BirCraft
GEARED MOTORS - LINEAR ACTUATORS - CONTROLS

- 40 YEARS of Supplying Africa -

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BADCD12/24-10
Variable Speed DC Drive –
10A Continuous, 20A Peak

Operation Manual

Please read this operation manual thoroughly before using this device.

Any failures and damages caused by non-compliance of precautions stipulated in this operation and installation manual are beyond the scope of warranty and the manufacturer disclaims any responsibility for them. This manual must be carefully kept. In case of any question, please contact us!

⚠ **This picture represents a kind of important notice or warning.**

⚠ **Safety precautions**

- Installation, connection and commissioning of this device shall be carried out by professionals.
- Do not install, remove or replace device circuit under charged circumstances.
- Please make sure that necessary protectors are mounted between power input end of this device and power supply (storage battery) to avoid accidents or fatal damages; Devices need to be mounted: over-current protector, fuse, emergency switch.
- Isolation and insulation protection between device and ground as well as devices shall be well equipped.
- In case that charged commissioning of this device is really needed, well-insulated non metal special screwdriver or special commissioning tools shall be used.
- This device shall be installed in well-ventilated environment.
- This device shall not be directly exposed to abnormal environments with high humidity, dust, corrosive gas and intense vibration.

Specification and model:

Model	Continuous Output Current DC: (A)	Max (Peak) Output Current DC: (A)	Max Output Voltage DC: (V)	DC Voltage Working Range 10-18DC: (V)
BA12-10	10	20	17	10-18
BA24-10	10	20	22.8	20-55

I. Product Characteristics:

This series of speed controller is a low voltage DC four-quadrant regeneration pulse width controller adopts special single-chip intelligent control system and has rapid response speed, steady operation, reliable work status and multiple protection functions.

◆ SMT technology, small size

◆ Pulse width modulation

Low noise during operation, high efficiency, and low maintenance cost which better enhance the service life of DC motor.

◆ Four-quadrant regenerative operating mode

◆ Regenerative braking function

It doesn't need external reversing contactor and will not result in electric motor parts or other components overheating or burning down.

◆ Enable/ reversing terminal

To realize certain functions by using simple passive switching value or transistor collector open circuit.

◆Status indicator light - Power supply indicator and over-current alarm indicator can provide the visible status of speed controller.

◆ Output current setting function (amplitude limiting)

◆ Torque compensate function

◆ Double closed-loop PI regulation (current, voltage)

◆ Standard analogue quantity signal control analogue quantity: 0-6V 0-10V or controlled by potentiometer

◆ A broader scope of input voltage: 10-55V

II. Performance indexes

1. PWM pulse width modulation
2. Speed ratio: 1:100
3. Control potentiometer: (1K ……50K)/2W
4. Input voltage: 10-55V VDC
5. Output current: 0-20A (amplitude limiting)
6. Input impedance: ≥50KΩ
7. Revolving speed (standard precision %): 1 %
8. Starting/braking time: 1-20 S
9. Environment temperature: -10℃~+50℃
10. Environment humidity: ≤80RH(no moisture condensation)(relative humidity)
11. Insulation and voltage resistance: 1100V DC 1 minute
12. Insulation resistance: ＞ 20 MΩ
13. Leakage current: ≤ 0.9 mA
14. Weight   0.25Kg
15. It is applicable for tombarthite, permanent magnet and separately excited motor

