DINGS'
Precision Motion Specialist

VER 1.0 **Technical Manual**

DS-OLBS8-FRS4

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Summary	DS-OLBS8-FRS4 brushless motor driver is a small power driver independently developed for the modern industrial automatic control field. It mainly uses high-performance special brushless DC motor driver chip, which has high integration and small size. A series of advantages such as perfect protection, simple and clear wiring, and high reliability. This driver is suitable for driving small and medium-sized brushless DC motors with rated power below 1000W. The driver adopts the new PWM technology, which makes the brushless motor have high running speed, low vibration, low noise, good stability and high reliability.

1. Product Characteristic

1.1 System Characteristic

Drive model	DS-OLBS8-FRS4
Input voltage	24 – 48 VDC
Max. Continuous current	30 A
Voltage range	10 - 60 VDC
Working temperature	0 ~ +45 °C
Storage temperature	-20 ~ +85 °C
Working & storage humidity	<85% (no frosting)
Structure	wall-mountable type

1.2 Basic Characteristic

Drive model	DS-OLBS8-FRS4
Cooling	Radiator
Control terminals	Isolation
Protection	Over load, over heat, over speed, over voltage, under voltage will cause the power abnormal.

⚠ Warning	* Do not measuring or touch any components without housing while operating. * Should check soleplate or change fuse 1minter later after power off. * Operating without housing is forbidden. * Make sure to connect the ground terminal, otherwise the brushless motor will working unsteadily * Sudden damage while drives working, our company only affords the service and replace in the guarantee. Personal injury and motor damage caused by the accident will invalidate the guarantee.

2. Mounting Dimension : 166×102×67mm
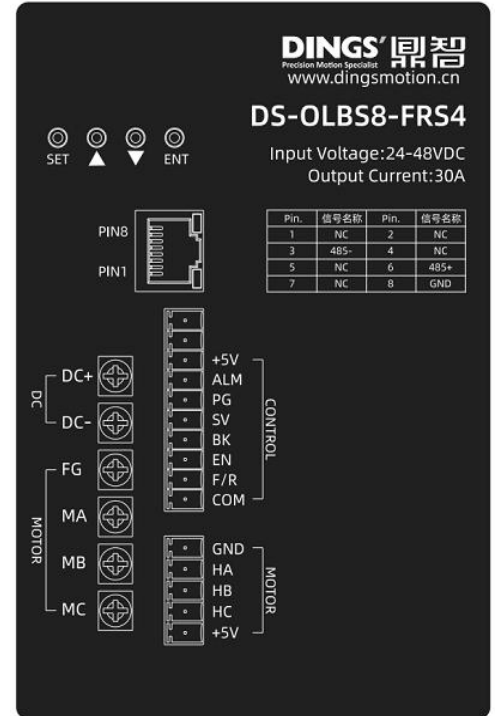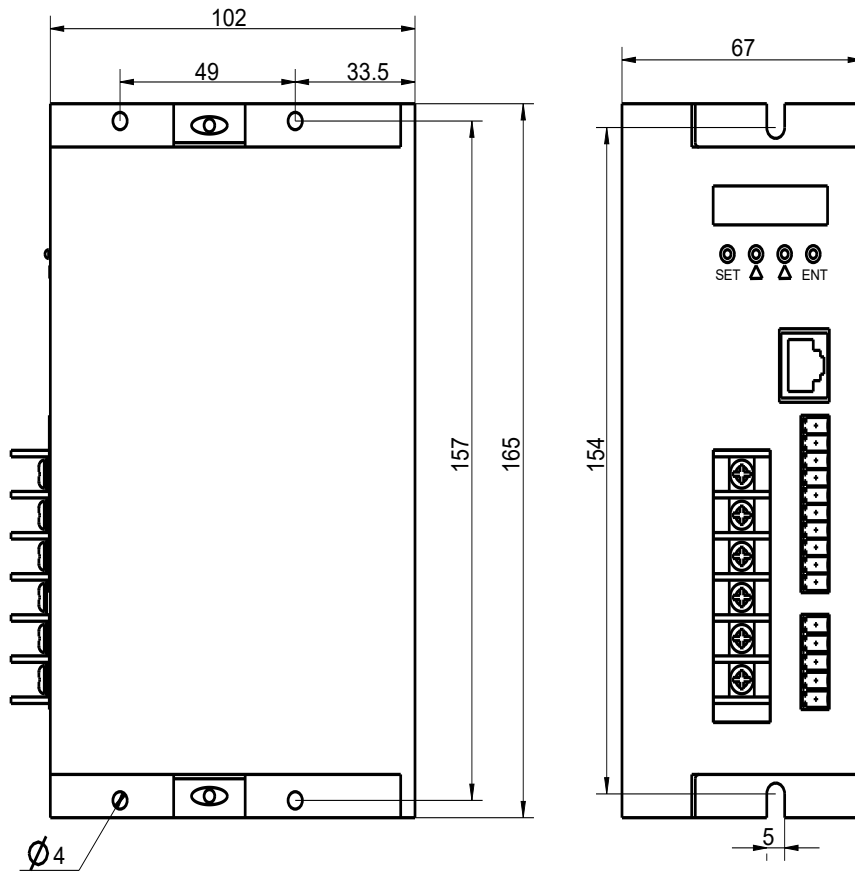
3. Terminal and Signal

