DBLS Series Brushless DC motor Drive

DBLS-30

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

Summary

DBLS series brushless motor drive is a new type of Brushless DC motor speed control field which is developed independently in the field of modern industrial automation. It is composed of a series of advantages, such as high integration, small size, perfect protection, clear wiring connection and high reliability.

The main function of the drive is as follows:

- Choose a variety of speed adjustable, including input voltage setting, drive's internal speed setting, communication interface setting etc.
- Complete isolation of electric supply, and Hall signal interface, guarantee of security.
- Digital display panel, abundant display content settings, abundant feature setting.
- The drive device of automatic protection, automatic control of current, with under-voltage and over-voltage, blocking and hall fault lamp protection function.
- The standard series can provide 2 times or even higher short-term overload current, different products with different supply.
- It can be equipped with various types of Brushless DC motors, the power range from 1500W to 3000W.

Product features:

1. System characteristics

Input Voltage: AC180-250VAC, 50/60Hz
Continuous Output current: 15A, suit for less than 3000W brushless motors
Max. Output current: 30A
Working temp.: 0~+45°C
Storage temp.: -20~+85°C
Working & storage humidity: <85% no frosting
Structure: wall-mountable type
Dimension: L180 x W85 x H190mm

2. Basic characteristics

Cooling mode: radiator mode
Control input and output signal: total isolation

Protection: over current, over voltage, over voltage, overheated, over speed, under voltage and control power abnormal.

Panel interface: 6 bit LED display, 4 bit key operation

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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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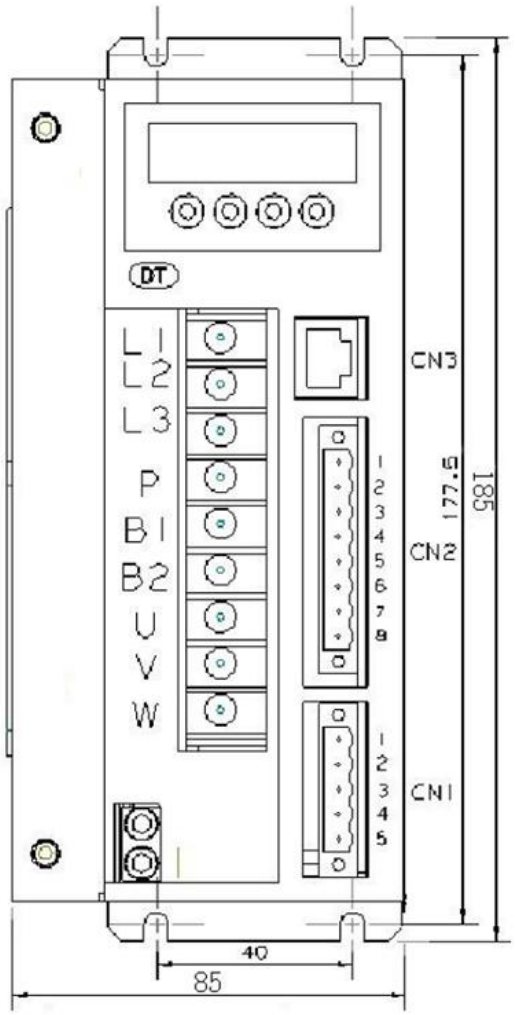
Terminal function specification

No.	Terminal Name	Signal	Function
1	L1(L)(R)	Power input of main circuit	Main circuit power input terminal AC220V 50Hz, when using single-phase 220V, connect L1 and L2.
2	L2(N)(S)		
3	L3(T)		
4	P	High voltage DC bus line positive terminal	The internal DC bus terminal of the driver is rated at 311V. Some products have a built-in braking resistor. If an external braking resistor is required, connect the external braking resistor to P and B2. Note! ! ! Never connect P and B1 at the same time.
5	B1	High voltage DC bus negative terminal	
6	B2	External brake resistance	
7	U	Motor output	The motor output terminals must be connected with U,V,W one-to-one. Attention: Do not reverse the motor by exchange 3 phase terminals, it is completely different with asynchronous motor
8	V		
9	W		
	PE	Protection	The release way is supplied for protection motor and drive when current leakage



CN2 Terminal	
1: +5V	COM positive
2: SV	Speed analog voltage input
3: COM	COM negative
4: F/R	Motor rotation direction control input
5: EN	Stop/Start
6: EMG	Emergency stop
7: ALM	Alarm
8: PG	Speed signal

CN1 Terminal	
1: GND	Hall power negative
2: A	Hall A
3: B	Hall B
4: C	Hall C
5: HVCC	Hall power positive

3. Parameters setting

The Drive has 3 parameter groups, P0, P1 and P2

3.1 Parameter P0

For most users, only one parameter in the P0 parameter group is useful: P0.6, when set to 1, unlocks the P1 parameter group. Normally the P1 parameter group is locked and invisible to prevent accidental modification.

