

# *User Manual*

## **ES2-3DA2306**

### Vector Easy Servo Drive



**Revision 1.0**  
**Revision 1.0**

**©2016 Leadshine Technology Co., Ltd.**

**Address:** Floor 11, Block A3, Nanshan iPark, Xueyuan Avenue 1001, Shenzhen, Guangdong, 518055, China

**Tel:** (86)755-26409254

**Fax:** (86)755-26402718

**Web:** [www.leadshine.com](http://www.leadshine.com)

**Sales:** [sales@leadshine.com](mailto:sales@leadshine.com)

**Support:** [tech@leadshine.com](mailto:tech@leadshine.com)

## Notice

Read this manual carefully before any assembling and using. Incorrect handling of products in this manual can result in injury and damage to persons and machinery. Strictly adhere to the technical information regarding installation requirements.

This manual is not for use or disclosure outside of Leadshine except under permission. All rights are reserved. No part of this manual shall be reproduced, stored in retrieval form, or transmitted by any means, electronic, mechanical, photocopying, recording, or otherwise without approval from Leadshine. While every precaution has been taken in the preparation of the book, Leadshine assumes no responsibility for errors or omissions. Neither is any liability assumed for damages resulting from the use of the information contained herein.

This document is proprietary information of Leadshine that is furnished for customer use ONLY. Information in this document is subject to change without notice and does not represent a commitment on the part of Leadshine. Therefore, information contained in this manual may be updated from time-to-time due to product improvements, etc., and may not conform in every respect to former issues.

## Record of Revisions

<b>Revision</b>	<b>Date</b>	<b>Description of Release</b>
<i>1.0</i>	<i>Dec, 2016</i>	<i>Initial Release</i>

## Table of Contents

1	Introductions.....	4
1.1	Features.....	4
1.2	Applications.....	4
2.	Specifications.....	4
2.1	Electrical Specifications.....	4
2.2	I/O Interface Specifications.....	5
2.3	Mechanical Specifications.....	5
2.4	Operating Environment.....	5
3	Connectors and Pin Assignments.....	6
3.1	Control Signal Connector CN1.....	6
3.2	Encoder Signal Input CN2.....	6
3.3	RS232 Communication Connector for Tuning CN3.....	8
3.3	Power Connector.....	8
3.4	Connector Pin-Out.....	9
3.5	Matching ESM Series Easy Servo Motors.....	10
4	Getting Start.....	11
4.1	Wiring Diagrams.....	12
4.1.1	Power Wiring.....	12
4.1.2	Control Signal Wiring.....	12
4.2	Sequence Chart of Control Signals.....	15
4.3	Configuring ES2-3DA2306.....	15
4.3.1	Configuring ES2-3DA2306 by the on-board HMI.....	15
4.3.2	Configuring ES2-3DA2306 by the ProTuner.....	17
5	Frequently Asked Questions.....	23
6	Warranty.....	24

## 1 Introductions

Leadshine ES2 series easy servo drives are based on the latest vector control algorithm of combining AC servo and stepper systems. They are featured with full closed-loop include current loop, speed loop and position loop, offering enhanced acceleration & quick response, extra lower noise & heating, smooth motor movement, no torque reservation, high standstill stiffness, no overshooting for almost zero settling time, and easy tuning for almost all applications. The ES2-3DA2306 operating voltage is 150-230VAC and it can output up to 6.0 current. Therefore, the ES2-3DA2306 is ideal for applications requiring fast response, precise position and smooth movement of NEMA34 and NEMA42 easy servo motors.

### 1.1 Features

- Advanced servo technology to combine advantages of open-loop stepper systems and AC servo systems
- Closed-loop controls to eliminate lose of steps, stall or movement synchronization
- High starting torque and quick response
- Vector control ,smooth motor movement with lower vibration & heating and quick response
- Excellent respond time, quick acceleration, and very high high-speed torque (30% over open-loop)
- Load-dependent dynamic current output from drive to motor to significantly motor heating deduction
- Input voltage from 150 to 230VDC; MAX 6.0A peak current output from drive to motor
- Micro step resolution value from 200-51,200 (increased by 1) via software configuration
- Isolated control inputs of Pulse, Direction and Enable
- Easy tuning for plug and play setup and built-in on-board HMI for easy setup and configuration
- Easy Servo motors with selectable encoder resolution 1000, 2500, 5000 lines (recommend 5000 lines) and output signal include A,B,Z;
- In-position and fault outputs to external motion controllers for complete system controls.
- Over voltage, over-current, and position-error protection

### 1.2 Applications

Due to combining the features of both AC servo drives and stepper drives, Leadshine ES2 series easy servo drives are suitable for both upgrading conventional stepper systems, and replacing AC servo systems which have closed loop and high torque requirements. ES2-3DA2306 has been successfully implemented by many OEM clients in applications such as electronic equipment, laser engraving machine, medical equipment, CNC routers, packaging machines and printing equipment.

