iBLD42NR-H-S Series

Integrated Closed-loop Brushless Motor Instruction Manual

Versions：V1.0

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Instruction Manual For iBLD42NR-H-S Series Integrated Closed-loop Brushless Motor

1. Product introduction

1.1. Introduction

The iBLD42NR-H-S series integrated closed-loop brushless motor is a high-performance closed-loop motor independently developed by CHANGZHOU FULLING MOTOR CO., LTD. It adopts a 32-bit dedicated motor control chip, with high integration, small size, and complete protection measures. This motor adopts a new PWM control technology, which makes the brushless motor operate with advantages such as high rotation, low vibration, low noise, and good smoothness.

1.2. Characteristics

- Adopting a dedicated 32-bit motor control chip
- Adopting FOC magnetic field orientation control technology and SVPWM (space vector modulation technology)
- Input voltage 10VDC~50VDC, wide voltage input
- Supports multiple speed regulation modes (PWM, analog, communication)
- Equipped with control functions such as start stop, forward and reverse rotation, braking, etc
- RS485 communication, supporting Modbus communication protocol
- High precision speed and current dual closed-loop control
- Support software settings for control signal limits, PID, acceleration/deceleration, current values, and other parameters

- It has protection functions such as overvoltage, undervoltage, overcurrent, overtemperature, and locked rotor
- Ultra high cost-effectiveness, economically efficient
- Acceptable customization

1.3. Application Fields

Widely used in various small and medium-sized automation equipment and instruments, such as electronic processing equipment, 3C non-standard automation equipment, screw locking machines, wire stripping machines, winding machines, terminal machines, laser machines, marking machines, spray painting machines, small and medium-sized carving machines, automatic grabbing equipment, specialized CNC machine tools, packaging equipment and robots.

2. Electrical, Mechanical and Environmental Indicators

2.1. Electrical index

Parameters	Index			
	Minimum value	Typical value	Maximum value	Unit
Power supply voltage	10	24	50	VDC
Continuous output current	0	3.6	5.4	A
Logic input voltage	0	5	24	VDC
Analog input voltage	0	-	5	VDC
Output logic voltage	0	-	5	VDC
Output logic current (Charging current)	0	50	80	mA
Output sensor voltage	4.5	5	5.5	VDC
Output sensor current	0		30	mA
PWM pulse frequency	1	-	20	kHz

2.2. Use environment and parameters

Parameters	Index
Temperature	-20℃ ～ 50℃
Humidity	40 ～ 90%RH (No condensation)
Vibration	＜ 55Hz／0.15mm
On site environment	Avoid approaching other heat sources, avoid dust, oil mist, corrosive gases, places with high humidity and strong vibrations, and prohibit the presence of combustible gases and conductive dust
Storage temperature	-20℃ ～ 65℃
Type of cooling	Natural cooling or forced air cooling

