ELECTRIC STEERING MOTOR
User manual (V1.5.3)

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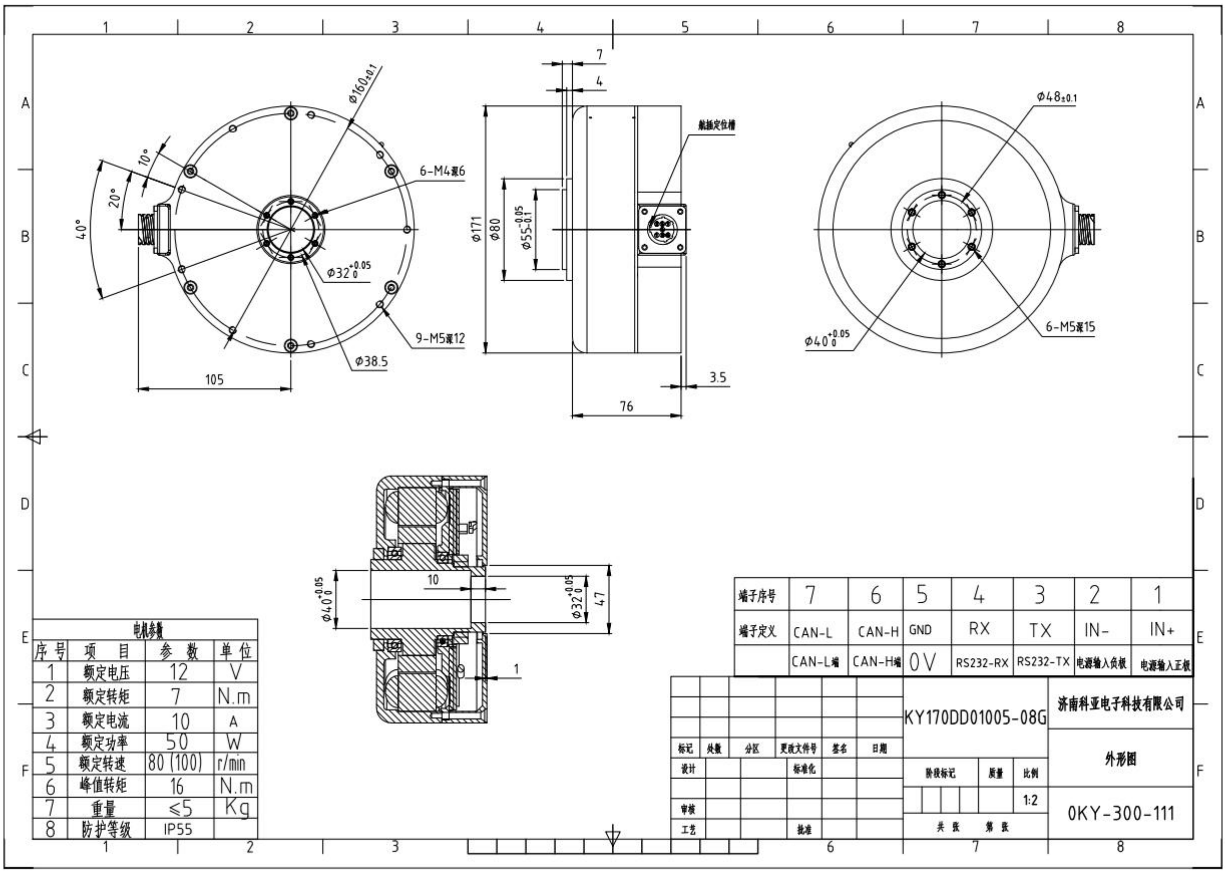
(2022-05-07)

I. Overview

1.1 Motor Parameter


Φ160±0.1
6-M4深6
10°
20°
40°
Φ32$^{+0.05}_{0}$
9-M5深12
Φ38.5
105
7
4
航插定位槽
Φ171
Φ80
Φ55$^{-0.05}_{-0.1}$
3.5
76
Φ48±0.1
Φ40$^{+0.05}_{0}$
6-M5深15
10
Φ32$^{+0.05}_{0}$
47
1
KY170DD01005-08G
济南科亚电子科技有限公司
外形图
0KY-300-111
标记 处数 分区 更改文件号 签名 日期
设计 标准化
审核
工艺 批准
阶段标记 质量 比例
1:2
共 张 第 张

电机参数			
序号	项目	参数	单位
1	额定电压	12	V
2	额定转矩	7	N.m
3	额定电流	10	A
4	额定功率	50	W
5	额定转速	80 (100)	r/min
6	峰值转矩	16	N.m
7	重量	≤5	Kg
8	防护等级	IP55	

端子序号	7	6	5	4	3	2	1
端子定义	CAN-L	CAN-H	GND	RX	TX	IN-	IN+
	CAN-L端	CAN-H端	0V	RS232-RX	RS232-TX	电源输入负极	电源输入正极

1.2 Specification

- DC working power +7V~32VDC
- Continuous current 10A, maximum peak current 20A
- Rated torque 7N.m, peak torque 16N.m
- Rated speed 80rpm - 100rpm (adjustable)
- Control signal: RS232, CAN2.0
- Working mode: speed mode, position mode.

Notice: When you use CAN, the motor support speed mode and position mode.

When you use R232, the motor support speed mode only.

1.3 Operation Condition

1.3.1 Power supply:

- Rated working power: 12VDC (factory setting 12VDC, if you need 24VDC, you can modify the motor configuration)

- Limit power supply range: 7--32VDC
- It can provide instantaneous current overload capability of 2 times continuous current

1.3.2 Feedback component:

- Linear encoder.

1.3.3 Working environment:

- Operating temperature: -25~55°C (based on environment temperature);

  Storage temperature: -35~65°C (based on environment temperature);
- Humidity: 5%--90%RH, condensation (25°C)
- Protection level: IP55.
- Insulation performance: input to the chassis DC600V, leakage current 0.07mA.The insulation resistance is 20 MΩ or more.
- Three-proof requirements: meet the requirements of three defenses (dust, moisture, salt spray).
- Vibration requirements: Frequency 5Hz ~ 25Hz, amplitude 3mm, 0.09g.

