# Datasheet of the Easy Servo Drive

## *ES-D508*



**20-45VDC, 8.0A Peak, Closed-loop, No Tuning**

## Features

● Step and direction control
● Closed position loop for no loss of movement synchronization
● Operating voltage: 20-45 VDC
● Load based output current of 0.5 - 8.0 A
● High torque at starting and low speed
● No torque reservation
● High stiffness at standstill
● Significantly reduced motor heating
● Smooth motor movement and extra low motor noise
● Quick response, no delay and zero settling time
● No loss of steps; no hunting; no overshooting
● Plug-and-play and no tuning

## Descriptions

ES-D508 is one of the models in Leadshine ES-D series easy servo drives which can take 20-45 VDC operating voltage and output 0.5 - 8.0 A continuous load-based current. It is capable of driving NEMA 17, 23, 24 and 34 (1-2 stacks) easy servo motors (stepper motors with encoders) with the position loop closed in real time.

Based on latest DSP technology and adopting Leadshine's advanced control algorithm, ES-D508 easy servo drive applies servo control on easy servo motors. When adopted with an easy servo motor, it combines features of both open loop steppers & brushless servo systems, and offers many unique advances features for excellent motion control system performance.

When an ES-D508 easy servo drive is implemented with a Leadshine ES-M series easy servo motor, there is No Configuration Needed for almost all applications. The factory setting of the resolution is 4000 pulses per revolution (equal to 20 microstep in 2-phase stepper systems). With Leadshine configuration software, ProTuner, an advanced user can also set custom settings of resolution, current & position loop parameters, idle current percentage, etc.

## Applications

With many unique advanced features, Leadshine ES-D508 easy servo systems are ideal for many industries to upgrade stepper performance or replace brushless servo systems in many applications.

Leadshine OEM clients have successfully implemented ES-D508 driven easy servo systems in applications such as desktop CNC routers, small CNC mills, laser cutters / engravers, dental mills, electronic assembly & inspection equipments, labeling equipments, pick & place machines, X-Y tables, scientific instruments.

## Specifications

### Electrical Specifications

| Parameter | Min | Typical | Max | Unit |
|---|---|---|---|---|
| Input Voltage | 20 | 36 | 50 | VDC |
| Output Current | 0.5 | - | 8.0(Peak) | A |
| Pulse Input Frequency | 0 | - | 200 | kHz |
| Logic Signal Current | 7 | 10 | 16 | mA |
| Isolation Resistance | 500 | - | - | MΩ |

### Operating Environment
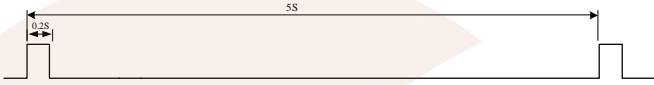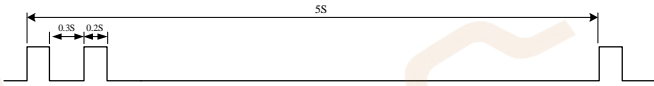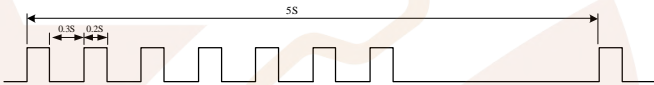
| Cooling | Natural Cooling or Forced cooling | |
|---|---|---|
| Operating Environment | Environment | Avoid dust, oil fog and corrosive gases |
| | Ambient Temperature | 0°C — 50°C (32°F — 122°F) |
| | Humidity | 40%RH — 90%RH |
| | Operating Temperature (Heat Sink) | 70°C (158°F) Max |
| Storage Temperature | -20°C — 65°C (-4°F — 149°F) | |
| Weight | 280 g (9.9 oz) | |

