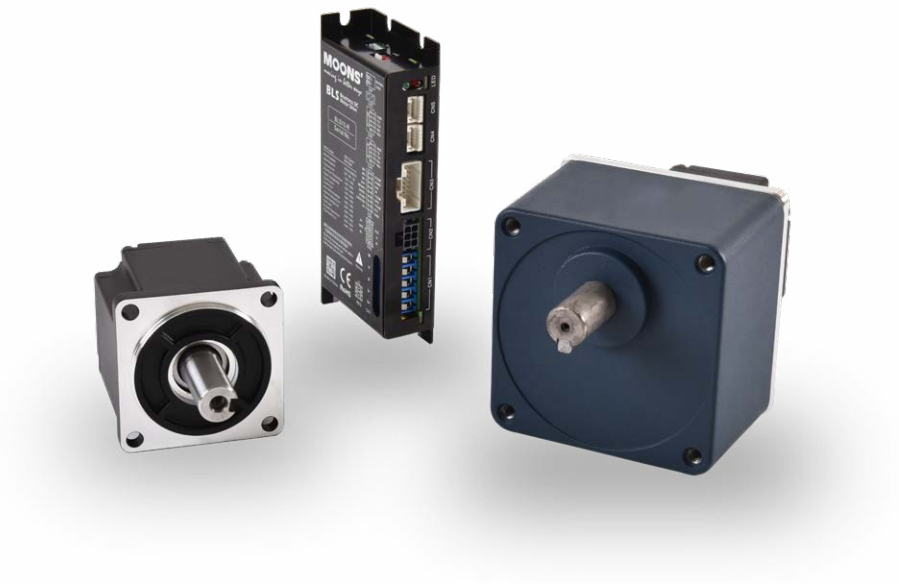
BLS10-R

DC Brushless

UserManual



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SHANGHAI AMP&MOONS' AUTOMATION CO.,LTD.

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03/05/2025

Contents

Version Change History

Rev	Time	Change content
1.0	2024.12	First Edition
1.1	2025.05	Correction of errors in the manual

1 Introduction

1.1 About Manual

This manual is the user manual for the BLS series drive.

It provides information about the installation, configuration, and basic operation of the BLS series drive unit.

This document is intended for qualified personnel who transport, assemble, and maintain this equipment. About this manual

1.2 Safety Statement

This chapter explains the safety precautions that need to be paid attention to for the correct use of this product. Before using this product, please read the instruction manual and correctly understand the relevant information on safety precautions. Failure to comply with the matters stipulated in the safety precautions may result in death, serious injury, or damage to the equipment.

- The "Danger", "Warning"; and"Caution&" items in the manual do not represent all the safety matters that should be followed, but only serve as a supplement to all safety precautions.
- This product should be used in an environment that meets the design specifications, otherwise it may cause malfunctions. Functional abnormalities or component damage caused by failure to comply with relevant regulations are not within the scope of product quality assurance.
- Our company will not assume any legal responsibility for personal safety accidents, property losses, etc. caused by failure to comply with the contents of this book and illegal operation of the product.

1.3 Safety Symbols

Safety signs indicate potential personal hazards or equipment damage, such as failure to follow recommended precautions and actual safe practices. The following are cautionary safety symbols used in this manual and on the drive:

 Caution  Dangerous Voltage  Earth  Caution, Hot Surface

1.4 Safety

To prevent hazards to people and damage to property, installation should only be performed by qualified personnel.

 BLS series products use dangerous voltage. The drive must be properly grounded.

Before you install BLS series products, please read the product manual carefully. Failure to follow safe operating instructions may result in personal injury or equipment damage.

1.5 Safety Notes

1.5.1 Installation Precautions

- It is forbidden to use this product in the environment with moisture, corrosive gas, flammable and explosive
- Do not use this product in places with strong vibration and shock
- Do not use cables immersed in water or oil
- Do not squeeze or stress the cable to avoid dangerous situations such as electric leakage caused by damage to the cable.
- Do not block the heat dissipation holes of the driver, and avoid metal chips and other conductive objects entering the driver during installation
- Do not directly touch the rotating motor shaft with your hands
- Do not knock the motor during installation, so as not to damage the motor shaft or the internal optical encoder
- In the first test run, first separate the coupling or belt of the mechanical equipment, so that the motor is in a no-load state
- Incorrect parameters will cause abnormal operation under load
- The temperature of the drive radiator, motor, and external regeneration resistor will rise during operation, please avoid touching
- Do not lift the motor lead wire during transportation and installation