## 2. Specifications

### 2.1 Electrical Specifications

Parameters	ES2-3DA2306
Operating Voltage	150-230VAC
Maximum Continuous Current	6.0 A
MAX Step Frequency	200KHz and 500KHz optional
Step, Direction and Enable Voltage	5-24 V
Logic Signal Input Current	7-20 mA

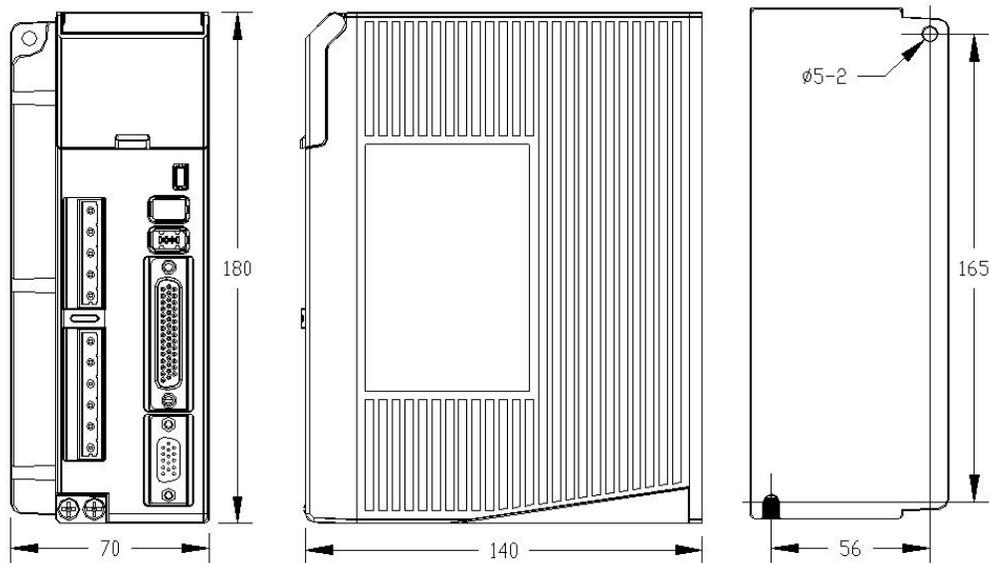
## 2.2 I/O Interface Specifications

Parameters	ES2-3DA2306
Command Input	Step/Direction, CW/CCW
Enable/Disable Input	Differential
Alarm Signal Output	Isolated OC Output
Encoder Signal Output	ABZ Output
Tuning Interface	On-board HMI or RS232 communication
Regeneration Resistor	Built-in ( 50 Ohm, 100W), Support External

## 2.3 Mechanical Specifications

(unit: mm [1inch=25.4mm])

