

ATO BLD-50A Controller



BLD-50A

Electrical Specifications

| Parameters | Min Value | Typical Value | Max Value | Unit |
|-------------------------|-----------|---------------|-----------|------|
| Environment Temperature | -25 | | 60 | °C |
| Input voltage | 18 | | 48 | V |
| Output Current | | 50 | 75 | A |
| Speed Control Range | 0 | | 20000 | rpm |
| Hall Signal Voltage | 4.5 | 5 | 5.5 | V |
| External potentiometer | | 10K | | Ω |

Connection Definition

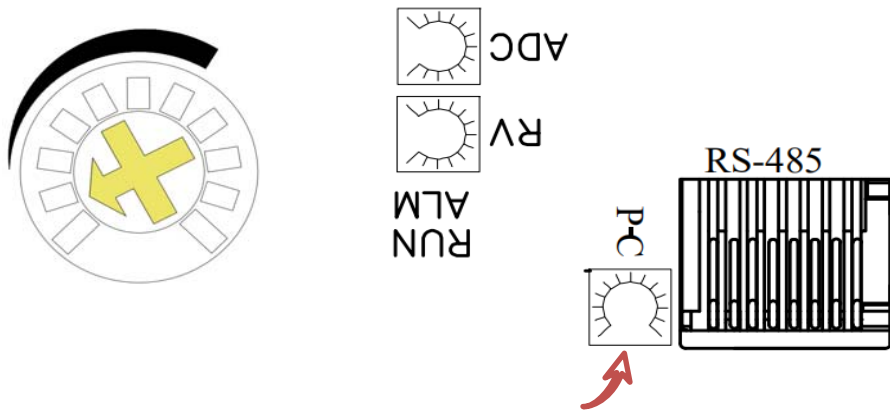
| Mark | Signal Category | Definition |
|-------|------------------|---|
| DC+ | Power Connection | Power supply positive electrode (18V-48V) |
| DC- | | Power supply negative electrode |
| W | Motor Connection | Motor line W phase |
| V | | Motor line V phase |
| U | | Motor line U phase |
| GND | Hall Signal | BLDC Hall signal power negative electrode |
| HW | | Hall sensor signal HW |
| HV | | Hall sensor signal HV |
| HU | | Hall sensor signal HU |
| VCC | | BLDC Hall signal power positive electrode |
| SV | Control Signal | External Potentiometer (No Connection When Adjusting Speed With Internal Potentiometer) or Pulse Rate In Note ① |
| COM | | Common (Low Level/Ground) |
| F/R | | Direction: Low Level/CCW High Level or No Connection/CW Note ② |
| EN | | Enable: High Level/Stop Low Level/Run Note ② |
| BRK | | Quick Brake: High Level/Stop Low Level/Run Note ② |
| SPEED | Output Signal | Speed Signal Output |
| ALARM | | Alarm Signal Output |

Note ①: Potentiometer/10KΩ or analog signal DC 0V~+5V (Change internal switch J1/DC0- 10V). Turn off the internal potentiometer RV when using an external potentiometer to adjust the motor speed.

Note ②: High level/5V (5mA)

Set the peak output current through PC potentiometer. When the load suddenly increases, the output current will be limited to the set value to reduce the motor speed and protect the motor from damage. Set the range to 4-50a.

Note: If overcurrent protection occurs when the motor is running, please adjust the knob clockwise.



1. RV knob is speed regulating potentiometer, connected to the motor power after the rotation of RV can be adjusted speed.
2. SW1 dial code is the motor pole setting port.
3. SW2 dial code is the motor maximum speed limit setting.
4. SW7=1, SW8=2, SW9=4, SW10=8, select bit for 485 address, follow 8421 code to set the address bit. For example, when SW7 and SW9 are ON, the drive has an address code of 5.

SPEED signal output description

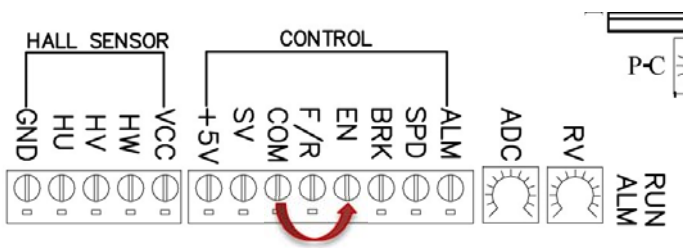
Speed pulse output, the end will output frequency and motor speed is proportional to the fixed pulse width pulse string, then the actual motor speed = $f/N \times 60$, N is the pole number of the motor, and f is the pulse frequency of the output.