  Frequency 25Hz~200Hz, amplitude 1.47mm, 116g.

  Horizontal, vertical, and longitudinal directions are 30 min in each direction.
- Cooling method: natural cooling

II. Functional Technical Indicators

2.1 Main Function

- Working mode: Speed mode, position mode

Notice: When you use CAN, the motor support speed mode and position mode.

When you use R232, the motor support speed mode only.

- Feedback: Linear encoder.
- Control: RS232, CAN
- Fault LED indicator
- Can be controlled by CAN bus networking
- Realize motor speed control and data reading through RS232
- Internal temperature monitoring of drive
- Overcurrent and overload protection

- Overvoltage and undervoltage protection
- Temperature protection
- Locked-rotor and over speed protection
- Motor short circuit protection

2.2. Working Mode Configuration Table

Operating mode	Control instruction		Feedback component
Speed mode	RS232	CAN	Linear encoder
Position mode	CAN		Linear encoder

2.3. Technical Parameters

Parameter	Label	Parameter value	unit
Voltage	U	7-32	VDC
Max continuous current	I_c	10	A
Max peak current	I_{max}	20	A
PWM switching frequency	f_{pwm}	10	kHz
Output encoder power supply	$+5V_{out}$	5	VDC
	I_{cc}	100	mA
Under voltage	Vu	7 (adjustable)	V
Over voltage	Vo	32(adjustable)	V
Operating temperature	Industrial grade (standard product)	-25 ~ +55	℃
	Military grade	-40 ~ +65	
Storage temperature	Industrial grade (standard product)	-35 ~ +65	℃
	Military grade	-55 ~ +85	

III. Port Description

3.1. Interface Definition

Port	Definition	Description	Recommend wire
1	IN+	Power input +	16AWG
2	IN-	Power input -	16AWG
3	TX	RS232—TX	18AWG
4	RX	RS232—RX	18AWG
5	GND	GROUND	18AWG
6	CAN-H	CAN-H	18AWG
7	CAN-L	CAN-L	18AWG

TX, RX, GND:

RS232 interface, to achieve command control, as well as parameter settings, operating state commissioning, etc.

CAN-H, CAN-L: CAN interface

Drive internal already provided 120 Ω terminal resistance, do not need to add other terminal when use.

IN+ 、IN- ：

Because the vehicle requires long power cable, when the current is large, the voltage drop more due to the line loss. We recommend below cable specification:

Cable length (m)	Cabel diameter (mm^2)	Allowable Continue Amps
1-3	2.5	＜17A
3-4.5	4	＜25A

Note: When the motor “undervoltage alarm”, there may be the following reasons:

(1) The battery is aging, and the internal resistance of the battery will increase after a long time of use, thereby reducing the battery's discharge capacity.

(2) The steering hydraulic pump is aging, the flow valve is blocked, etc., which causes the steering resistance to increase and the motor current to increase.

(3) The cable diameter is too thin, the voltage drop more, and when the torque is large, the voltage is pulled down, causing the driver to detect undervoltage.

3.2. Serial Port Connection

Using high-speed standard serial cable, DB9 plug meets the label definition:

Driver label	RS232 cable
TX	2
RX	3
GND	5

IV. Operating Instructions

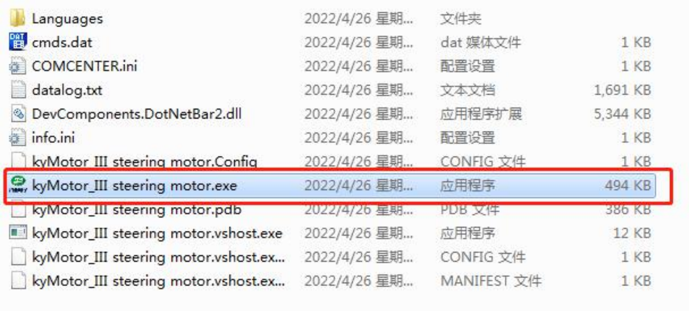
4.1. The auto steering motor software Description

4.1.1 Configuration instructions

- Servo controller parameters can be set by the software.
- The software communicates with the control through RS232, and the baud rate is 115200bit.
- The software is developed under the .NET environment. XP systems need to have .NET 4.0 installed.

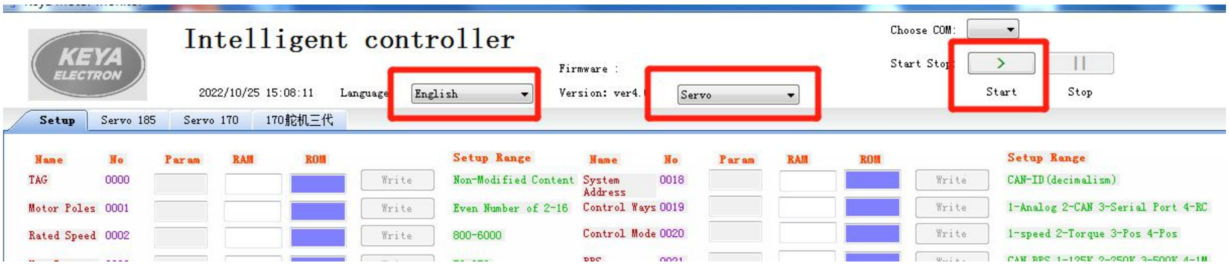
4.1.2 The software instructions

4.1.2.1 Double click the icon



Languages	2022/4/26 星期...	文件夹	
cmds.dat	2022/4/26 星期...	dat 媒体文件	1 KB
COMCENTER.ini	2022/4/26 星期...	配置设置	1 KB
datalog.txt	2022/4/26 星期...	文本文档	1,691 KB
DevComponents.DotNetBar2.dll	2022/4/26 星期...	应用程序扩展	5,344 KB
info.ini	2022/4/26 星期...	配置设置	1 KB
kyMotor III steering motor.Config	2022/4/26 星期...	CONFIG 文件	1 KB
kyMotor_III steering motor.exe	2022/4/26 星期...	应用程序	494 KB
kyMotor_III steering motor.pdb	2022/4/26 星期...	PDB 文件	386 KB
kyMotor_III steering motor.vshost.exe	2022/4/26 星期...	应用程序	12 KB
kyMotor_III steering motor.vshost.ex...	2022/4/26 星期...	CONFIG 文件	1 KB
kyMotor_III steering motor.vshost.ex...	2022/4/26 星期...	MANIFEST 文件	1 KB

4.1.2.2 Please select the software version “Servo”, click “Start”, If the communication is successful, the interface will read the control parameters, while the LED on the upper left will flash green, indicating that the parameters are communicating successfully.