3.1 Control Terminal

No.	Terminal Name	Description
1	REV	
2	REV	
3	+5V	+5V power output terminal
4	ALARM	Alarm output terminal
5	PG	Speed output terminal
6	SV	Analogy signal(0-5V) input terminal
7	BK	Brake terminal
8	EN	Stop/Start terminal
9	F/R	CW/CCW terminal
10	COM	COM terminal

3.2 Hall Signal Terminal

No.	Name	Description
1	GND	Hall sensor Negative
2	HA	Hall sensor A phase
3	HB	Hall sensor B phase
4	HC	Hall sensor C phase
5	+5V	Hall sensor Positive

3.3 Motor Connection Terminal

No.	Name	Description
1	DC+	DC+
2	DC-	DC-
3	FG	For the ground
4	U	BLDC winding U phase(A)
5	V	BLDC winding V phase(B)
6	W	BLDC winding W phase(C)

4. Function and Usage

4.1 Speed Adjustment Method

This driver provides the user below three-speed control method:

Panel speed regulation : in panel mode, change the speed through + - regulation.

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 rotate speed is 0 to rated speed.

You also can use the external digital signal to adjust speed: apply PWM with 5V amplitude and 1KHz~2KHz Frequency between SV and GND to adjust the speed. And the motor speed is linearly adjusted by its duty cycle.

4.2　Motor Operate / Stop Control (EN)

You can control the brushless motor to run or stop by controlling the terminal "EN" and "GND" connecting. 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 adding on the motor.

4.3　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 caused to damage.**

4.4　Brake the Motor to Stop (BK)

You can break the motor to stop if need. The motor will run when the terminal "BK" not connects to "GND", but if you connect these two terminals, the motor will stop quickly. And the motor stopping time will be decided by inertia and load adding on the motor.

ⓘ	**Attention**	**If you are not necessary to stop the motor quickly, please DO NOT use this function, cause it has some electrical and mechanical impact on the motor and driver.**

4.5　Speed Signal Output (PG)

The speed pulse output port is 0C, output 30V/10mA max. You can connect with a resistance (3K ohm ~10K ohm) between signal and input power to get the pulse signal, this port will output serial pulses which has fixed extent (it is 50uS). This output pulse from every rotation of the motor is 3 x N, "N" means the total pole number of the magnet. For example, 2 pair of poles, means 4 poles motor, 12 pulses per turn, when the motor speed is 500rpm, the pulses out from the PG is 6000.

4.6　Alarm Output (ALM)

The alarm output port is 0C, output 30V/10mA max. You can connect a resistance (3K ohm ~10K ohm) with the input power to get the alarm signal. When alarm, this port is connecting the GND (Low voltage), and the driver will stop working and keep in alarm status.

4.7 Drive Failure

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

5. Display and Keyboard
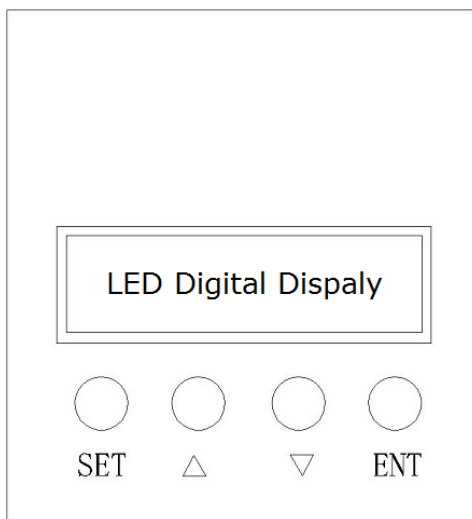
Display and Keyboard Operation

Remark: "SET": Start/stop, (backspace)

"△" : "+", Plus 1

"▽" : "-" , Minus 1

"ENT": "ENTER" (call out setting parameter)

5.1 Parameter Setting Sequence

Please ensure that the motor is under the stop situation when setting the parameter. That is, in the case of panel mode, the motor is in the stop state or an external port mode, the motor is enabled to disconnect.