Example: 2 pairs of poles motor is 4-pole and the output pulse frequency is 100HZ. Then the motor speed is $(100/2) \times 60 = 3000$ RPM.

Interface Function Description

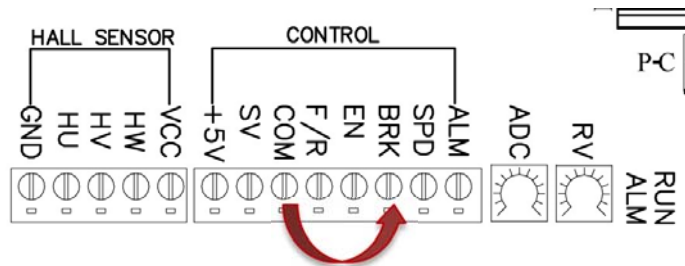
I . Start and stop (EN port)

1. The connection wires at both ends of EN and COM control the operation and stop of the motor. The motor runs when the EN and COM ends are connected. Disconnect and slow stop the motor.
2. By connecting the switch between COM and EN or using PLC to control its on and off, the switch between motor start and stop can be realized.



II. Fast stop (BRK port)

1. Connecting or disconnecting the BRK and COM terminal cable can control the motor operation or stop.
2. When connecting the BRK and COM terminals, the motor runs normally.
3. When the connection wire between BRK end and COM end is disconnected, the motor stops running.



Note:

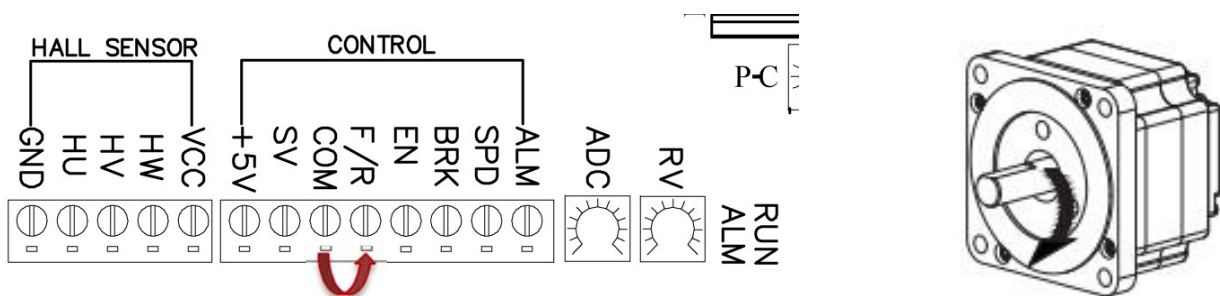
EN and BRK differences and usage options:

- ① EN control for natural stop; BRK controls for fast stop
- ② EN and BRK control the same startup state
- ③ Choose either EN or BRK to control when you start and stop, the wiring of the other way shall be kept in the factory state.

III. Direction control

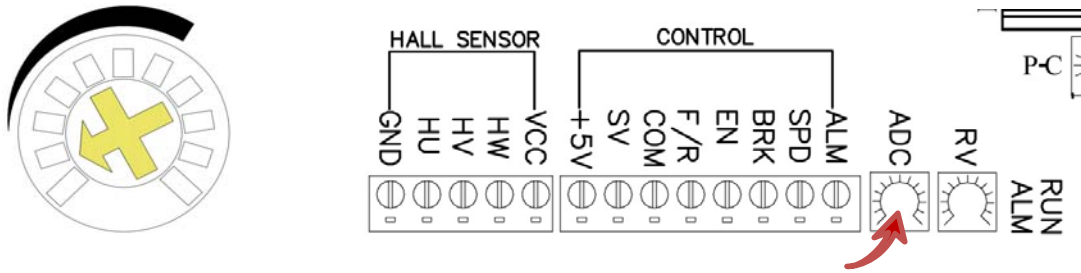
1. The F/R terminal is not connected with the factory setting of COM terminal. When the power is switched on, the motor turns forward.
2. When the connection wire between F/R end and COM terminal is disconnected, the motor turns forward.
3. When F/R terminal and COM terminal are connected, the motor is reversed.