KEYA ELECTRON
Intelligent controller
Choose COM:
Start Stop:
Start
Stop
Setup
Servo 185
Servo 170
170舵机三代
Write

2022/10/25 15:08:11

Language: English

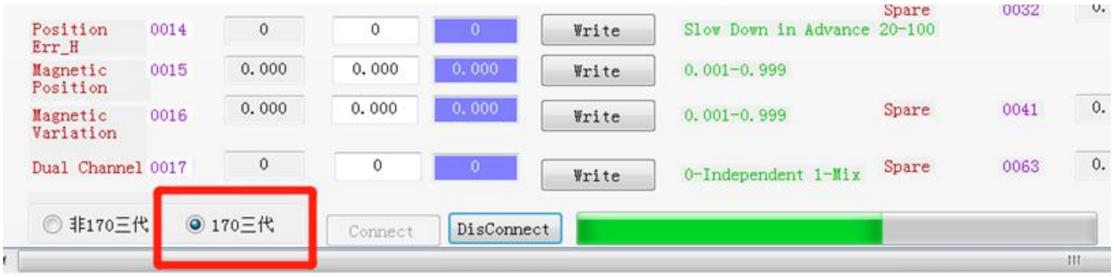
Firmware :

Version: ver4.

Servo

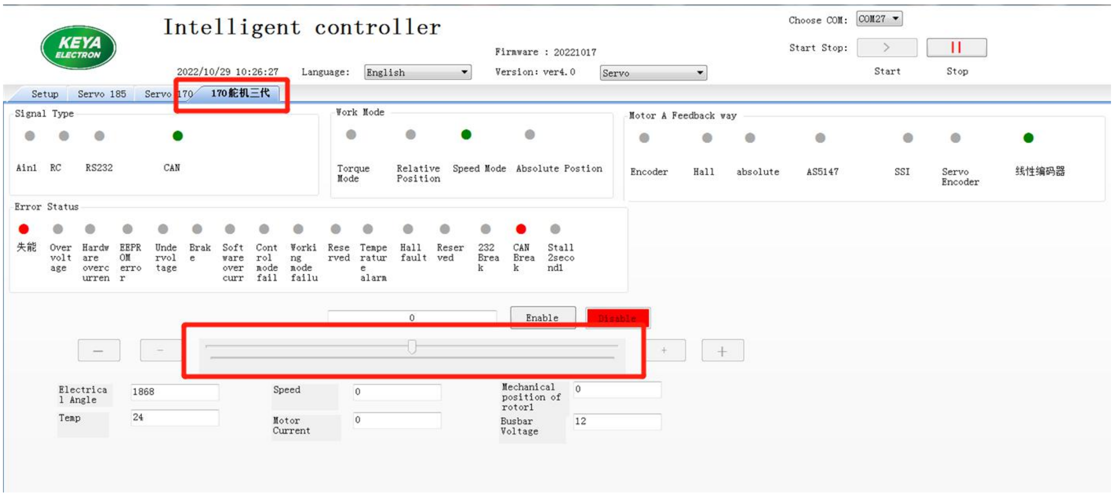
Name	No	Setup Range	Name	No	Setup Range
TAG	0000	Non-Modified Content	System Address	0018	CAN-ID (decimalism)
Motor Poles	0001	Even Number of 2-16	Control Ways	0019	1-Analog 2-CAN 3-Serial Port 4-RC
Rated Speed	0002	800-6000	Control Mode	0020	1-speed 2-Torque 3-Pos 4-Pos

4.1.2.3 Open the configuration interface, select “170 三代” and click the “Connect” button in the lower left corner to establish a connection between the software and the controller.


Write
○ 非170三代
● 170三代
Connect
DisConnect

Name	No	Param	RAM	ROM	Setup Range	Name	No
						Spare	0032
Position Err_H	0014	0	0	0	Slow Down in Advance 20-100		
Magnetic Position	0015	0.000	0.000	0.000	0.001-0.999		
Magnetic Variation	0016	0.000	0.000	0.000	0.001-0.999	Spare	0041
Dual Channel	0017	0	0	0	0-Independent 1-Mix	Spare	0063

4.1.2.4 If you want run the motor via software, please open below page, and you can drag the slide to adjust the motor direction and speed.


KEYA ELECTRON
Intelligent controller
Start
Stop
Setup
Servo 185
Servo 170
170舵机三代
Signal Type
Ain1
RC
RS232
CAN
Work Mode
Torque Mode
Relative Position
Speed Mode
Absolute Postion
Motor A Feedback way
Encoder
Hall
absolute
AS5147
SSI
Servo Encoder
线性编码器
Error Status
失能
Overvoltage
Hardware overcurren
EEPROM error
Undervoltage
Brake
Software overcurr
Control mode fail
Working mode failu
Reserved
Temperature alarm
Hall fault
Reserved
232 Break
CAN Break
Stall 2second1
Enable
Disable