1.5.2 Wiring Precautions

- Do not connect the power grid to the UVW motor terminal on the drive side, it will damage the drive or cause a fire
- Please connect the output UVW of the driver and the UVW of the servo motor directly, and do not pass the electromagnetic contactor in the middle.
- Please tighten the fixing screws of the power supply and motor output terminals, otherwise it may cause fire
- Do not switch the main power supply of the driver frequently. If you really need to switch the power supply repeatedly, please control it to less than 1 time per minute.
- Avoid bundling the main circuit cable with the input and output signal cables.
- Please use twisted pair shielded wire for input signal wire and encoder signal wire
- Please use the specified power supply voltage
- One wire insertion port of the terminal block, please insert only one wire
- When inserting the wire, do not short the core wire with the adjacent wire
- Be sure to ensure that the driver power supply and motor are well grounded
- Before powering on, make sure all wiring is correct

1.5.3 Precautions during trial operation

- Do not directly touch the rotating motor shaft with your hands
- In the first test run, first separate the coupling or belt of the mechanical equipment, so that the motor is in a no-load state
- Incorrect parameters will cause abnormal operation under load
- The temperature of the drive radiator, motor, and external regeneration resistor will rise during operation, please avoid touching
- Before the machine starts running, please confirm whether the emergency stop device can be activated at any time
- Use servo motors with brakes on vertical loads to avoid equipment falling during alarm, failure, power failure

2 Product Information

2.1 Product Introduction

Thank you for choosing MOONS' BLS series brushless servo system. This series of DC input drivers is based on advanced digital current and speed control technology, which can provide large torque output, stable speed and low noise. We hope that the superior performance, excellent quality and excellent cost performance of our products can help you successfully complete your motion control project.

Features:

- Low-voltage DC input voltage 24-48V wide voltage input.
- Rated current 15A, triple overload capacity.
- Accept analog control signals, digital control signals and RS485 communication commands.
- EMC can reach industrial level and retain a large margin.
- The anti-interference ability of the feedback signal is enhanced, and the contact discharge is upgraded to 6KV.

2.2 Drive model introduction

2.2.1 Drive model description

BLS 10 - 4XU - R - ****

① ② ③ ④ ⑤

① BLS Brushless Servo Drive

② Output Current

10：Rated Current 15A (Peak Current 45A)

③ Type

Null：Singal Axis

4XU：Vertical 4-in-1

④ Communication Mode

R：RS-485

⑤ Customized Code

2.3 Product Specifications

2.3.1 Electrical Specifications

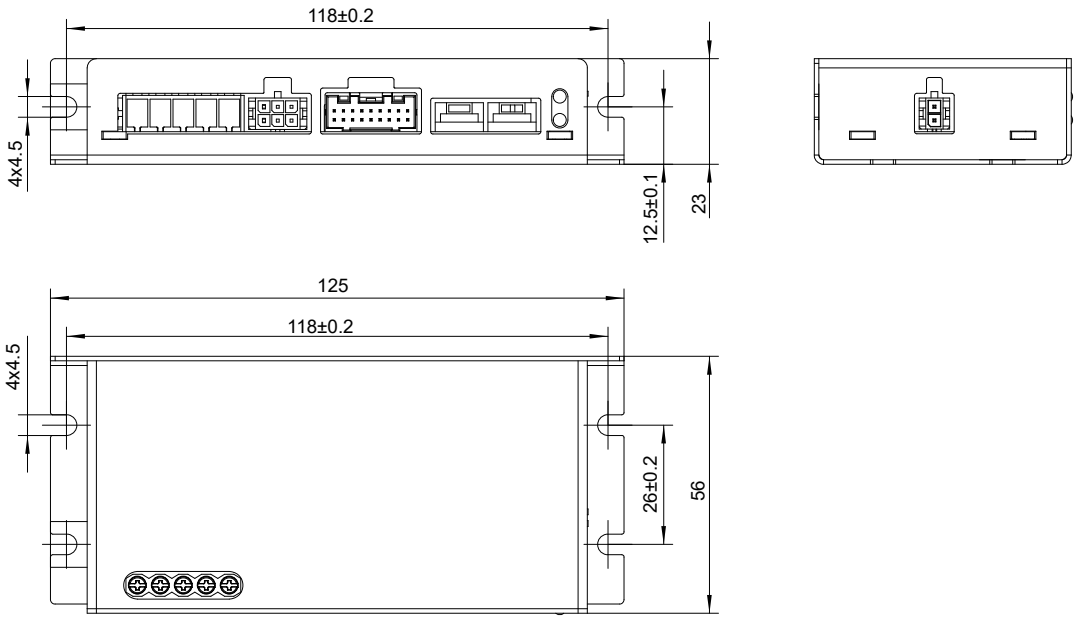
Product model	BLS10-R
Structure size	118*56*23
Continuous output A (rms)	15A
Maximum output current A (rms)	45A
Main circuit power supply	24～48VDC
Typical power supply voltage	24VDC or 48VDC
Insulation voltage	Primary to ground: withstand voltage 500VDC, 1 min
Cooling method	Natural cooling

