DINGS
Precision Motion Specialist

VER 1.0

Technical Manual

DS-OLBS2-FRS4

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Summary

This closed-loop speed controller is designed with the latest type IGBT and MOS power devices. It takes advantage of DC brushless motor's Hall signal to double frequency for closed-loop speed control. PID control links with the speed controller. The control system is stable and reliable, especially at low speed, it always can reach the maximum torque, The speed control range is from 150 to 20000rpm.

1. Features

- PID speed, current double loop regulator.
- 20KHz chopper frequency.
- Electrical stop to ensure the quick action.
- Over load ratio larger than double, the torque can always reach the maximum at low speed.
- Fault alarm function with Over voltage, Under voltage, Over current, Over temperature, and incorrect Hall signal.

2. Product Characteristic

Drive model	DS-OLBS2-FRS4
Input voltage	24 VDC - Under voltage protection : 12±2 VDC - Over voltage protection : 40±2 VDC
Continuous output current	5 A
Max. output power	100 W
*The default current setting is 5A, different current can be modified by changing the parameters	
Factory value of acceleration time constant	1sec, others can be customized

Warning

*** Do not measuring or touch any components without housing while operating.**
*** Should check soleplate or change fuse 1minute later after power off.**
*** Operating without housing is prohibited.**
*** Make sure to connect the ground terminal, otherwise the brushless motor will working improperly.**
*** Sudden damage while drive is working, our company only affords the service and replacement guaranteed. Personal injury and motor damage caused by the accident will invalidate the guarantee.**