2022/10/29 10:26:27

Choose COM: COM27

Language: English

Firmware : 20221017

Version: ver4.0

Servo

Electrical Angle: 1868

Temp: 24

Speed: 0

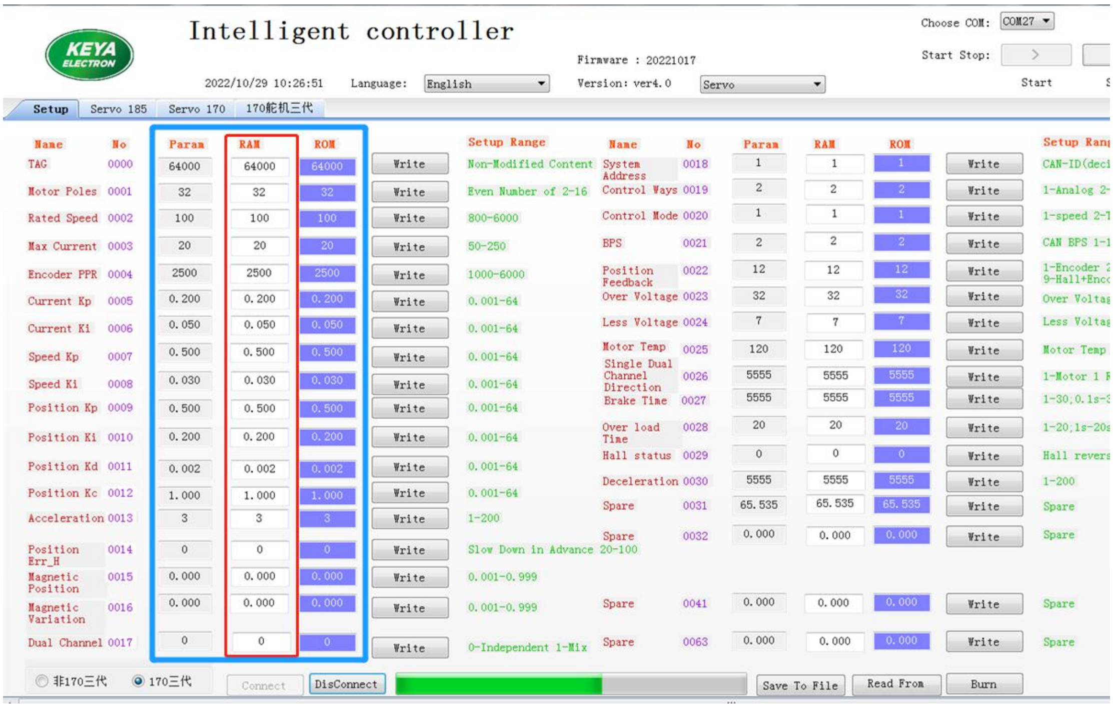
Motor Current: 0

Mechanical position of rotor1: 0

Busbar Voltage: 12

4.1.2.4 The RAM in the red box can be modified. The left side of the red box is the controller parameter, and the right side of the red box is the data in the E^2ROM. In the correct case, the three data are consistent (equal).

As the software data is continuously scanned, when modifying the data, modify it quickly and click the “Write” button.



2022/10/29 10:26:51

Language: English

Firmware : 20221017

Version: ver4.0

Servo

Choose COM: COM27

Name	No	Param	RAM	ROM	Setup Range
TAG	0000	64000	64000	64000	Non-Modified Content
Motor Poles	0001	32	32	32	Even Number of 2-16
Rated Speed	0002	100	100	100	800-6000
Max Current	0003	20	20	20	50-250
Encoder PPR	0004	2500	2500	2500	1000-6000
Current Kp	0005	0.200	0.200	0.200	0.001-64
Current Ki	0006	0.050	0.050	0.050	0.001-64
Speed Kp	0007	0.500	0.500	0.500	0.001-64
Speed Ki	0008	0.030	0.030	0.030	0.001-64
Position Kp	0009	0.500	0.500	0.500	0.001-64
Position Ki	0010	0.200	0.200	0.200	0.001-64
Position Kd	0011	0.002	0.002	0.002	0.001-64
Position Kc	0012	1.000	1.000	1.000	0.001-64
Acceleration	0013	3	3	3	1-200
Position Err_H	0014	0	0	0	Slow Down in Advance 20-100
Magnetic Position	0015	0.000	0.000	0.000	0.001-0.999
Magnetic Variation	0016	0.000	0.000	0.000	0.001-0.999
Dual Channel	0017	0	0	0	0-Independent 1-Mix

Name	No	Param	RAM	ROM	Setup Rang
System Address	0018	1	1	1	CAN-ID(deci
Control Ways	0019	2	2	2	1-Analog 2-
Control Mode	0020	1	1	1	1-speed 2-T
BPS	0021	2	2	2	CAN BPS 1-1
Position Feedback	0022	12	12	12	1-Encoder 2 9-Hall+Enco
Over Voltage	0023	32	32	32	Over Voltag
Less Voltage	0024	7	7	7	Less Voltag
Motor Temp	0025	120	120	120	Motor Temp
Single Dual Channel Direction	0026	5555	5555	5555	1-Motor 1 F
Brake Time	0027	5555	5555	5555	1-30;0.1s-3
Over load Time	0028	20	20	20	1-20;1s-20s
Hall status	0029	0	0	0	Hall revers
Deceleration	0030	5555	5555	5555	1-200
Spare	0031	65.535	65.535	65.535	Spare
Spare	0032	0.000	0.000	0.000	Spare
Spare	0041	0.000	0.000	0.000	Spare
Spare	0063	0.000	0.000	0.000	Spare

4.1.2.5 For example, if you want modify the number of encoder lines from 48000ppr to 49000ppr, the E^2 ROM data is 48000, please write 49000 in the RAM, and click “Write” button quickly. Confirm that 49000 is no longer changing. Same steps for other parameters, multiple parameters can be modified at the same time.

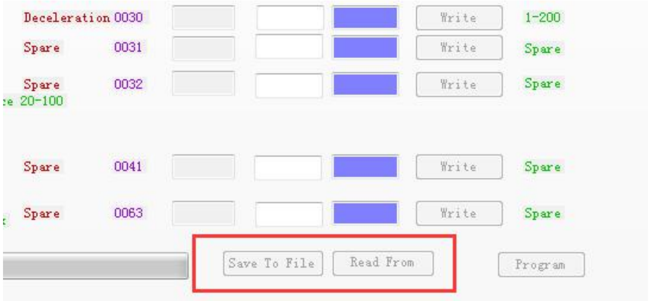
4.1.2.6 Click the "Program(Burn)" button at the bottom right. Program the data in RAM to E2ROM. Note: The programming process takes 3-5 seconds.

4.1.2.7 The “Program(Burn)” button turns red, indicating that data is being programmed. Please wait and observe the data. Untill it remind “Programed successfully”. Then the three datas(RAM, ROM, Param) in blue block are consistent, indicating that the ROM data is programed into the controller.