Parameters	ES2-3DA2306
Size	180mm * 140mm* 70mm
Weight	1500 g

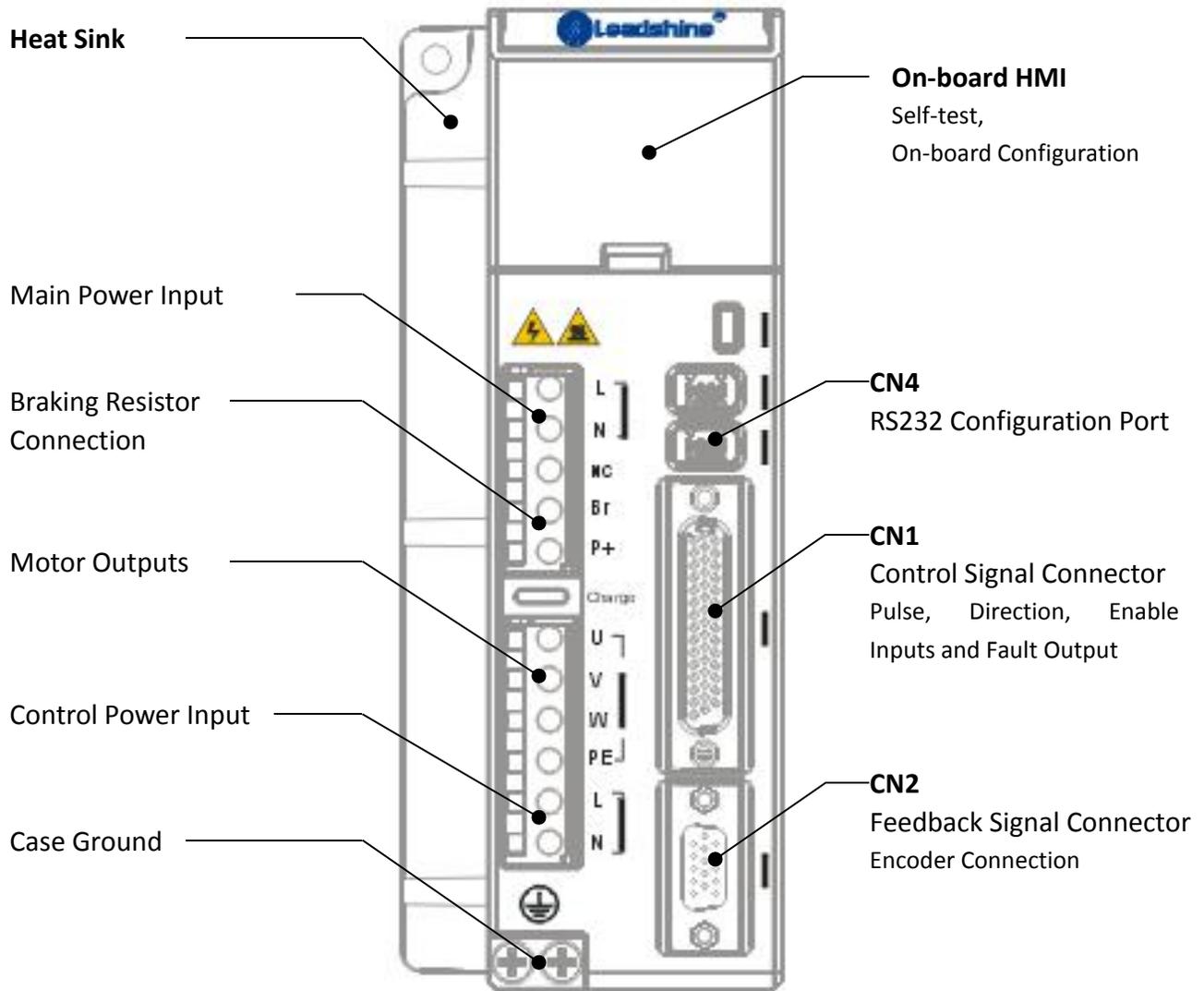


## 2.4 Operating Environment

( $T_j = 25^\circ\text{C}/77^\circ\text{F}$ )

Cooling	Natural cooling or Forced cooling
Ambient Temperature	0 – 40 °C
Humidity	40% RH to 90% RH, No Condensation
Vibration	5.9 m/s <sup>2</sup> MAX
Storage Temperature	-20 °C to 80 °C

### 3 Connectors and Pin Assignments



#### 3.1 Control Signal Connector CN1

CN1 – Control Signal Connector			
DB44, 44Pin, Female			
Pin	Name	I/O	Description
1	NC	-	No connection.
2	NC	-	No Connection.
3	PUL+	I	Pulse signal: In single pulse (pulse/direction) mode, this input represents pulse signal, each rising or falling edge active (software configurable); In double pulse mode (software configurable), this input represents clockwise (CW) pulse, active both at high level and low level. 5-24V when PUL-HIGH, 0-0.5V when PUL-LOW. For reliable response, pulse width should be longer than 2.5uS(200K bandwidth) or 1uS(500K
4	PUL-	I	

			bandwidth)
5	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 5 $\mu$ s at least. 5-24V when DIR-HIGH, 0-0.5V when DIR-LOW. The direction signal's polarity is software configurable.
6	DIR-	I	
7	ALM+	O	Alarm Signal: OC (Open Collector) output signal, activated when one of the following protection is activated: over-voltage, over current, braking error and position following error. They can sink or source MAX 100mA current at 5V. The active impedance of alarm signal is software configurable.
8	ALM-	O	
9	Pend+	O	<u>In-position Signal</u> : OC output signal, active when the difference between the actual position and the command position is zero. This port can sink or source 20mA current at 24V. The resistance between Pend+ and Pend- is active at high impedance. The signal also can be used for <b>brake output by setting parameter NO 30004 in ProTuner.</b>
10	Pend-	O	
11	ENA+	O	Enable signal: This signal is used for enabling/disabling the driver. By default, high level (NPN control signal) for enabling the driver and low level for disabling the driver. It is usually left UNCONNECTED (ENABLED). Please note that the PNP and Differential control signals are on the contrary, namely Low level for enabling. The active level of ENA signal is software configurable.
12	ENA-	O	
13-22	NC	-	No connection.
23	AO+	O	Encoder A + output
24	AO-	O	Encoder A - output
25	BO+	O	Encoder B+ output
26	BO-	O	Encoder B- output
27	ZO+	O	Encoder Z+ output
28	ZO-	O	Encoder Z- output
29-44	NC	-	No connection.
	FG	-	Ground Terminal for shield

