

BLDC DRIVERS

Low Voltage Brushless Driver

Manual 1.6-0915

DBLS-02-S



Read the operating instructions carefully before putting the driver into operation with power

Summary

DBLS-02-S 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 600W. 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.

Product Characteristic

1. System Characteristic

Input voltage range: 24-48Vdc

Suitable for motor: $\leq 750W$

Working temp.: 0~+45 °C

Storage temp.: -20~+85 °C

Working & storage humidity: <85% (no frosting)

Structure: wall-mountable type

2. Basic Characteristic

Cooling: Radiator

Control terminals : Isolation

Protection: Over load, over heat, over speed, over voltage, under voltage will cause the power abnormal.

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* Do not measuring or touch any components without housing while operating.

* Should check soleplate or change fuse 1minter later after power off.

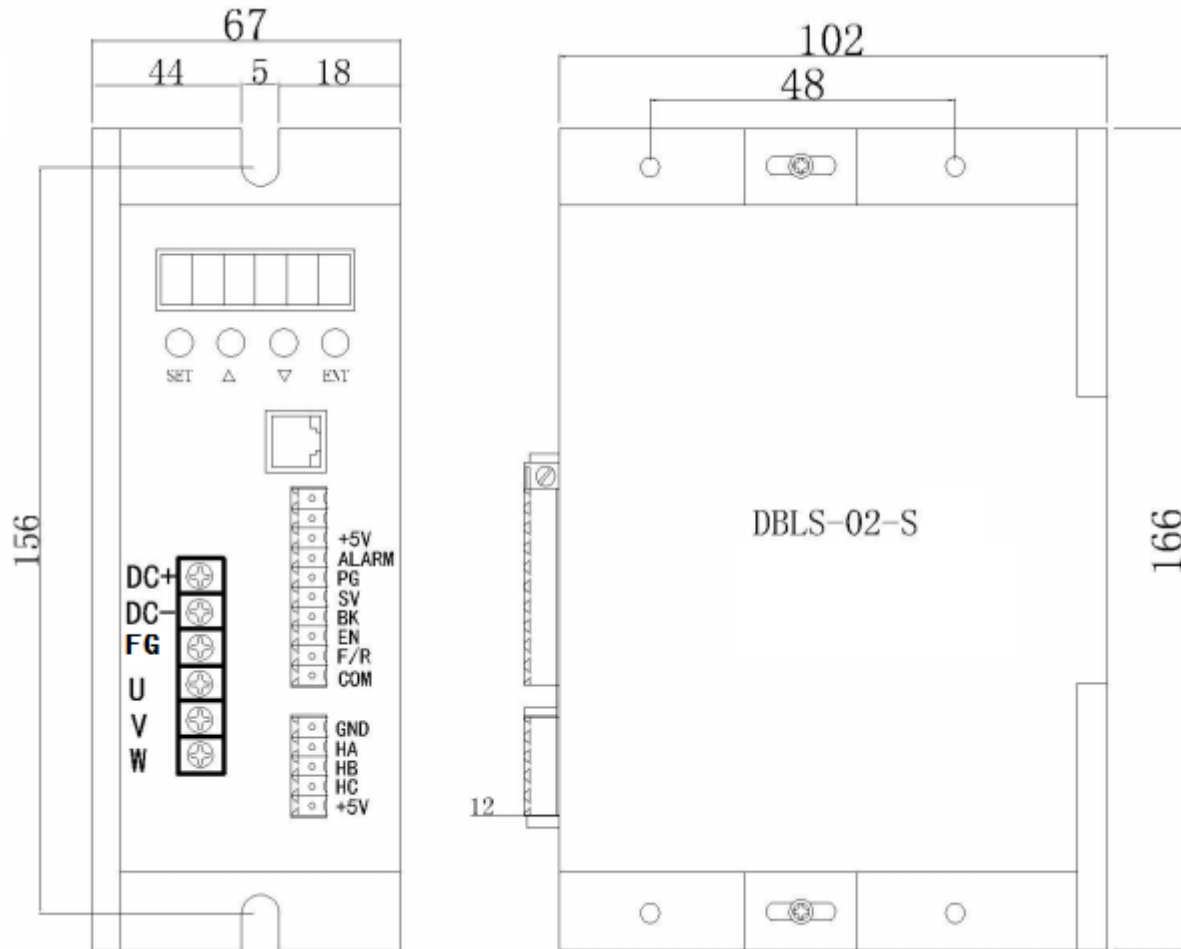
* Operating without housing is forbidden.

* 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.

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3. Mounting Dimension: 166x102x67mm



4. Terminal and Signal

Control Terminal

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

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

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)

5. Function and Usage

Speed adjust method

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

Inner potentiometer speed adjustment: Rotate the potentiometer on the driver panel counterclockwise, the rotate speed decrease, rotate the potentiometer on the driver panel clockwise, the rotate speed becomes higher. Please make sure the potentiometer is set in the minimum state when you use external input mode to adjust the speed.

External input adjustment: Connect the terminals of the external potentiometer to the GND and +6.25v 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. the motor rotate speed is adjusted by the duty ratio liner adjustment. At this time, by adjusting the R-SV potentiometer, SV digital signal amplitude can be 0~1.0 ratio attenuation processing. Generally, adjust R-SV to 1.0, SV input digital signal without attenuation processing.