4.1.2.8 At this point, the modification of the control parameters is completed. Click the "Disconnect" button and click the "Exit" button.

4.1.2.9 Re-power the controller. (Note: No matter whether the configuration is modified or not, it must be powered off and reset to start normally)

4.1.2.10 When programming the configuration for multiple motors, you can “save a modified configuration to a file” and then “read from a file” to download to another motor.


Deceleration 0030
Write
1-200
Spare 0031
Write
Spare
Spare 0032
Write
Spare
20-100
Spare 0041
Write
Spare
Spare 0063
Write
Spare
Save To File
Read From
Program

4.1.3 Parameter function description

0000 Identifier. when the system is connected, identify the software communication or serial port control. (Don't need modify)

0001 The number of motor poles (this motor is 32 poles)

0002 Rated motor speed (set to 80)

0003 Motor maximum current (Don't need modify)

0004 The number of encoder lines, his parameter is invalid.

0005 Kp parameter of controller current loop PI control (typical value 0.2)

Can be modified appropriately.

0006 Ki parameter of controller current loop PI control (typical value 0.02)

Can be modified appropriately.

0007 Kp parameter of controller speed loop PI control (typical value 0.5)

Can be modified appropriately.

0008 Ki parameter of controller speed loop PI control (typical value 0.005)

Can be modified appropriately.

0009-0012 Position loop PID control parameters

0013 Acceleration time. "5" means the acceleration time from 0rpm to rated speed is 0.5s.

0015 Zero position compensation of magnetic encoder

0016 Zero position compensation of rotary encoder

0018 Controller system address, or node number of control.

This parameter is used in the CAN, CANOpen, and EtherCAT buses.

For example: set the data to 1, then the ID in CAN bus: 0x0600000 + controller system address, it will be (0x06000001)

0019 Control signal selection

2. CAN open control; 3. RS232

0020 Control mode selection, including speed control, position control

1.Speed control,

3.Absolute position control, refer to the CAN bus protocol

4.Relative position control, refer to the CAN bus protocol

0021 CAN bus baud rate selection (Factory setting is 250K)

1.125k 2.250k 3. 500k 4. 1M

0022 Position sensor selection

12. Linear encoder (线性编码器）

Other parameters: spare

4.2 Indicator Description

4.2.1 Status indicator (RED light): Observe the status of the controller according to the blinking frequency of the indicator.

Number of flashes	Definition	Cause of issue
1	Working normally	Disability state
2	Over voltage	Supply voltage is over 32V(adjustable)
3	Hardware overcurrent protection 22A	Overcurrent protection caused by motor short circuit and field tube damage
4	EEPROM error	Data saving error
5	Less voltage	Supply voltage is lower than 7V(adjustable)
6	brake	Turn on the brake signal
7	Software overcurrent protection (software set protection value)	The phase current reaches the software setting protection value for 1 second to stop output.
8	Control mode failure	Control mode selection error
9	Working mode failure	Speed, position working mode not selected or wrong
10	Speed loss protection	Actual speed exceeds 25% of rated value
11	Temperature alarm	The temperature above 85 °C
12	Hall error	Motor Hall is off or malfunctioning

13	Reserved	Reserved
14	232 break	232 mode, no 232 signal input
15	CAN break	CAN mode, no CAN signal input
16	Blocking for 2 seconds	Motor stalled 2s protection

4.3.2 Enable indicator (BLUE)

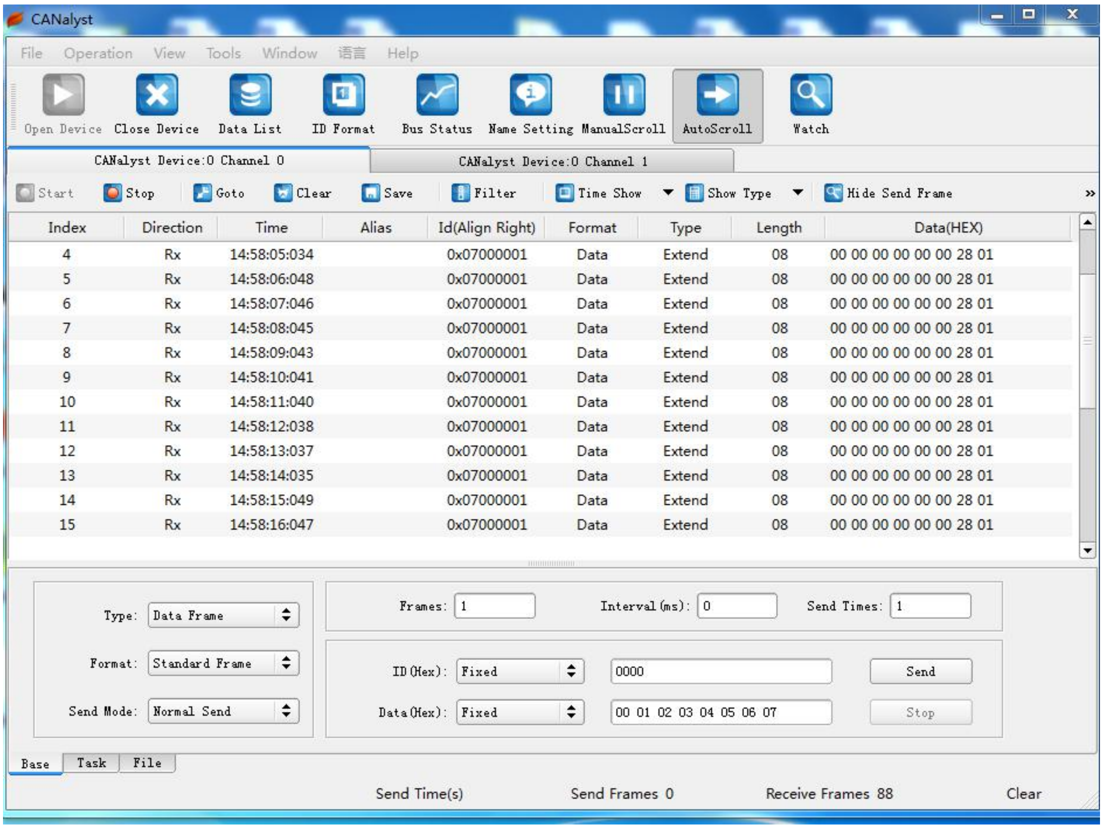
In any control mode, the red indicator light will go out after the drive is enabled.