Note: When viewed from the direction of the motor shaft, the motor shaft is clockwise for forward rotation and counterclockwise for reverse rotation.



IV. Acceleration/deceleration time setting

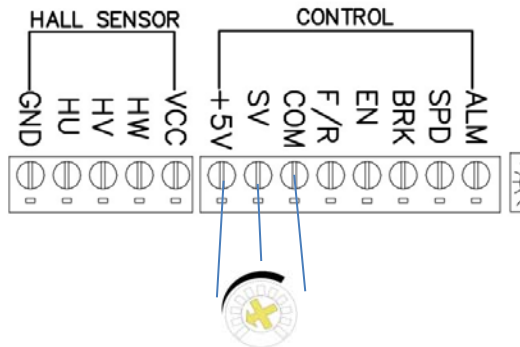
The acceleration time and deceleration time of the motor are set through the potentiometer ADC. By rotating the ADC left and right, the acceleration and deceleration time can be increased or decreased. Setting range: 0.3-15s.



V. Use an external potentiometer for speed regulation

When using external potentiometer control, please use the resistance value of 10 k Ω potentiometer. The middle outlet end of the potentiometer is connected to SV end, and the outlet ends on both sides are respectively connected to 5V+ and GND end.

- SW3 ON
- SW4 OFF
- SW5 ON
- SW6 OFF

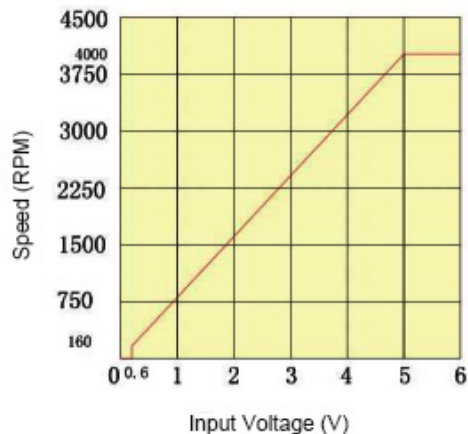


VI. Use external analog signal speed adjustment

When using external analog voltage, use 0-5v analog voltage input. The voltage output end is connected to SV end, and the outlet ends on both sides are connected to SV and GND end respectively.

When the input voltage is about 0.6v, the motor speed is 160rpm. When the input voltage is about 5V, the motor speed is 4000rpm.

- SW3 ON
- SW4 OFF
- SW5 ON
- SW6 OFF

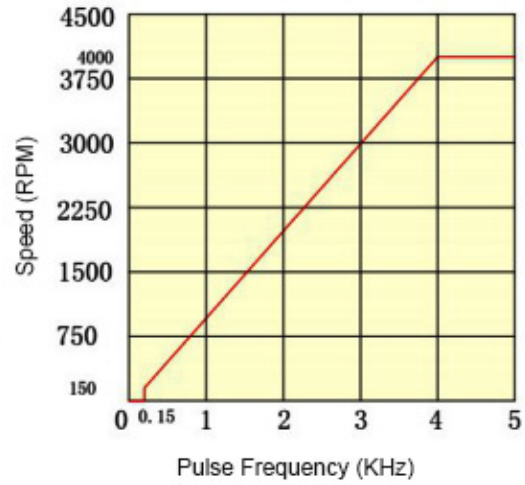


VII. Use pulse frequency control

When selecting this mode, set SW3=0N. The pulse frequency can be 0.15-4KHz and duty ratio is 50%.

When the pulse frequency is 0.15KHz, the motor speed is 150rpm. When the pulse frequency is 4KHz, the motor speed is 4000rpm. Pulse output is connected to SV GND terminal.

