25-30mm Integrated Drive-Control User Manual

Change Description V20260204

1）Supports multi-controller CAN network interconnection, supporting up to 60 controllers. Controller numbers range from 1 to 60, where N in the communication protocol represents the controller number. This can be configured by modifying the program.

2）In addition to the original MIT mode, speed mode and position mode have been added.

3）A byte is added to the motor status to indicate the current motor type.

1: Interface Definition

Pigment	Definition
Red	Source +
Black	Source -
Blue	CanH
White	CanL

The default power supply voltage is 12V, with a range of 10-18V.

2: Canfd Configuration

Iso Canfd

Arbitration zone port rate: 1M 80%

Data field baud rate: 4M 80%

Note: For CAN protocol, both the transmitter and receiver must connect a 120-ohm terminal matching resistor to ensure signal quality.

3: Communication Protocol

The 'N' in the canid identifier represents the controller's serial number, ranging from 1 to 60. For example, if a controller's number is 1, the canid for 'mit mode transmission' would be 0x501 + 1*4 = 0x505. By default, all controllers are assigned the number 1. If you require networking with different serial numbers, please notify us in advance so we can make the necessary adjustments.

Three modes are currently supported. The system defaults to MIT mode upon power-on and can be switched via motor control commands. During mode switching, a stop command must be sent to the motor.

1）Speed mode controls motor speed by sending the specified speed through the MIT mode.

2）Position mode controls motor position by sending commands through the MIT mode, specifying the target position.

3）Mit pattern

Send in 3.1 Mit Mode

Direction: Host machine sends
Canid: Standard frame 0x501 + N * 4.
DLC: Data length 12 bytes
Current loop bandwidth: 1000 Hz
data：

Data0 Data1 Data2 Data3	Motor position code value = (s32)(((u32)data3 <<24) | ((u32)data2 <<16) | ((u32)data1 <<8) | data0)) -0x80000000; The motor position angle = motor position code value / 2097152 * 360 degrees. This position is a multi-turn location with a 21-bit encoder, where one full rotation of 360 degrees corresponds to 2,097,152 encoder pulses. The maximum range of motor position code values is-0x7CFFFFFF to 0x7CFFFFFF.
Data4 Data5	Speed code value = (s16)(((u16)data5 <<8) | ((u16)data4)) -0x8000); Speed = speed code value / 10 rpm. Speed code value range: -30000 to 30000
Data6 Data7	Valid only in MIT mode; other modes have their own fixed parameters. Kp, position loop ratio coefficient Kp = 0.00001*((u16)data7 << 8) | ((u16)data6)。 We recommend setting the initial debugging value to 0.008, as higher values may cause excessive oscillation. In the physical model, the input unit is rad and the output unit is A. Assuming the proportion coefficient at this point is kact, the relationship is given by Kp = kact * 0.001115.
Data8 Data9	Valid only in MIT mode; other modes have their own fixed parameters. Kd, speed loop proportional coefficient Kd = 0.01*((u16)data9 << 8) | ((u16)data8)。 We recommend setting the initial debugging value to 1, as higher values may cause excessive oscillation. In the physical model, the input unit is rad/s and the output unit is A. Assuming the proportion coefficient at this time is kact, the relationship is Kd = kact * 85.636.
Data10 Data11	Valid only in MIT mode. Invalid in other modes. Feedforward current code value = (s16)(((u16)data11 <<8) | ((u16)data10) - 0x8000). Feedforward current value = current code value × 11 / 4096 A.

example：
position mode：
25mm, 30mm motor
01 00 01 80 00 80 20 03 64 00 00
80 //Set position code value =
65537
Speed = 0
Kp = 0.008
Kd = 1
Current = 0

Current mode:

01 00 01 80 00 80 00 00 00 00 64 80

Set position code value = 65537

Speed = 0

Kp = 0

Kd = 0

Current code value = 100

3.2 Mit Mode Reply

For each frame sent in MIT mode, the controller returns a frame direction in MIT mode: The motor controller responds.

Canid: Standard frame 0x701 + 4 * N

DLC: Data length 12 bytes

Data0	Canid，data0 = 0x01 + 4 * N，data1 = 0x05
Data1	
Data2	Motor position code value = (s32)(((u32)data5 <<24) | ((u32)data4 <<16) | ((u32)data3 <<8) | data2)) -0x80000000); The motor position angle = motor position code value / 2097152 * 360 degrees. This position is a multi-turn location with a 21-bit encoder, where one full rotation of 360 degrees corresponds to 2,097,152 encoder pulses.
Data3	
Data4	
Data5	
Data6	Speed code value = (s16)(((u16)data7 <<8) | ((u16)data 6)) -0x8000); Speed = speed code value / 10 rpm.
Data7	
Data8	Current code value = (s16)(((u16)data9 <<8) | ((u16)data8) -0x 8000). Current value = Current code value × 11 / 4096 A.
Data9	
Data10	0x00
Data11	0x00

3.3 Motor Status

Direction: The motor controller sends data, transmitting one frame every 20ms.