3.2 Parameter P1

Parameter name	Parameter No.	Set numerical range	Factory default	Function specification
Display optional	P1.0	0~9	0	0 Display real speed 1 Display DC voltage of main circuit 2 Display external analog input 3 Display motor current 4 Display driver's real-time power 8 Duty ratio 10 Hall and PWM status display, the first

				position is Hall state, the normal sequence when turning the motor clockwise is 1-5-4-6-2-3. This display function is often used to check whether the Hall signal of the motor is normal.
Internal running speed	P1.1	0~9999	1000	When the internal speed is selected, the motor speed is determined by this parameter. (view P1.2)
Choose signal sourcing of speed	P1.2	0~2	1	0: Internal command speed (tP1[0] is the internal speed, and the up and down keys on the panel are used to accelerate and decelerate when the motor is running) 1: Analog input, use CN2's seventh-spindle SV signal as the motor speed. 2: Communication order control (Temporarily unavailable)
Direction setting	P1.3	0~1	0	0: CW 1: CCW
Choose signal sourcing of start-stop	P1.4	0~2	1	0: Button by hand control（ENT is start-stop, SET is reverse motor, +/- for acceleration and deceleration） 1: External port control, using CN4's pin 4 signal to start and stop the motor. 2: Communication order control
Pole pairs of motor	P1.5	0~99	2	The number of poles of the motor. If the setting is incorrect, the speed displayed on the panel will not match the actual speed. Note: motor series = motor pole pairs × 2
Drive address	P1.6	0~255	1	The address of the drive when using the communication control motor.
Speed scale factor	P1.7	0~99999	1500	Scale factor KP for use in PID speed control
Speed integral factor	P1.8	0~99999	500	Integral factor KI for PID speed control
Motor acceleration	P1.9	1~60000	1000	This parameter is proportional to the acceleration in revolutions per second, and 1000 means 1000 rpm acceleration per minute. However, the actual motor acceleration will be related to the load and the motor.
Motor deceleration	P1.10	1~60000	1000	
Analog input speed range	P1.11	0~99999	3000	Unit revolutions per minute (RPM) corresponds to the motor speed when the analog input is at maximum.
Analog input deadband voltage	P1.12	0~3300	100	Unit millivolts, this parameter is used to set the corresponding input voltage when the motor is at zero speed.

Manual speed adjustment equivalent	P1.13	1~999	1	In the internal speed mode, use the button to change the equivalent of the speed (press the 1 button to increase or decrease the speed)
System reserved parameters	P1.14	0~1	0	The user must not set this parameter, otherwise the drive will enter an abnormal working mode, resulting in damage to the drive or even an accident.
Driver address	P1.15	1~255	1	In the communication mode, the drive address used to set the drive address and connected via the RS-485 bus must not have the same address.
Filter coefficient	P1.19	0~5	2	Display the speed filter coefficient. Increasing this parameter can increase the stability of the speed display, but it will lengthen the follow-up time with the actual speed.
Display current coefficient	P1.20	1~99999	100	Calibration current display, this parameter may be different for drives of different power levels.
AD input maximum voltage	P1.21	0~3300	3100	This parameter is used to adjust the maximum value of the analog input used to control the speed. P1. 23 is used to adjust the slope of the analog input.
AD input minimum voltage	P1.22	0~3300	200	This parameter is used to adjust the maximum value of the analog input used to control the speed. P1. 22 is used to adjust the slope of the analog input.
Speed monitor output signal frequency ratio	P1.23	1~10	1	Reserve
Multi-segment internal speed input terminal selection speed 1	P1.24	0~65535	500	The drive provides 4 segments of motor speed internally, which can be determined by a combination of two external input terminals. This is the first paragraph.
Multi-segment internal speed input terminal selection speed 2	P1.25	0~65535	1000	The drive provides 4 segments of motor speed internally, which can be determined by a combination of two external input terminals. This is the second paragraph.
Multi-segment internal speed input terminal selection speed 3	P1.26	0~65535	1500	The drive provides 4 segments of motor speed internally, which can be determined by a combination of two external input terminals. This is the third paragraph.
Multi-segment internal speed input terminal selection speed 4	P1.27	0~65535	2000	The drive provides 4 segments of motor speed internally, which can be determined by a combination of two external input terminals. This is paragraph 4.
Enable (EN) signal input level inversion setting	P1.28	0~3	1	0: Active high 1: Active low 2: Forced invalid 3: Mandatory effective (this function is too dangerous, it is best to shield)
Acceleration selection (function selection of special models) signal input level inversion	P1.29	0~3	1	0: Active high 1: Active low 2: Forced invalid 3: Mandatory effective