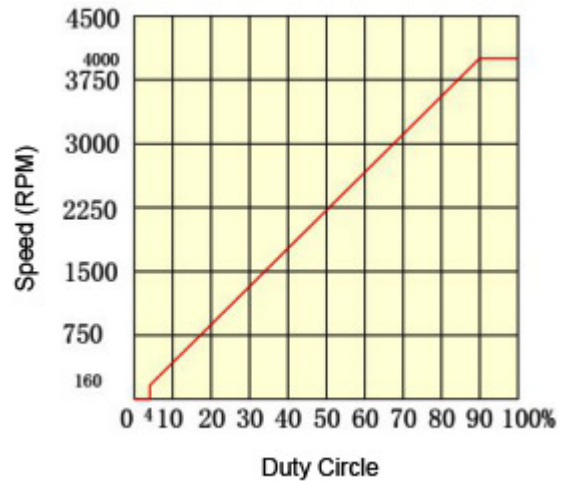
| | |
|-----|-----|
| SW3 | ON |
| SW4 | ON |
| SW5 | OFF |
| SW6 | ON |



VIII. Use PWM speed regulation

When the duty cycle is 4%, the speed of the motor is 160rpm. When the duty cycle is 100%, the speed of the motor is the highest speed, 4000rpm. The output of the pulse is connected to SV and GND.

| | |
|-----|-----|
| SW3 | OFF |
| SW4 | ON |
| SW5 | OFF |
| SW6 | ON |



Alarm Indicator Status

When the motor is over current, Hall input error, blocking, over temperature, over voltage and other circumstances, the driver will send an alarm signal. At this time, the fault alarm output end (ALM) And the common end (COM) will conduct, so that the fault alarm output end (ALM) becomes low level, at the same time the driver stops working, alarm light flashing.

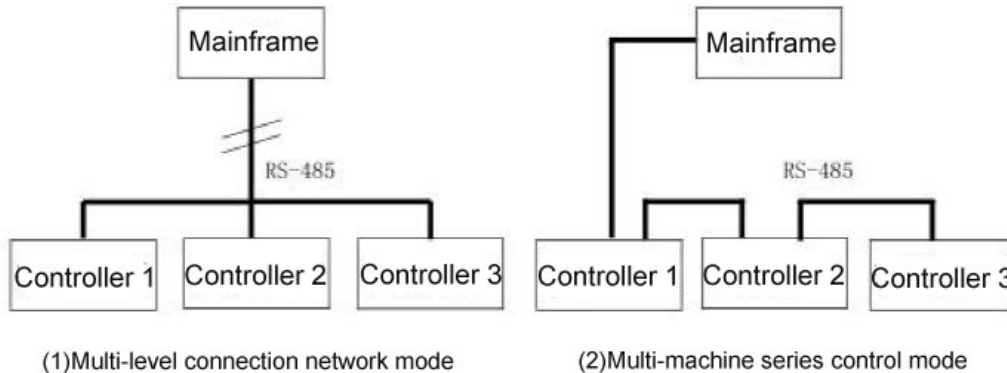
| Alarm Indication | State | Cause | Solution |
|---|------------------------|--|--|
| Red light flashes once Green light flashes once | Over current alarm | In short, resulting in excessive current flow into the controller | Please confirm whether the wire between the motor and the controller is damaged |
| Red light flashes twice Green light flashes once | Over temperature alarm | The temperature of the controller is over the temperature of the alarm | Reduce ambient temperature or Improving airframe ventilation |
| Red light flashes three Green light flashes once | Over voltage | More than 130% of the rated voltage | Verify the power supply voltage or reduce the load, or extend the acceleration and deceleration time |
| Red light flashes four Green light flashes once | Low voltage alarm | Power voltage below rated 60% | Confirm the power supply voltage and check the connection of the power line |
| Red light flashes five Green light flashes once | Sensor abnormal | The motor signal line in operation is broken or the motor signal connector falls off | Confirm the connection of controller and motor |
| Red light flashes six Green light flashes once | Over speed | The motor output shaft speed of more than 4800 r/min | Properly reduce the motor speed |

RS485 Communication function

Our series of BLDC controllers provide common RS485 communication interface for industrial control. MODBUS standard communication protocol is adopted in the communication protocol. The controller can be used as the communication between slave computer and upper computer (such as PLC controller and PC) with the same communication interface and the same communication protocol to realize the centralized monitoring of the controller.