The indicator light is always on when the controller disabled.

4.3 CAN Instruction

4.3.1 General Configuration

- CAN bus protocol baud rate 250Kb
- CAN bus ID with extended ID
- Sending data format: low before, high later (hexadecimal)
- According to the CANOpen format, the data adopts the query mode.
- According to the CANOpen format, there is a fixed heartbeat and send related data.
- The watchdog detects the line-off period of 1000ms (speed command is sent continuously, the interval must not exceed 1000ms)
- Query data returns are hexadecimal data, which need to be converted into decimal data.


CANalyst
File
Operation
View
Tools
Window
语言
Help
Open Device
Close Device
Data List
ID Format
Bus Status
Name Setting
ManualScroll
AutoScroll
Watch
CANalyst Device:0 Channel 0
CANalyst Device:0 Channel 1
Start
Stop
Goto
Clear
Save
Filter
Time Show
Show Type
Hide Send Frame
Send
Stop
Base
Task
File
Clear

Index	Direction	Time	Alias	Id(Align Right)	Format	Type	Length	Data(HEX)
4	Rx	14:58:05:034		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
5	Rx	14:58:06:048		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
6	Rx	14:58:07:046		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
7	Rx	14:58:08:045		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
8	Rx	14:58:09:043		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
9	Rx	14:58:10:041		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
10	Rx	14:58:11:040		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
11	Rx	14:58:12:038		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
12	Rx	14:58:13:037		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
13	Rx	14:58:14:035		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
14	Rx	14:58:15:049		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01
15	Rx	14:58:16:047		0x07000001	Data	Extend	08	00 00 00 00 00 00 28 01

Type: Data Frame
Format: Standard Frame
Send Mode: Normal Send
Frames: 1
Interval(ms): 0
Send Times: 1
ID(Hex): Fixed 0000
Data(Hex): Fixed 00 01 02 03 04 05 06 07

Send Time(s)
Send Frames 0
Receive Frames 88

4.3.2 CAN bus instruction

Note 1: The controller ID is a decimal number in the configuration software, and the CAN software is a hexadecimal number.

Example: 1. The configuration software sets the controller ID to 1, and the CAN software ID is 06000001 (extension ID).

2. The configuration software sets the ID to 112, and the CAN software ID is 06000070.

Note 2: ID of sending data: 0x0600000 + controller ID (hexadecimal)

ID of returned data: 0x0580000 + controller ID (hex)

ID of heartbeat data: 0x0700000 + controller ID (hex)

Enable: 23 0d 20 01 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 0d 20 00 00 00 00 00

Disable: 23 0c 20 01 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 0c 20 00 00 00 00 00

Speed control: 23 00 20 01 DATA_L(h) DATA_L(l) DATA_H(h) DATA_H(l)

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 00 20 00 00 00 00 00

Motor current query: 40 00 21 01 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 00 21 01 DATA 00 00 00

DATA =((unsigned char*)(&send_float))

Fault query: 40 12 21 01 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 12 21 01 DAT1 DAT2 00 00

DAT1 =((unsigned char*)(&TYPE_RunData.err)) [L]

DAT2 =((unsigned char*)(&TYPE_RunData.err)) [H]

TYPE_RunData.err is the fault code

Encoder speed query: 40 03 21 01 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 03 21 01 DAT1 DAT2 00 00

DAT1 =((unsigned char*)(&send_float))[L]

DAT2 =((unsigned char*)(&send_float))[H]

Power supply voltage query: 40 0D 21 02 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 0D 21 02 DATA 00 00 00

DATA =((unsigned char*)(&send_float))

Radiator temperature query: 40 0F 21 01 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 0F 21 01 DATA 00 00 00

DATA = ((unsigned char*)(&send_short))

Encoder count value query: 40 04 21 01 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 04 21 01 DAT1 DAT2 DAT3 DAT4

DAT1 = ((unsigned char*)(&send_int))[4];

DAT2 = ((unsigned char*)(&send_int))[3];

DAT3 = ((unsigned char*)(&send_int))[2];

DAT4 = ((unsigned char*)(&send_int))[1];

AD input query: 40 05 21 01 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 05 21 01 DAT1 DAT2 00 00

DAT1 =((unsigned char*)(&send_float))[L]

DAT2 =((unsigned char*)(&send_float))[H]

Program version query: 40 01 11 11 00 00 00 00

Return ID: 0x0580000 + controller ID (hexadecimal)

Data 60 01 11 11 DAT1 DAT2 DAT3 DAT4

DAT1 = ((unsigned char*)(&send_int))[1];

DAT2 = ((unsigned char*)(&send_int))[2];

DAT3 = ((unsigned char*)(&send_int))[3];

DAT4 = ((unsigned char*)(&send_int))[4];

Heartbeat return command:

Return ID: 0x0700000 + controller ID (hexadecimal)

Return instruction: Data0 Data1 Data2 Data3 Data4 Data5 Data6 Data7

Data0 Data1, Electrical Angle: 0——1000

Data2 Data3, motor speed: – speed —— + speed

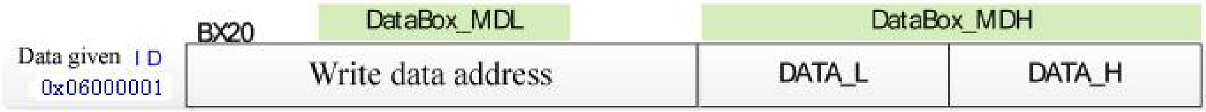
Data4 Data5, speed command: 0-1000 (rated speed) command value

Data6 Data7, Control_Close (fault code)

(Notice: the high data in the front and the low data is later)

4.3.3 CAN bus data description

4.3.3.1 Control mode



	BX20 DataBox_MDL	DataBox_MDH	
Data given ID 0x06000001	Write data address	DATA_L	DATA_H