### Mechanical Specifications

www.servosystem.ru    +7(495) 407-01-02
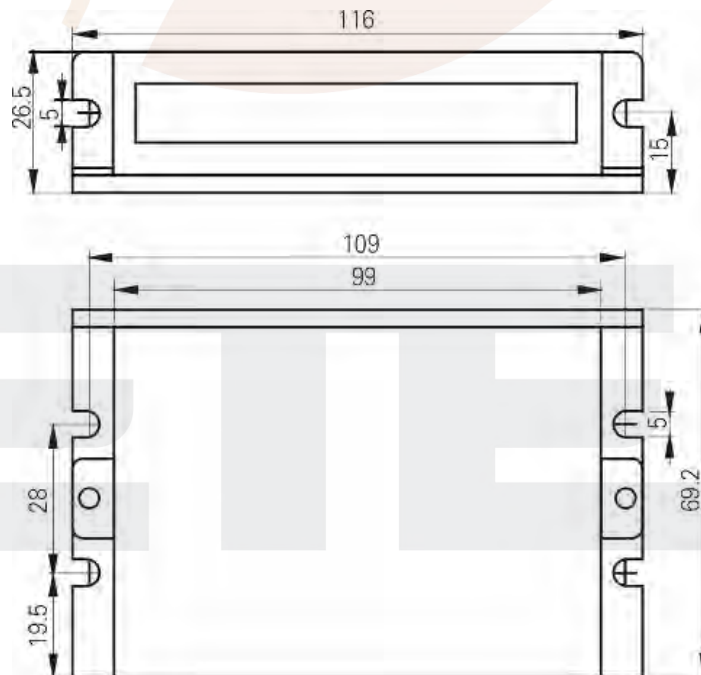
## Protection Indications

The green indicator turns on when power-up. When drive protection is activated, the red LED blinks periodicity to indicate the errors.

| Priority | Time(s) of Blink | Sequence wave of RED LED | Description |
|---|---|---|---|
| 1st | 1 | | Over-current protection |
| 2nd | 2 | | Over-voltage protection |
| 3rd | 7 | | Position Following Error |

## Connectors and Pin Assignment

The ES-D508 has three connectors, connector for control signals connections, connector for encoder feedback and connector for power and motor connections.

| Control Signal Connector - Screw Terminal | | | |
|---|---|---|---|
| Pin | Name | I/O | Description |
| 1 | PUL+ | I | Pulse Signal: In single pulse (pulse/direction) mode, this input represents pulse signal, each rising or falling edge active (software configurable, see easy servo software operational manual for more details); In double pulse mode (software configurable), this input represents clockwise (CW) pulse, active both at high level and low level. 4-5V when PUL-HIGH, 0-0.5V when PUL-LOW. For reliable response, pulse width should be longer than 2.5μs. Series connect resistors for current-limiting when +12V or +24V used. The same as DIR and ENA signals. |
| 2 | PUL- | I | |
| 3 | DIR+ | I | Direction Signal: In single-pulse mode, this signal has low/high voltage levels, representing two directions of motor rotation. In double-pulse mode (software configurable), this signal is counter-clock (CCW) pulse, active both at high level and low level. For reliable motion response, DIR signal should be ahead of PUL signal by 5μs at least. 4-5V when DIR-HIGH, 0-0.5V when DIR-LOW. Toggle DIP switch SW1 to reverse motion direction. |
| 4 | DIR- | I | |
| 5 | ENA+ | I | Enable Signal: This signal is used for enabling/disabling the driver. In default, high level (NPN control signal) for enabling the driver and low level for disabling the driver. Usually left UNCONNECTED (ENABLED). Please note that PNP and Differential control signals are on the contrary, namely low level for enabling. The active level of ENA signal is software configurable. |
| 6 | ENA- | I | |

## Connectors and Pin Assignment (Continued)

| Pin | Name | I/O | Description |
|---|---|---|---|
| Control Signal Connector - Screw Terminal ||||
| 7 | FAULT+ | O | Fault Signal: OC output signal, active when one of the following protection is activated: over-voltage, over current, short circuit and position following error. This port can sink or source 20mA current at 24V. In default, the resistance between FAULT+ and FAULT- is low impedance in normal operation and become high when the ES-D508 goes into error. The active level of alarm signal is software configurable. See easy servo software operational manual for more details. |
| 8 | FAULT- | O | |