2.3. Mechanical structure dimension diagram

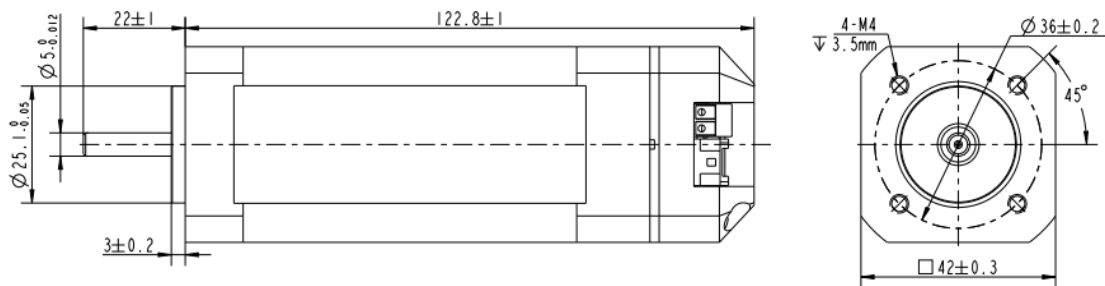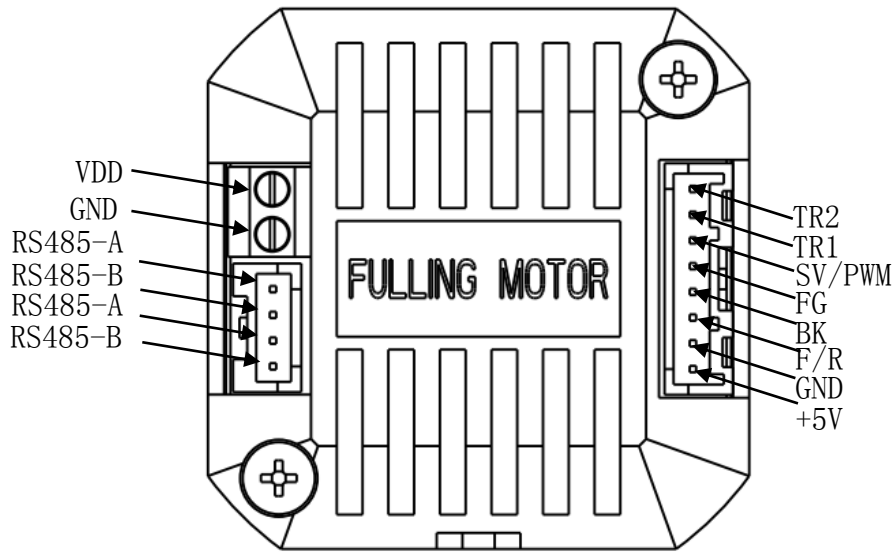### 2.3.1 Mechanical dimension diagram

图 1　机械尺寸图

图 2 端子定义图

2.4. Heat dissipation precautions

The reliable working temperature of an integrated closed-loop brushless motor is usually within 80 ℃. When installing, please use an upright side installation to create strong air convection on the surface of the heat sink. If necessary, install a fan near the driver to forcibly dissipate heat, ensuring that the driver operates within a reliable working temperature range.

3. Driver interface definition and wiring introduction

3.1. Interface Description

3.1.1 Control Port（B08B-PASK-1(LF)(SN) 8-bit pin）

Pin number	signal	function	Explanation
1	TR2	Terminal resistor terminal	TR2\ TR1 Short circuiting will connect to the terminal resistor
2	TR1	Terminal resistor terminal	TR2\ TR1 Short circuiting will connect to the terminal resistor
3	SV/PWM	Speed regulation signal (Can be	Analog speed control: 0.5V~4.5V，PWM speed regulation: Duty cycle polarity configurable

		configured by communication)	0~5% Full speed 5~95% Linear speed regulation 95~100% cease
4	PG	Speed signal	TTL-5V level，1 pulse /1 Antipolar / rotate
5	BK	Brake signal	Invalid when suspended or connected to a high level (2.6V~24V) Connected to low-level brake effective (0V~0.7V)
6	F/R	Directional signal	CW\CCW High and low level polarity can be configured by software High level（2.6V~24V） Low level (0V~0.7V)
7	GND	Sensor power supply Ground	Sensor power supply ground, shared with main power supply ground
8	+5V	Sensor +5V power supply	Sensor +5V power supply, Output current <=30mA

3.1.2 Power Port （B06B-XASK-1(LF)(SN) 6-bit pin）

Pin number	Signal	Function Description
1	VDD	Power input positive terminal，input voltage 10V~50Vdc
2	GND	Power input negative terminal
3	A	Communication RS485-A
4	B	Communication RS485-B
5	A	Communication RS485-A
6	B	Communication RS485-B