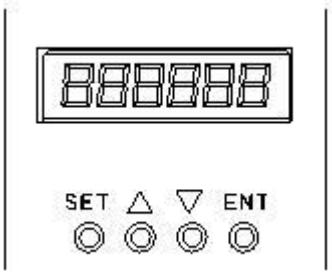
setting				
Motor rotation direction signal input level inversion setting	P1.30	0~3	1	0: Active high 1: Active low 2: Forced invalid 3: Mandatory effective
Emergency stop signal input level inversion setting	P1.31	0~3	1	0: Active high 1: Active low 2: Forced invalid 3: Mandatory effective
Multi-segment internal speed selection 1 signal input level inversion setting	P1.32	0~3	1	0: Active high 1: Active low 2: Forced invalid 3: Mandatory effective
Multi-segment internal speed selection 2 signal input level inversion setting	P1.33	0~3	1	0: Active high 1: Active low 2: Forced invalid 3: Mandatory effective
Alarm output signal output level inversion setting	P1.34	0~3	0	0: Active low 1: Active high

3.3 Parameter P2

This parameter group is the underlying parameter of the motor. It is currently only open to developers. Users are not allowed to adjust it by themselves. It is possible to enter and adjust the possibility of damage to the drive or motor.

3.2 Panel Operation

Display instructions: 6 digital tubes displaying "888888", and the one on the far right is the first and lowest.



As picture on left, there are 4 keys on the panel,

“SET”: press this key can enter or quite P1 setup menu

“▲”and “▼”: “+”and “-”,to choose the function and adjust the parameters.

“ENT”: “confirmation” and “operation”, when setting parameters, this button is used to enter the parameter value adjustment interface and jump position; in the trial operation mode, this button is used to start and stop the motor operation.

Attention: If the value of the parameter you are trying to modify is greater than the maximum allowed value of the parameter, the change will not be allowed and the button will not respond.

3.3 How to set parameters

Example:

Demand: set internal speed (P1.1) to 1000rpm/min

Operation step as below:

1. After connecting with power, display “H 0”, the driver is standby, press “SET”, will display“P0.0”, press “▲”until displayed “P0.6”, press “ENT”, display”00000”, and the first of light most is flashing, press” ▲”, change into “1”, press ”SET”, display “P0.6” . This step is to complete the P1 parameter set to unlock

2. Press “SET”, display “P1 0”, the driver is entering P1 setting state

3.Press “▲”, until display “P1。 1”

