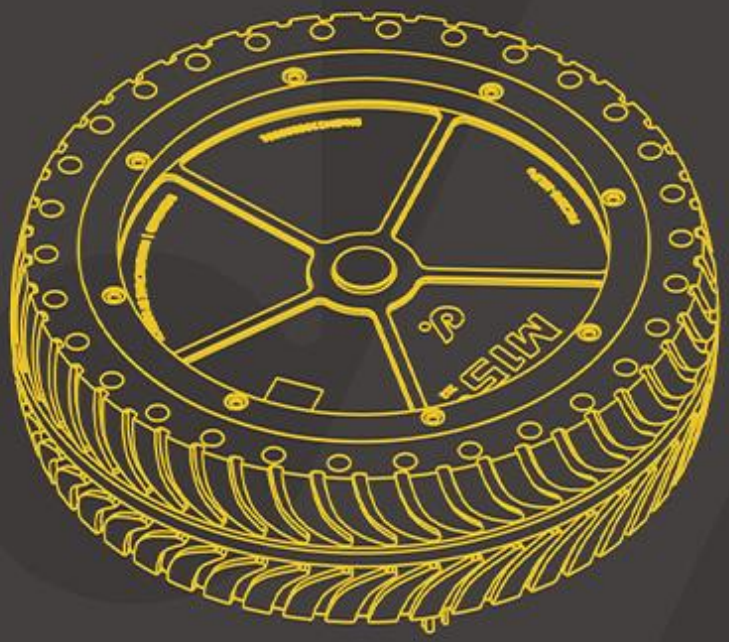
M15 2D 233

User Manual

V1.0 2023.06.03



Direct Drive Tech

Contents

◆Disclaimer

Thank you for purchasing the M15 series Permanent Magnet Synchronous Motor (referred to as "motor") from Direct Drive Technology Limited. This manual will guide you on the proper usage of the product. Please read this document carefully and follow the instructions to avoid any harm or damage. By using this product, you are deemed to have accepted all the terms and content stated in this specification sheet and related documents. You are solely responsible for using this product for legitimate purposes and bear all consequences that may arise. Direct Drive Technology Limited shall not be liable for any damages, injuries, or legal liabilities resulting from direct or indirect use of this product.

◆Safety Precautions

1. Confirm the working voltage before use according to the specifications.
2. Ensure the motor operates within the specified temperature range.
3. Avoid submerging the motor in water, as it may cause abnormal operation or damage.
4. Ensure correct and secure wiring connections to avoid poor contacts.
5. Refer to the installation instructions for proper motor installation and stability.
6. Refer to the installation instructions for proper installation and stability of the external output parts of the motor.
7. Avoid damaging the wires during use, as it may cause abnormal operation or damage to the motor.
8. Do not touch the rotating part of the motor during operation to avoid injury.
9. The motor may generate heat when delivering high torque. Do not touch the motor to avoid burns.
10. Do not disassemble the motor without authorization, as it may cause abnormal operation, damage to the motor, and potential safety hazards.

◆Product Profile

The M15 series motor is a product independently developed by Direct Drive Technology Limited. It is an integrated high-reliability permanent magnet synchronous motor that combines the outer rotor brushless motor, encoder, and servo drive. It features a compact structure, easy installation, stable operation, small size, and high torque, making it particularly suitable for direct-drive applications in robotics, AGV platforms, automation equipment, and warehousing logistics. By optimizing the pole slot number, slot type, air gap, and permanent magnet material, the motor ensures greater torque output, reduced torque fluctuation, and achieves direct drive with low speed and high torque, providing users with high-performance direct-drive solutions. The motor is compatible with a driver that uses Field-Oriented Control (FOC) algorithm, combined with the motor's built-in high-precision sensor, to achieve precise control and better silent operation. The driver has a comprehensive and reliable motor OBD monitoring mechanism and protection functions to ensure safe and reliable motor operation.