Canid: Standard frame 0x702 + 4 * N

DLC: Data length 20 bytes

Data0	Canid，data0 = 0x01 + 4 *N，data1 = 0x05
Data1	
Data2	Motor position code value = (s32)(((u32)data5 <<24) | ((u32)data4 <<16) | ((u32)data3 <<8) | data2)) -0x80000000); The motor position angle = motor position code value / 2097152 * 360 degrees.
Data3	
Data4	

Data5	This position is a multi-turn location with a 21-bit encoder, where one full rotation of 360 degrees corresponds to 2,097,152 encoder pulses.
Data6 Data7	Speed code value = (s16)(((u16)data7 <<8) | ((u16)data 6)) -0x8000); Speed = speed code value / 10 rpm.
Data8 Data9	Current code value = (s16)(((u16)data9 <<8) | ((u16)data8) -0x 8000). Current value = current code value × 11 / 4096 A.
Data10 Data11	Bus voltage value = (float)(((u16)data11 <<8) | ((u16)data1-0x8000)) / 10 V
Data12 Data13 Data14 Data15	Fault condition Fault = (((u32)data15 << 24) | ((u32)data14 << 16) | ((u32)data13 << 8) | data12)) Bit0: Drive chip failure Bit1: Overvoltage fault, bus voltage exceeds 18V Bit2: Under-voltage fault, bus voltage below 8V Bit3: Overcurrent fault, motor power exceeded limit within 10 seconds Bit4: Encoder failure
Data16	Motor status 0: Initialize 1: Current calibration 2: Encoder zero point calibration 3: Stop 4: Run 5: Error
Data17	Encoder zero-point calibration status 0: Idle 1： calibration 2: Completed 3: Error
Data18	Current motor mode 0x00：MIT pattern 0x01: Speed mode 0x02: Position Mode
Data19	Motor type 0x01:30mm 0x02：25mm 0x03：20mm 0x04：16mm

3.4 Electric Machine Control

Direction: Host machine sends
Canid: Standard frame 0x502 + 4 * N
DLC: Data length 8 bytes

Data0	0x01: Motor operation 0x00: Motor stopped Note: To control the motor in MIT mode, first send a command to start the motor.
Data1	0x01: Set the current motor position to point 0 for position control. Others: No effect
Data2	Set motor mode To change the motor mode, you must stop the motor (set data0 to 0X00) for the change to take effect. 0x00: MIT mode 0x01: Speed mode 0x02: Position Mode
Data3	0x00
Data4	0x00
Data5	0x00
Data6	0x00
Data7	0x00

3.5 Continue to Have Id

0x503 + 4 * N, used for encoder zero-point calibration. Users should avoid using this ID to prevent accidental operations.
0x703 + 4 * N, used to return the encoder zero-point calibration result. Users should avoid using this ID to prevent conflicts.

4: Command Indication

全选	手动发送	帧ID	类型 数据长度	时间戳	备注	帧数据
0001	发送	00000509	标准 数据 FDBRS 12	0	设置位置	01 00 00 90 00 80 20 03 64 00 00 80
0002	发送	00000509	标准 数据 FDBRS 12	10000	设置电流	01 00 01 80 00 80 00 00 00 00 C8 80
0003	发送	0000050A	标准 数据 FDBRS 8	20000	运行	01 00 00 00 00 00 00 00
0004	发送	0000050A	标准 数据 FDBRS 8	30000	设置零点	00 01 00 00 00 00 00 00
0005	发送	0000050A	标准 数据 FDBRS 8	40000	mit模式	00 00 00 00 00 00 00 00
0006	发送	0000050B	标准 数据 FDBRS 8	50000	校准	[illegible]
0007	发送	0000050A	标准 数据 FDBRS 8	60000	速度模式	00 00 01 00 00 00 00 00
0008	发送	0000050A	标准 数据 FDBRS 8	70000	位置模式	00 00 02 00 00 00 00 00
0009	发送	00000509	标准 数据 FDBRS 12	80000	设置速度	01 00 00 A0 20 CE 00 00 00 00 00 80

0001: Set the location in MIT mode
For motors with 25mm and 30mm diameters, the following recommendations are advised:

Kp = 0.008

Kd = 1

01 00 00 90 00 80 20 03 64 00 00 80

0002: Set current in MIT mode
0003: Motor operation command
0004: The motor sets the current position to point 0, stops, and enters MIT mode.
0005: The motor stops and enters MIT mode
00006: Calibration instruction
0007: The motor stops and enters speed mode

0008: The motor stops and enters position mode

0009: Used to set position and speed in position mode and speed mode. The current speed is 2000 rpm, and the position is 0x20000001.

1) mit pattern

position control：

Send 0005 – 0003 – 0001.

current-controlled：

Send 0005 – 0003 – 0002.

2) Speed mode

Send 0007 – 0003 – 0009, the motor operates at 2000 rpm.

3) position mode

Send 0008 – 0003 – 0009 to position the motor at 0x20000001.

4) calibration

Send 0005 – 0006, then wait 10 seconds for calibration to complete.