DM-J4340-2EC Geared Motor

User Manual V1.0 2024.03.14

Disclaimer

Thank you for purchasing the DM-J4340-2EC geared motor (hereinafter referred to as "the motor").

Before using this product, please carefully read and follow the instructions in this document and all safety guidelines provided. Failure to do so may result in harm to yourself or others, or cause damage to the product or surrounding property.

By using this product, you are deemed to have read this document thoroughly and to have understood, acknowledged, and accepted all the terms and contents of this document and any related materials.

You agree to use this product only for legitimate purposes and assume full responsibility for its usage and any resulting consequences.

The manufacturer shall not be held liable for any damage, injury, or legal responsibility caused directly or indirectly by the use of this product.

Precautions

1. Please strictly operate the motor within the specified working environment and the maximum allowable winding temperature range. Failure to do so may result in permanent and irreversible damage to the product.
2. Prevent foreign objects from entering the rotor; otherwise, abnormal rotor operation may occur.
3. Before use, check whether all components are intact. Do not use the product if any parts are missing, aged, or damaged.
4. Ensure correct wiring and that the motor is installed properly and securely.
5. Do not touch the electronic rotor section during operation to avoid accidents. The motor may become hot during high-torque output; be cautious to prevent burns.
6. Users must not disassemble the motor without authorization, as this may affect control accuracy or lead to abnormal operation.

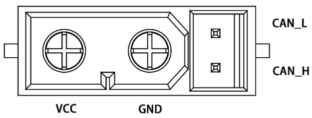
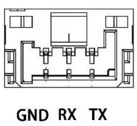
Motor Features

1.Dual encoders provide single-turn absolute position output on the output shaft, ensuring no loss of position even after power failure.
2.Integrated motor and driver design with a compact and highly integrated structure.
3.Supports upper-computer visual debugging and firmware upgrades.
4.Capable of reporting motor speed, position, torque, and temperature via the CAN bus.
5.Equipped with dual temperature protection.
6.Supports trapezoidal acceleration and deceleration in position control mode.

Packing List

1. Motor (with driver) ×1
2. Power cable (with CAN communication terminal): XT30 (2+2)-F plug, single-ended cable (100mm) ×1
3. Debug serial signal cable: GH1.25 3-pin cable (opposite side, 300mm) ×1

Interface and Wiring Description

<table>
<tr><th>Specific Name – Number</th><th>Interface Label</th><th>Description</th></tr>
<tr><td>Power Interface – 1
(with integrated CAN Communication Terminal)</td><td rowspan="2">
</td><td rowspan="2">1. Connect the power supply using the XT30(2+2)-F plug power cable. The rated voltage is 24V, which powers the motor.
2. Use the CAN communication terminal to connect to an external control device. It can receive CAN control commands and transmit motor status information.
3. The motor is equipped with two power interfaces. Either interface can be used independently or connected in series with multiple motors for streamlined wiring.</td></tr>
<tr><td>Power Interface – 2
(with integrated CAN Communication Terminal)</td></tr>
<tr><td>Debug Serial Port – 3</td><td>
</td><td>Connect via GH1.25 3-pin cable. Use a USB to CAN debugging tool (or a general USB-to-serial module) to connect to a PC for parameter configuration and firmware upgrades via the debugging assistant.</td></tr>
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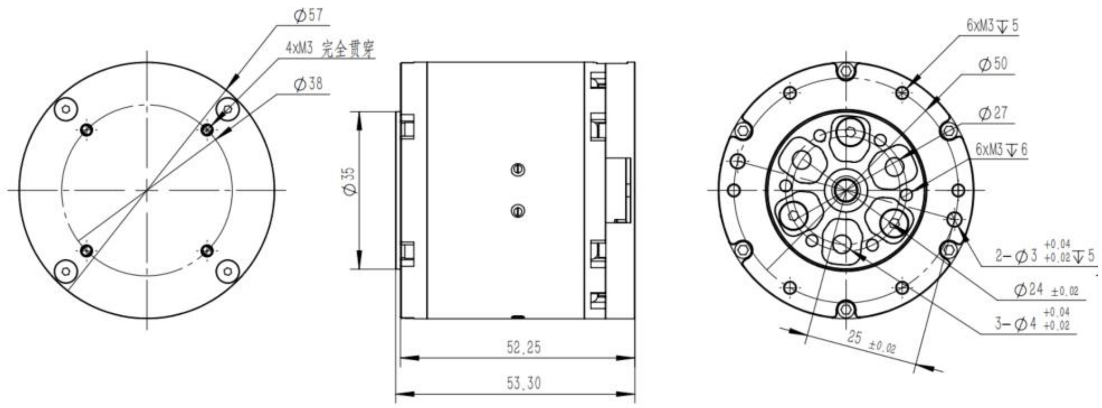
Motor Dimensions and Installation