3.2. Interface circuit
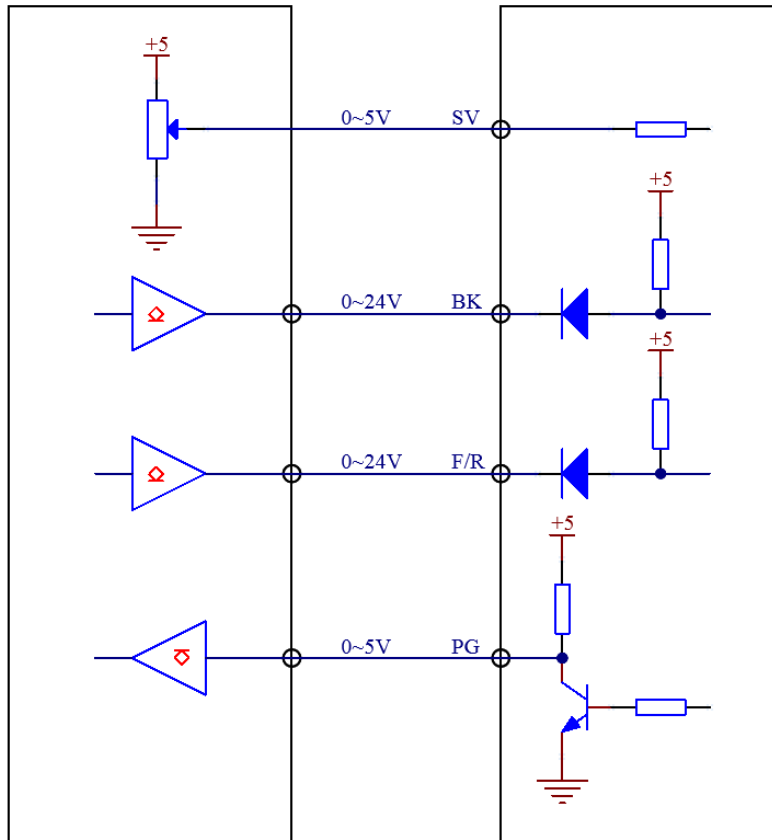
Input signal of iBLD42NR-H-S.

FIG. 3 Wiring diagram of control signal

3.3.   Speed regulation mode control

IBLD42NR-H-S provides the following three speed regulation modes that users can choose from (configured through the upper computer):

External analog speed regulation: By using Fulling's upper computer software, set the control mode (0x0002) to 0, and speed regulation can be achieved through external analog output or potentiometer (recommended potentiometer 5K~100K).

External PWM speed regulation: By using Fulling's upper computer software, the control mode (0x0002) is set to 1 or 2. A pulse width digital signal (PWM) with an amplitude of 5V and a frequency of 1KHz-20KHz can be applied between SV/PWM and GND for speed regulation. The motor speed is linearly adjusted by its duty cycle.

Communication speed regulation: By using Fulling's upper computer software, set the control mode (0x0002) to 3, set the target speed (0x0004), and set the communication start stop (0x0003) to 1.

3.4. LED Status Indication

The green LED is the power indicator light. When the motor is powered on, the green LED remains on; Cut off the power and the green LED will turn off.

The red LED is the fault indicator light. When a fault occurs, the red indicator light flashes for a period of 600ms (Duty 50%). After flashing, the light goes off for 1 second and cycles back and forth; When the fault is cleared by the user, the red LED remains off. The number of red LED flashes represents different fault information, as shown in the table below.