1. In standby condition, press "ENTER" to call out the system parameters, press "ENTER" again, it will call out the parameter value.
2. Press "△"or "▽"to the parameter number. Press "SET" to return to standby mode if there is no need to change value.
3. Press "ENTER" to show the parameter setting value. Press "SET" to return to standby mode if there is no need to change value.
4. Press"△"or "▽" to the value demanded.
5. Press "ENTER" to save the changes, then press "SET" to return to standby mode.

> **ℹ Notes** **At setting mode, it will return to the display interface if there is no press within one minute.**

5.2   Working Mode

The motor works at two modes. One is the panel mode, the other is external terminal control. The motor runs as the setting, LED digital display shows the speed of the motor. Under the panel mode, Press "SET" to start/stop the motor, long press   "△"or "▽" to acceleration or deceleration speed, press "ENTER" to insure and know the running speed. The motor runs as setting speed.

5.3   Protect Mode

While Motor operates abnormally, display will show Err×

> (1) Err-01: stall
>
> (2) Err-02: over current
>
> (3) Err-04: hall fault
>
> (4) Err-05: stall and hall fault
>
> (5) Err-08: under-voltage
>
> (6) Err-10: over-voltage
>
> (7) Err-20: peak current alarm
>
> (8) Err-40: temperature alarm

5.4   Drives Parameter Setting

P00X: Operating Parameter					
Function Code	Function Name	Setting Range	Unit	Default value	Change
P000	Control mode	**00** is the external port control mode **10** is the sectional speed regulation mode, which is matched with p003 parameters **18** is panel control mode and 485 communication control mode		00 External port control mode	
P001	Pair of Pole	1~255	Pair	2	O
P002	Rated Speed	1~65535 (external port mode effective)	RPM	3000	O
P003	Display mode	00: speed display 01: PWN speed adjustment 02: sectional speed regulation mode (when p000 parameter is 10)		00	O
P004	No sense starting torque	1~255		16	O

P005	Initial speed w/o sensor start	1~255		04	⭕
P006	Acceleration time	1~255	0.1s	0	⭕
P007	Deceleration time	1~255	0.1s	0	⭕
P008	Current setting	1~255		44	
P009	Temperature alarm	1~255		34	
P010	Panel speed setting	0~65535 only external port mode effective	RPM	2000	
P011	Brake force	0-1023		1023	
P012	Site address	0~250		1	
P013	Sensor / sensorless setting	0 No hall sensor mode 255 with hall sensor mode		255	
P014	Current adjusting parameter	0-FF	Hexade cimal	3A	
P015	Reserved				
P016	Per speed at Segmental speed adjusting	0~65535	decimal system	500	
P017	First stage speed	0~65535	decimal system	1000	
P018	Second stage speed	0~65535	decimal system	2000	
P019	third stage speed	0~65535	decimal system	3000	
P020	fourth stage speed	0~65535	decimal system	4000	
P021	Fifth stage speed	0~65535	decimal system	5000	
P022	Sixth stage speed	0~65535	decimal system	6000	
P023	Seventh stage speed	0~65535	decimal system	7000	
P024 - P031		Reserve			

5.5   Description of Sectional Speed Control

5.5.1   Setting sectional speed regulation mode

: P-000 parameter changed to 10, P-003 changed to 02, EN to 0V

5.5.2   DS-OLBS8-FRS4 sectional speed control table

: 0 for 0V, 1 for 5V, SV suspended 0V, 1 pin 2 pin suspended 5V

	SV	1pin K1	2pin K2	Speed：RPM
COM	0	0	0	500
COM	0	0	1	1000
COM	0	1	0	2000
COM	0	1	1	3000
COM	1	0	0	4000
COM	1	0	1	5000
COM	1	1	0	6000
COM	1	1	1	7000

6. System Usage

Connect on the wires of the motor and driver (motor winding wires, Hall sensor and power supply) strictly as request. It can not achieve the CW and CCW through changing the wires connection like asynchronous motor. The motor will run abnormality with the wrong wires connection, like brushless motor will shake much or heat quickly (the temperature will up to 80 degree in seconds to 2 min.),and will damage the motor and driver.

Please run the motor while connect the power supply, Hall wires and drive power supply. Firstly set the potentiometer to the minimum, press the start switch, increase the motor potentiometer a little, the motor should run. If the motor does not run, or shaking, maybe did the wrong wires connection, please recheck the brushless motor wires till the motor running normally.