In addition, the user can also use address broadcast function to realize the multi-machine linkage and synchronous action of the controller. The MODBUS communication protocol RTU mode of this controller is described in detail below.

I. Communication network



II. Communication protocol parameters and interface definition

| Items | Parameter |
|--------------------------|---|
| Number of slave stations | 16 |
| BPS | 9600bps |
| Data exchange mode | Asynchronous serial communication/half duplex |
| Communications protocol | MODBUS RTU |
| Data bits | 8-bit |
| Stop bit | 1-bit |
| Check bit | no |
| Error checking mode | CRC16 |
| Frame length | Fixed byte 8 bits |

III. Communication protocol

PC or PLC can work as the host control driver. The specific communication methods are as follows:

- (1) The driver is slave, and the master-slave point-to-point communication.
- (2) The driver is slave, and the host controls multiple slave communication.
- (3) When the host USES the broadcast address to send the command, many slave machines run synchronously. When the host USES the broadcast address to send the command, the slave machine does not reply.
- (4) MODBUS communication protocol RTU mode.

IV. Written data description

Transmission mode asynchronous serial, half duplex transmission mode. At the same time, only one host and slave can send data, while the other can only receive data. In serial asynchronous communication, data is sent frame by frame in the form of message.

| slave address (1byte) | Function Code (1byte) | Access address (2byte) | accessing data (2byte) | CRC check (2byte) | Function description |
|-----------------------|-----------------------|------------------------|------------------------|-------------------|----------------------|
| 0Xnn | 0X06(write data) | 0X00B6 | 0X0001 | CRC check | RS-485 Valid |
| 0Xnn | 0X06(write data) | 0X00B6 | 0X0002 | CRC check | RS-486 Invalid |
| 0Xnn | 0X06(write data) | 0X0056 | 0X0000 | CRC check | Motor speed |
| 0Xnn | 0X06(write data) | 0X0066 | 0X0000 | CRC check | Motor stopped |
| 0Xnn | 0X06(write data) | 0X0066 | 0X0001 | CRC check | Motor forward |
| 0Xnn | 0X06(write data) | 0X0066 | 0X0002 | CRC check | Motor reverse |
| 0Xnn | 0X06(write data) | 0X0066 | 0X0003 | CRC check | Motor brake |

This function code is used to diagnose communication between host and slave. Arbitrary data is sent and returned to determine whether the communication is normal. Write specific access and slave machine response data description.

V. Slave access write

| Fieldname | Data | Description |
|----------------------------------|-------|------------------------------------|
| Slave address | 0X01H | The first slave address |
| Function data | 0X06H | Write data to register |
| Slave register address | 0X00H | Register address to write (high) |
| Slave register address | 0X00H | Register address to write (low) |
| Slave register data | 0X00H | Data write to the register address |
| Slave register data | 0X00H | Data write to the register address |
| Error check address low bit bit | 0XECH | CRC16 result |
| Error check address high bit bit | 0X9EH | |

VI. Return response from slave

| Fieldname | Data | Description |
|--------------------------|-------|--------------------------------------|
| Slave address | 0X01H | Returns the same data as was written |
| Function data | 0X06H | |
| Slave register address | 0X00H | |
| Slave register address | 0X00H | |
| Slave register data | 0X00H | |
| Slave register data | 0X00H | |
| Error check address low | 0XECH | |
| Error check address high | 0X9EH | |

VII. Reading data description

| slave address (1byte) | Function Code (1byte) | Access address (2byte) | accessing data (2byte) | CRC check (2byte) | Function description |
|-----------------------|-----------------------|------------------------|------------------------|-------------------|--------------------------------------|
| 0Xnn | 0X03(Read data) | 0X005F | 0X0001 | CRC check | Read the actual speed of the motor |
| 0Xnn | 0X03(Read data) | 0X00C6 | 0X0001 | CRC check | Read the actual current of the motor |

This function code is used to read a register (8 bits)