◆Product Features

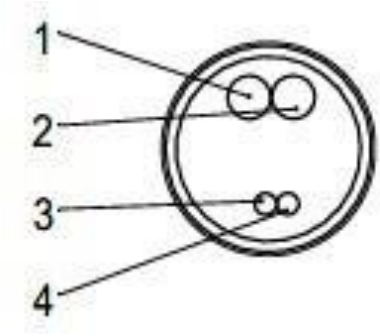
1. Integrated design of motor and driver, compact structure, high integration.
2. Small size with high torque, supporting ultra-low speed operation.
3. Supports CAN communication.
4. Special structural design allows temperature sensing of the motor's overall temperature, enabling more precise control.
5. Motor position, speed, current, fault codes, and other information can be obtained through communication.
6. Equipped with a complete monitoring mechanism and protection functions.
7. Has a high IP protection rating.

◆ Motor Assembly

Motor Assembly：Motor ×1

◆Motor Driver Interface and Cable Instructions

Wiring Diagram：

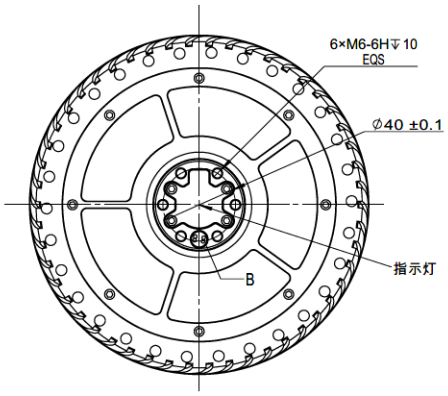


Serial Number	Name	Description
1	Positive Power Supply (Red)	Rated Voltage 24V
2	Negative Power Supply (Black)	GND
3	CAN Signal H (Yellow)	This interface is a non-isolated CAN interface. Please ensure that the motor driver is correctly connected to the bus wiring. Do not connect it incorrectly.
4	CAN Signal L (White)	

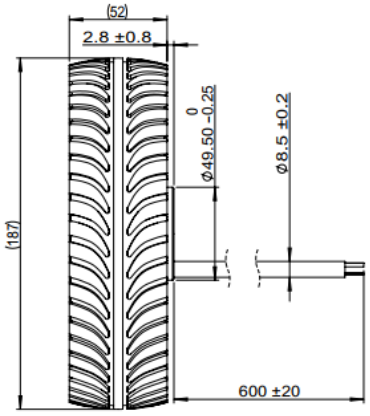
◆Installation Guidelines

Please refer to the motor installation hole dimensions and locations to install the motor on the corresponding device.

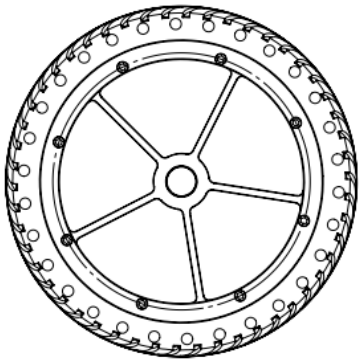
1. Motor installation interface



Bottom View



Side View



Top View

2. Precautions

1) It is recommended that the indicator light is unobstructed;
2) Try to avoid pulling the wires;
3) Pay attention to the selection of screw length to avoid unreliable installation.

◆Motor Driver Instructions

Supports CAN bus signal control. The driver controls the speed, position, or current of the motor in a closed loop according to the user's input target instructions and feeds back real-time information such as the speed, position, torque current, and temperature of the motor.

1．CAN ID Indicator Light Description：

ID	Indicator Light Description
1	Green light flashes once every 5 seconds
2	Green light flashes twice every 5 seconds
3	Green light flashes three times every 5 seconds
4	Green light flashes four times every 5 seconds
5	Green light flashes five times every 5 seconds
6	Green light flashes six times every 5 seconds
7	Green light flashes seven times every 5 seconds

2．Fault indicator light description and related protection settings:

Fault description	Indicator light and corresponding protection description
Under-voltage 1 (18V < Bus voltage < 22V)	Red light flashes corresponding ID
Under-voltage 2 (Bus voltage < 18V)	Shutdown, red light stays on
Over-voltage (Bus voltage > 63V)	Shutdown, red light stays on
Over-current (Bus current > 20A)	Shutdown, red light stays on
Over-speed (Speed > 300RPM)	Shutdown, red light stays on
Over-temperature 1 (Motor winding temperature > 80℃)	Yellow light flashes corresponding ID
Over-temperature 2 (Greater than 120℃)	Shutdown, yellow light stays on
Position sensor itself fault	Shutdown, blue light stays on
Position sensor signal interference	Blue light flashes corresponding ID
Communication timeout	Control value reset, red light stays on
Sampling resistor fault	Shutdown, blue light stays on
Stall	Shutdown, red light stays on

3．The relationship of the identifiers in CAN communication is as follows:

Motor ID	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**
Feedback message identifier	0x97	0x98	0x99	0x9A	0x9B	0x9C	0x9D	0x9E
Control Message identifier	0x32				0x33			

◆CAN Communication Protocol

1．Parameter

1) Rate: 1000Kbps
2) Frame Type: Standard Frame
3) Data Length: 8 Bytes
4) Open loop mode: Given value 0~-32767 corresponds to reverse zero speed to maximum speed, 0~32767 corresponds to forward zero speed to maximum speed
5) Current loop mode: Given value range -16383 ~ 16383, corresponding to -55A ~ 55A
6) Speed loop mode: Given value range -21000 ~ 21000, corresponding to speed -210rpm ~210rpm
7) Position loop mode: Given value range 0 ~ 32767, corresponding to 0° ~360°
8) Feedback data methods include both active reporting and query methods

To avoid frequent Flash erasing, a separate command to save parameters is required after the user parameter settings are completed (See section 9 for the parameter saving command)

2．Operation Steps:

1) Set the feedback mode (default is 1Khz active reporting)
2) Set the motor mode (open loop, current loop, speed loop, position loop, default open loop)
3) Send the given value.

3．Example of sending in open-loop mode (the data format is consistent in other modes)

The sender is used for open-loop commands, range:-32767 ~ 327677.

Send command								
Identifier	**0x32**							
Data field	DATA[0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Openloop given high eight bits	Openloop given low eight bits	Openloop given high eight bits	Openloop given low eight bits	Openloop given high eight bits	Openloop given low eight bits	Openloop given high eight bits	Openloop given low eight bits
Motor ID	1	2		3		4		
Identifier	**0x33**							
Data field	DATA[0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Openloop given high eight bits	Openloop given low eight bits	Openloop given high eight bits	Openloop given low eight bits	Openloop given high eight bits	Openloop given low eight bits	Openloop given high eight bits	Openloop given low eight bits
Motor ID	5	6		7		8		

Receiver: Feedback relevant values

Feedback content: Frequency 1KHZ								
Identifier	**0x96 + Motor ID**							
Data field	DATA[0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	High eight bits of speed measurement value	Low eight bits of speed measurement value	High eight bits of torque current value	Low eight bits of torque current value	High eight bits of position value	Low eight bits of position value	Fault value	Current mode

1) Speed value range: -21000 ~ 21000, corresponding to -210RPM ~ 210RPM
2) Torque current value: -32767 ~ 32767, corresponding to -55A ~ 55A
3) Position value range: 0 ~ 65535 (Can be set to 0 ~ 32767 through chapter 15: Mechanical Zero Calibration), corresponding to 0 ~ 360°

Fault value and corresponding fault description：

Fault value	Fault description
0x00	No fault
0x01	Under-voltage 2 (Bus voltage < 18V)
0x02	Under-voltage 1 (18V < Bus voltage < 22V)
0x03	Over-voltage (Bus voltage > 63V)
0x0A	Over-current (Default: Bus current > 20A)
0x14	Over-speed (Speed > 300RPM)
0x20	Over-temperature 1 (Motor winding temperature > 80℃)
0x1F	Over-temperature 2 (Motor winding temperature > 120℃)
0X29	Sampling resistor fault
0x2A	Position sensor itself fault
0x2B	Position sensor signal interference
0X2D	Temperature sensor out of range
0x3C	Communication timeout (Default no protection, user needs to enable)
0x62	Stall (Default: Current > 5A and Speed is 0)