2.3.2 General specifications

Usage Environment	Temperature		Ambient temperature: 0°C ~ 55°C (If the ambient temperature of servo drive is higher than 45°C, please install the drive in a well-ventilated location) Storage temperature: -20°C ~ 70°C
	Humidity		Both operating and storage : 10 ~ 85%RH or less
	Altitude		Below 1000m, if above 1000m, the rating should be reduced The derating if used at an altitude of 1000m ~ 2000m for every 100m increase in use is 1%
	Vibration		9.8m/s² or less, 10 ~ 60Hz (Do not use continuously at resonance frequency)
I/O	Digital Signal	Input	7 digital signal inputs: Opto-isolated, single-ended input, supports NPN and PNP connections, 5~24 VDC, minimum pulse width 50μs, maximum pulse frequency 5kHz
		Output	3 digital signal outputs: Optoelectronic isolation, open collector, maximum withstand voltage 30V, maximum current 100mA, maximum pulse frequency 1kHz
	Analog Signal	Input	1 Analog input, 0～10V, 12bit
Communication Port	RS-485		Modbus/RTU protocol communication (supported by -R series)
Status Indicator			Red, Green LED
Protection			Overcurrent, overvoltage, undervoltage, overtemperature, overload, speed limit, emergency stop, communication abnormality, power reverse protection, phase loss protection, save failure

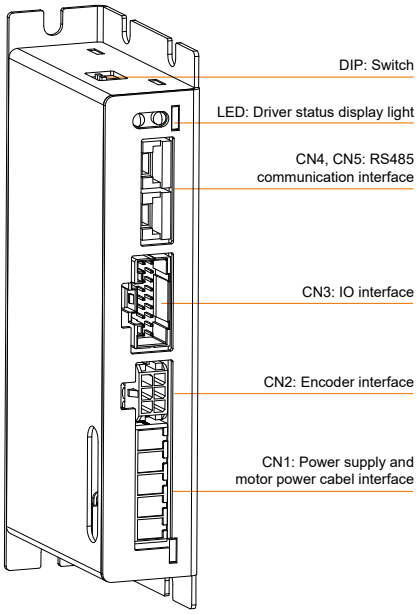
2.4 Drive Dimensions(Unit: mm)

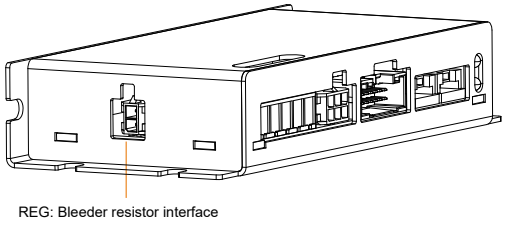
BLS10-R:



2.4.1 Parts Description

BLS10-R





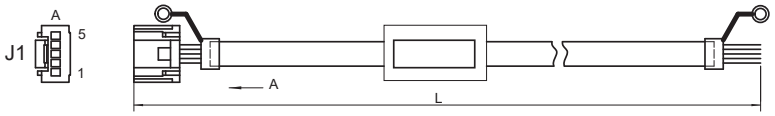
Serial number	Part Name	Description
1	CN1	Power supply and motor power cabel interface
2	CN2	Encoder interface
3	CN3	I/O interface
4	CN4、CN5	RS485 communication interface (can be connected to debugging software)
5	LED	Driver status display light
6	DIP	DIP switch