3. Terminal Connection

3.1 Power Input

1	V+	8VDC~24VDC input
2	GND	GND input

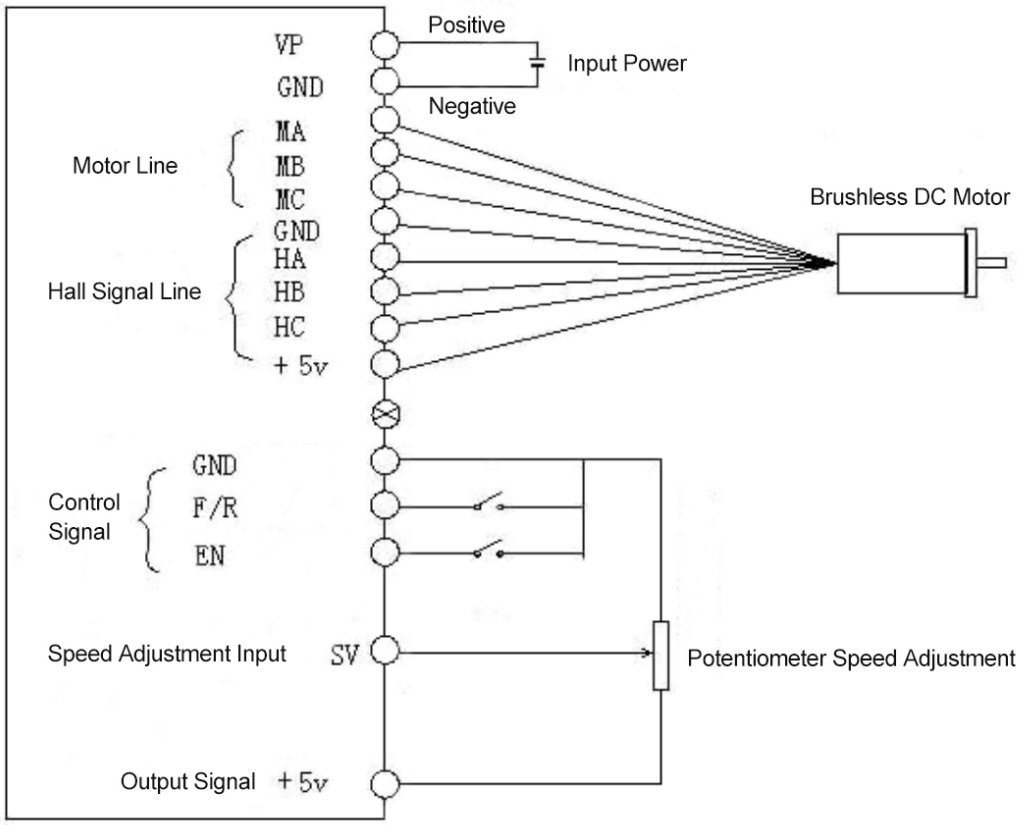
3.2 Motor Input

1	MA	A phase
2	MB	B phase
3	MC	C phase
4	GND	GND
5	HA	Hall signal A input
6	HB	Hall signal B input
7	HC	Hall signal C input
8	+5V	Hall signal power line

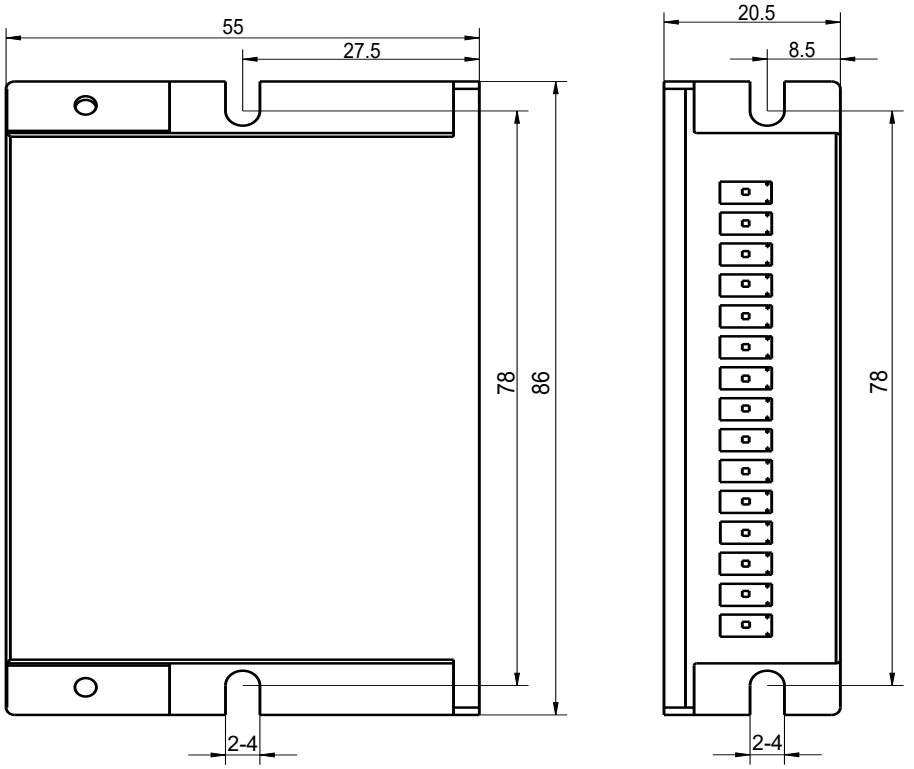
3.3 Control Signal

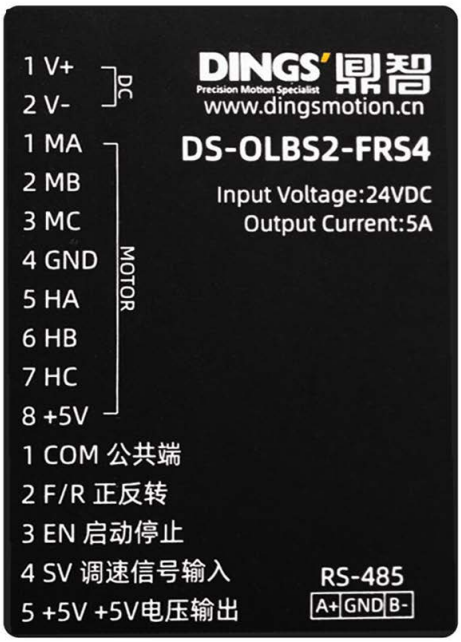
No.	Terminal Name	Description
1	GND	Signal ground
2	F/R	CW/CCW terminal
3	EN	Stop/Start terminal
5	SV	Analog signal input terminal
8	+5V	+5V power output terminal