| Pin | Name | I/O | Description |
|---|---|---|---|
| Encoder Feedback Connector – HDD15 Female ||||
| 1 | EA+ | I | Encoder channel A+ input |
| 2 | EB+ | I | Encoder channel B+ input |
| 3 | EGD | GND | Signal ground |
| 4 | NC | I | Not Connected, Reserved for future use. |
| 5 | NC | I | Not Connected, Reserved for future use. |
| 6 | FG | - | Ground terminal for shielded |
| 7 | NC | I | Not Connected, Reserved for future use. |
| 8 | NC | I | Not Connected, Reserved for future use. |
| 9 | NC | I | Not Connected, Reserved for future use. |
| 10 | NC | - | Not Connected |
| 11 | EA- | I | Encoder channel A- input |
| 12 | EB- | I | Encoder channel B- input |
| 13 | VCC | O | +5V @ 100 mA max. |
| 14 | NC | - | Not Connected |
| 15 | NC | - | Not Connected |

| Pin | Name | I/O | Description |
|---|---|---|---|
| Power and Motor Connector- Screw Terminal ||||
| 1 | U | O | Motor Phase U |
| 2 | V | O | Motor Phase V |
| 3 | W | O | Motor Phase W |
| 4 | +Vdc | I | Power Supply Input (Positive), 20-45VDC recommended, leaving rooms for voltage fluctuation and back-EMF. |
| 5 | GND | GND | Power Ground (Negative) |

## RS232 Communication Port

It is used to configure the peak current, microstep, active level, current loop parameters and anti-resonance parameters.

| Pin | Name | I/O | Description |
|-----|------|-----|-------------|
| RS232 Communication Port – RJ11 |
| 1 | NC | - | Not connected. |
| 2 | +5V | O | +5V power output. |
| 3 | TxD | O | RS232 transmit. |
| 4 | GND | GND | Ground. |
| 5 | RxD | I | RS232 receive. |
| 6 | NC | - | Not connected. |
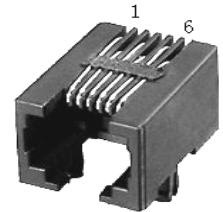
## DIP Switches

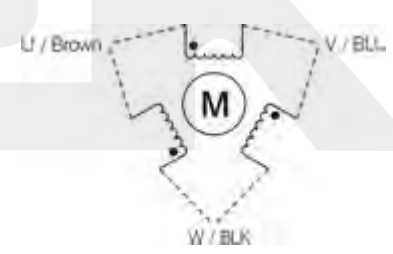|     | Function | On | Off |
|-----|----------|-----|-----|
| SW1 | Default Direction [Note] | CW (clock-wise) | CCW (counter-clock-wise) |
| SW2 | Self-test | Self-test is active | Self-test is close |

*Note: the actual direction is related to the DIR level. You can toggle SW1 to change it once.*

## Current Control

The motor current will be adjusted automatically regarding to the load or the stator-rotor relationship. However, the user can also configure the current in the tuning software. The configurable parameters include close-loop current, holding current, encoder resolution, micro step and etc. There are also PID parameters for the current loop, and they have been tuned for Leadshine's matching motors so the user does not need to tune them.

## Easy Servo Motors

The ES-D508 can work with the following Leadshine easy servo motors:

|  | ES-M32309 | ES-M32320 | Wiring Diagram |
|--|-----------|-----------|----------------|
| Step Angle (Degree) | 1.2 | 1.2 | |
| Holding Torque (N.m) | 0.9 | 2.0 | |
| Phase Current (A) | 5.8 | 5.8 | |
| Phase Resistance (Ohm) | 0.37 | 0.62 | |
| Phase Inductance (mH) | 0.92 | 1.85 | |
| Inertia (g.cm$^2$) | 300 | 500 | |
| Weight (Kg) | 0.7 | 1.3 | |
| Encoder (lines / Rev. ) | 1000 | 1000 | |

www.servosystem.ru    +7(495) 407-01-02
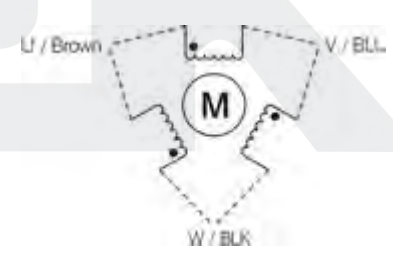
## Motor Encoder Cable Pin-Out