3 Optional Accessories

3.1 Optional Accessories List

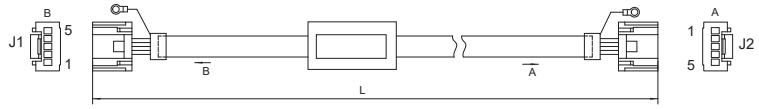
☐ Motor extension cable

Model	length(L)
3004-313-1M	1m
3004-313-3M	3m



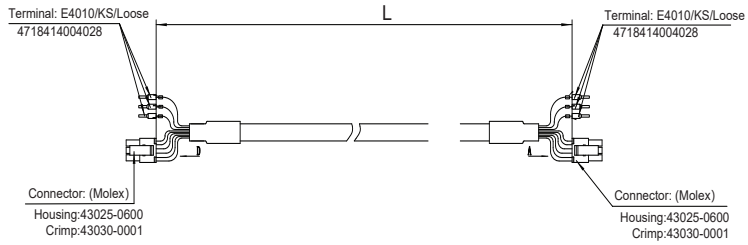
□ Networking cable

Model	length(L)
2111-050	0.5m
2111-0100	1m
2111-0300	3m
2111-0500	5m



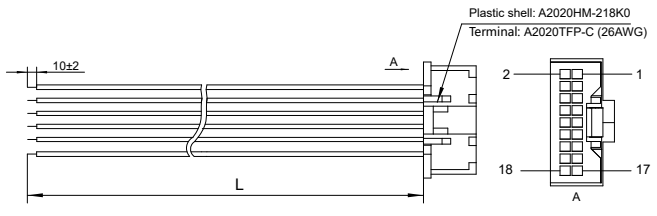
□ Power and encoder cable

Model		length(L)
Standard Cable	Flexible Cable	
4203-0100	4203-0100-C10	1m
4203-0300	4203-0300-C10	3m
4203-0500	4203-0500-C10	5m



□ IO extension cable

Model	length(L)
1677-0030	0.3m



4 Installation

4.1 Storage Conditions

Please note the following when storing:

- Correctly packaged and store in a clean and dry place, avoid direct sunlight
- Store within an ambient temperature range of -20 ℃ ~ +70 ℃
- Store within a relative humidity rang of 20% to 85% and non-condensing
- DO NOT store in a place subjected to corrosive gasses

4.2 Installation Conditions

The operating environment conditions of the product driver are:

1) Temperature is 0℃ ~ 50°C. If the ambient temperature exceeds 45 ℃, please place it in a well-ventilated place. It is recommended to operate at 45℃ for a long time

2) If this product is installed in a distribution box, the distribution box must be sized and ventilated so that there is no danger of overheating of all electronic devices used inside.

3) Ambient humidity is 10%~85% RH, no condensation

4) Vibration below 9.8m/s^2

5) Do not use the driver near corrosive gas, flammable gas or combustible material

6) Please install the driver in an indoor electrical control box without water and direct sunlight

7) Please avoid using these drive-in dusty places

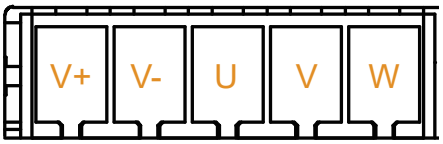
4.3 Drive installation space

- When installing the drive, please reserve enough space for the drive, down, left and right. It is recommended to leave more than one spacing on both sides of the horizontal direction to heat dissipate, and leave more than one spacing on both sides of the vertical direction to 10mm (0.39in.) and 50mm (1.97in.) on both sides of the vertical direction to leave more than one spacing on both sides of the vertical direction to 50mm (1.97in.) , ensure good circulation cooling effect
- Do not block the cooling holes of the drive.
- To ensure the temperature in the cabinet, it is recommended to install a cooling fan in the cabinet.
- Please ground the drive well during installation.