III. Boundary dimension: see figure below 112*76*33mm
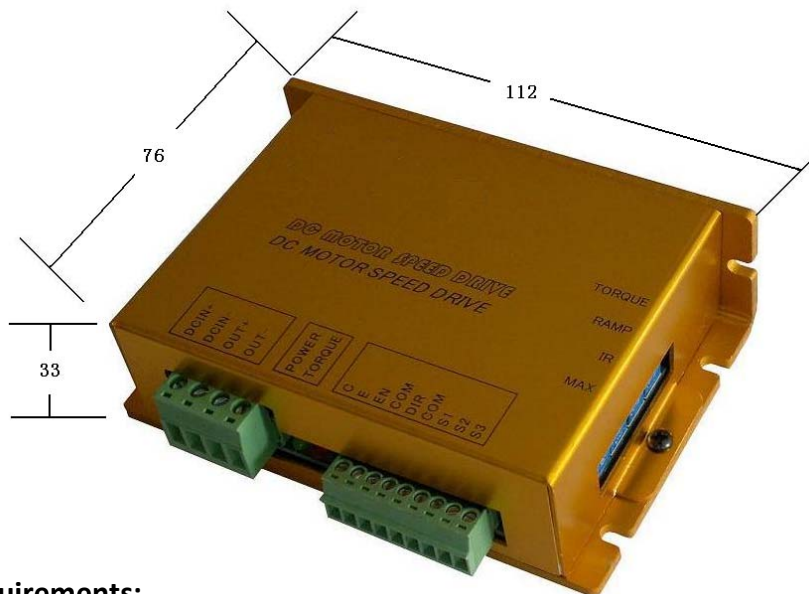
IV. Installation requirements:

⚠️ **WARNING**

1.   Controller cannot be installed, connected or removed under charged circumstance. Otherwise accidents or severe damages may be caused. You should read and understand the details of "safety warning"(Page 1) before installation, and obey the rules strictly.

2.   Drive element is sensitive to electrostatic magnetic interference shall be kept away from environments where static is easy to be generated; otherwise, speed controller may be damaged.

3. The driver shall be kept away from dust, high humidity environment and prevented from accidental contact. Sufficient space shall be reserved around the driver for easy ventilation and regulation.

4. When fixed, the driver shall be kept from other heat sources. Guarantee that the driver works in the specified environment temperature range.

5. The driver shall not be installed on equipment's with extreme vibration; if not, precaution against vibration shall be taken.

V. Wiring requirements:

1. Do not connect wire under charged.

2. Insulated connection, shielded wire which match with driver's voltage current shall be selected and connected, specifications of driver's power input wire and motor's wire are shown below:

Table 1 Wire Specification and Length Table

Current (A)	Wire Specification (mm^2)	Max. Length (M)
10	1.5	15
20	2.5	15

3. Signal line and control line shall adopt shielded wire and shall be separated with power input wire and output wire.
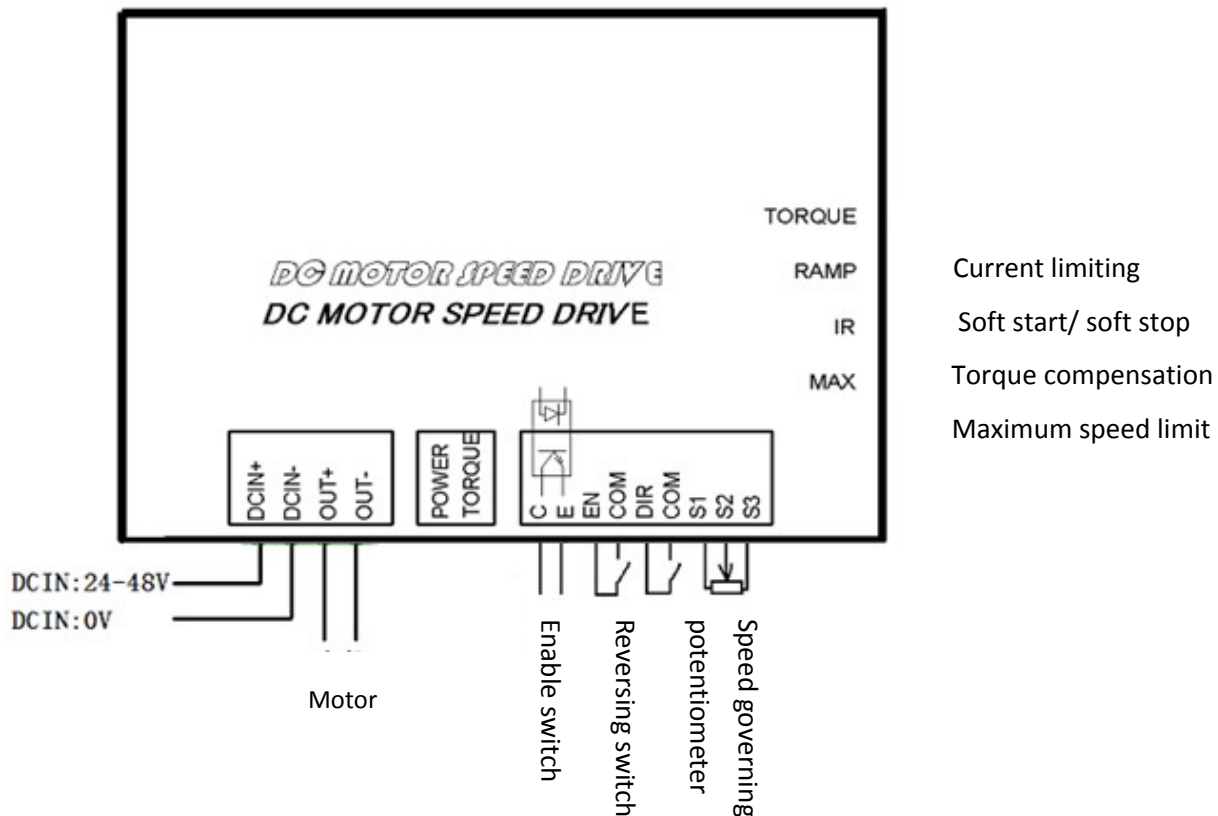
⚠️ **WARNING**

In any cases, signal line and logic control line shall not be bound, mixed and wired with power input wire, output wire (motor line) and other power lines. Induced voltage generated may cause interface, malfunction or directly damage the driver.

4. The driver do not have internal power supply reverse connection protection function, make sure that wiring between power input and driver is correct, otherwise the driver may be damaged.
5. Proper tools shall be used for wiring and make sure that wiring is correct.

VI. Driver terminal function diagram:

DC MOTOR SPEED DRIVE

TORQUE

RAMP — Current limiting

IR — Soft start/ soft stop

MAX — Torque compensation

Maximum speed limit

DCIN+ DCIN- OUT+ OUT-   POWER TORQUE   C E   EN COM DIR COM S1 S2 S3

DCIN: 24-48V
DCIN: 0V

Motor

Enable switch

Reversing switch

Speed governing potentiometer

VII. Description of control terminal's functions:

1. EN (enable control)
During motor operation, simply connect/ disconnect EN with COM to control the start and stop of motor
Connect EN terminal with COM, EN terminal is effective, at this time regulate external speed potentiometer and motor is in normal operation.
EN terminal suspends in the air or is not connected, EN terminal is invalid; circuit of controller is blocked and motor stops.

2. DIR (direction control)
During motor operation, simply connect/ disconnect EN with COM to reverse the motor rotation. It doesn't need external reversing contactor and will not result in electric motor parts or other components overheating or burning down.
Connect DIR terminal with COM, DIR terminal is effective, motor is in negative rotation.
DIR terminal suspends in the air or is not connected, DIR terminal is invalid; motor is in positive rotation (runs in opposite direction as above mentioned).

