DINGS
Precision Motion Specialist

Closed Loop Stepping Motor Driver

VER 1.4

User Manual

DS-CLS9-FETC

DINGS
Precision Motion Specialist

Table of Contents

1. Main Specification

Project	Content	Remarks
Model	DS-CLS9-FETC	
Power supply	DC 24V - 48V	
Output current	0.5 – 6.5A	Adapted motor 28, 42, 57, 60, 86
Control object motor	2-phase bipolar stepper motor with encoder	
Drive mode	PWM constant current drive	
Communication Interface	**Input** □ High-speed input 2 □ 5 digital inputs □ Encoder input (A, B, Z) **Output** □ 3 digital outputs □ Encoding signal output (differential A, B, Z)	
Digital input details	Enable, Alarm reset, Positive limit, Negative limit, Emergency stop, Origin, etc.	
Digital output details	In position output, Alarm output	
Brake	Brake output	
Digital indication	Status and fault display	
EtherCAT Communication address (NODES)	1 - 255	
Control mode	PP, PV, Home, CSP	
Dimensions (mm)	156（L）×97（W）×33.5（H）	Without terminal block
Weight	About 500g	Without terminal block
Operating temperature/humidity	0 ~ 40℃, 85%RH the following	Prevent condensation
Storage temperature	0 ~ 85℃, 85% the following	Prevent condensation
Ambient gas	Prevent corrosive gas	

2. Before Operation

Be sure to perform the following tasks before turning on the power.

2.1 Wiring

Please be sure to refer to the specified connector specification table for wiring.

1. CN1 : Power supply

   Please use wire material above AWG #20.
2. CN2 : Motor wiring
3. CN3 : Brake output
4. CN4 : Encoder wiring
5. CN5 : Wiring of interface signals

   Please configure the necessary digital input and digital output signals. The universal input/output are isolated by optocouplers. Please prepare the power supply (+24V) for the interface separately. (Note: The encoder signal is a differential output, not isolated by an optocoupler)
6. CN6

   Please use the RJ45 connector for the wiring of EtherCAT communication.
7. CN7

   Please use the RJ45 connector for the wiring of EtherCAT communication.
8. SW1 : Eight-speed DIP switch, node setting
9. CN8 : Debug interface

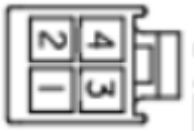
3. Connector Specification Table

3.1 CN1 (Power Supply)

Terminal number	Icon	Pin.	Signal name
CN1		2	V+ (DC24V ~ 72V)
		1	GND

Pay attention to the power polarity when wiring
Specification of wire: AWG 20 ~ AWG 16 (multi strand wire)

3.2 CN2 (Motor)

Terminal number	Icon	Pin.	Signal name
CN2		4	A+
		3	B+
		2	A-
		1	B-

3.3 CN3 (Brake Output)

Terminal number	Icon	Pin.	Signal name
CN3		2	BRK+
		1	BRK-

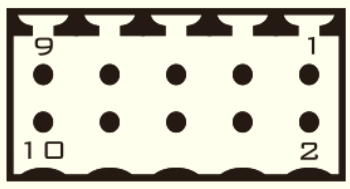
Notes

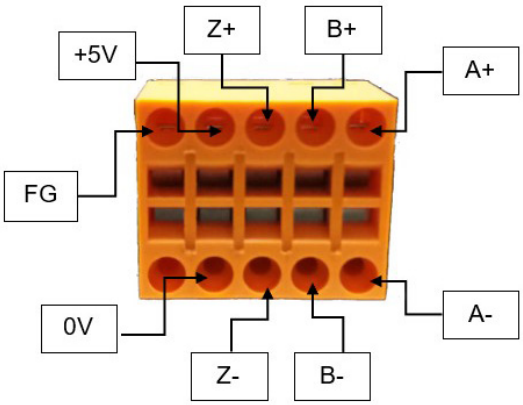
1. The maximum output current is 500mA, without external relay
2. To set it default, this function is disabled at DINGS'. When you need this function, please turn it on and set the relevant parameters through the debugging software.