5 Wiring

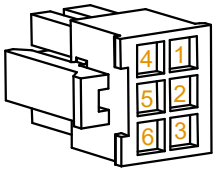
5.1 Power terminal wiring (CN1)

The optimal operating voltage of the driver is 24-48VDC. Users can select the power supply according to the rated voltage and power of the motor. Under the same output current, the higher the power supply voltage, the higher the temperature rise of the motor and the driver. Using it at the maximum input voltage allowed by the driver will reduce the adjustment range of the PWM duty cycle. When the driver uses a 48VDC power input, in order to prevent overvoltage caused by regenerative electromotive force, please use an appropriate voltage clamping device. Using MOONS's back-EMF clamp absorption module RC880 can effectively solve this problem. If you use an uncalibrated DC power supply, please make sure that the output voltage of the power supply does not exceed the maximum input voltage allowed by the driver when it is unloaded.



Pin	Pin definition
1	V+
2	V-
3	U
4	V
5	W

5.2 Feedback signal terminal wiring(CN2)

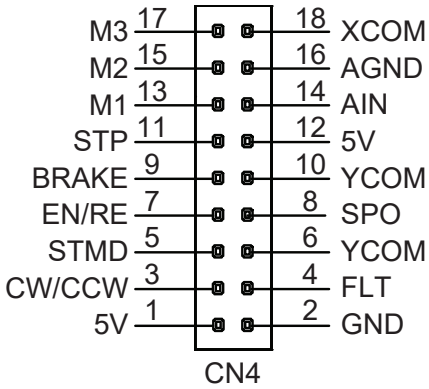


Pin	Pin definition
1	VCC
2	A-
3	B-
4	A+
5	GND
6	B+

5.3 IO input/output signal wiring(CN3)

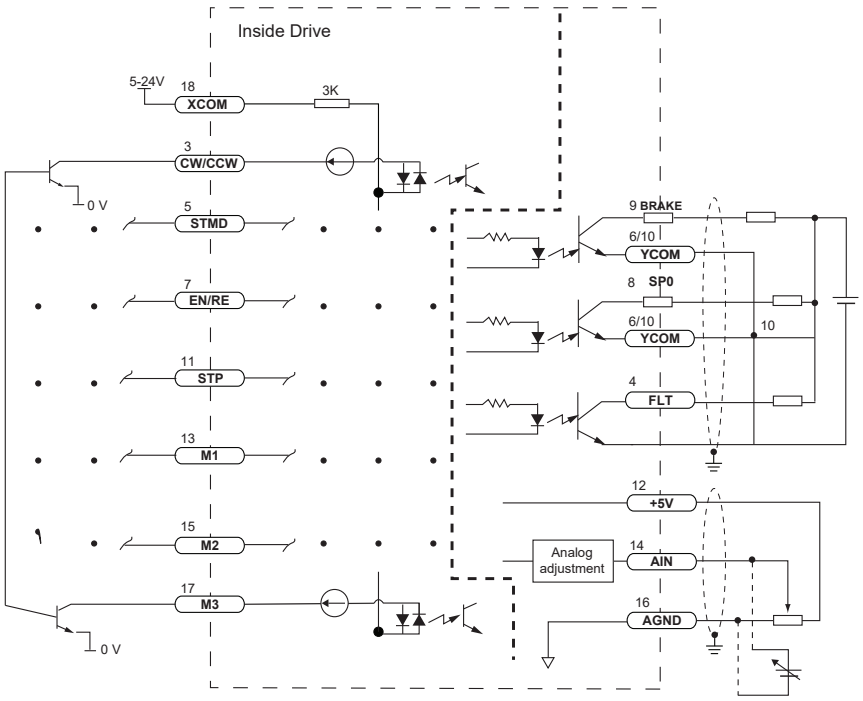
In order to ensure that the IO signal line is not affected by strong external interference noise, it is recommended that the signal cable use a shielded cable with a shielding layer. Different analog signals should use separate shielded wires, and shielded twisted pair cables are recommended for digital signal lines.

The wiring should be separated from the main circuit wiring (UVW) and other power lines or power lines by at least 30cm, otherwise the IO signal will be interfered.