3. C E (OC door alarm output)
The internal design of "OC door alarm output" is that over-current signal is transmitted through an opto-coupler to give alarms. When over-current is detected on the controller, over-current signal will be immediately sent to diode of opto-coupler for break over and then transmitted to C, E ports. The client can wire as their own requirements, as shown in Figure 1, connect to over-current indicator, Figure 2, relay actuation after over-current to give alarms. Internal wiring diagram of "OC door alarm output" is shown as follows:
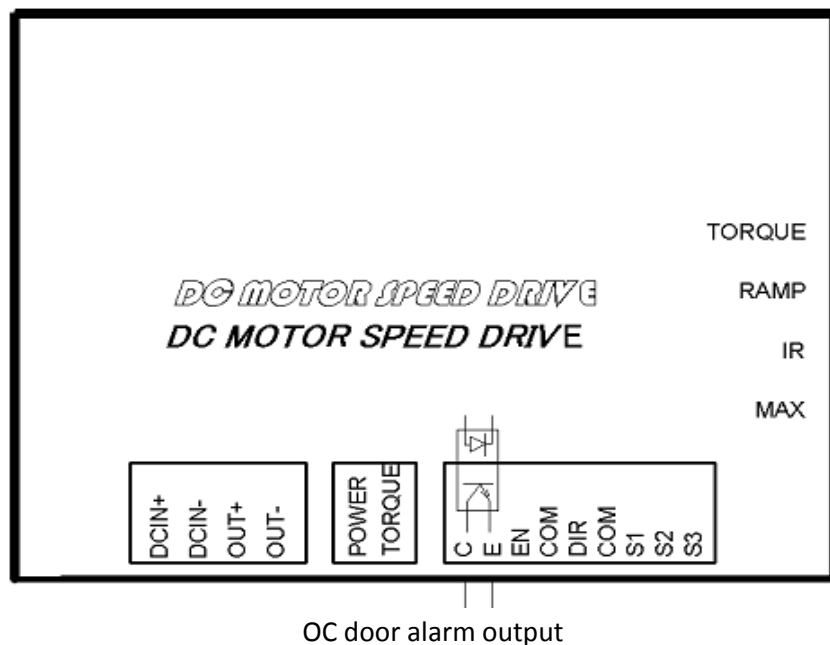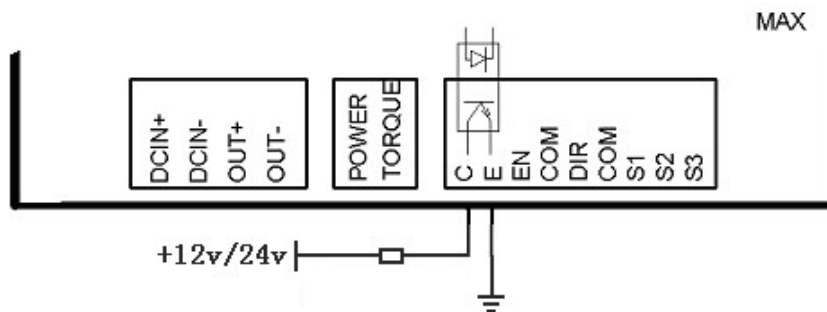
OC door alarm output
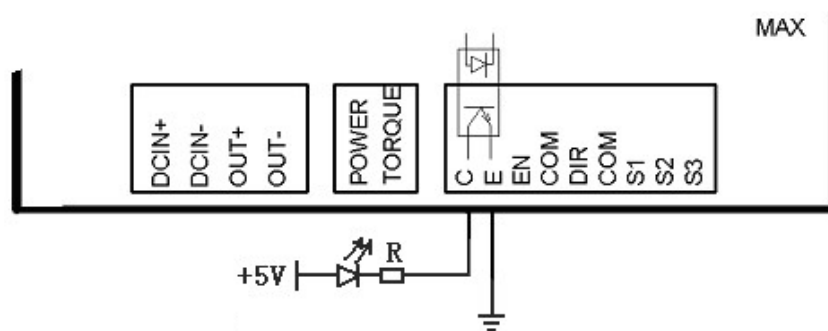
Alarm indicator output
Figure 1: Wiring description of alarm indicator output

Relay coil
Figure 2: Wiring description of alarm relay output

4. S1 S2 S3 signal output terminal

Such controller has two control modes of external speed potentiometer control and external analogue quantity input. Description of various terminals is as follows:

S1 Terminal: external power+10V ,

S2 Terminal: signal input terminal

S3 Terminal: GND (grounded).