3.4 CN4 (Encoder)

Pin.	Signal name	Pin.	Signal name
1	A+	2	A-
3	B+	4	B-
5	Z+	6	Z-
7	+5V	8	0V
9	FG	10	NC

Schematic Diagram





Pay attention to the polarity of the encoder power supply when wiring

Use wire specification: AWG28 ~ AWG18 (multi-stranded wire)

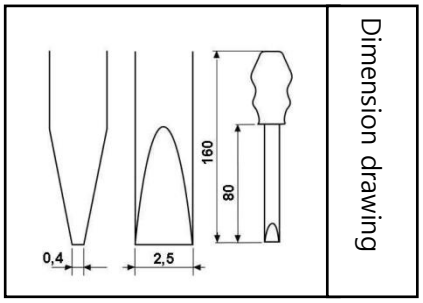
The terminal is a pull back spring connection and adopts the front wiring mode. It is very easy to operate when a special screwdriver is used.

Fasten the terminal block with the special tool

When tightening the terminal, Please use a blade width 0.4×2.5 screw driver.

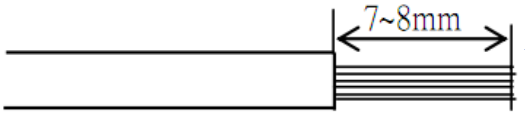
For example：Phoenix Contact Screw Driver

（Product No：1205037，Model SZS 0.4×2.5）



Wiring Method：

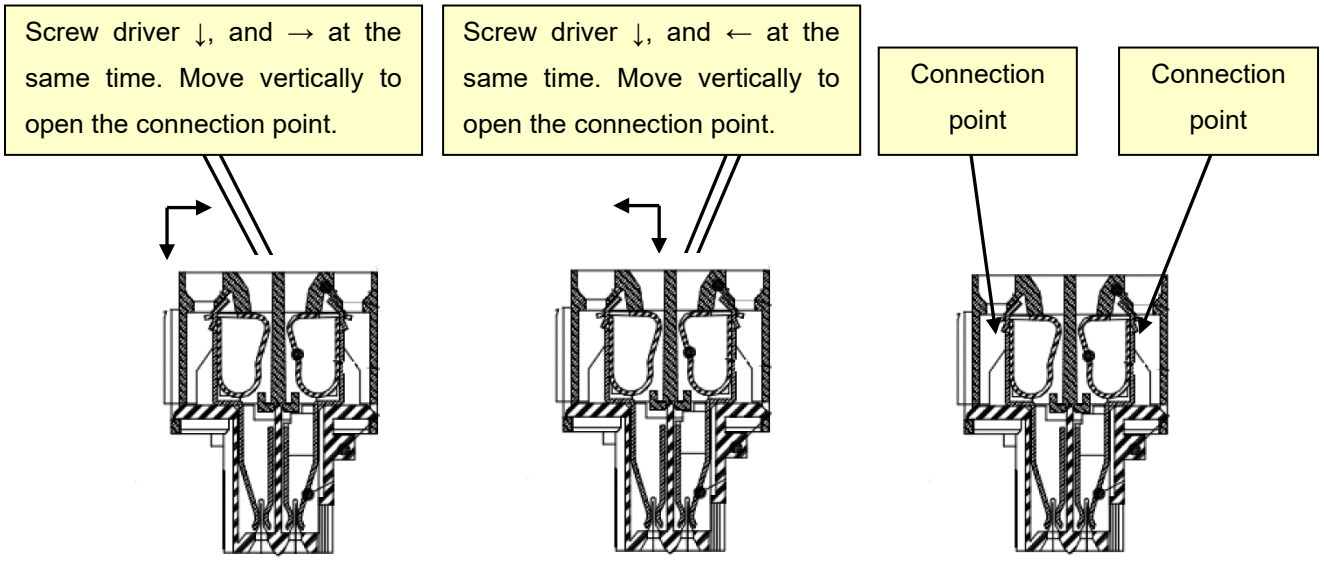
① Strip Length：7 ~ 8mm



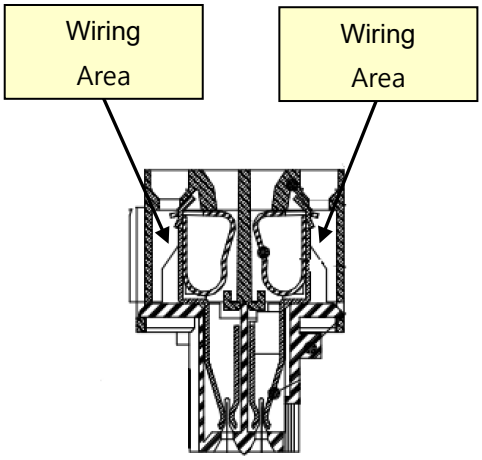
Do not apply a layer of solder to the wire head first
(it may lead to a failure of normal wiring)