### 3.2 Encoder Signal Input CN2

CN2 – Feedback Signal (Encoder) Connector			
HDD15, 15Pin, Female			
Pin	Name	I/O	Description
1	EA+	I	Encoder A+ input
2	EB+	I	Encoder A- input

3	EGND	I/O	+5V output return ground
4	NC	I	No Connection.
5	NC	I	No Connection.
6	FG	I	Ground terminal for shield
7	EZ+	I	Encoder Z+ input
8	EZ-	I	Encoder Z- input
9	NC	I	No Connection.
10	NC	I	No Connection.
11	EA-	I	Encoder A- input
12	EB-	I	Encoder B- input
13	VCC	O	External +5V power input need if the required current >50mA, no connection as normally
14	NC	I	No Connection.
15	NC	I	No Connection.

### 3.3 RS232 Communication Connector for Tuning CN3

CN3 – RS232 Communication Connector			
<b>RS232</b>		Can be connected to PC for drive and motor tuning. Recommended twisted shielded cable and cable length < 2 meter.	
Pin	Name	I/O	Description
1	GND	GND	Ground.
2	TxD	O	RS232 transmit.
3	+5V	O	Reserved +5V power output ( Note: Do not connect it to RS232 port)
4	RxD	O	RS232 receive.
5	NC	-	NC
6	NC	-	NC

### 3.5 Power and motor Connector

Main Power Supply Connector			
Pin	Name	I/O	Description
1	L	I	Main power supply input connected to 150- 240VAC.
2	N	I	
3	NC	-	
4	BR1	I	External regeneration resistor connection.

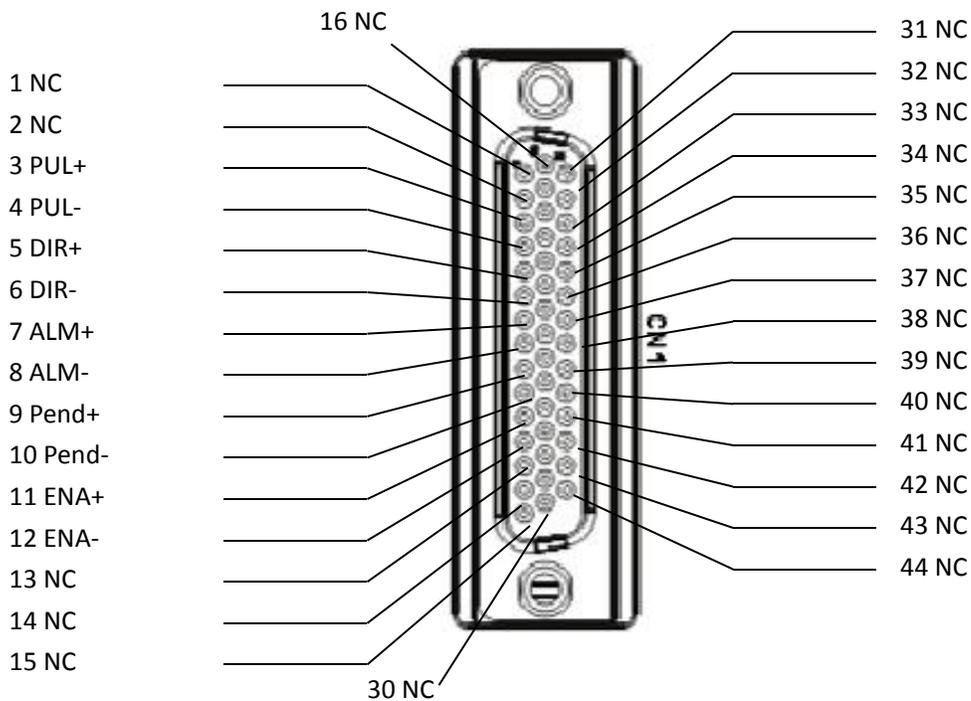
5	P+	O	Internal DC bus voltage output. The regeneration resistor should be connected between BR1 and P+.
---	----	---	---