4. Press “ENT”, display “2000”, and the first of light most is flashing

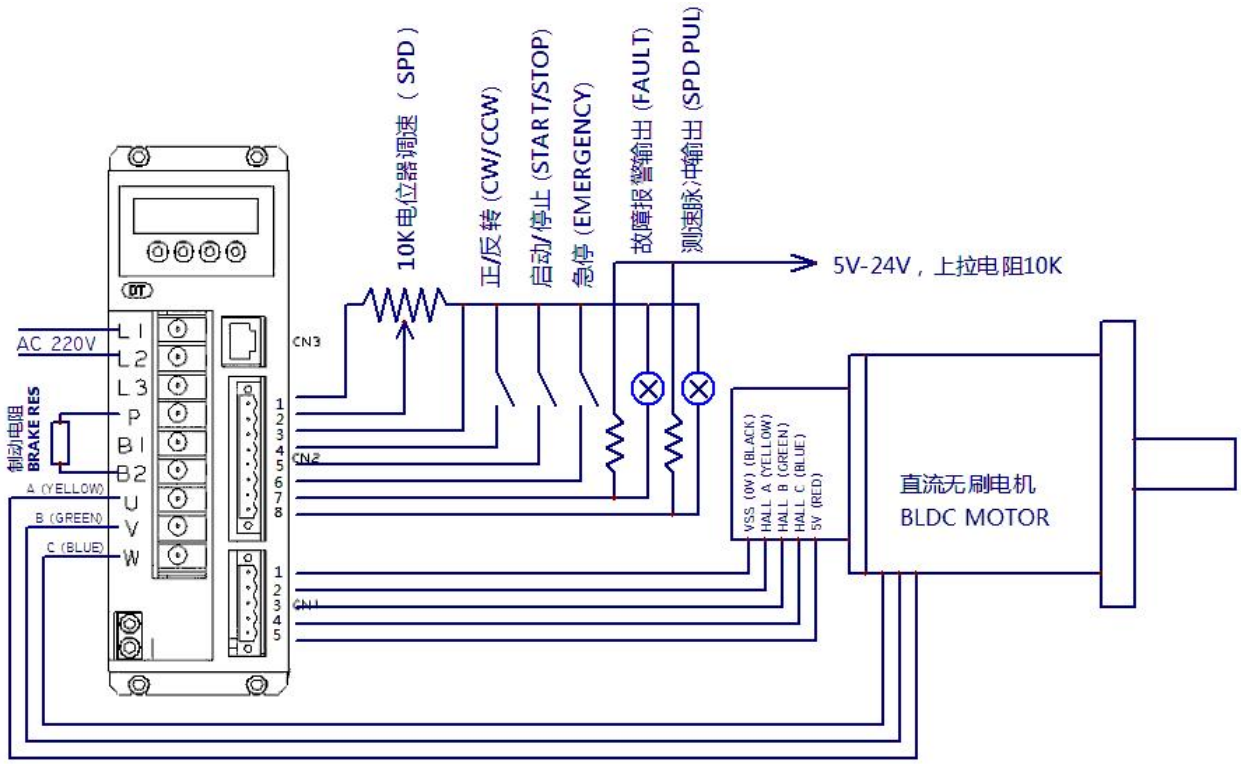
5. Press “ENT”, until the flashing is moving to the fourth position

6. Press “▼”, change into “1000”

7. Press “SET”, display “P1.1”, the parameters had been set up and save automatic

8. Press “SET” again, back to standby state, display “H 0”. Now, the new parameters adjustment had finished and take effect

Attention: After some parameters are modified, they must be powered on again to take effect.
If the value of the parameter you are trying to modify is greater than the maximum allowed value of the parameter, the change will not be allowed and the button will not respond.



4. Function and Operation

4.1 Speed adjustment method

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

1.1 Analog voltage adjustment speed:

The two fixed ends of the external potentiometer can be connected to the +5V and COM terminals of the control signal port of the driver respectively. The adjustment terminal can be connected to the SV terminal to adjust the speed with an external potentiometer (10K~100K). The control unit (such as PLC. MCU, etc.) inputs the analog voltage to the SV terminal to achieve speed regulation (relative to COM). The acceptance range of the SV port is DC 0V~+5V, and the corresponding motor speed is 0~rated speed.

It can also be adjusted by external PWM signal: a pulse width digital signal (PWM) with amplitude of 5V and frequency of 1KHz~20KHz can be applied between SV and GND for speed regulation, and the motor speed is linearly adjusted by its duty cycle.

1.2 Panel control mode:

This mode makes it possible to start the motor without relying on external control signals. It is useful for starting and stopping the motor during commissioning and repairing, or checking if the motor and drive system are normal.

Set the target speed of the motor operation by setting the system parameter P1.1. After setting the speed, press the “ENT” key and the motor will start and accelerate to the set speed. During motor operation, manual speed adjustment is also possible by long pressing the “▲” and “▼” keys on the

panel to adjust the speed value.

Motor operate/stop control (EN)

The operation and stop of the motor can be controlled by the on/off of the control terminal EN relative to the COM. When the terminal is connected, the motor runs, otherwise the motor stops.

