for defective products.

2. Exclusions from Warranty

- ✓ Improper wiring, such as reversed power polarity and hot-plugging
- ✓ Unauthorized modification of internal components
- ✓ Use beyond electrical and environmental requirements
- ✓ Poor environmental heat dissipation

3. Repair Process

Please contact our company's sales representative.

4. Warranty Limitations

The warranty scope of our products is limited to product components and workmanship (i.e., consistency).

Our company does not guarantee that our products are suitable for the customer's specific application, as suitability also depends on the technical requirements and operating conditions and environment of that application.

Important Notice:

Since the driver does not have reverse polarity protection, please confirm that the power supply polarity is correctly connected before powering on. Reversed polarity will cause the fuse in the driver to burn!

For detailed information please contact simon@stepping-motor.cn

www.adampower.de