ES-M32309, ES-M32320

| Pin | Name | Wire Color | I/O | Description |
|-----|------|-----------|-----|-------------|
| 1 | EA+ | Black | O | Channel A+ output |
| 2 | VCC | Red | I | +5V power input |
| 3 | GND | White | GND | Ground |
| 11 | EB+ | Yellow | O | Channel B+ output |
| 12 | EB- | Green | O | Channel B- output |
| 13 | EA- | Blue | O | Channel A- output |
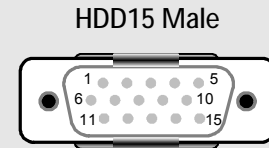
HDD15 Male



## Motor Encoder Extension Cable

CABLEG-BMXMX
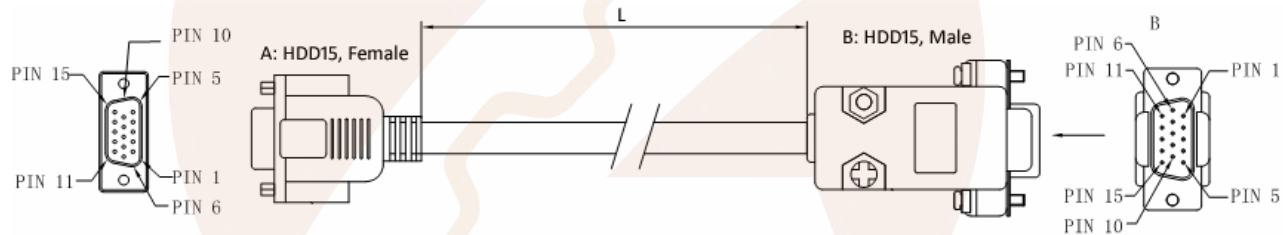


Pin Assignments

| A: HDD15 Female Pin | Wire Color | B: HDD15 Male Pin | Name | Description |
|-----|-----------|-----|------|-------------|
| 1 | Black | 1 | EA+ | Channel A+ |
| 2 | Red | 13 | VCC | +5V power input |
| 3 | White | 3 | GND | +5V GND |
| 11 | Yellow | 2 | EB+ | Channel B+ |
| 12 | Green | 12 | EB- | Channel B- |
| 13 | Blue | 11 | EA- | Channel A- |

Cable Length

| Part Number | L | Matching Motor |
|-------------|------|----------------|
| CABLEG-BM3M0 | 3.0m | |
| CABLEG-BM8M0 | 8.0m | ES-M32309, ES-M32320 |
| CABLEG-BM10M0 | 10.0m | |
| CABLEG-BM12M0 | 12.0m | |

Note: The encoder extension cable must be connected between the ES-M323 motor and the ES-D508. You can not connect the motor's encoder cable to the ES-D508 directly.
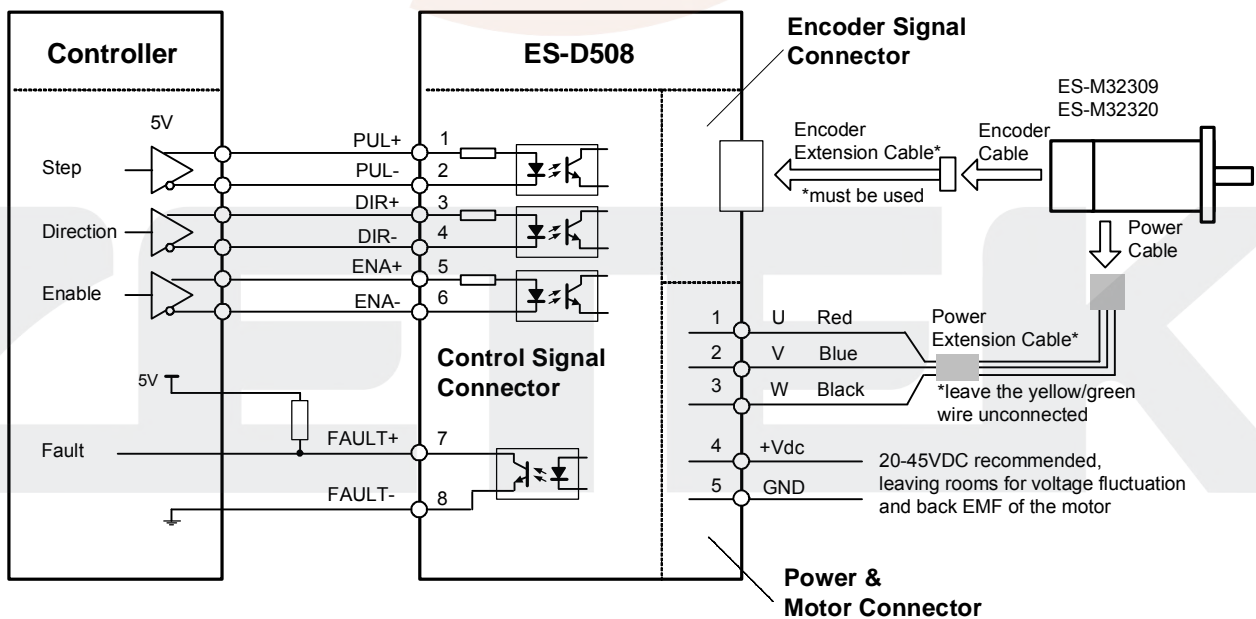
## Motor Power Extension Cable