Motor rotation direction control (F/R)

The running direction of the motor can be controlled by the on/off of the control terminal F/R and the terminal COM. When F/R and terminal COM are not connected, the motor runs clockwise (facing the motor shaft), otherwise the motor runs counterclockwise: when the motor is in the running state for positive/reverse selection switching, the motor will automatically stop first. Then start the operation in the opposite direction. (Motors of different specifications and models may have inconsistent steering, users need to confirm the steering by themselves)

Emergency Stop (EMG)

Through the control of the terminal COM and the terminal EMG to control the motor stop or running. The motor is running when the terminal EMG and terminal COM shut off, stop when connected, and display "br" on the panel.

Speed signal output（PG）

The speed pulse output is 0C, (output 30V/10mA max.). Connect with a pull-up resistance (3K Ω ~10KΩ) between “PG” and power positive (5V-24V, If the user does not own power, it can also be directly connected to the “ +5V” of 8 pin CN2) . The formula of the output frequency F(HZ) and the motor speed N(RPM) is as follows: F=N * P / 60, where P is the pole number of the motor, that is, the pulse output per revolution of the motor is the pole number of the motor.

Alarm output (ALM)

Drive alarm output, this port is open collector (OC gate output) (maximum 30V/10mA). The alarm output is connected to the positive pole of the power supply (5V-24V, if the user does not have the power supply, it can also be directly connected to +5V on the 8th pin of CN2) to connect the 3KΩ ~10KΩ pull-up resistor. When the alarm is issued, the terminal is turned on with GND (low level), and the driver stops working by itself and is in an alarm state.

4.2 Alarm message

When the motor is running in the process of the abnormal, the panel on the digital tube will show AL XX.

Alarm display	Alarm code meaning	Possible causes and solutions
AL oc	Drive current	1. Check UVW lines connection is correct or not, we must pay special attention to whether the phase sequence connection error or short circuit. Note! Brushless motor absolutely CAN NOT change the direction of rotation by changing the motor’s phase!!

		This is quite different from the AC induction motor. 2. Whether the motor line is too long? Motor line and Hall line is usually not more than 10 meters, it needs to take appropriate measures if ›10 meters, otherwise it may cause OC alarm or other issues. 3. Check the hall sensor line is correctly connected. 4. check the start acceleration of motor is set too large? Try to reduce the value of P1.9. 5. Motor or drive may occur fault, please contact the supplier.
AL hE	Motor hall sensor fault alarm	1. The Hall line is not connected properly or the sensor plug is not plugged in. 2. The motor line and hall line length are too long cause interference will trigger the alarm, when the length of more than 3 meters, should use the shielded wire, the shielded layer should be connected the fifth terminal (GND) of driver CN1, the shielding layer should have been connected to the Hall line in the side of the motor, As a Single ended shielding method, The shielding layer on the motor side should be left floating, DO NOT connect with motor's shell. 3. The hall sensor has failure, try to replace the motor.
AL hU	Drive bus voltage too high alarm	1. the input voltage is too high. 2. the internal parameter of the drive is not appropriate. You will see the real bus voltage back to the main interface after setting P1.0 to 1. When in the 220V AC input, it should be displayed as about 310V + 20V (220V x 1.4) or so, the same way, about 530V while 380V. If there is a large error will lead to alarm to stop. If it is found that the value and the actual value (use multimeter of the voltage on the 1000V pin to measure the voltage on the P-B1 terminal) is larger, please contact the supplier to adjust the internal parameters. 3. If it is occurred in the deceleration, it is in the process of braking feedback electric power over the limit and the occurrence of the bus voltage rise over the limit and alarm (this situation occurs only when the driver is set into a brake mode, the default setting is no brake mode, it should not happen this alarm). Firstly, in accordance with article second above to check the bus voltage display is normal or not, then check the brake resistance installation is normal or not, the resistance is normal or not (typically 30 ohms to 200 ohms). If it is normal, the value of P1.10 (reduced speed) should be reduced, then the voltage rise rate decreases when the regenerative braking. 4. If it is still in trouble, it may detection circuit failure of drive voltage, or other problems, please contact the supplier.
aAL LU	Bus voltage too low alarm	1. the input voltage is too low. 2. the internal parameter of the drive is not appropriate. You will