Please refer to the motor mounting hole dimensions and positions to install the motor onto the corresponding equipment.



Indicator Light Status

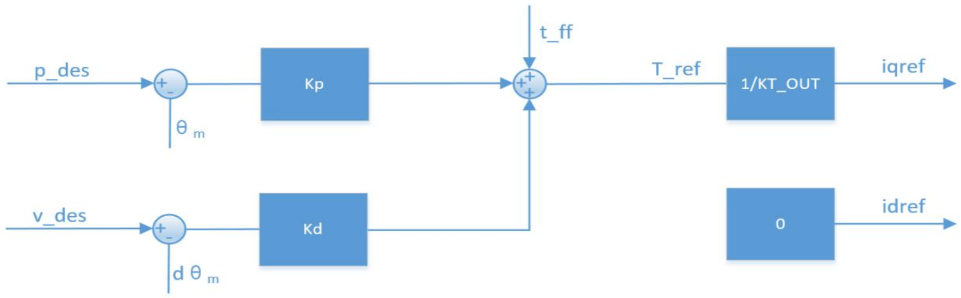
Normal Status	Green-Solid On	ERR bit is 1, indicating enabled mode and normal operating status
	Red-Solid On	ERR bit is 0, indicating disabled mode
Abnormal Status	Red – Blinking	Indicates a fault. Corresponding fault types include: 8 – Overvoltage 9 – Undervoltage A – Overcurrent B – MOS Overtemperature C – Motor Coil Overtemperature D – Communication Loss E – Overload You can check the fault type via the feedback frame or through the debugging assistant interface.

Operating Modes

❖ MIT Mode

MIT mode is designed to be compatible with the original MIT mode. It allows seamless switching while enabling flexible configuration of control ranges (P_MAX, V_MAX, T_MAX). The ESC converts received CAN data into control variables to calculate the torque value, which serves as the current reference for the current loop. The current loop then regulates to achieve the specified torque current.

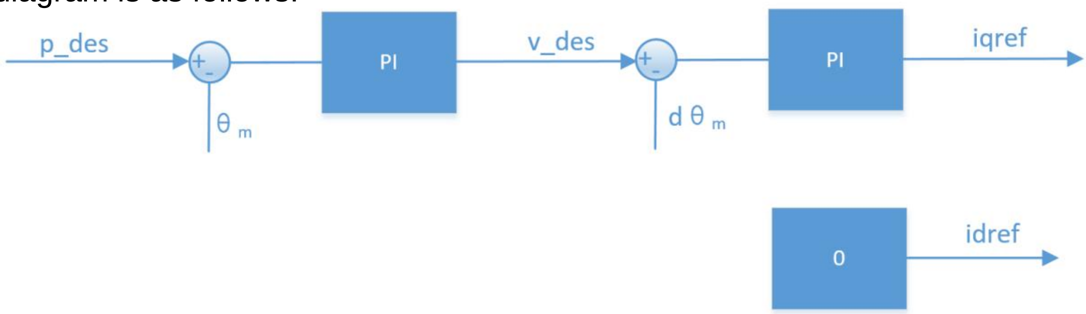
The control block diagram is as follows:



Derived from the MIT mode, various control modes can be implemented.
For example:
When kp = 0 and kd ≠ 0, setting v_des enables constant speed rotation;
When kp = 0 and kd = 0, setting t_ff enables constant torque output.
Note:
When controlling position, kd must not be set to 0, otherwise it may cause motor oscillation or even loss of control.