### Motor & Control Power Supply Connector

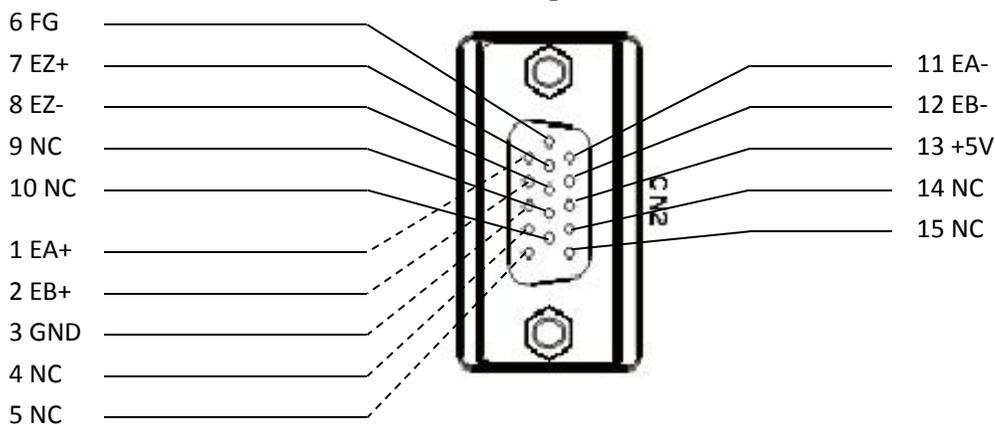
Pin	Name	I/O	Description
1	U	O	Motor phase U
2	V	O	Motor phase V
3	W	O	Motor phase W
4	PE	-	Case ground
5	L	I	Control Power Supply from 150VAC to 240VAC.
6	N	I	

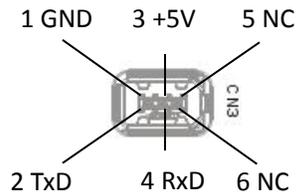
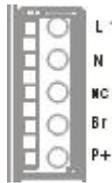
### 3.6 Connector Pin-Out

#### CN1 – Control Signal Connector



#### CN2 – Feedback Signal Connector



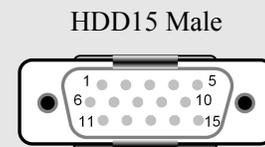
**CN3 – RS232 & RS485 Connector**

**CN5 – Main Power Supply Connector**
**CN6 – Motor & Control Power Supply Connector**

**3.7 Matching ESM Series Easy Servo Motors**

	ES2-MH33480- E5Z	ES2-MH334100- E5Z	ES2-MH342120- E5Z	Wiring Diagram
Step Angle (°)	1.2	1.2	1.2	
Holding Torque (N.m)	8.0	10.0	12.0	
Phase Current (A)	6.0	6.0	4.5	
Phase Resistance (Ohm)	2.6	2.66	1.2-	
Phase Inductance (mH)	17.4	18.9	13	
Shaft Inertia (g.cm <sup>2</sup> )	3	3.0	10.8	
Weight (Kg)	4.7	5.0	8.6	
Encoder (lines / Rev.)	5000	5000	5000	

**3.8 Motor Encoder Cable Pin-Out**

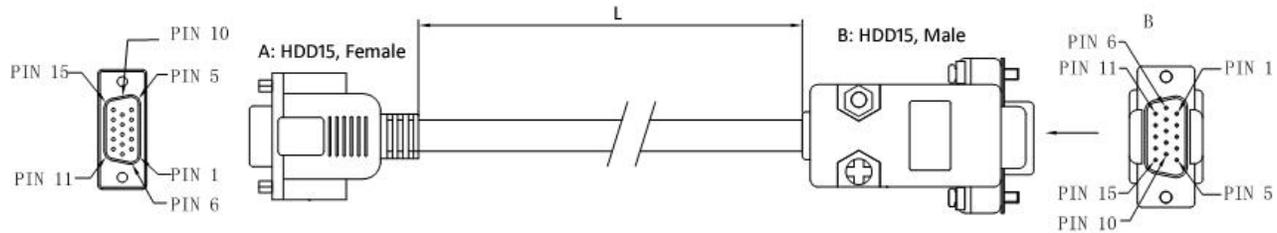
ES2-MH33480-E5Z, ES2-MH334100-E5Z, ES2-MH342120-E5Z