4．Example of setting mode and feedback mode

Setting Mode								
Identifier	**0x105**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Mode value	Mode value	Mode value	Mode value	Mode value	Mode value	Mode value	Mode value
Motor ID	1	2	3	4	5	6	7	8
Feedback content								
Identifier	**0x200 + Motor ID**							
Data field	DATA[0]	DATA[1]	DATA[2]	DATA[3]	DATA[4]	DATA[5]	DATA[6]	DATA[7]
Content	Current mode value	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

Mode value：	**Explanation**
0x00	Voltage open loop
0x01	Set to current loop
0x02	Set to speed loop
0x03	Set to position loop
0x09	Disable motor
0x0A	Enable motor (default enable)

Note:

1) Do not switch modes during motor operation

2) Active reporting is still active in this mode, you can check the mode value in the active feedback information to determine if the setting is successful

3) In position loop, users can set absolute zero point according to actual usage

4) In position loop, the rotation method is to reach the target position at the closest distance

Setting feedback mode								
Identifier	**0x106**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Feedback Method	Feedback Method	Feedback Method	Feedback Method	Feedback Method	Feedback Method	Feedback Method	Feedback Method
Motor ID	1	2	3	4	5	6	7	8
Feedback content								
Identifier	**0x264 + Motor ID**							
Data field	DATA[0]	DATA[1]	DATA[2]	DATA[3]	DATA[4]	DATA[5]	DATA[6]	DATA[7]
Content	Value of Feedback Method	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

Feedback Method:

The data is 8 bits. The highest bit sets the feedback method to be active reporting or query method, 1 is the query method, 0 is the active reporting method, and the lower 7 bits are the reporting frequency under the active reporting method, in ms, ranging from 1 to 127ms.

Example: Data 0b1000 0000 - represents setting to query method;

Data 0b0100 0000 - represents setting to report data once every 64ms;

Note: Under the query method, setting the reporting frequency is invalid, when there is no feedback method set, it is in the default state, the default state is the active reporting method of 1ms, and it is not saved when power is cut off.

5．Query operation when the feedback method is query method

Send command								
Identifier	**0x107**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Query target content 1	Query target content 2	Query target content 3	Custom value	Reserved	Reserved	Reserved
Feedback content								
Identifier	**0x96 + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	High eight bits of query target 1	Low eight bits of query target 1	High eight bits of query target 2	Low eight bits of query target 2	High eight bits of query target 3	Low eight bits of query target 3	Custom value	Reserved

Query Target Content Value：

0x01: Speed Query

0x02：Bus Current Query

0x03：Winding Temperature Query

0x04：Position Value Query

0x05：Fault Value Query

0x06：Current Mode Query

Custom Value: Any setting, range 0~255, used to distinguish the return frame

Reserved: Any value

Example: The motor receives the following frame:

Identifier：0x107

Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	0x01	0x01	0x03	0x04	0xAA	Reserved	Reserved	Reserved

Feedback content：

Identifier：0x97

Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	High eight bits of speed	Low eight bits of speed	High eight bits of motor temperatu -re	Low eight bits of motor temperatu -re	High eight bits of motor position	Low Eight bits of motor position	0xAA	Reserved

6．Motor ID setting

Send command								
Identifier	**0x108**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved	Reserved
Feedback content								
Identifier	**0x96 + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF	0xFF

Note:

1) Only one motor ID can be set each time it is powered on, and the feedback identifier can be used to judge whether the setting is successful.

2) Parameter saves on power-off

7．Motor CAN terminal resistor switch setting

Setting feedback mode								
Identifier	**0x109**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	0/1	0/1	0/1	0/1	0/1	0/1	0/1	0/1
Motor ID	1	2	3	4	5	6	7	8
Feedback content								
Identifier	**0x390 + Motor ID**							
Data field	DATA[0]	DATA[1]	DATA[2]	DATA[3]	DATA[4]	DATA[5]	DATA[6]	DATA[7]
Content	Motor ID	0/1	0XFF	0XFF	0XFF	0XFF	0XFF	0XFF

Note:

1) 0 - Disconnect terminal resistor (default disconnect) 1 - Access terminal resistor