The terminal is a pull back spring connection. The front wiring mode is adopted. The operation is very simple.

② Open the wiring point with a standard screw driver.



③ Insert lead into the wiring area and remove the screw driver. Automatic connection of wires.



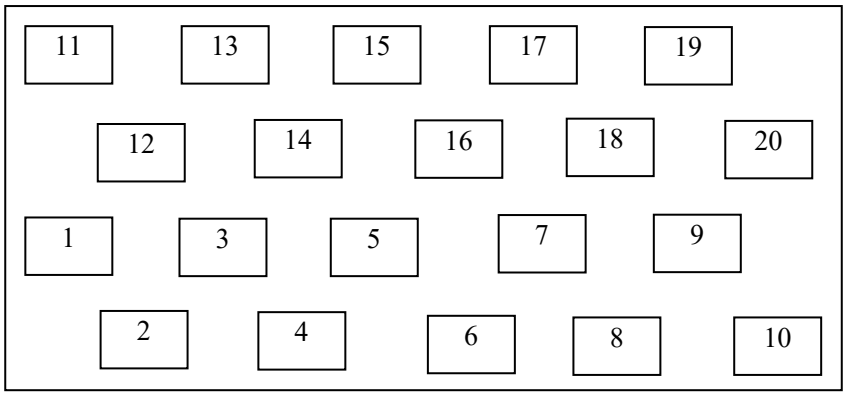
※Precautions during wiring

Observe the following items and be careful not to break the wire.

- **Do not damage the core wire when stripping the cladding.**
- **During wiring, pay attention not to kink the core wire and the core wire shall not leak out to avoid short circuit of the conductor.**
- **Please connect the core wire directly instead of welding. Otherwise, the line will be broken due to vibration**
- **After wiring, do not apply pressure to the wire.**
- **Screw driver of the specified size and the same type must be used otherwise there is a risk of damaging the terminal shrapnel.**

3.5 CN5 (I/O)

Schematic Diagram



Terminal Number	Pin	Signal Name	Description
CN5	1	COM（IN）	Describe the common terminal of single-ended input signal, common anode or common cathode
	2	IN1	Single-ended input signal IN1 ~ IN5, 18 ~ 24V valid, maximum input frequency 10KHz, signal definition can be configured, IN1 defaults to positive limit, IN2 defaults to negative limit, IN3 defaults to origin, IN4 and IN5 defaults to general input
	3	IN2	
	4	IN3	
	5	IN4	
	6	IN5	
	7	IN6+	Differential input signal IN6, 5 ~ 24V is valid, the maximum input frequency is 500KHz, the signal definition can be configured, the default is the probe input signal 1
	8	IN6-	
	9	IN7+	Differential input signal IN7, 5 ~ 24V is valid, the maximum input frequency is 500KHz, the signal definition can be configured, the default is the probe input signal 2
	10	IN7-	

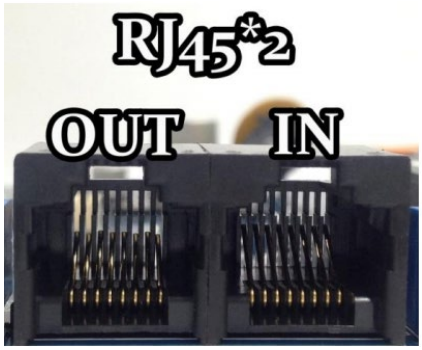
	11	OUT1	Single-ended output signal, common cathode connection, maximum output current 50mA, maximum withstand voltage 30Vdc. The output function can be configured, the default alarm output
	12	OUT2	Single-ended output signal, common cathode connection, maximum output current 50mA, maximum withstand voltage 30Vdc. The output function can be configured, the default alarm output
	13	OUT3	Single-ended output signal, common cathode connection, maximum output current 50mA, maximum withstand voltage 30Vdc. The output function can be configured, the default alarm output
	14	COM（OUT）	Output common cathode common terminal
	15	Encoder A+	Encoder A channel positive output
	16	Encoder A-	Encoder A channel negative output
	17	Encoder B+	Encoder B channel positive output
	18	Encoder B-	Encoder B channel negative output
	19	Encoder Z+	Encoder Z channel positive output
	20	Encoder Z-	Encoder Z channel negative output