❖ Position-Velocity Mode

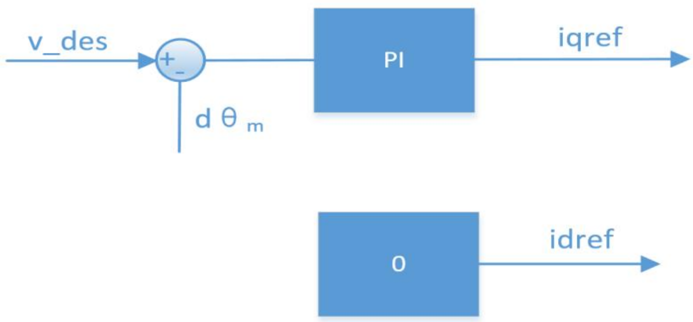
The position-velocity mode uses a three-loop cascaded control scheme. The position loop serves as the outermost loop, and its output is the setpoint for the velocity loop. The velocity loop ’ s output is used as the setpoint for the inner current loop, which controls the actual current output. The control block diagram is as follows:



p_des is the target position for control, and v_des limits the maximum absolute speed during motion.
When using the recommended control parameters from the debugging assistant in position cascaded mode, high control accuracy can be achieved with relatively smooth operation. However, the response time is relatively longer.
Configurable parameters include not only v_des but also acceleration/deceleration settings. If additional oscillations occur during control, increasing the acceleration/deceleration values may help.
Note:
p_des and v_des are in units of rad and rad/s respectively, and both use the float data type.

❖ Velocity Mode

Velocity mode allows the motor to run steadily at the set speed. The control block diagram is as follows:



Note:
The unit of v_des is rad/s, and the data type is float.
To enable automatic parameter calculation using the debugging assistant, the damping factor must be set to a non-zero positive value.
Typically, it ranges from 2.0 to 10.0:A value that is too small may cause speed oscillation and significant overshootA value that is too large may result in a longer rise timeThe recommended setting is 4.0.

Usage

Control is implemented using the standard CAN frame format with a fixed baud rate of 1 Mbps. Based on function, frames are categorized into command frames and feedback frames:
Command frames: These carry control data received by the motor to execute specific control commands.
Feedback frames: These are sent from the motor to the upper-level controller and contain the motor ’ s status data.
The format and frame ID of the command frames vary depending on the motor ’ s selected mode, whereas the feedback frame format remains consistent across all modes.

❖ Feedback Frame

The Feedback Frame ID is configured via the debugging assistant (Master ID) and defaults to 0. It mainly reports the motor's position, speed, and torque.
The specific frame format is defined as:

Feedback Message	D[0]	D[1]	D[2]	D[3]	D[4]	D[5]	D[6]	D[7]
MST_ID	ID|ERR<<4	POS[15:8]	POS[7:0]	VEL[11:4]	VEL[3:0]|T[11:8]	T[7:0]	T_MOS	T_Rotor

ID: Controller ID, corresponding to the lower 8 bits of the CAN ID.
ERR: Status indicator, with types as follows:

- 0 – Disabled
- 1 – Enabled
- 8 – Overvoltage
- 9 – Undervoltage
- A – Overcurrent
- B – MOS overtemperature
- C – Motor coil overtemperature
- D – Communication lost
- E – Overload

POS: Motor position information
*VEL: Motor speed information
*T: Motor torque information
*T_MOS: Average temperature of the MOSFETs on the driver board (unit: °C)
T_Rotor: Average temperature of the motor ’ s internal coil (unit: °C)
* Position, speed, and torque are converted from floating-point to signed fixed-point
format using a linear mapping:
Position uses 16-bit data
Speed and torque use 12-bit data each

❖ Control Frame in MIT Mode

Control Message	D[0]	D[1]	D[2]	D[3]	D[4]	D[5]	D[6]	D[7]
ID	p_des [15:8]	p_des [7:0]	v_des [11:4]	v_des[3:0]|| Kp[11:8]	Kp [7:0]	Kd [11:4]	Kd[3:0]|| t_ff[11:8]	t_ff[7:0]