4. Connection Diagram of Motor and Driver



5. Dimension : 86×55×20mm





6. Functions and Usage

6.1 Speed Adjustment Method

External input adjustment : Connect the terminals of the external potentiometer to the GND and +5v terminal, connect the regulator terminal to SV, then you can adjust the speed by using an external potentiometer. It also can achieve speed adjust through other control units (Such as PLC, SCM, etc.) input analog voltage to SV. The acceptance of SV is DC 0V~+5V, and the corresponding motor rotation speed is 0 to rated speed.

6.2 Motor Operation / Stop Control (EN)

You can control the brushless motor to run or stop by controlling the terminal “EN” and “GND” connection. The motor will be running when we connect the terminal “EN” to “GND” ; when shut down, the motor will stop naturally, and the stopping time will be decided by the inertia and load added to the motor.

6.3 Motor Rotation Direction Control (F/R)

You can control the motor rotation direction by controlling the terminal “F/R” and “GND” connection. When connect terminal “F/R” to terminal “GND”, the motor will run at CCW (view from motor output side), and when shut down, the motor will run at another direction.

Attention **If you need to change the motor rotation direction, please stop the motor at first, otherwise the driver shall be damaged.**

6.4 Driver Failure

Over-voltage or over-current will lead the driver to a protection status, the driver will automatically stop operation, the motor stop and blue light will blink. As long as you enable terminals to reset (EN and GND disconnected) or power off, the driver will stop alarm. Please check the motor wiring once this failure occurred.

6.5 RS485 Communication Port

The driver communication mode adopts the standard Modbus protocol, which conforms to the national standard GB / T 19582.1-2008. RS485 based two-wire serial link is used for communication, and the physical interface adopts conventional 3-pin wiring port (A +, GND, B -), which is very convenient for serial connection.

If the driver control adopts communication mode, it is directly connected to the upper computer through RS485 and controlled through RS485 communication command. Transmission mode RTU, validation mode CRC, CRC start word FFFFH. Data mode: 8-bit asynchronous serial, 1 stop bit, invalid bit check, and fixed communication rate of 9600bps. Specific communication instructions and sample routines can be obtained from DINGS'.

7. Use of Product

1. Ensure that motor line, hall line and power line connected correctly, Motor and driver will be damaged if lines connected incorrectly.
2. When adjusting speed with an external potentiometer, connect the moving point (intermediate interface) of the external potentiometer to the SV port of the driver and the other two to GND and + 5V ports.
3. Power on and run. At this time, the motor is in the closed-loop maximum speed state. Adjust the attenuation potentiometer to the required speed.

8. RS-485 Communication

The communication mode adopts standard Modbus protocol and RS485 based two-wire serial link communication. The physical interface adopts conventional 3-pin wiring ports (A +, GND, B -). It is directly connected to the host computer through RS485 and controlled by RS485 communication command. Transmission mode RTU, validation mode CRC, CRC start word FFFFH. The data mode is 8-bit asynchronous serial, 1 stop bit, invalid bit check, and the communication rate is fixed at 9600bps. The register is defined as follows:

No.	Address	Name	Setting range	Default	unit
00	$8000	First byte : control bit state	First byte : Bit0: EN Bit1: FR Bit2: BK Bit3: NW1 Bit4: NW Bit5: KHX Bit6: HR60 Bit7: KH	00H	
		Second byte : Hall angle and motor poles	Second byte : Bit0-7: poles 1-255	02H	