4.1 When external speed potentiometer control is used, S1, S2, S3 terminals shall be connected with external potentiometer as shown in VI. Driver terminal function diagram to regulate external potentiometer for speed governing

4.2 When external analogue quantity input control is used, speed can be controlled through S2 and S3 input, both 0-5V and 0-10V are OK.

MAX

DCIN+ DCIN- OUT+ OUT- | POWER TORQUE | C E EN COM DIR COM S1 S2 S3

0–5v or :0–10v _____ 0v

Analogue quantity input
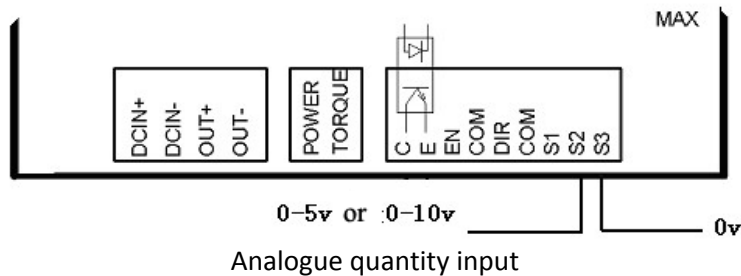
VIII. Description of indicator:

1. POWER (Green) power indicator

If the controller is charged, this indicator lights up to indicate that controller is under normal operation.

2. TORQUE (Red) over-current indicator turns red to indicate that output current of the controller exceeds client's pre-set current, and the controller will automatically limit the output current to such value.

IX. Regulation description of functional potentiometer:

9.1 MAX (maximum revolving speed limit)

It is used for limiting motor's maximum revolving speed. Increase in clockwise rotation and decrease in counter clockwise rotation.

9.2 IR (Torque compensation)

Regulate "IR" enable motor work under different loads and keep revolving speed constant (normally factory default is 0), Increase in clockwise rotation and decrease in counter clockwise rotation.

9.3 RAMP (soft start/ stop)

Regulate "RAMP" to set motor's starting and stopping time (1-20 S). Increase in clockwise rotation.

9.4 TORQUE (current limit regulation)

Regulate "TORQUE" to set over-current protection value of the controller; regulating range is 0-20A, Increase in clockwise rotation and decrease in counter clockwise rotation. When reaches over-current limit value, over-current indicator (Red) lights constantly and current is be limited to such value, at this time, continue to regulate the external potentiometer, current value is invariant(i.e. amplitude limiting).

X. Driver examination steps before charged:

10.1 Firstly, check whether positive and negative connection of battery pack and driver is correct, reliable and whether input power is within driver's applicable range.

10.2 Check whether the circuit board of driver is clean, clear and without conductive metals, humidity, dew and debris

10.3 Check whether periphery connecting line of driver is correct and free from short circuit and ground connection.

10.4 Confirm that external speed governing potentiometer is at minimum position (given signal is at 0)

XI. Common fault treatment

Problems	Causes	Recommended solutions
Motor is out-of-operation	1. Wiring is incorrect. 2. Command signal is 0 V. 3. Disconnection of INHIBIT enable terminal. 4. Current output is limited.	1. Carefully check the wiring between controller and motor 2. Regulate external potentiometer or external analogue signal 3. Contact enable terminal 4. Regulate the output current of controller after confirming that motor is not blocked
Acceleration and deceleration time of motor is improper	Regulate of starting and breaking potentiometer is inappropriate	Regulate starting and breaking potentiometer
Motor vibrates after acting load	1. IR COMP setting is too big 2. Lack of current limit	1. Carefully regulate the setting of IR COMP 2. Regulate the TORQUE potentiometer after confirming that motor matches well with the driver
Speed up after acting load of motor	IR COMP setting is too small	Increase IR COMP setting
Slow down after acting load of motor	IR COMP setting is too big	Decrease IR COMP setting