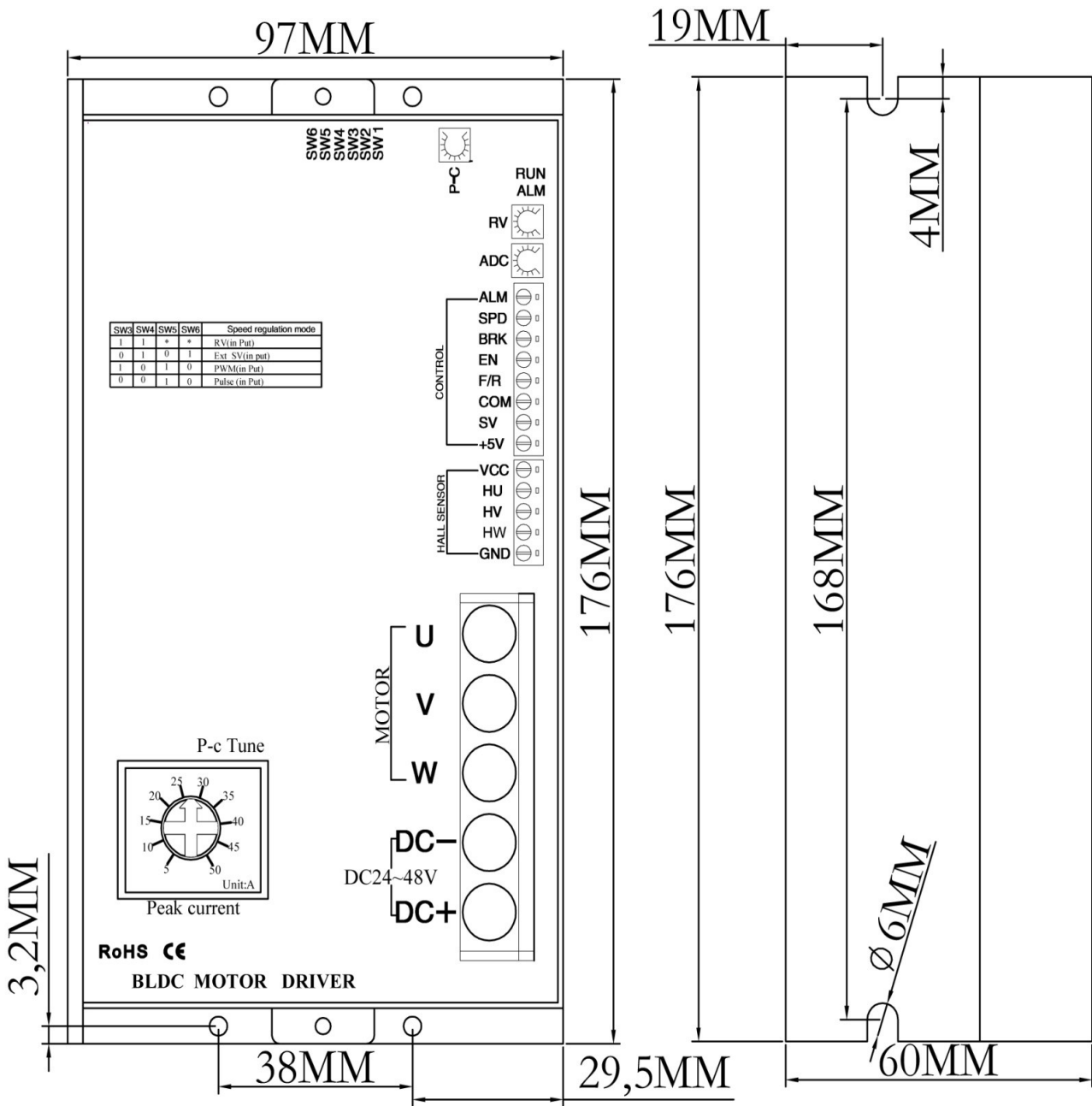
VIII. Slave access write

| Fieldname | Data | Description |
|------------------------------|-------|--|
| Slave address | 0X01H | The first slave address |
| Function data | 0X03H | To read data from a register |
| Slave register address | 0X00H | Read register address |
| Slave register address | 0X00H | |
| Slave register data | 0X00H | Read the byte length of the register address |
| Slave register data | 0X04H | |
| Error check address low bit | 0XECH | CRC16 result |
| Error check address high bit | 0X9EH | |