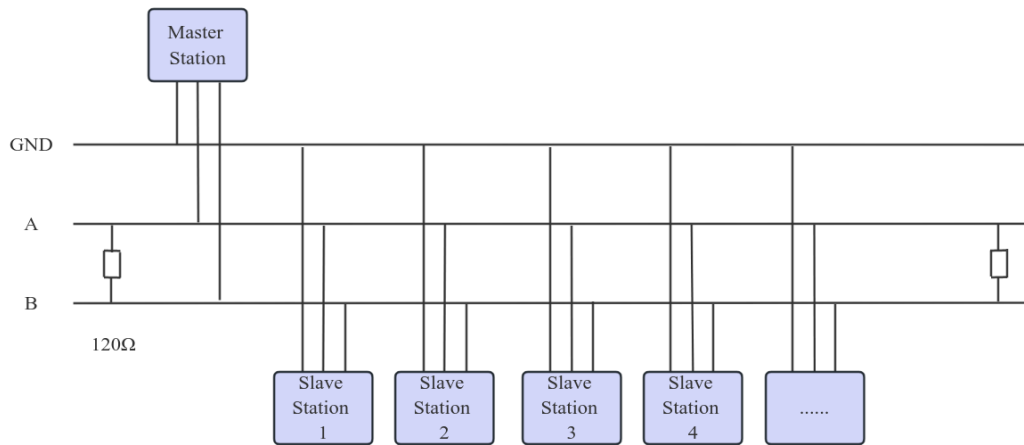| Serial number	Flashing frequency	Red indicator light flashing waveform	Fault Description
1	0	Red light goes out	No faults
2	1	⎍_____⎍	Overcurrent fault
3	2	⎍⎍_____⎍	Undervoltage fault
4	3	⎍⎍⎍_____⎍	Overvoltage fault
5	4	⎍⎍⎍⎍_____⎍	Over temperature fault
6	5	⎍⎍⎍⎍⎍____⎍	HALL malfunction
7	6	⎍⎍⎍⎍⎍⎍___⎍	Motor blocking protection

3.5. Communication wiring diagram

FIG. 4 RS485 Communication Wiring Diagram

3.6. Communication Protocol

The communication mode adopts the standard Modbus protocol and uses RS485 dual wire serial link communication. The serial port baud rate is 115200, with one stop bit and no parity check.

Serial number	Modbus Protocol address	Parameter name	Access	Default value	Value range	Value Definition
1	1	Software version	R	-	-	-
2	2	Control mode	R/W	0	0-3	0-Analog voltage 1-Pwm Low duty cycle 2-Pwm High duty cycle 3- Communication
3	3	Communication start stop	R/W	0	0-1	0- Communication stopped 1- Communication start (Only valid in communication mode)
4	4	Target speed (rpm)	R/W	0	-6000-6000	

5	5	Acceleration time (milliseconds)	R/W	1000	0-65535	
6	6	Deceleration time (milliseconds)	R/W	1000	0-65535	
7	7	maximum current (0.01A)	R/W	1000	0-65535	
8	8	SV Starting voltage (0.01V)	R/W	50	0-500	
9	9	Minimum rotative speed (rpm)	R/W	50	0-1000	
10	10	Maximum SV voltage (0.01V)	R/W	450	0-500	
11	11	Maximum speed of revolution （rpm）	R/W	4000	1000-20000	
12	12	Overvoltage protection threshold (0.01V)	R/W	3000	1000-6000	
13	13	Undervoltage protection threshold (0.01V)	R/W	1200	500-3000	
14	14	Over and under pressure hysteresis area (0.01V)	R/W	200	50-1000	
15	15	Overvoltage and undervoltage time threshold (second)	R/W	3	0-1000	
16	16	Over temperature point (0.01 Celsius)	R/W	11000	5000-18000	
17	17	Over temperature hysteresis threshold (0.01 Celsius)	R/W	1000	100-5000	
18	18	Over temperature	R/W	10	1-6000	

		hysteresis time (second)				
19	19	locked-rotor current (0.01A)	R/W	400	300-600	
20	20	Locked rotor time (second)	R/W	3	0-10	
21	21	Directional polarity selection	R/W	0	0-1	0-low level CW 1-high level CW
22	22	Speed loop Kp	R/W	30000	0-65535	
23	23	Speed loop Ki	R/W	2000	0-65535	
24	24	Current loop Kp	R/W	15000	0-65535	
25	25	Current loop Ki	R/W	4096	0-65535	
26	26	Flash Parameter control	R/W	0	0-2	0- Reading power outage parameters 1- Save parameters to EEPROM 2- Restore factory settings
27	32	Slave address	R/W	1	1-250	
28	48	Actual speed	R	-	0-65535	-
29	49	Real time voltage	R	-	0-65535	-
30	50	Real time current	R	-	0-65535	-
31	51	Fault status	R	-	0-65535	-
32	52	Real time temperature	R	-	0-65535	-
33	53	Given speed	R	-	-6000-6000	
34	54	Phase current	R	-	0-65535	