3.6 CN6 (IN) / CN7 (OUT) (EtherCAT)

Pin.	Signal name	Pin.	Signal name
1	E-TX+	2	E-TX-
3	E-RX+	4	NC
5	NC	6	E-RX-
7	Terminating resistor（CN5）	8	Terminating resistor（CN5）

Standard: RJ45 type × 2

See the position of each pin in a face-to-face view



3.7 SW1 (Node Setting)

SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8	Add
ON	ON	ON	ON	ON	ON	ON	ON	1
ON	ON	ON	ON	ON	ON	ON	OFF	2
ON	ON	ON	ON	ON	ON	OFF	ON	3
ON	ON	ON	ON	ON	ON	OFF	OFF	4
ON	ON	ON	ON	ON	OFF	ON	ON	5
.....								…
OFF	OFF	OFF	OFF	OFF	OFF	ON	OFF	254
OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	255
OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	customize

3.8 CN8 (Debug Interface)

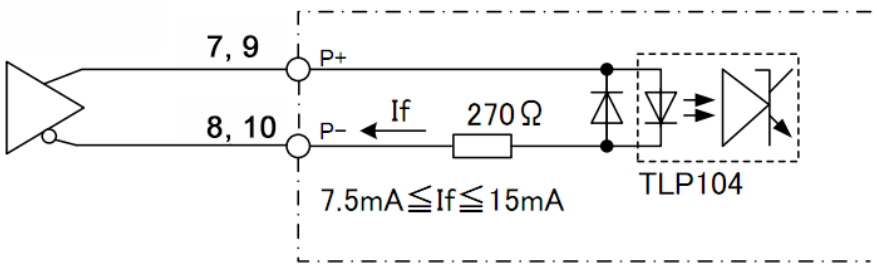
USB-B Interface

Notes Need to select a dedicated debugging line

4. Input Circuit Diagram

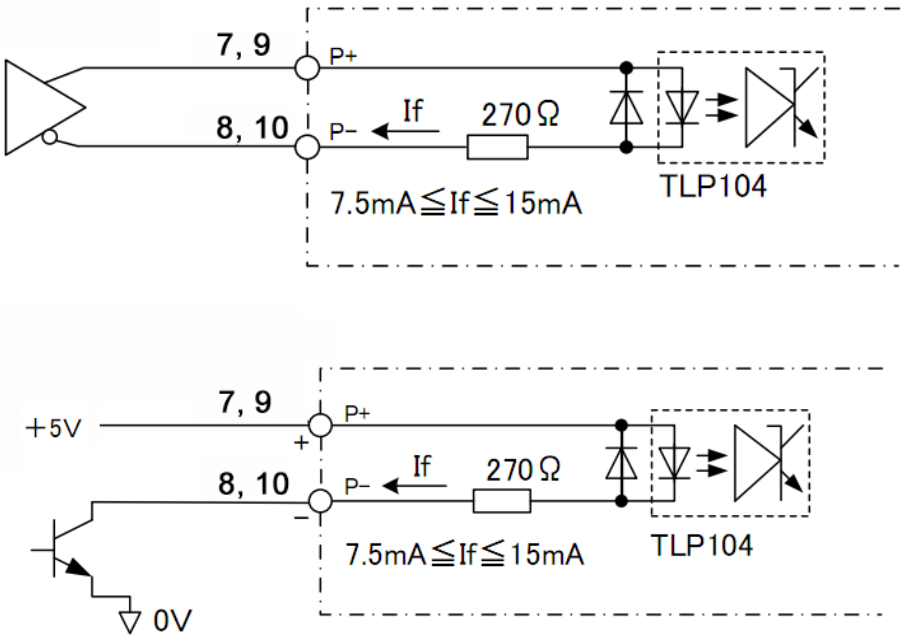
4.1 High speed input circuit (Differential drive)