CABLEH-RZXMX
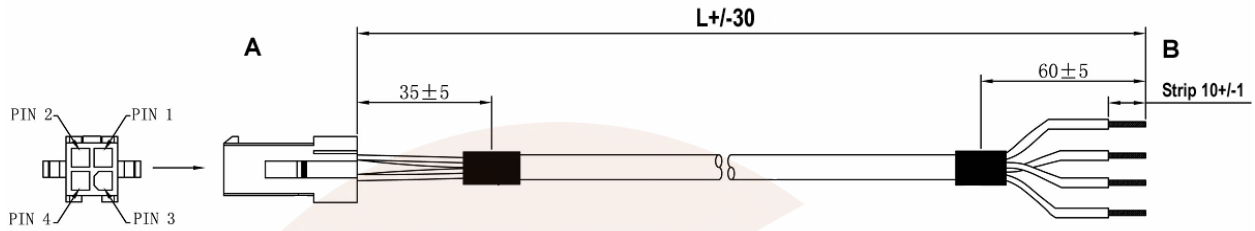


### Pin Assignments

| A | B | Name | Description |
|---|---|---|---|
| Pin | Wire Color | | |
| 1 | Blue | V | Motor Phase V |
| 2 | Red | U | Motor Phase U |
| 3 | Black | W | Motor Phase W |
| 4 | Yellow / Green | NC | No connection |

### Cable Length

| Part Number | L | Matching Motor |
|---|---|---|
| CABLEH-RZ3M0 | 3.0m | |
| CABLEH-RZ5M0 | 5.0m | ES-M32309, ES-M32320 |
| CABLEH-RZ10M0 | 10.0m | |

## Typical Connections



Connections to controller of differential output

## Typical Connections (Continued)



R=0 if VCC=5V;
R=1K(Power>0.125W) if VCC=12V;
R=2K(Power>0.125W) if VCC=24V;
R must be connected to control signal terminal.
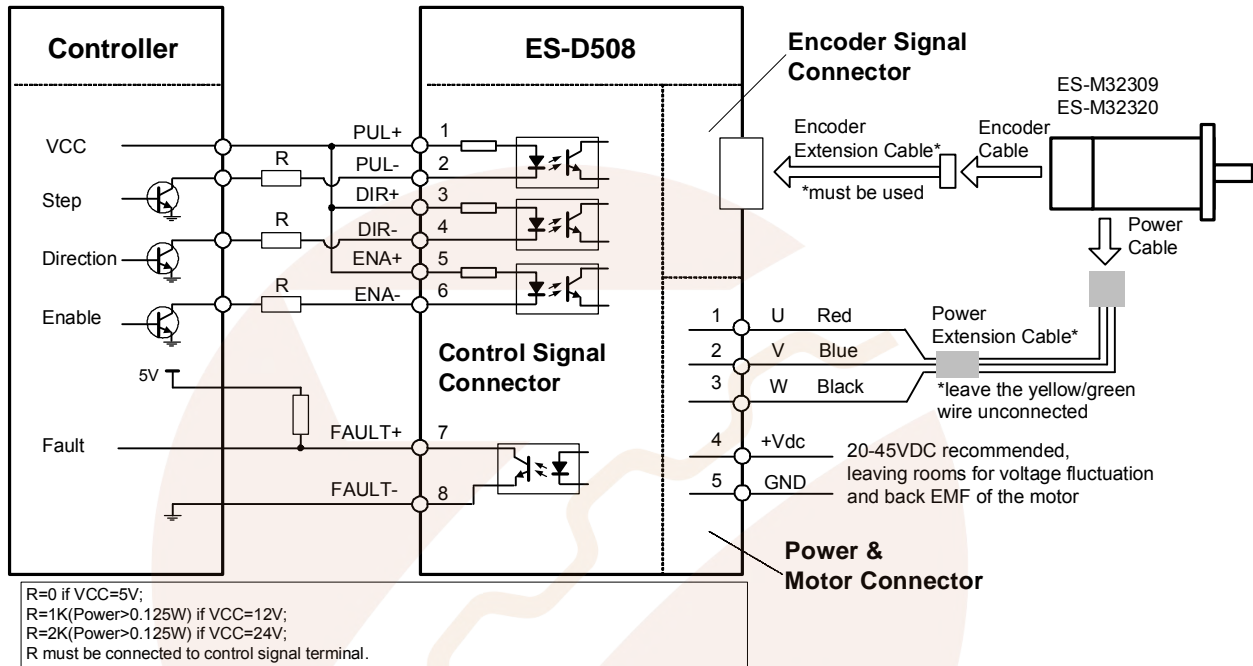
Connections to controller of sinking output



