



# INTECNO

power transmissions

## Brushless Motor Driver BLD60 Digital



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# Brushless DC motor controls

## Summary

BLD30 Digital BLDC motor driver is a closed-loop speed controller, which uses IGBT and MOS power, uses the Hall signal of the DC brushless motor to perform double-loop speed control, and has a PID speed regulator in the control link. The system control is stable and reliable.

It can always reach the maximum torque at low speed, and the speed control range is 150 to 4000rpm. The driver use the protocol Modbus RS485 RTU to communicate in a network.

## Features

- PID speed, current double loop regulator
- 20KHZ chopper frequency
- Electrical stop to ensure the quickly action
- Fault alarm function with Over voltage, Under voltage, Over current, Over temperature, and Hall signal illegal.

## 1. Product Characteristic

<b>Input voltage</b>	24VDC-36VDC-48VDC
<b>Continuous output current</b>	50A
<b>Nominal output power</b>	1500W
<b>Peak output current</b>	75A

## Hall Signal Terminal

No.	Name	Description
1	<b>GND</b>	Hall sensor Negative
2	<b>HA</b>	Hall sensor A H1 phase
3	<b>HB</b>	Hall sensor B H2 phase
4	<b>HC</b>	Hall sensor C H3 phase
5	<b>+5V</b>	Hall sensor Positive

## Motor Connection Terminal

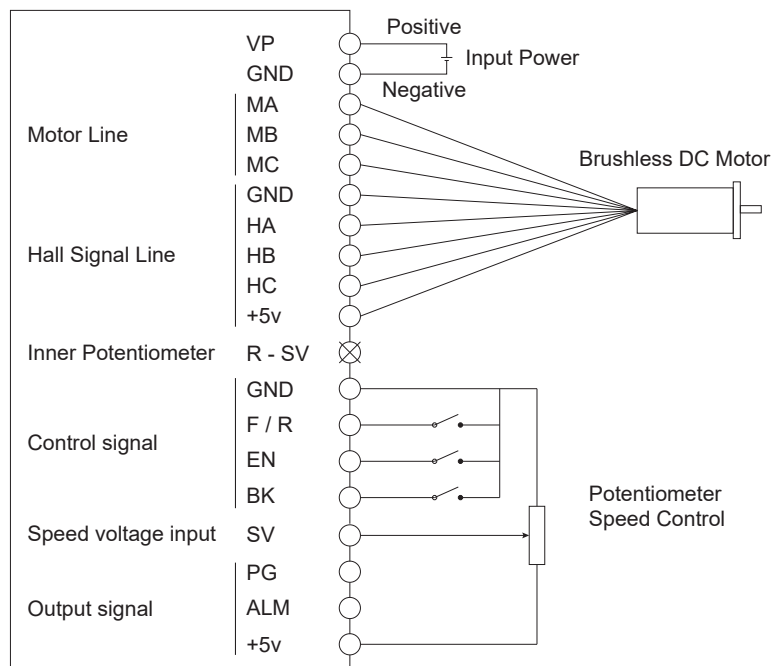
No.	Name	Description
1	<b>DC+</b>	DC+
2	<b>DC-</b>	DC-
3	<b>FG</b>	Ground wire
4	<b>MA(U)</b>	Winding U phase (A)
5	<b>MB(V)</b>	Winding V phase (B)
6	<b>MC(W)</b>	Winding W phase (C)