01	$8001	Maximum speed in analog adjustment	0-65535	6000	RPM
02	$8002	First byte : start torque	1-255	40H	
		Second byte : start speed without sense start	1-255	04H	
03	$8003	First byte : accelerate time	1-255	0	0.1s
		Second byte : decelerate time		0	
04	$8004	First byte : max. current		90H	90h is hexadec
		Second byte : Type		15	15 is sensor, 16 is sensorless
05	$8005	Communication speed setting	0-65535	2000	RPM
06	$8006	Brake force	0-1023	1023	
07	$8007	First byte : site address	1-250	1	
		Second byte : reserved		0	
08	$8008	Segment 0 speed	0-32767	1000	RPM
09	$8009	Segment 1speed	0-32767	1500	RPM
0A	$800A	Segment 2 speed	0-32767	2000	RPM
0B	$800B	Segment 3 speed	0-32767	3000	RPM
0C	$800C	Segment 4 speed	0-32767	4000	RPM
0D	$800D	Segment 5 speed	0-32767	5000	RPM
0E	$800E	Segment 6 speed	0-32767	6000	RPM
0F	$800F	Segment 7 speed	0-32767	7000	RPM
10-17		$8010-$8017	reserve		
18	$8018	Real speed			
19	$8019	First byte : bus voltage second byte : bus current			
1A	$801A	First byte: control port state Second: analog port value	Bit0: SW1 Bit1: SW2 Bit2: SW3 Bit3: SW4		
1B	$801B	First byte : fault state	Bit0: stall		
		Second byte : motor running state	Bit1: over current Bit2: hall abnormality Bit3: low bus voltage		

		Bit4: over bus voltage Bit5:peak current alarm Bit6: temperature alarm Bit7: reserved
1C	$801C-$801F	Reserve
20	$8020 above illegal	

Site address 8000H-8017H Read-write register

Site address 8018H-801FH Read-only register

Other address is illegal

8000: first byte:

EN: when NW=0, 0: external EN low level effective 1: external EN high level effective

when NW=1, 0: EN ineffective 1: EN effective

FR: when NW=0, 0: external FR low level effective 1: external FR high level effective

when NW=1, 0: FR ineffective 1: FR effective

BK: when NW=0, 0: external BK low level effective 1: external BK high level effective

when NW=1, 0: BK ineffective 1: BK effective

NW	MDX	X12	Function
0	0	X(arbitrarily)	External analog speed
0	1	0	External SW speed regulation mode 1
0	1	1	External SW speed regulation mode 2
1	X(arbitrarily)	X(arbitrarily)	Internal communication control

KH: reversed

Example:

Write speed 1000 driver original instruction return

01 06 80 05 E8 03 BE 0A

Terminal address write register speed hexadecimal low two high two CRC low high

Write speed 2000 driver original instruction return

01 06 80 05 D0 07 AC 09

Write speed 3000 driver original instruction return

01 06 80 05 B8 0B 83 CC

Start in the original direction (changed to communication mode)

01 06 80 00 09 02 27 9B

Change direction start

01 06 80 00 0B 02 26 fb

Stop it

01 06 80 00 0A 02 27 6b

Read speed

01 03 80 05 00 01 bd cb

Read acceleration time setting

01 03 80 03 00 01 5d ca

Write acceleration and deceleration time (slowest)

01 06 80 03 FF FF 51 BA

Write acceleration and deceleration time (fastest)

01068003000500a

Reading current

01 03 80 04 00 01 EC 0B

Write current (factory current F0) 90

01 06 80 04 F0 10 A4 07

Read fault status

01 03 80 1B 00 01 DD CD

Change to external port control

01 06 80 00 00 02 21 CB

Write speed 10000rpm

Terminal address write register speed hexadecimal low two high two CRC low high

01 06 80 05 10 27 fd d1

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