		see the real bus voltage back to the main interface after setting P1.0 to 1. When in the 220V AC input, it should be displayed as about 310V + 20V (220V x 1.4) or so, the same way, about 530V while 380V. If there is a large error will lead to alarm to stop. If it is found that the value and the actual value (use multimeter of the voltage on the 1000V pin to measure the voltage on the P-B1 terminal) is larger, please contact the supplier to adjust the internal parameters. 3. If it is occurred in the acceleration of the motor, it may be due to the acceleration of the load is too large, resulting in excessive load, may be appropriate to reduce the acceleration of the acceleration of the P1.9 value. 4. If it is still in trouble, it may detection circuit failure of drive voltage, or other problems, please contact the supplier.
AL Er	Motor blockage alarm	1. The motor can't work normally cause the wrong connection of motor's lines 2. The potentiometer is adjusted to a position close to 0 rpm, or the internal speed is set to 0, Or the speed command voltage is set close to 0 3. The motor is blocked, please check the load.
AL oL	Motor overload alarm	Usually caused by overload of the motor, please check the load.
AL ot	Driver overheat alarm	The drive alarm to stop cause the temperature is too hot. it may be due to the heat dissipation or overload. Please check the driver's heat dissipation.

4.3 Causes and Treatments:

Failure	Possible causes and treatments
Motor out of running	1. Firstly check whether there is alarm information on the panel of driver, if there is, check the alarm message at first. 2. Check whether the emergency stop signal is released or not, if not, the motor could not start, at the same time, the panel shows: "br". 3. The potentiometer is adjusted to a position close to 0 rpm, or the internal speed is set to 0, Or the speed command voltage is set close to 0. This will cause the motor to have been started, but there is no speed, this situation will usually trigger "Er" alarm. 4. The motor wire connection is not connected or phase error, the motor can't operate normally. If the motor speed is still 0rpm in 3 seconds after starting, the "Er" alarm will be triggered. 5. The load locked dead will cause the motor stop, at this time will trigger the "Er" alarm. 6. The motor can't run cause the abnormal Hall signal. It is

	usually leads to "HE" alarm signal if hall signal unplug or lines failure, but it won't trigger the alarm if hall ABC sequence disorder. in order to confirm that hall is normal, set P1.0 to 10, the hall status will displayed in the panel. Then rotate motor clockwise slowly by hand, if the first 3 digits showed regular changes of 1-5-4-6-2-3, the hall signal is no problem. If not, the hall signal is abnormal
Motor overheating	Usually it is due to the overload and heat dissipation is not good, In particular, the motor or the drive itself will cause the motor overheating. Please set P1.0 to 4, it showing the driver's real-time power, check the power is too large or not. It is better if replace another drive to compare. If there is no difference after replace driver, and the load is normal, it may be a problem for the motor. However, because of the replacement of the motor is usually more troublesome, so the first test load, and then the driver, and finally the motor.
Motor speed failed to meet the requirements	1. The load resistance is too heavy, the maximum current of the motor is still unable to overcome the load resistance. 2. The input of speed signal is abnormal, check the potentiometer and input speed signal voltage is normal or not.
Abnormal noise when the motor is running	1. Remove the load and then start the motor, if the noise still exists, and the noise related with speed, the problem is about motor's bearings or fan, try to another motor to check the noise if possible. 2. If the noise is high frequency noise, has nothing to do with the speed, it may be the noise of current chopper, chopper frequency of drive is 16KHz by default, usually the current noise couldn't be heard, if reduced to 12K or even 8K, because the frequency is reduced to the human ear sensitive range, then the noise will gradually become obviously. In order to reduce the power loss, the high power drives will reduce the chopping frequency set, that it is a normal phenomenon.
Motor running time and high speed	1. Firstly check the speed signal is normal or not. It could change into internal speed mode to compare the speed is stable or not.. 2. If the internal speed is also the same phenomenon, usually it is the situation that load inertia is relatively large, such as the large turntable or roller type load, the response delay of over speed lead to speed closed loop vibrated. The solution is to reduce the speed of the PID gain, reduce the P1.7 and P1.8 multiplied to see the effect. Or increase the reduction ratio mechanical is the most effective and beneficial to the motor operating conditions.
Alarm signal or speed signal without output	1. Check the external pull-up resistors are connected or not, the resistance is appropriate or not, the voltage is normal or not.

	2. If there is no alarm signal, in order to find the problem easily, need to make a man-made alarm signal, at this point you can disconnect the motor line, only retain the hall signal lines, and then start the motor, artificially created "Er" alarm. If there is no speed signal, without starting the motor, rotate the motor slowly by hand, check if there is a change in the output signal.