Frame ID is equal to the configured CAN ID value.
P_des: Position command
V_des: Velocity command
Kp: Position proportional gain
Kd: Position derivative gain
T_ff: Torque feedforward value

All parameters follow the mapping relationships described in the previous section.
The ranges of p_des, v_des, and t_ff can be configured via the debugging assistant.
Kp range: [0, 500] Kd range: [0, 5]
A standard CAN data frame contains only 8 bytes.
In MIT mode, the control command format packs five parameters
— Position, Velocity, Kp, Kd, and Torque — into those 8 bytes.
Position: 16 bits (2 bytes)
Velocity: 12 bits
Kp: 12 bits
Kd: 12 bits

❖ Control Frame in Position-Velocity Mode

Control Message	D[0]	D[1]	D[2]	D[3]	D[4]	D[5]	D[6]	D[7]
0x100+ID	p_des				v_des			

Frame ID = configured CAN ID value + 0x100
P_des: Position command, float, little-endian (low byte first, high byte last)
V_des: Velocity command, float, little-endian (low byte first, high byte last)
In this mode, the CAN ID used to send commands is 0x100 + ID. The velocity command (v_des) defines the maximum speed during the movement to the target position—i.e., the speed during the constant-velocity phase.

❖ Control Frame in Velocity Mode

Control Message	D[0]	D[1]	D[2]	D[3]
0x200+ID	v_des			

Frame ID = configured CAN ID value + 0x200
V_des: Velocity command, float, little-endian (low byte first, high byte last)In this mode, the CAN ID used to send commands is 0x200 + ID.

Using the Debugging Assistant

Use the USB-to-CAN debugging tool to connect the motor to the computer, and configure motor parameters or perform firmware upgrades via the debugging assistant.
The motor's serial port connects to the PC through a GH1.25 3-pin cable. The CAN communication terminal on the motor ’ s power interface is connected to the USB-to-CAN debugging tool using an XT30 (2+2)-F plug cable. Parameter configuration and firmware upgrades can be carried out through the debugging assistant.
After connecting the motor ’ s serial port, CAN port, and power interface, open the debugging assistant on the computer, select the appropriate serial port device, and open the port. Once the motor is powered on, the serial port will output information, with “ Control Mode ” indicating the current drive mode.

Key Parameters

Please refer to the following parameters for proper motor usage:

Motor Parameters	Rated Voltage	24V/48V
	Rated Phase (Power) Current	2.5 A
	Peak Phase (Power) Current	8A
	Rated Torque	9 NM
	Peak Torque	27 NM
	Rated Speed	36 rpm
	Max No-Load Speed	100 rpm
Motor Characteristics	Gear Ratio	40 : 1
	Pole Pairs	14
	Phase Inductance	317 uH
	Phase Resistance	760 mΩ
Structure & Weight	Outer Diameter	57 mm
	Height	53.3 mm
	Motor Weight	≈ 362 g
Encoder	Encoder Resolution	14-bit
	Number of Encoders	2
	Encoder Type	Magnetic encoder (single-turn)
Communication	Control Interface	CAN@1Mbps
	Tuning Interface	UART @ 921 600 bps
Control & Protection	Control Modes	MIT mode / Velocity mode / Position mode
	Driver Over-temperature Protection (threshold)	120 °C — exits "enabled mode" when exceeded
	Motor Over-temperature Protection (user-set, recommended ≤ 100 °C)	Exits "enabled mode" when exceeded
	Motor Over-voltage Protection (user-set, recommended ≤ 32(24V Version)/52V(48V Version)	Exits "enabled mode" when exceeded
	Communication-loss Protection	If no CAN command within set period → exits "enabled mode"
	Motor Over-current Protection (user-set, recommended ≤ 9.8 A)	Exits "enabled mode" when exceeded
	Motor Under-voltage Protection (supply must be ≥ 15 V)	Exits "enabled mode" when below threshold