DataBox_MDL=0x230D2001 Enable

DataBox_MDL=0x230C2001 Disable

DataBox_MDL=0x23002001 Speed control

DataBox_MDL=0x23012001 Torque control

DataBox_MDL=0x23022001 Position control

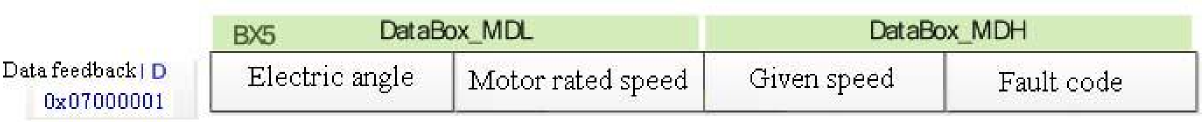
Note：need to make up 8 digit，Eg：23 0D 20 01 00 00 00 00

Speed: -1000 -- 1000, negative rated speed -- rated speed

Torque: -1000 -- 1000, negative rated torque x2 -- rated torque x2

Position: -25000 -- 25000, 2.5 circles clockwise -- 2.5 circles anticlockwise

4.3.3.2 Heartbeat data



	BX5 DataBox_MDL		DataBox_MDH	
Data feedback I D 0x07000001	Electric angle	Motor rated speed	Given speed	Fault code

4.3.4 CAN bus control example

4.3.4.1 Speed Control:

(Speed command value ‰）* (The setted max speed in the software) = the real speed. If the setting max speed is 80rpm, then the Speed command set point -1000 - +1000 means -80rpm - +80rpm （0xFC18）（0x03E8）

The software setting control mode is CAN control (0019 is set to 2)

The software setting control mode is set to speed control (0020 is set to 1)

The software sets the system address to 1 (0018 is set to 1)

- If you want set the speed +40 (rated speed 80)

Control command ID: 0x06000001 (extended ID)

Enable: 23 0d 20 01 00 00 00 00

Speed given: 23 00 20 01 01 F4 00 00 (0x01F4 = 500)

- If you want set the speed -40 (rated speed 80)

Control command ID: 0x06000001 (extended ID)

Enable: 23 0d 20 01 00 00 00 00

Speed given: 23 00 20 01 FE 0C FF FF

4.3.4.2 Position control:

Position given value -50000 - 50000 means 5 circles clockwise - 5 circles anticlockwise (0x3CB0 FFFF) (0XC350 0000)

The software setting control mode is CAN control (0019 is set to 2)

The software setting control mode is absolute position control (0020 is set to 3)

Or the software setting control mode is set to relative position control (0020 is set to 4)

The software sets the system address to 1 (0018 is set to 1)

Control command ID: 0x06000001 (extended ID)

- Data transmission order:

（a） Disability 23 0C 20 01 00 00 00 00
（b） Enable 23 0D 20 01 00 00 00 00
（c） Position control: 23 02 20 01 DATA_L(h) DATA_L(l) DATA_H(h) DATA_H(l)

For example, you need the motor rotate 1.8 circles clockwise

（a） Make sure the position control has been switched
（b） Enable 23 0D 20 01 00 00 00 00
（c） Position control command: 23 02 20 01 B9 B0 FF FF

For example, you need the motor to rotate the mechanical angle 76 degrees counterclockwise (76 * (10000 / 360) = 2052 = 0x0804)

（a） Make sure the position control has been switched
（b） Enable 23 0D 20 01 00 00 00 00
（c） Position control command: 23 02 20 01 08 04 00 00

4.4 Serial port instructions

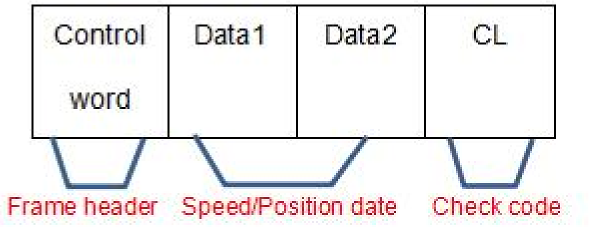
4.4.1 General Configuration

Serial port configuration

The serial port communication port of the controller is set as follows:

115200bits/s
4-bit data
1 start bit
Check code
Hexadecimal

4.4.2 Send control command format



Frame Header: AD AC
AD: Enable, you can make the motor run.
AC: Disable, the motor/driver are in torqueless status.

Speed /Position Data:
[Data] is the given speed/position data, high before, low after.
The speed data range is -1000 ~ +1000, means - 80rpm ~ +80rpm (factory setting)
The position data range is -3000000~+3000000, means -300 circles ~ +300 circles (10000/circle)

Check code:

The check uses the sum check method, that is, starting from the frame head, accumulating all the bytes, and the low bit of the final result obtained is the check code.

Example: motor enable, speed 0rpm

AD 00 00 AD Data feedback：AC xx xx xx

Example: motor disable, speed 0rpm

AC 00 00 AC Data feedback：AC xx xx xx

Example: motor enable, speed 100rpm （Rated speed 100）

AD 03 E8 98 Data feedback：AC xx xx xx

Example: motor disable, the speed given 100rpm（Rated speed 100）

AC 03 E8 97 Data feedback：AC xx xx xx

Example: motor enable, the speed given -100rpm （Rated speed 100）

AD FC 18 C1 Data feedback：AC xx xx xx

Example: motor disable, the speed given -100rpm （Rated speed 100）

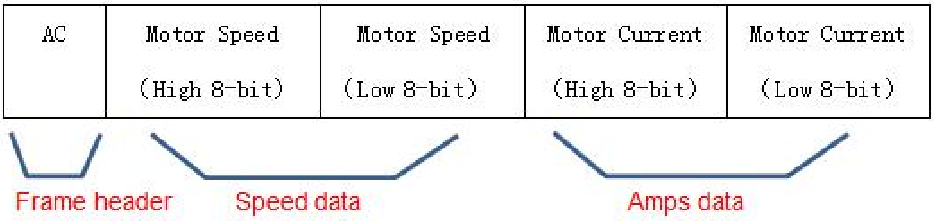
AD FC 18 54 Validation error Data feedback：A8 xx xx xx

- **Notice：Time interval between two instructions when sending instructions continuously.**