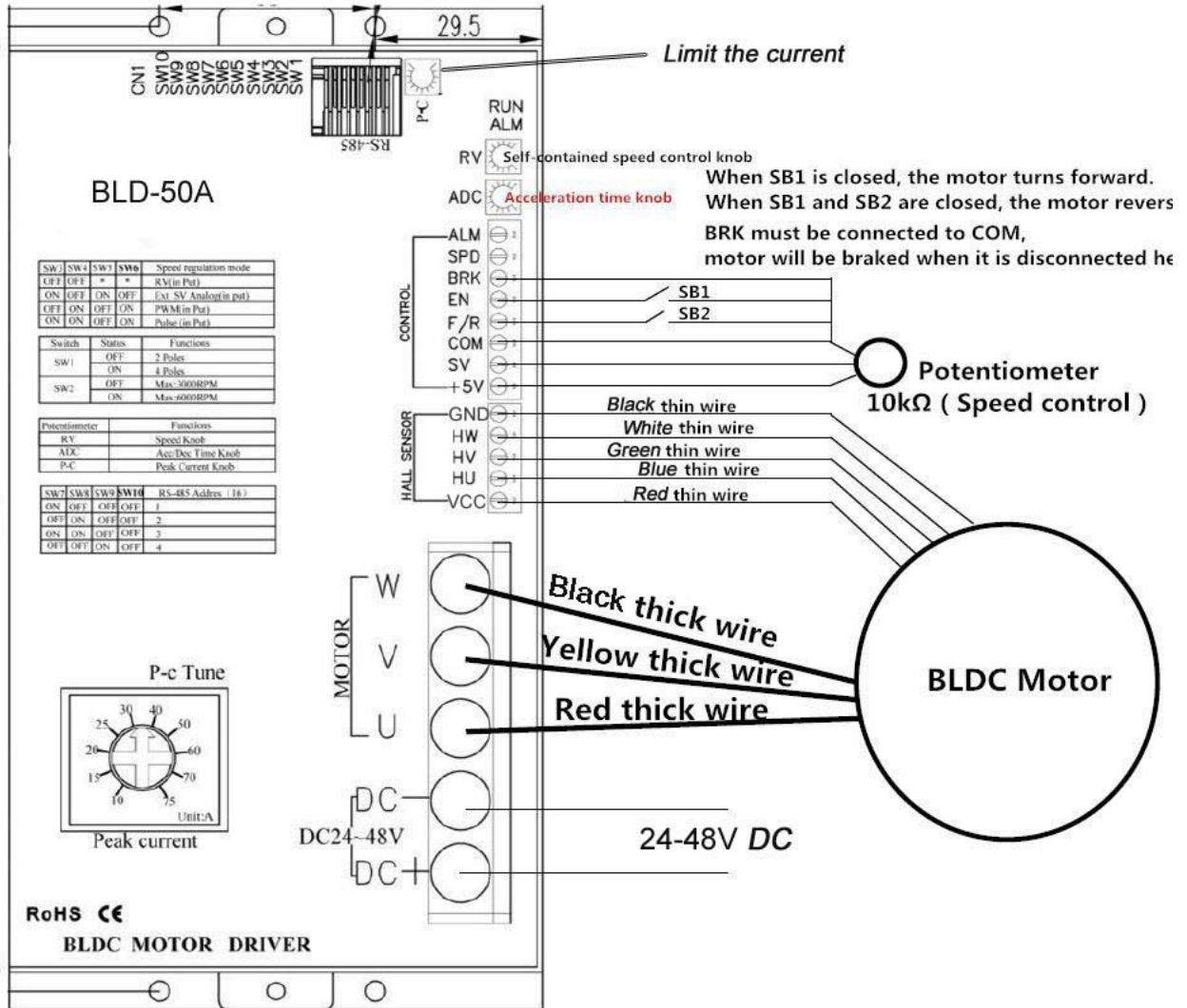
IX. Return response from slave

| Fieldname | Data | Description |
|------------------------------|-------|-------------------|
| Slave address | 0X01H | Same query method |
| Function data | 0X03H | |
| Slave register address | 0X00H | |
| Slave register address | 0X00H | |
| Slave register data | 0X00H | |
| Slave register data | 0X04H | |
| Error check address low bit | 0XECH | |
| Error check address high bit | 0X9EH | |

Mechanical Drawings



Controller Wiring Diagram



BLDC Driver