Similar AM26LS31



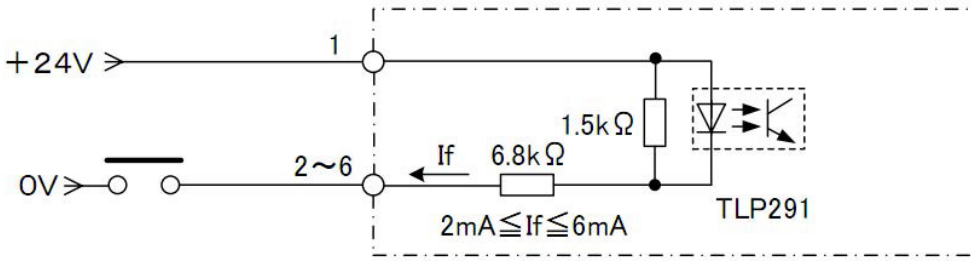
4.2 Command pulse input circuit (Collector)

Similar AM26LS31

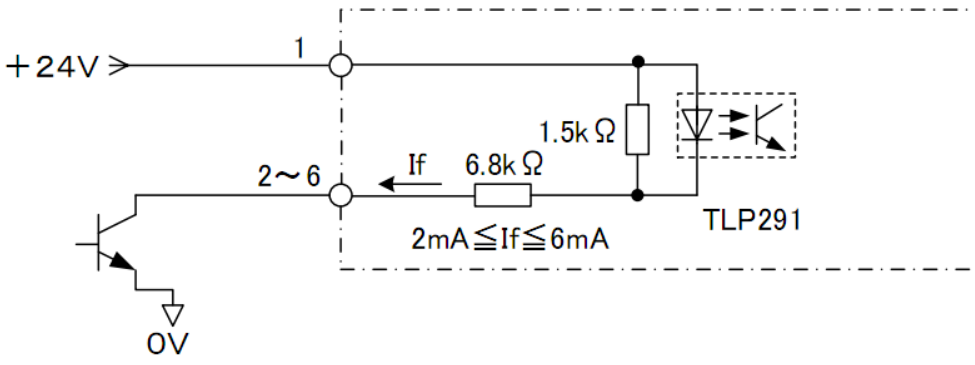


Notes This product is compatible with+5V/+24V signal and there is no need to connect current limit resistor in serial when 24V input.