Read multiple register examples：

Default baud rate for all-in-one machine: 115200; default station number: 1; default verification method: no verification; default stop bit: 1

Send message: 01 03 00 30 00 02 C4 04

Feedback message: 01 03 04 00 00 09 54 FD 9C

Analysis:

Host → Slave Data:

message	01	03	00 30	00 02	C4 04
explain	The addresses of	Function code	Register address	Read the number of registers	CRC check code

	the slave stations					

Slave → Host Data:

message	01	03	04	00 00	09 54	FD 9C
explain	The addresses of the slave stations	Function code	Number of bytes returned	The content of address 0030H	The content of address 0031H	CRC check code

Note: This message is used to read the contents of the two consecutive addresses 0x0030 and 0x0031 registers starting from address 0x0030, and return data 0000 (hexadecimal) and 0954 (hexadecimal), that is, 0x0000 has a speed of 0rpm and 0x0954 (hexadecimal)=2388, which is the actual voltage of 23.88V.

3.7. Wiring requirements

1) To prevent interference with the driver, it is recommended to use shielded cables for control signals, and the shielding layer should be short circuited to the ground wire. Unless otherwise specified, the shielding wire of the control signal cable should be grounded at one end: the upper computer end of the shielding wire should be grounded, and the driver end of the shielding wire should be suspended. Grounding is only allowed at the same point within the same machine. If it is not a true grounding wire, it may cause serious interference, and the shielding layer is not connected at this time.

2) If a power supply supplies multiple drives, parallel connection should be adopted at the power supply, and chain connection from one to another is not allowed.

3) It is strictly prohibited to plug and unplug the driver terminals with electricity. When a live motor stops, there is still a large current flowing through the coil, and plugging and unplugging the terminals will cause a huge instantaneous induced electric potential that will burn out the driver.

4) It is strictly prohibited to solder the wire head and connect it to the wiring terminal, otherwise it may overheat and damage the terminal due to increased contact resistance.

5) The wiring terminal should not be exposed outside the terminal to prevent

accidental short circuit and damage to the driver.

4. Product warranty clause of FULLING MOTOR

1) One year warranty

FULLING provides a one-year warranty against defects in the raw materials and workmanship of its products from the date of shipment. During the warranty period, FULLING provides free repair service for defective products.

2) Not covered by warranty

A、Inappropriate wiring, such as reversed polarity of the power supply and live plugging and unplugging

B、Unauthorized modification of internal components

C、Use beyond electrical and environmental requirements

D、Poor environmental heat dissipation

3) Repair process

If the product needs to be repaired, the following process will be followed:

(1) Before shipping, please call the customer service personnel of FULLING to obtain a repair permit number;

(2) Please send a written explanation along with the goods, explaining the phenomenon of the faulty drive being repaired; The voltage, current, and usage environment at the time of the malfunction; The name, phone number, and mailing address of the contact person.

(3) Prepaid postage to CHANGZHOU FULLING MOTOR Co., Ltd., No. 69 Kunlun Road, Xinbei District, Changzhou City, Jiangsu Province
Postal code: 213032.

4) Warranty Limitations

A、The warranty scope of FULLING's products is limited to the components and processes of the products (i.e. consistency)

B、FULLING does not guarantee that its products will be suitable for the specific use of customers, as the suitability is also related to the technical specifications, usage

conditions, and environment of the use.

5) Maintenance requirements

When repairing, please truthfully fill out the "Repair Report" (this form can be downloaded from www.fullingmotor.com) for maintenance analysis. Mailing address: CHANGZHOU FULLING MOTOR Co., Ltd., No. 69 Kunlun Road, Xinbei District, Changzhou City, Jiangsu Province. Postal code: 213032.

5. Version Description

Version number	Summary of Revision Content	date
V1.0	Create	2024-3-11

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