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
7	EZ+	Orange	O	Channel Z+ output
8	EZ-	Grey	O	Channel Z- output
11	EB+	Yellow	O	Channel B+ output
12	EB-	Green	O	Channel B- output
13	EA-	Blue	O	Channel A- output



### 3.9 Motor Encoder Extension Cable

#### CABLEG-BMXXM



#### Pin Assignments

A: HDD15 Female	Wire Color	B: HDD15 Male	Name	Description
Pin		Pin		
1	Black	1	EA+	Channel A+
2	Red	13	VCC	+5V power input
3	White	3	GND	+5V GND
7	Orange	7	EZ+	Channel Z+
8	Grey	8	EZ-	Channel Z-
11	Yellow	2	EB+	Channel B+
12	Green	12	EB-	Channel B-
13	Blue	11	EA-	Channel A-

#### Cable Length

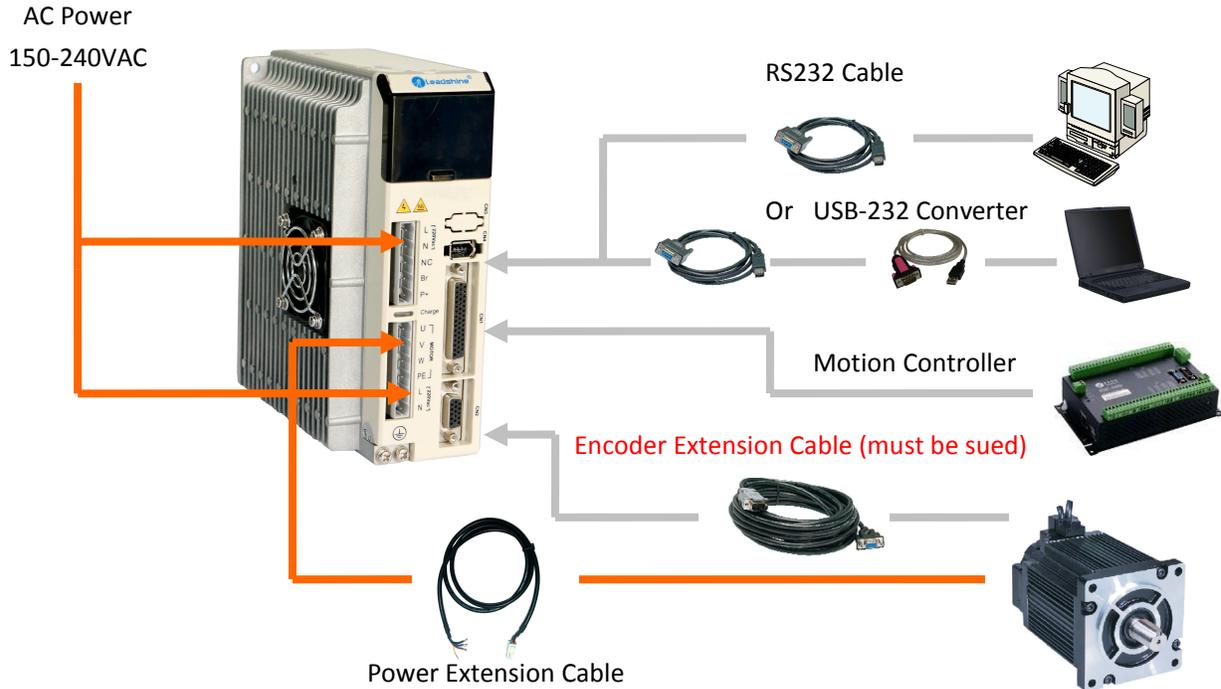
Part Number	L	Matching Motor
CABLEG-BM3M0 (V4.0)	3.0m	ES2-MH33480-E5Z, ES2-MH334100-E5Z, ES2-MH342120-E5Z
CABLEG-BM8M0(V4.0)	8.0m	
CABLEG-BM10M0(V4.0)	10.0m	
CABLEG-BM12M0(V4.0)	12.0m	

**Note:** The encoder extension cable must be connected between the ES2-M (H) motor and the ES-3DA2306. You can not connect the motor's encoder cable to the ES-3DA2306 directly.