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.

Motor rotation direction control (F/R)

You can control the motor rotation direction by controlling the terminal “F/R” and “GND” connecting. When connecting 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.

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.

Speed signal output(PG)

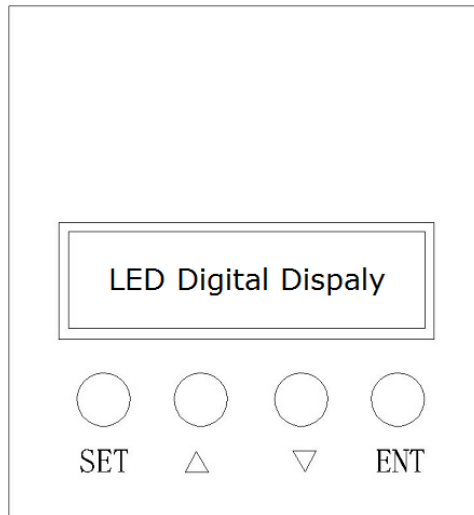
The speed pulse output port is 0C, output 30V/10mA max. You can connect with a resistance (3K ohm ~10K ohm) between signal and input power to get the pulse signal, this port will output serial pulses which has fixed extent (it is 50uS). This output pulse from every rotation of the motor is 3 x N, “N” 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.

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.

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.



6. Display and keyboard

Display and Keyboard Operation

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

"Δ": "+", Plus 1

"∇": "-", Minus 1

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

6.1 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 "Δ" 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 "Δ" or "∇" to the value demanded.
5. Press "ENTER" to save the changes, then press "SET" to return to standby mode.

Note: At setting mode, it will return to the display interface if there is no press within one minute.

6.2 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 "Δ" or "∇" to acceleration or deceleration speed, press "ENTER" to insure and know the running speed. The motor runs as setting speed.

6.3 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

6.4 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		External port control mode	
P001	Pair of Pole	1~255	Pair	2	<input type="checkbox"/>
P002	Rated Speed	1~65535 (external port mode effective)	RPM	3000	<input type="checkbox"/>
P003	Display mode	00: speed display 01: PWN speed adjustment 02: sectional speed regulation mode (when p000 parameter is 10)		00	<input type="checkbox"/>
P004	No sense starting torque	1~255		16	<input type="checkbox"/>
P005	Initial speed w/o sensor start	1~255		04	<input type="checkbox"/>
P006	Acceleration time	1~255	0.1s	0	<input type="checkbox"/>
P007	Deceleration time	1~255	0.1s	0	<input type="checkbox"/>
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	Odd number is a sensor			

	control	Even numbers are sensorless			
P014	Current adjusting parameter	0-FF	Hexadecimal	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			

6.5 Description of sectional speed control

6.51: setting sectional speed regulation mode: P-000 parameter changed to 10, P-003 changed to 02, EN to 0V

6.52: DBLS-02-S sectional speed control table: 0 for 0V, 1 for 5V, SV suspended 0V, 1 pin 2 pin suspended 5V

COM	SV	1pin K1	2pin K2	Speed : RPM
0	0	0	0	500
0	0	0	1	1000
0	0	1	0	2000
0	0	1	1	3000

0	1	0	0	4000
0	1	0	1	5000
0	1	1	0	6000
0	1	1	1	7000

7. 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.

8. 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.

Note: 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 Second byte: Hall angle and motor poles	First byte: Bit0: EN Bit1: FR Bit2: BK Bit3: NW1 Bit4: NW Bit5: KHX Bit6: HR60 Bit7: KH Second byte: Bit0-7: poles 1-255	00H 02H		
01	\$8001	Maximum speed in analog adjustment	0-65535	3000	RPM	
02	\$8002	First byte: start torque Second byte: start speed without sense start	1-255 1-255	10H 04H		
03	\$8003	First byte: accelerate time Second byte: decelerate time	1-255	0 0	0.1s	
04	\$8004	First byte: max. current Second byte: temperature alarm point		38H 30H		
05	\$8005	External speed setting	0-65535	2000	RPM	
06	\$8006	Brake force	0-1023	1023		
07	\$8007	First byte: site address Second byte: reserved	1-250	1 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: control port state Second: analog port value	Bit0: SW1 Bit1: SW2 Bit2: SW3 Bit3: SW4			
1B	\$801B	First byte: fault state Second byte: motor running	Bit0: stall Bit1: over current Bit2: hall abnormality			

		state	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: 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

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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)

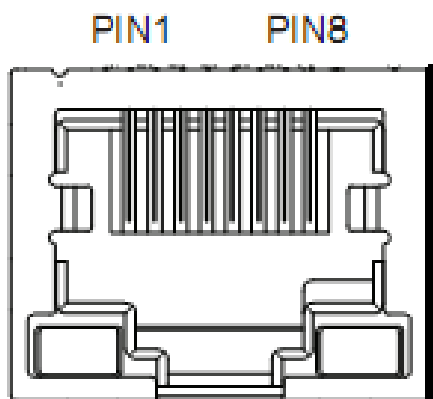
The successful feedback message is explained as follows

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

9. Communication wires connection

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