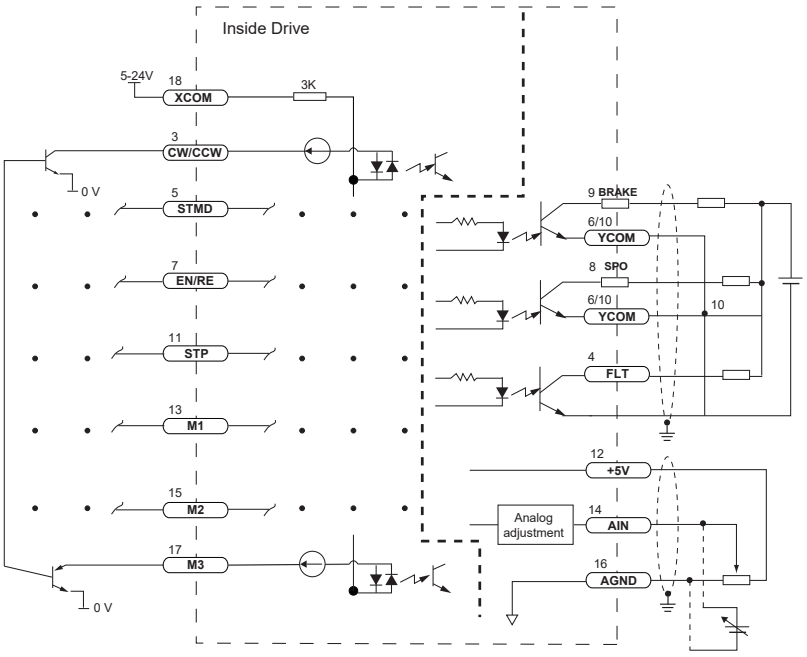


Pin	Pin definition	Pin	Pin definition
1	5V	2	GND
3	CW/CCW	4	FLT
5	STMD	6	YCOM
7	EN/RE	8	SPO
9	BRAKE	10	YCOM
11	STP	12	5V
13	M1	14	AIN
15	M2	16	AGND
17	M3	18	XCOM

Input Connection:

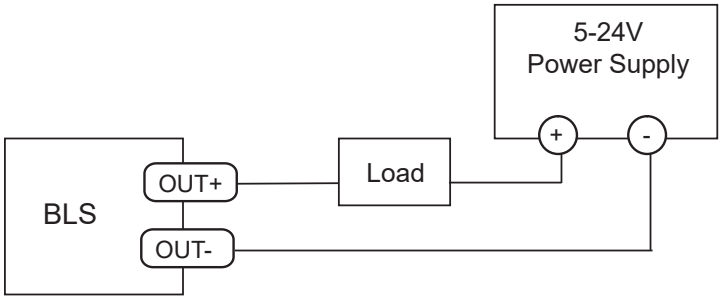


Connecting to control IO with external Sinking Outputs

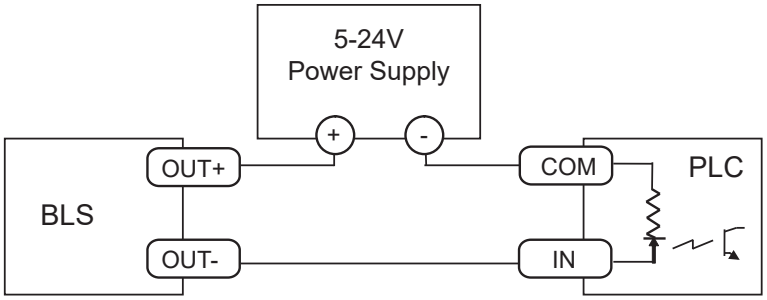


Connecting to control IO with external Sourcing Outputs

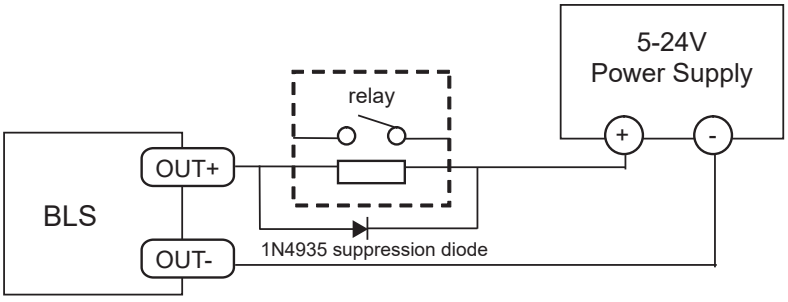
Output Connection:



Connecting a Sinking Output



Connecting a Sourcing Output



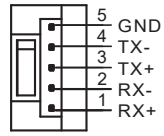
Driving a Relay

5.4 Communication interface wiring

5.4.1 R type debugging interface (CN4 CN5)

RS-485 communication allows a host PC (or PLC or HMI or other type of computer) to connect and control multiple drives. The baud rate is set to 9600bps by default and can be adjusted by dialing.