### 4 Getting Start

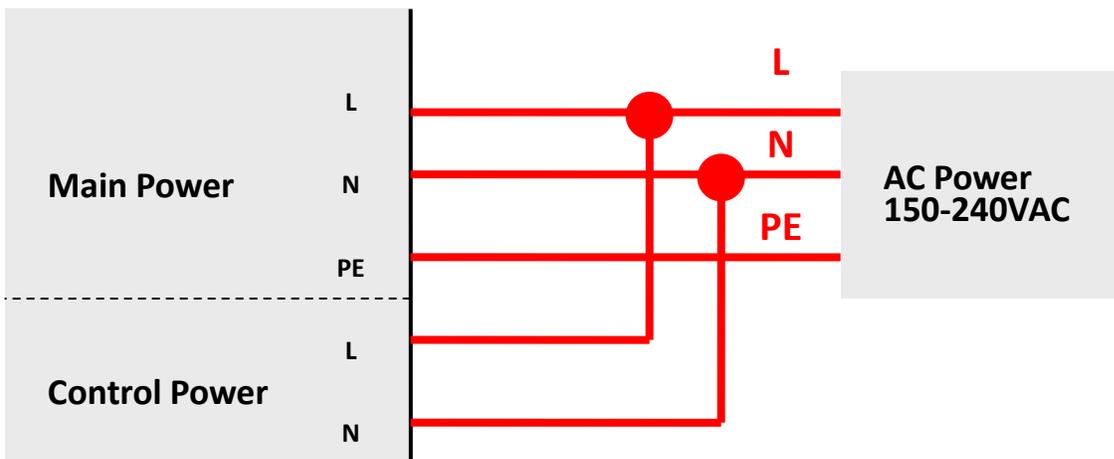
To get start you need one easy servo drive, one easy servo motor (stepper drive with encoder) and an AC / DC power supply for the first time evaluation. A motion controller - like indexer, pulse generator or PLC is required too if you would like to verify the complete function. If you have a PC with one serial port or one PC with USB-RS232 converter, you can also rotate the motor in the PC software. However it is recommended to verify the complete function of the easy servo using another motion controller

## 4.1 Wiring Diagrams



### 4.1.1 Power Wiring

The ES2-3DA2306 requires two powers input as follows. The main power is used to energize the motor and the control power is used for logic circuit. Typically they can share the same AC power.



### Power Supply Selection

To achieve good driving performances, it is important to choose a suitable supply voltage and use a matching current value. Generally speaking, supply voltage determines the high speed performance of the motor, while output current determines the output torque of the driven motor (particularly at lower speed). Higher supply voltage will allow higher motor speed to be achieved, at the price of more noise and heating. If the motion speed requirement is low, it's better to use lower supply voltage to decrease noise, heating and improve reliability.