## 2. Control Signal

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

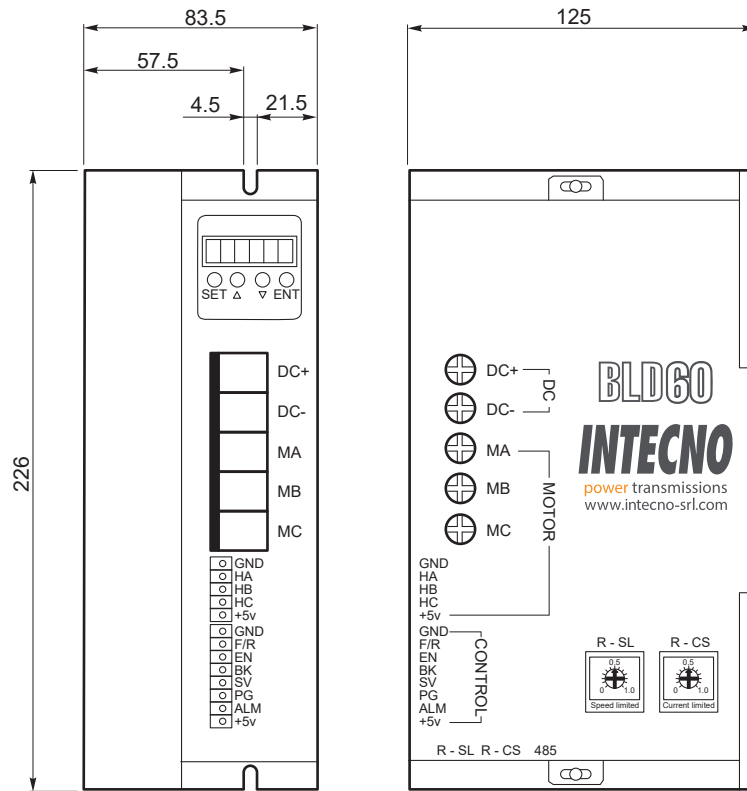
## Connection Diagram of motor and driver





# Brushless DC motor controls

## 3. Mounting Dimension



## 4. Function and Usage

Choose any of the below speed command:

### Build-in potentiometer:

Speed reduced while CCW potentiometer, otherwise speed increased. Set the potentiometer at minimum while use the external speed command.

### External potentiometer:

Connect on the "GND" and +5V of the drives, speed can be adjusted on external potentiometer (5K~100K) when connect "SV" terminal. Input simulate voltage through other control command (e.x. PLC, SCM etc.) to SV terminal to achieve the speed adjust as well (relative "GND"). The range of the "SV" terminal is DC 0V~+5V, the relevant motor speed is 0~rated speed.

### External digital signal speed regulation:

Add 5V between "SV" and "GND", speed can be adjusted by PWM control between the 1KHz~2KHz, motor speed is influenced by duty. 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 running/stop control (EN):

Control the brushless motor to run or stop by controlling the terminal "EN" and "GND" connecting. The motor will running when we connect the terminal "EN" to "GND"; if shut down, the motor will stop, and the stopping time will decided by the motor inertia and load adding on the motor.

### Motor rotation direction control (F/R):

Control the motor rotation direction by controlling the terminal "F/R" and "GND" connecting. When shut off terminal "F/R" to terminal "GND", the motor will run at CW (view from motor output side), and when connect on, the motor will run at another direction. For avoiding to damage the driver, please stop the motor running and then change the motor rotation direction.

### Brake the motor to stop (BK):

Motor stop can be controlled by connect "BK" and "GND" terminal. When shut off the "BK" and "GND" terminal, motor running, otherwise motor will fast stop. Motor stopping time is decided by the motor inertia and load adding on the motor. If it is unnecessary to fast stop the motor, please don't use this function since it has some electrical and mechanical impact on the motor and controller.

**Speed signal output (PG):**

The speed pulse output port is “OC”, 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 motor is  $3 \times N$ , “N” means the total pole number of the magnet. For example, 2 pair of poles, means 4 poles motor, 12 pulses per turning, when the motor speed is 500rpm, the pulses out from the “PG” is 6000.

**Alarm output (ALM):**

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

**Driver failure:**

Drivers enter to protection status while inner overload or over current, drivers and motor will stop automatic, the led will flashed on the driver. The alarm can be released by reset the enable terminal (shut off “EN” and “GND”) or switched off. Please check the motor connection wires when failure.