R=0 if VCC=5V;
R=1K(Power>0.125W) if VCC=12V;
R=2K(Power>0.125W) if VCC=24V;
R must be connected to control signal terminal.
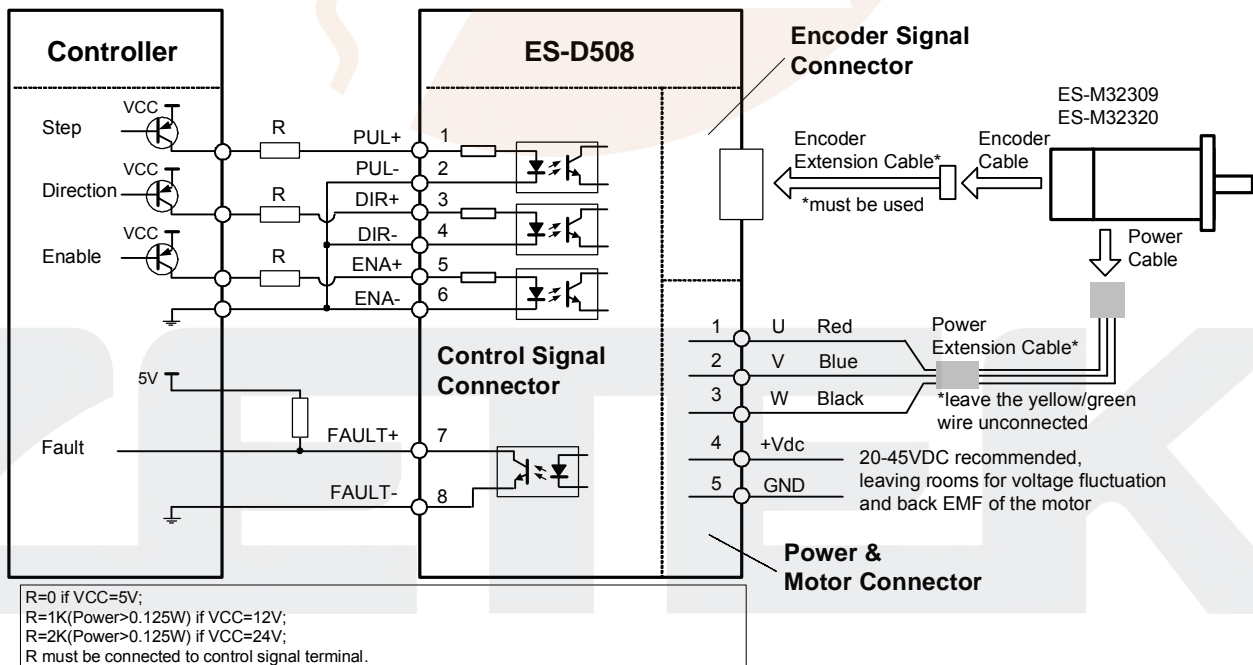
Connections to controller of sourcing output

www.servosystem.ru    +7(495) 407-01-02