  20ms < Time interval < 500ms

4.4.3 Return information format

● Every time the controller receives a control command, the controller will return a response data defined as follows: (hexadecimal)



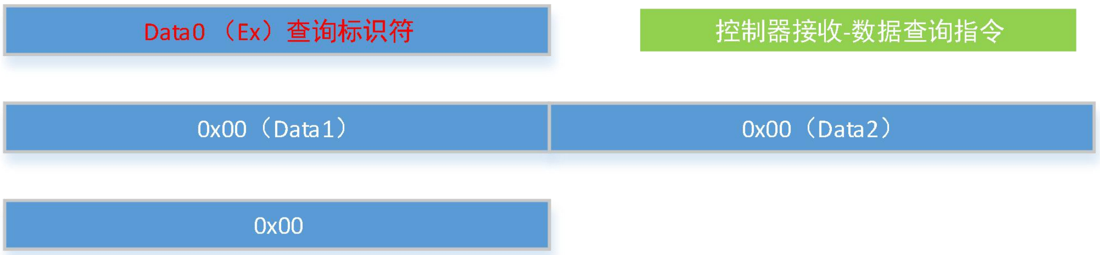
AC	Motor Speed (High 8-bit)	Motor Speed (Low 8-bit)	Motor Current (High 8-bit)	Motor Current (Low 8-bit)

Frame header
Speed data
Amps data

AC: Check passed.

A8: Check failed

4.4.4 Query data format



Marker (Data0): Ex means query data command.

Query data marker description:

0xE0	System control states
0xE1	Motor rotor position Electric angle (0-1000)
0xE2	Motor speed (rpm)
0xE3	Motor winding Amps (positive number)
0xE4	Motor rotor mechanical angle (0-10000)
0xE5	System controller voltage
0xE6	Motor/controller temperature
0xE7	Error code
0xE8	Motor rotor mechanical position (position mode)
0xEF	System program version

Such as:

- Read motor speed (rpm)

  The software send: E2 02 00 00 00

  Controller feedback: E2 00 64 00 00

  The motor speed is 100rpm

- Read controller current (A)

  The software send: E2 02 00 00 00

  Controller feedback: E2 00 64 00 00

  The controller voltage is 10A

- Read controller voltage (V)

  The software send: E5 00 00 00

  Controller feedback: E5 00 0B 00 00

The controller voltage is 12V

- Read controller temperature (℃)

  The software send: E6 00 00 00

  Controller feedback: E6 1A 00 00 00

  The controller temperature is 26℃

- Read motor position (10000/Circle)

  The software send: E8 00 00 00

  Controller feedback: ED 00 09 2D EE

  The motor position is 601528

Note: The data returned by the query are all in hexadecimal and need to be converted to decimal to read.

- Read controller error code

  The software send: E7 00 00 00

  Controller feedback: E7 03 01 00 00

  The controller error code is 03 01

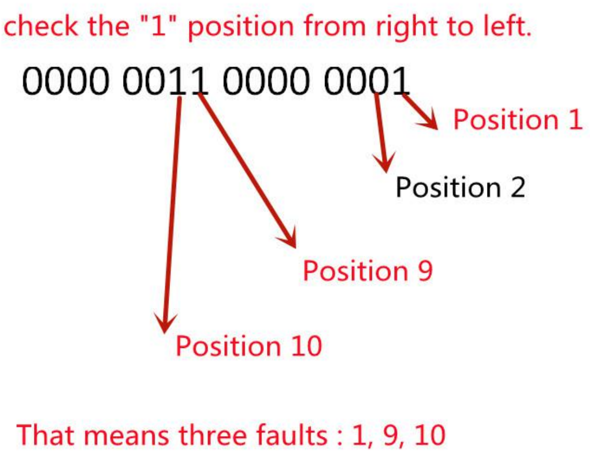
Fault code failure resolution:

At first, convert the hexadecimal to binary, then check the "1" position from the right to the left, which corresponds to the indicator blinking frequency.

Eg: The feedback data is 03 01

0 3 0 1 (Hexadecimal)

0000 0011 0000 0001 (Binary); means faults 1, 9, 10.


check the "1" position from right to left.
0000 0011 0000 0001
Position 1
Position 2
Position 9
Position 10
That means three faults : 1, 9, 10

Data	Definition	Cause of issue
1	Working normally	Disability state
2	Over voltage	Supply voltage is over 32V(adjustable)
3	Hardware overcurrent protection 60A	Overcurrent protection caused by motor short circuit and field tube damage
4	EEPROM error	Data saving error
5	Less voltage	Supply voltage is lower than 7V(adjustable)
6	brake	Turn on the brake signal
7	Software overcurrent protection (software set protection value)	The phase current reaches the software setting protection value for 1 second to stop output.
8	Control mode failure	Control mode selection error
9	Working mode failure	Speed, position working mode not selected or wrong
10	Speed loss protection	Actual speed exceeds 25% of rated value
11	Temperature alarm	The temperature above 85 °C
12	Hall error	Motor Hall is off or malfunctioning
13	Reserved	Reserved
14	232 break	232 mode, no 232 signal input
15	CAN break	CAN mode, no CAN signal input
16	Blocking for 2 seconds	Motor stalled 2s protection

V. Fault Protection and Reset

5.1 Fault protection basis

5.1.1 Temperature alarm

When the temperature of the drive exceeds 85 °C, a temperature alarm is generated; when it is restored to 80 °C, the alarm flag is cleared automatically.

5.1.2 Overcurrent protection

When the phase current reaches the setting value with setting time, it stops. Re-enable can reset the motor.

5.1.3 Overvoltage and undervoltage protection

The system will make undervoltage protection when the power supply voltage is lower than setting data.

And the system will make overvoltage protection when the power supply voltage is higher than setting data.

5.2 Fault information table

Protection category	Security Level	Turn off the PWM output	FAULT output
Temperature	Status latch	Yes	Yes
Overcurrent	Status latch	Yes	Yes
Undervoltage	Status latch	Yes	Yes
Overvoltage	Status latch	Yes	Yes
EEPROM error	Status latch	Yes	Yes

Note: When the fault status is locked, the controller will stop the power output; you can re-enable the motor to clear all fault flags.

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