BLS10-R supports two-wire or four-wire communication. The connection mode for host control can be point-to-point or multi-station network.



CN4 CN5

Pin	Pin definition	Description
1	RX+	Receive data+
2	RX-	Receive data-
3	TX+	Send data+
4	TX-	Send data-
5	GND	DGND

5.5 DIP Switch

The RS485 communication method allows one host or human-computer interface or other type of computer to connect and control multiple drives. Its baud rate is fixed, and the RS-485 PC (PLCHMI) can be adjusted by dialing 9600bps

Pin	Description
1	Terminal resistance 120 selection, ON-select 120 ohms, OFF-disconnect 120 ohms
2	Baud rate selection, ON-9600bit/s, OFF-adjustable by the host computer, 9600-115200 bit/s (initial default 9600).

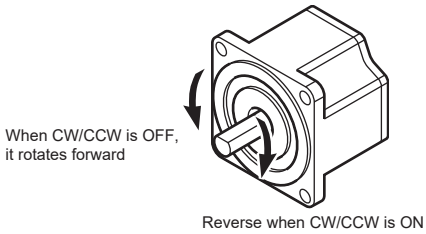
6 Control function

6.1 Input signal function

Since the driver can choose common anode or common cathode connection, the ON/OFF of input/output signal is defined as follows: Input (output) [ON] means the optocoupler inside the driver is in the on state. Input (output) [OFF] means the optocoupler inside the driver is in the off state.

CW/CCW

When CW/CCW is OFF, the motor will rotate clockwise along the axis; when CW/CCW is ON, the motor will rotate counterclockwise along the axis. The acceleration and deceleration when the motor starts and stops are controlled by the JA/JL software command.



STMD

When the STOPMOD input is turned OFF, the machine stops at the deceleration rate set by the acceleration/deceleration setting device. When the STOPMODE input is turned ON, the machine stops instantly by electromagnetic braking.

EN/RE (Enable/Reset)

When EN/RE is OFF, the motor is excited. When EN/RE is ON, the motor is de-excited. Regardless of other input states, ENABLE turning ON is the highest priority function and can be used as an emergency stop function. By turning ON first and then OFF, the drive can be reset.

SPST(Speed-set)

Using M1, M2, M3 input, up to 8 speed data can be selected.
Note: When M1,M2, M3 are OFF, the drive analog input takes effect

STOP

When STOP is ON, the motor runs normally; when STOP is OFF, the motor stops according to the set stop method.

6.2 Output signal function

FAULT

The driver outputs a fault signal when a fault such as overheating, overcurrent, overvoltage, undervoltage, internal voltage error, HALL signal failure or motor open circuit occurs.

SPEED OUT

The default value of the number of output pulses per motor revolution is 6 times the number of motor pole pairs.

MOVE

When the motor is running, the output is ON.

VA

Speed arrival command output. The difference between the actual motor speed and the set speed is within the speed arrival output range, that is, the signal is output. The speed arrival output range can be set relative to the set speed in 0~+/-400rpm. The default is (+/-200rpm). FAULT alarm command output, which can be divided into overload warning output and general warning output, which can be used at the same time;

Warning

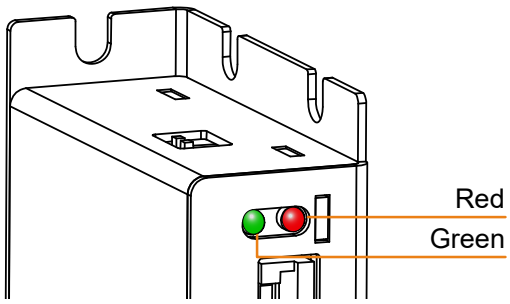
When a communication error occurs or the back EMF voltage is high, a warning alarm is output and the system recovers after the warning disappears.

TLC

This signal is output when the output torque generated by the motor reaches the torque limit setting value.