4.3 Sensor and digital input circuit (Contact)

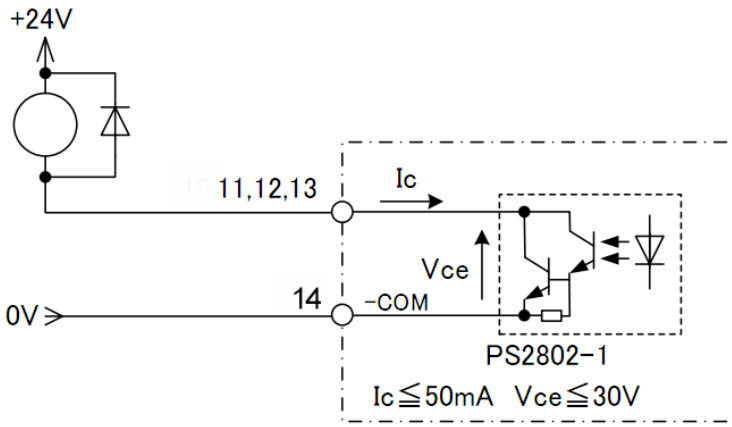


4.4 Sensor and digital input circuit (Collector output)



5. Output Circuit Diagram

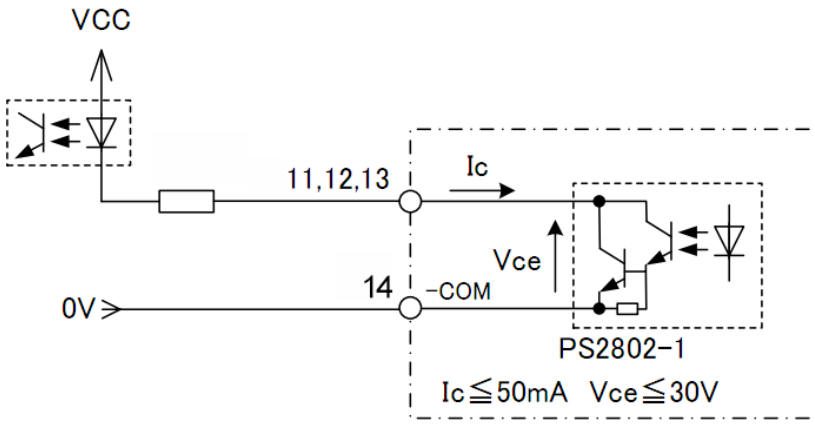
5.1 Digital output circuit (Relay connection)



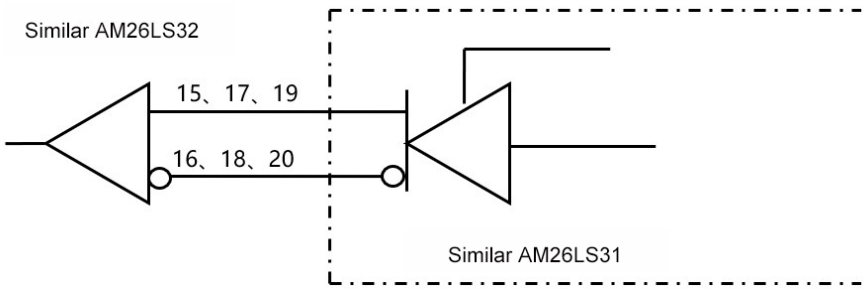
Notes

When the relay is connected, it is required to connect diodes at both ends of the relay(for example IN4000 series).

5.2 Digital output circuit (Optocoupler connection)



5.3 Differential output circuit (Encoder output)



Notes

The encoder output is not isolated by optocoupler. Before power on, please confirm whether the wiring is correct and whether there is short circuit so as to avoid introducing 24V power supply on the port and damaging the upper master and driver.

6. LED Indicator

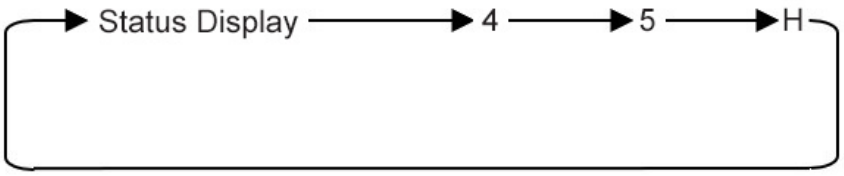
6.1 Status display

Display	Description
	Motor rotation display Lights when the motor rotates, lights off when stopped
	Device enable status The device enable indicator is on and the device disable indicator is off.
	Displayed in command input Command input light is on
	Displayed in CONNECT CONNECT light is on

6.2 Node number display

The Station Address is displayed verbatim and ends with H. After the CONNECT connection is successful, only the status is displayed.

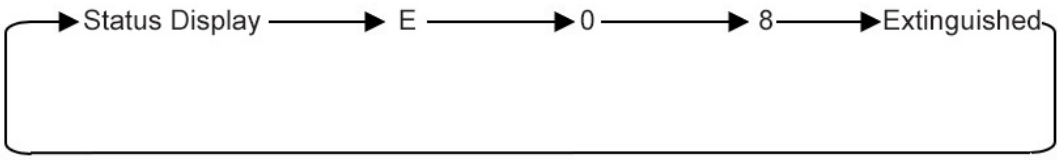
Example : Station Address : 45H



6.3 Alarm display

The alarm code is displayed verbatim and flashes, ending with E

Example : Alarm Code E8H



Features	Alarm code	Alarm /warning	Description
Motor overcurrent	alarm	AH	Motor phase current overcurrent or drive failure
Motor phase loss	alarm	bH	The motor is not connected