## 5. Display and keyboard

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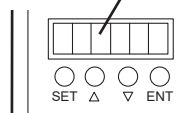
**Display and Keyboard Operation:**

“SET”: start / Stop (backspace)

“Δ”: “+”, Plus 1

“▽”: “-”, Minus 1

“ENT” : “ENTER” (Recall setting parameter)

**LED Digital Display**

### 5.1 Protect mode

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While Motor operates abnormally, display will show Errx

- (1) Err-01: motor stall
- (2) Err-02: over current
- (3) Err-04: hall fault
- (4) Err-05: motor 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



## Operating Parameter

Function Code	Function Name	Range di utilizzo	Unit	Default Value
P000	Control mode	00 External port mode 18 Panel control mode		00
P001	Reserved to Intecno			
P002	Rated Speed	1~65535	rpm	3000
P003	Display mode	00: speed display 80: current display		00
P004	No sense starting torque	1~255		16
P005	Reserved to Intecno			
P006	Acceleration time	1~255	0.1 s	0
P007	Deceleration time	1~255	0.1 s	0
P008	Current setting	1~255		23 *
P009	Reserved to Intecno			
P010	Panel speed setting	0~65535	rpm	2000
P011	Brake force	0-1023		1023
P012	Site address	0~250		1
P013	Reserved to Intecno			
P014	Reserved to Intecno			
P015	Reserved to Intecno			
P016	Reserved to Intecno			

\* the set value corresponds to half of the limiting current  
If the driver has to intervene on a current of 10A, P008 = 05 must be set

## 6. System Usage

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 minutes 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

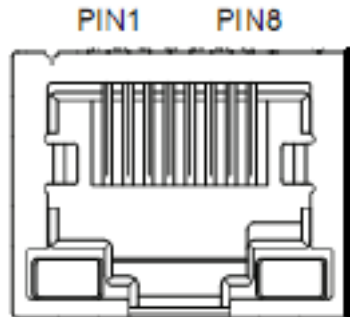
This communication model is used standard Mod bus protocol, implement national standards GB/T 19582.1 - 2008. It is using RS485 two-wire serial link communication, Physical interface uses two 3.81mm spacing 3 core Phoenix terminals, serial connection is very convenient. Transmission mode is RTU, testing mode is CRC, CRC start word is FFFFH. Data mode is 8 bit asynchronous serial, 1 is stop bit, without invalid bit. Currently there is only one communication speed 9600bps.



## 8. Communication wires connection

RS485 communication can be carried out by using the RJ45 cable connector.

The RJ45 connector pins are defined as follows:



PIN	Description
8	GND
6	A
3	B

No.	Address	Name	Setting range	Default	Unit
00	8000H	First byte: control bit state  Second byte: Hall angle and pair of poles	First byte: Bit0: EN Bit1: FR Bit2: BK Bit3: NW1 Bit4: NW Bit5: KHx Bit6: HR60 Bit7: KH  Second byte: Bit 0-7: pair of poles 1-255	00H       02H	
01	8001H	Maximum speed in analog adjustment	0-65535	3000	rpm
02	8002H	First byte: start torque  Second byte: start speed without sense start	1-255  1-255	10H  04H	
03	8003H	First byte: accelerate time  Second byte: decelerate time	1-255	10  10	0.1 s
04	8004H	First byte: max. Current  Second byte: temperature alarm point		35H  30H	
05	8005H	External speed setting	0-65535	2000	rpm
06	8006H	Brake force	0-1023	1023	



# Brushless DC motor controls

No.	Address	Nome	Parametri	Default	Unit
<b>07</b>	8007H	First byte: site address  Second byte: reserved	1-250	1  0	
<b>18</b>	8018H	Real speed			
<b>19</b>	8019H	First byte: bus voltage  Second byte: bus current			
<b>1A</b>	801AH	First byte: control port state  Second: analog port value	Bit0: SW1 Bit1: SW2 Bit2: SW3 Bit3: SW4		
<b>1B</b>	801BH	First byte: fault state  Second byte: motor running state	Bit0: stall Bit1: over current Bit2: hall abnormality Bit3: low bus voltage Bit4: over bus voltage Bit5: peak current alarm Bit6: temperature alarm Bit7: reserve		

**Site address 8000H-8017H Read-write register**

**Site address 8018H-801FH Read-only register**

**Other address is illegal**

8000H: Primo byte:

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

**HR60:** 0: 120° hall control

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

**For example:**

1. Write 1500RPM speed 01 06 80 05 DC 05 28 C8
2. Write 4 poli ed EN start 01 06 80 00 19 04 AA 59
3. Write EN stop 01 06 80 00 18 04 04 BA
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 RPM
8. 01 06 80 05 E8 03 BE 0A Write 1000 RPM
9. 01 60 80 00 18 02 2B CB EN stop





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