7 LED Display

7.1 Status LED Codes



Alarm code		32-bit AL error code	Cause of alarm
	1 Red，1 Green	0x00000001	Position error exceeds limit
	1 Red，2 Green	0x00008000	Command the motor to operate when it is not enabled
	2 Red，1 Green	0x00000002	Reversal prohibition limit
	2 Red，2 Green	0x00000004	Forward rotation prohibition limit
	3 Red，1 Green	0x00000008	Driver overtemperature
	3 Red，2 Green	0x00000010	Internal voltage error
	4 Red，1 Green	0x00000020	Driver overvoltage
	4 Red，2 Green	0x00000040	Driver low voltage
	4 Red，3 Green	0x00004000	Memory error
	4 Red，4 Green	0x00000100	Drive undervoltage
	5 Red，1 Green	0x00000080	Drive overcurrent
	5 Red，2 Green	0x00002000	Motor heavy load status
	5 Red，4 Green	0x00400000	RS485 bus communication error
	6 Red，2 Green	0x00000200	Motor encoder error
	7 Red，1 Green	0x00000400	Serial port communication abnormality
	7 Red，2 Green	0x00000800	Parameter saving failed

8 Matching motor

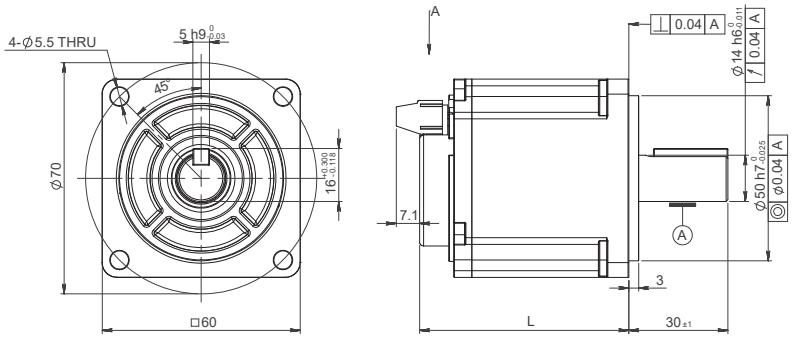
8.1 SM Series motor specifications

□ 60mm specifications

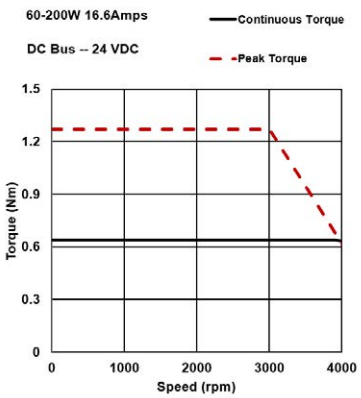
Specifications	Unit	Model	
		SM0601JSA-KCF-NNV	SM0602GSA-KCF-NNV
Length	mm	63.3	86.3
Input voltage	VDC	24	48
Rated power	watts	200	400
Rated speed	rpm	3000	
Max. speed	rpm	4000	
Rated torque	Nm	0.65	1.27
Peak torque	Nm	1.28	3.8
Rated current	A (rms)	16.6	12.6
Peak current	A (rms)	33.2	38
Voltage constant	V(rms)/Krpm	2.55	6.4
Torque constant	Nm/A (rms)	0.041	0.103
Rotor inertia	g·cm²	0.313	0.566
Winding resistance (Line-Line)	Ω	0.085	0.185
Winding inductance (Line-Line)	mH	0.18	0.42
Sensor	AB差分磁性编码器		
Insulation class	F		
Protection level	IP20		
Storage temperature	-20~+80℃		
Operating temperature	-20~+40℃		
Humidity	85% RH or less (no condensation)		
Environment	Outdoors (no direct sunlight), no corrosive gas, no flammable gas, no oil mist, no dust		
Altitude	1000m or less		

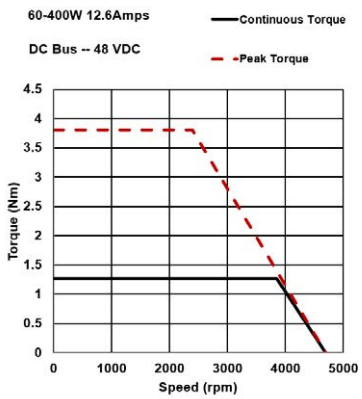
□ Dimensions (Unit: mm)

Series	Length (L)
	mm
SM0601JSA-KCF-NNV	63.3
SM0602GSA-KCF-NNV	86.3



□ Torque Curves





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