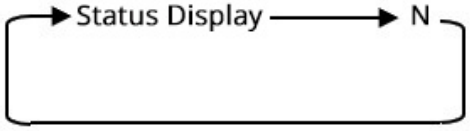
Spare	alarm	CH	Reserved for DINGS
Under Voltage	alarm	dH	Power input is less than 18V
Over Voltage	alarm	EH	Power input is greater than 60V
Over Temperature	alarm	FH	The temperature of the drive radiator reaches 85°C or more
MOS tube driver voltage failure	alarm	10H	MOS tube driver voltage failure
Spare	alarm	11H	Reserved for DINGS
Spare	alarm	12H	Reserved for DINGS
Spare	alarm	13H	Reserved for DINGS
Abnormal EEPROM data writing	alarm	14H	Abnormal EEPROM data writing
Position Error	alarm	19H	Position Error
Current Overload	alarm	1AH	Current Overload
Encoder Error	alarm	1BH	Encoder Wiring Error
Abnormal Communication	alarm	64H	The communication bus is abnormal. When the device is enabled, the communication line is disconnected or the communication quality is unstable
Abnormal EEPROM data read reading	warning	100H	Abnormal EEPROM data reading
Unstable Bus Voltage	warning	200H	Unstable Bus Voltage
Emergency Stop	warning	400H	Emergency Stop
Positive Limit	warning	800H	On the positive limit or over the positive soft limit
Negative Limit	warning	1000H	On the negative limit or over the negative soft limit
Back to origin failed	warning	2000H	Back to origin failed

6.4 Overtravel display

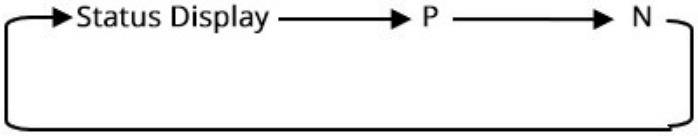
When an overtravel occurs, it is displayed as follows：

① forward side overtravel（P-OT）

② reverse side overtravel（N-OT）



③ forward side / reverse side overtravel occurs



7. Object Directory

7.1 Configuration parameter

Object Directory	Name	Attribute	Word	Range	Default Value	Unit	Remarks
2064	Current	RO	1	0~65535	--	0.1%A	
2065	Bus Current	RO	1	0~65535	--	1%V	
206C	Error Code	RO	1	0~65535	--		
206D	Running State	RO	1	0~65535	--		
206E	H/W Version	RO	1	0~65535	--		
206F	S/W Version	RO	1	0~65535	--		
2075	Current Location	RO	2	-2147483647~ 2147483647	--	pulse	
2077	Current Speed	RO	1	0~65535	--		
207E	Actual Position	RO	1	0~65535	--		
20C9	Running Direction	RW	1	0~65535	0		
20CE	Control Command	RW	1	0~65535	0		
20D5	Idle Current	RW	1	0~65535	50		
20E0	Filter Coefficient	RW	1	0~65535	5		
20F1	Current Setting	RW	1	0~65535	3000	0.1%A	
20F2	Resolution Setting	RW	2	0~ 4294967296	10000	PPR	
20F5	Idle Current Time	RW	1	0~65535	200	ms	
212A	Debug Address	RW	1	0~65535	1		
212B	Debug Baud rate	RW	2	0~ 4294967296	19200		