7. Communication Mode

Connect on the wires of the motor and driver (motor winding wires, Hall wires and power lines) strictly as request. It can not achieve the CW and CCW through changing the wires connection like asynchronous motor. The motor will run abnormality with the wrong wires connection, like brushless motor will shake much or heat quickly (the temperature will up to 80 degree in seconds to 2 min.),and will damage the motor and driver.

Please run the motor while connect the power supply, Hall wires and drive power supply. Firstly set the potentiometer to the minimum, press the start switch, increase the motor potentiometer a little, the motor should run. If the motor does not run, or shaking, maybe did the wrong wires connection, please recheck the brushless motor wires till the motor running normally.

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> ℹ️ **Notes** If the communication mode is required to control the motor, it must be under the internal speed adjustment mode.

● ModenBUS communication control register definition

No.	address	Name	Setting range	Default	unit
00	$8000	First byte: control bit state	First byte:	00H	
			Bit0: EN		
			Bit1: FR		
			Bit2: BK		
			Bit3: NW1		
			Bit4: NW		
			Bit5: KHX		
			Bit6: HR60		
			Bit7: KH		
		Second byte: Hall angle and motor poles	Second byte:	02H	
			Bit0-7: poles 1-255		
01	$8001	Maximum speed in analog adjustment	0-65535	3000	RPM
02	$8002	First byte: start torque	1-255	10H	
		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		38H	
		Second byte: temperature alarm point		30H	
05	$8005	External 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	
08-0F		$8008-$800F	Segmental speed value		
10-17		$8010-$8017	reserve		
18	$8018	Real speed			
19	$8019	First byte: bus voltage			
		second byte: bus current			

1A	$801A	First byte: reserved	reserve
		Second: reserved	
1B	$801B	First byte: fault status	00: No Alarm 01: Motor Blocked (shaft stuck) 02: Overload 03: Motor hall fault (hall wire disconnected or damaged) 04: Low supply voltage 08: High supply voltage 20: Large instantaneous motor current (sudden motor load increase or motor phase circuit short)
		Second byte: 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: 0: Speed external effective,   1:speed internal internal effective(under panel speed

     adjusting mode, PWN speed adjusting mode and segmental speed adjusting mode,

     it must set to 1)

KHX: stall alarm under the open loop w/sense mode.   0: stall alarm   1: NO alarm

HR60:   0: 120° hall control   1: 60° hall control   temporarily not supported

KH: 0: closed loop control   1: open loop control

For example:

1. Write 1500 speed

    01 06 80 05 DC 05 28 C8

2. Write 2 pair of poles EN start

    01 06 80 00 19 02 2A 5B

3. Write EN stop

    01 06 80 00 18 02 2B CB

4. Write brake

    01 06 80 00 1D 02 28 9B

5. Checking the fault state

    01 03 80 1b 00 01 DD CD

6. 01 06 80 00 19 02 2A 5B   EN start   2 pair of poles

7. 01 06 80 05 D0 07 AC 09   Write 2000

8. 01 06 80 05 E8 03 BE 0A   Write 1000

9. 01 60 80 00 18 02 2B CB   EN stop

10. 01 06 80 00 19 01 6A 5A   1 pair of pole EN start

The write message is explained as follows

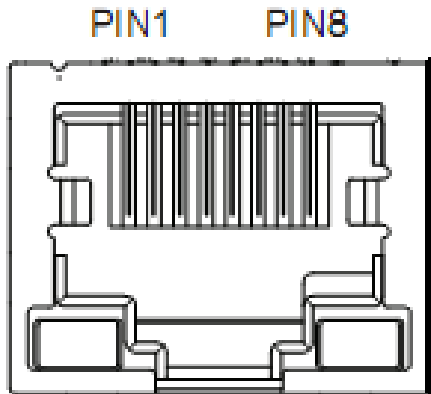| Message	Explain
01	Address
10	Function code
00 1B	Start address register
00 05	The numbers of register
0A	Total byte digits
02 58	Write the first register data
02 58	Write the second register data
00 F0	Write the third register data
00 03	Write the fourth register data
0D 40	Write the fifth register data
CD 83	CRC testing(from the address to the fifth register data)

The successful feedback message is explained as follows

Message	01	10	00 1B	00 05	70 0D
explain	address	Function code	The start register address	The wrote register number	CRC testing code

8. Communication Wires Mode

RS-485 communication can be carried out by using the RJ45 cable connector

The RJ45 connector pins are defined as follows:

Pin	Function
8	GND
6	A
3	B

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