2) Parameters are not saved when power is cut off

9．Motor firmware version query

Send command								
Identifier	**0x10A**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	0X00	0X00	0X00	0X00	0X00	0X00	0X00	0X00
Feedback content								
Identifier	**0x2C8 + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Software major version	Software minor version	Hardware major version	Hardware minor version	Year	Month	Day

For example: 010101030116020F represents: Motor ID is 1; software major version 01, software minor version 01 (i.e., software version 1.1); hardware major version 03, hardware minor version 01 (i.e., hardware version 3.1); 16020F represents the last modified date (i.e., February 15, 2022)

Note: After the version query is completed, the motor actively reports default feedback information

10．Communication Timeout Read/Write Operation Setting

Send command								
Identifier	**0x10B**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Communication Timeout Setting Flag	Read/Write Flag	High eight bits of timeout time setting	Low eight bits of timeout time setting	0X00	0X00	0X00
Feedback content								
Identifier	**0x32C + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Communication Timeout Setting Flag	0XFF	High eight bits of timeout time setting	Low eight bits of timeout time setting	0XFF	0XFF	0XFF

Note:

1) Communication Timeout Setting Flag: 0X10 - Setting; 0X11 - Reset (restore to default value)
2) Read/Write Flag: 0X01 - Write; 0X00 - Read
3) After this parameter is set, a parameter save command needs to be sent to save the parameters
4) Parameter save: Send the parameter save command (see: Chapter 9: Parameter Save)
5) Timeout time setting range: 0~65535 (default value is 0), unit ms. That is: 1000ms = 1s. If the motor does

12. Motor PI Parameter Adjustment

(1) Motor PI Parameter Adjustment

Send command								
Identifier	**0x10C**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Mode	P Dividend High Eight Bits	P Dividend Low Eight Bits	P Divisor	I Dividend High Eight Bits	I Dividend Low Eight Bits	I Divisor
Feedback content								
Identifier	**0x3F4 + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Mode	P Dividend High Eight Bits	P Dividend Low Eight Bits	P Divisor	I Dividend High Eight Bits	I Dividend Low Eight Bits	I Divisor

Note:

1) Mode: see (3) Mode Values and Corresponding Descriptions
2) Integral Upper Limit = 32767 * I Divisor Integral Lower Limit = -32767 * I Divisor
3) Example: To set P=0.97, configure: P Dividend = 0X3E8, P Divisor = 10 (i.e., 0X3E8/2^10); similarly for I

(2) PI Parameter Output Limit Value Adjustment

Send command								
Identifier	**0x10D**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Mode	Maximum Output Value High Eight Bits	Maximum Output Value Low Eight Bits	Minimum Output Value High Eight Bits	Minimum Output Value Low Eight Bits	Reserved	Reserved
Feedback content								
Identifier	**0x3F4 + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Mode	Maximum Output Value High Eight Bits	Maximum Output Value Low Eight Bits	Minimum Output Value High Eight Bits	Minimum Output Value Low Eight Bits	Reserved	Reserved

Note:

1) Mode: see (3) Mode Values and Corresponding Descriptions
2) Current loop limit output value: limit range -32767~32767
3) Speed loop limit output value: data is enlarged 32 times, if limit is 10rpm, data should be set to 320 (1032)
4) Position loop limit output value: data is enlarged 32 times, if limit is 10rpm, data should be set to 320 (1032)

(3) Mode Values and Corresponding Descriptions

Mode	Description
0X01	Modify Current Loop PI Parameters
0x02	Modify Speed Loop PI Parameters
0x03	Modify Position Loop PI Parameters
0x11	Modify Current Loop PI Parameter Output Limit
0x22	Modify Speed Loop PI Parameter Output Limit
0x33	Modify Position Loop PI Parameter Output Limit
0xFF	Reset All Loop PID Parameters

Note:

1) In the protocol, all the divisors involved are powers of 2, for example, if the divisor is set to 32, 32 should be converted to 2^n (i.e., 2^5 = 32), and then input 5 at the corresponding position; the divisor setting should not exceed 15
2) After resetting parameters, you may choose mode 0XFE to save the reset parameters; default parameters are used after reset
3) If parameters are not set, the motor uses internal solidified parameters
4) All set values must be given non-zero values
5) Adjusting PID parameters requires a certain foundation, the parameters are effective immediately after being sent, it is recommended to limit the power to avoid burning the motor, I can be set to 0 first, adjust P parameters and then adjust I parameters, please pay attention to install the motor during the debugging process
6) After all the above parameters are set, the command to save parameters should be sent to save the parameters
7) Parameter saving: Send the command to save parameters (see: Chapter 9: Parameter Saving)

14．Parameter Saving

Send command								
Identifier	**0x10C**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	0XFE	0X00	0X00	0X00	0X00	0X00	0X00
Feedback content								
Identifier	**0x3F4 + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Mode	0XFE	0X00	0X00	0X00	0X00	0X00

Note:

Mode: feedback current control mode (0 —— open loop, 1 —— current loop, 2 —— speed loop, 3 —— position loop)

15．Current Filtering Coefficient Setting

Send command								
Identifier	**0x10D**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Current Filtering Coefficient Setting Flag	Read /Write Flag	Current Filtering Value High Eight Bits	Current Filtering Value Low Eight Bits	0X00	0X00	0X00
Feedback content								
Identifier	**0x458 + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Current Filtering Coefficient Setting Flag	0XFF	Current Filtering Value High Eight Bits	Current Filtering Value Low Eight Bits	0X00	0X00	0X00

Note:

1) Current Filtering Coefficient Setting Flag: 0X20 —— Set; 0X21 —— Reset
2) Read/Write Flag: 0X01 —— Write; 0X00 —— Read
3) Actual Current Filter Value = User-defined Value / 1000 (floating point number) (default value is: 0.01)
4) User-defined value range: 0 ~ 1000
5) After this parameter is set, the command to save parameters should be sent to save the parameters
6) Parameter saving: Send the command to save parameters (see: Chapter 9: Parameter Saving)

16．Feedback Last Byte Setting

Send command								
Identifier	**0x10E**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Setting Flag for the Last Byte	Read /Write Flag	Mode	0X00	0X00	0X00	0X00
Feedback content								
Identifier	**0x4BC + Motor ID**							
Data field	DATA [0]	DATA [1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Setting Flag for the Last Byte	0XFF	Mode	0XFF	0XFF	0XFF	0XFF

Note:

1) Last Byte Setting Flag: 0X30 —— Set; 0X31 —— Reset

2) Read-Write Flag: 0X01 —— Write; 0X00 —— Read

3) 0X00: Feed back motor control mode (default feedback control mode)

   0X01: Feed back motor winding temperature

   0X02: Feed back motor MOS temperature

The parameter is not saved, and can be set multiple times after powering on.

17. Stall Protection Settings

Send command								
Identifier	**0x10F**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Stall Protection Setting Flag	Read /Write Flag	Stall Current High Eight Bit	Stall Current Low Eight Bit	Duration	Recovery Time	0X00
Feedback content								
Identifier	**0x520 + Motor ID**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Stall Protection Setting Flag	0XFF	Stall Current High Eight Bit	Stall Current Low Eight Bit	Duration	Recovery Time	0XFF

Note:

1) Stall Protection Setting Flag: 0X40 —— Set; 0X41 —— Reset
2) Read-Write Flag: 0X01 —— Write; 0X00 —— Read
3) Stall current unit: mA (default 5000mA) Duration, recovery time unit: S (default 5S)
4) This parameter needs to be saved after being set
5) Save Parameter: Send the save parameter instruction (see: Chapter 9: Parameter Saving)

18．Over-Temperature, Over-Current Protection Switch Setting

Send command								
Identifier	**0x10F**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Switch Setting Flag	Read /Write Flag	0 / 1	0X00	0X00	0X00	0X00
Feedback content								
Identifier	**0x520 + Motor ID**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Switch Setting Flag	0XFF	0 /1 /2	0XFF	0XFF	0XFF	0XFF

Note:

1) Over-Temperature, Over-Current Switch Setting Flag: 0X50 —— Set; 0X51 —— Reset
2) Read-Write Flag: 0X01 —— Write; 0X00 —— Read
3) 0 —— Open (default is to turn on over-temperature, over-current protection); 1 —— Close; 2 —— Setting failure (indicating that the given value is not 0 or 1, and needs to be reset)
4) This parameter needs to be saved after being set
5) Save Parameter: Send the save parameter instruction (see: Chapter 9: Parameter Saving)

19．Protection Mode Switch Setting

Send command								
Identifier	**0x111**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Protection Mode Setting Flag	Write Flag	0 / 1	0X00	0X00	0X00	0X00
Feedback content								
Identifier	**0x5E8 + Motor ID**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	0X60	0XFF	0/1/2	0XFF	0XFF	0XFF	0XFF

Note:

1) Protection Mode Setting Flag: 0X60 —— Set
2) Write Flag: 0X01 —— Write
3) 0 —— Open (default is open); 1 —— Close; 2 —— Setting failure (indicating that the given value is not 0 or 1, and needs to be reset)
4) This parameter needs to be saved after being set
5) Save Parameter: Send the save parameter instruction (see: Chapter 9: Parameter Saving)

20．Mechanical Zero Calibration Setting

Send command								
Identifier	**0x112**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	0X00	0X00	0X00	0X00	0X00	0X00	0X00	0X00

Note:

There is no reply for this setting, you can determine whether the setting is successful based on the position value fed back by the motor

21．LED Selection Setting

Send command								
Identifier	**0x113**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	0X00	0X00	0X00	0X00	0X00	0X00	0X00	0X00
Description	ID1	ID2	ID3	ID4	ID5	ID6	ID7	ID8

Note:

1) 0 —— Close; 1 —— Open (default is open)
2) There is no reply for this setting, you can determine whether the setting is successful based on the LED indicator of the motor
3) This parameter is not saved

22．Absolute Zero Calibration

Send command								
Identifier	**0x104**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	0X16	0X32	0X64	0X00	0X00	0X00	0X00	0X00

Note:

1) During the calibration process, the motor should be in a no-load state and ensure that the motor can rotate a full circle
2) You need to calibrate the absolute zero point when it comes out of the factory
3) Once the calibration is complete, there is no need for further calibration

23. Absolute Zero User Defined

Send command								
Identifier	**0x114**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Absolute Zero Point Setting Flag	Read/Write Flag	Mechanical Angle High Eight Bit	Mechanical Angle Low Eight Bit	0X00	0X00	0X00
Feedback content								
Identifier	**0x5E8 + Motor ID**							
Data field	DATA [0]	DATA[1]	DATA [2]	DATA [3]	DATA [4]	DATA [5]	DATA [6]	DATA [7]
Content	Motor ID	Absolute Zero Point Setting Flag	0XFF	Mechanical Angle High Eight Bit	Mechanical Angle Low Eight Bit	0XFF	0XFF	0XFF

Note:

1) Absolute Zero Point Flag: 0X70 —— Write; 0X71 —— Read
2) Read-Write Flag: 0X01 —— Write; 0X00 —— Read
3) Mechanical Angle: obtained through motor feedback, write the preset zero point into it

◆ Firmware Update

A specialized tool can be used for updates

If needed, please contact the official after-sales service.

◆ Motor Parameters

Motor Parameters Testing with M15 Built-in Driver	
No-load Speed	≥200 rpm
No-load Current	≤0.5 A
Rated Speed	115 rpm
Rated Torque *1	9.6 Nm
Rated Current	≤11.5 A
Max Efficiency	≥72%
Stall Torque	≥17 Nm
Stall Current	≤21 A
Rated Voltage	24 VDC
Torque Constant*2	0.88 Nm/A
Speed Constant	8.3 rpm/V
Ambient Temperature	-20℃~45℃
Weight	2.3 kg
Encoder Resolution	16384
Relative Precision	8192
Noise Level	≤52 dB
Ingress Protection	IP55

Note:

*1 : Duty Cycle S2； *2： Measured at Rated Speed

The above parameters are measured under the rated voltage of 24V DC.

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