7.2 Motion parameter

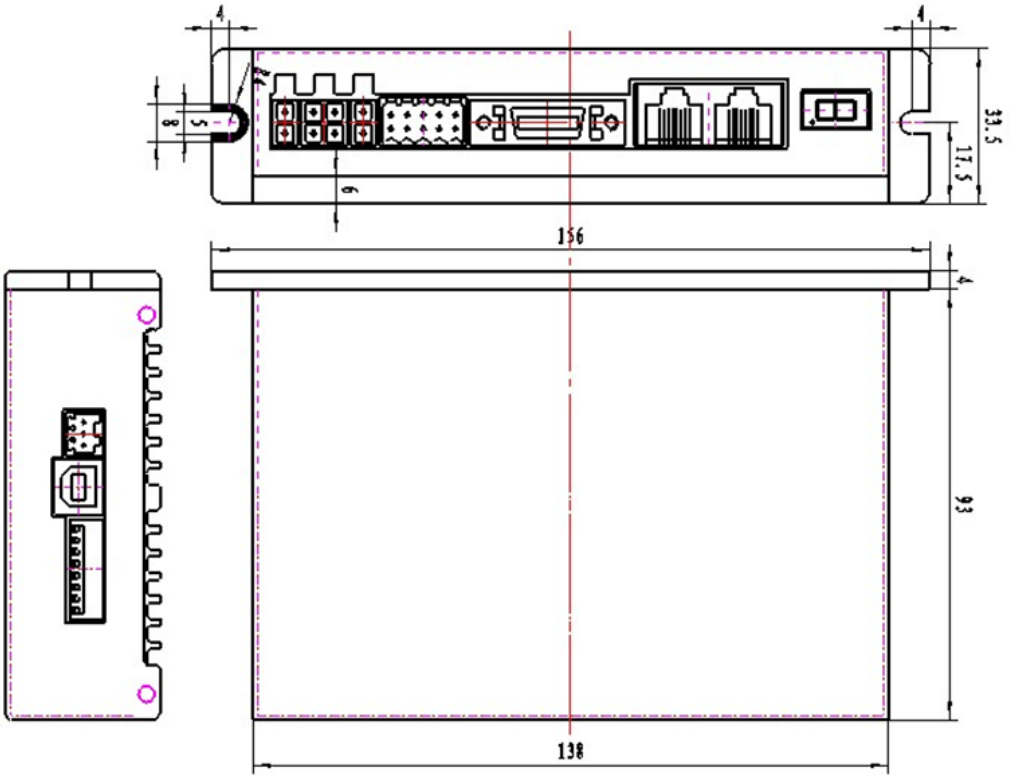
Object Directory	Name	Attribute	Word	Range	Default Value	Unit	Remarks
603F	Error Register	R	1	0~65535	0	--	
6040	Control Word	R/W	1	0~65535	0	--	
6041	Status Word	R	1	0~65535	0	--	
605A	Quick Stop	R/W	1	0~65535	0	--	
6060	Operation Mode	R/W	1	0-255	1	--	1—pp,3—pv,6—Home,8--CSP
6061	Operation Mode Display	R	1	0-255	0	--	
6064	Actual Position	R	2	-2147483647~ 2147483647	0	pulse	

606C	Actual Speed	R	2	-2147483647~ 2147483647	0	PRS	
607A	Target Position	R/W	2	-2147483647~ 2147483647	0	pulse	pp mode 1 Target position command
6081	Trapezoidal Velocity	R/W	2	-2147483647~ 2147483647	50000	PRS	pp mode 1 Max. speed
6083	Acceleration	R/W	2	-2147483647~ 2147483647	4000	PRS^2	pp, pv mode 1, 3 Acceleration
6084	Deceleration	R/W	2	-2147483647~ 2147483647	4000	PRS^2	pp, pv mode 1, 3 Deceleration
6085	Emergency Stop Deceleration	R/W	2	-2147483647~ 2147483647	40000000	PRS^2	Emergency stop deceleration (pp, pv, Home)
60FD	Input IO Status	R	2	0~ 4294967296	0	--	Input IO function logic status
6502	Support Operation Mode	R	2	0~ 4294967296	165	--	Control mode supported by the driver
6098	Origin Mode	R/W	1	0~ 100	19	--	
609A	Origin Return Acc/Dec	R/W	2	-2147483647~ 2147483647	25000	PRS^2	
6099	Origin Velocity	R/W	2	-2147483647~ 2147483647	50000	PRS	
607C	Origin Offset	R/W	2	-2147483647~ 2147483647	0	pulse	

7.3 Closed loop parameter setting (Category 04)

adr	word	Contents	Explanation	Range/Unit
0246	1	Encoder Resolution	Resolution=Number of encoder lines x 4	200~65535
0247	2	Pulse Duration	Approach distance to target position and output in place signal Default □ 0	1~1000 Encoder Resolution
0251	1	Speed Loop Kp	Speed Loop Kp	0□ 30000
0252	1	Velocity Loop Ki	Velocity Loop Ki	0□ 30000
0255	1	Position Loop Kp	Position Loop Kp	0□ 30000
0258	1	Position out of threshold	In Encoder Resolution	0□ 30000 Encoder Resolution

8. Dimensions (mm)



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