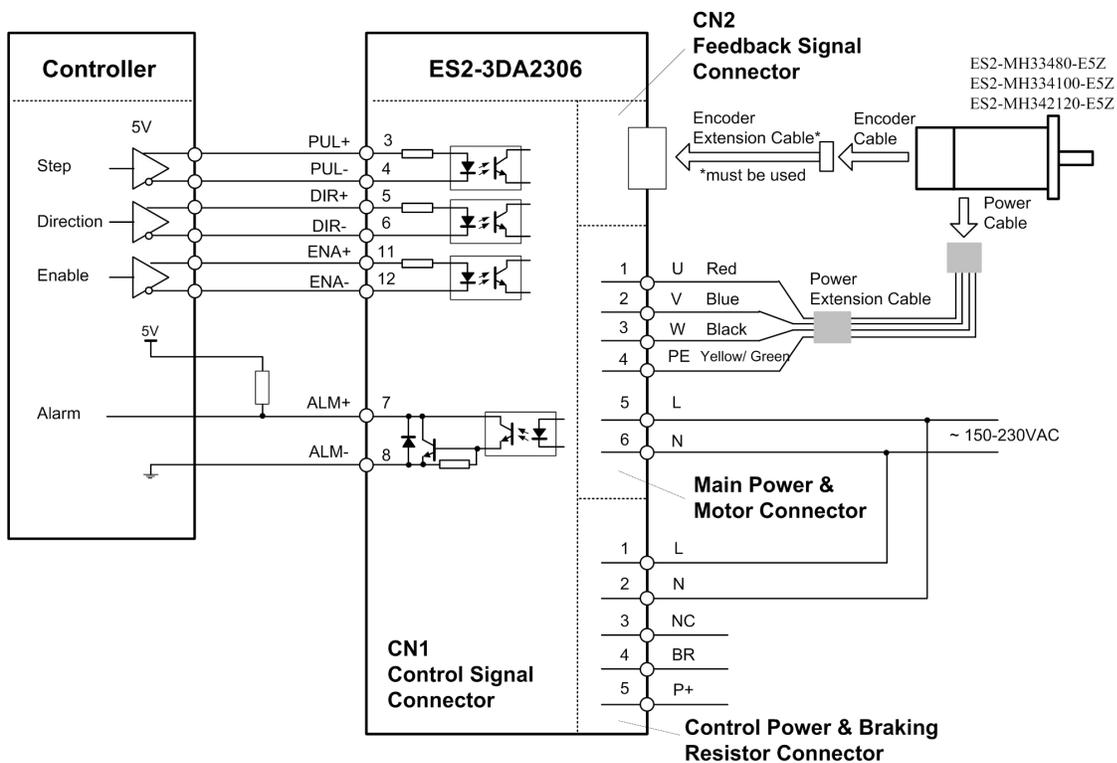
## Multiple Drives

It is recommended to have multiple drives to share one power supply to reduce cost, if the supply has enough capacity. To avoid cross interference, DO NOT daisy-chain the power supply input pins of the drives. Instead, please connect them to power supply separately.

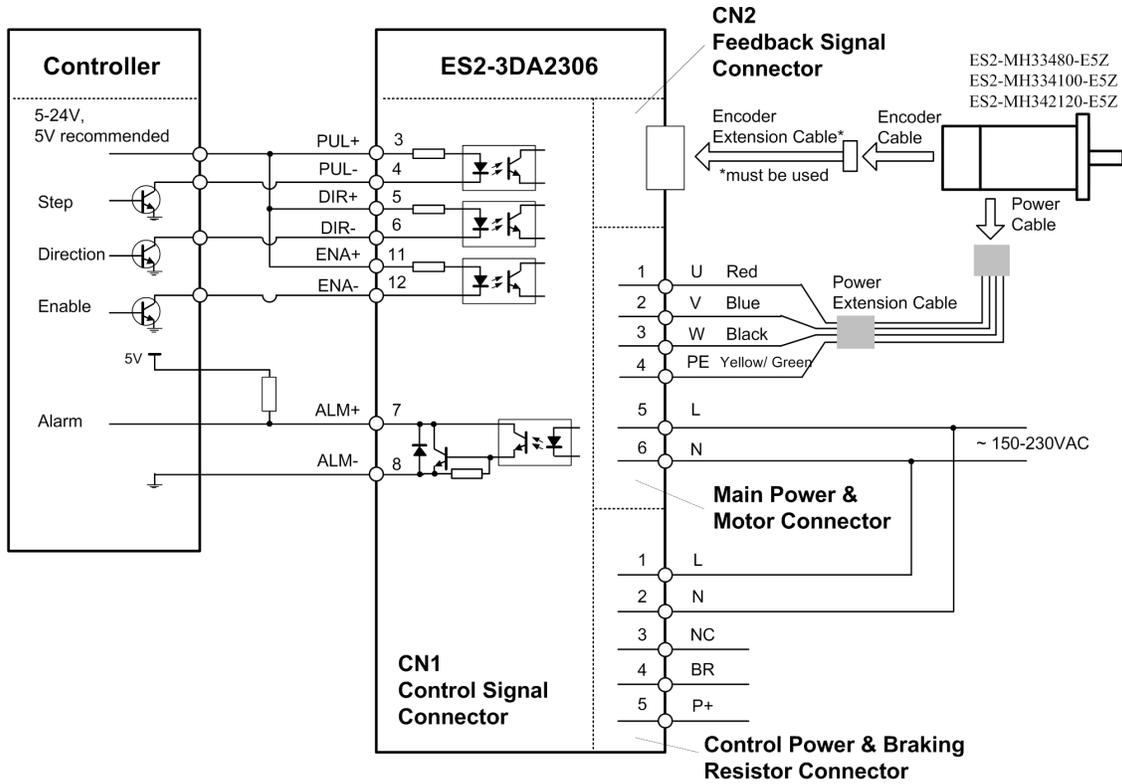
## Selecting Supply Voltage

Higher supply voltage can increase motor torque at higher speeds, thus helpful for avoiding losing steps. However, higher voltage may cause bigger motor vibration at lower speed, and it may also cause over-voltage protection or even drive damage. Therefore, it is suggested to choose only sufficiently high supply voltage for intended applications, and it is suggested to use power supplies with theoretical output voltage of drive's minimum + 10% to drive's maximum - 10%, leaving room for power fluctuation and back-EMF.

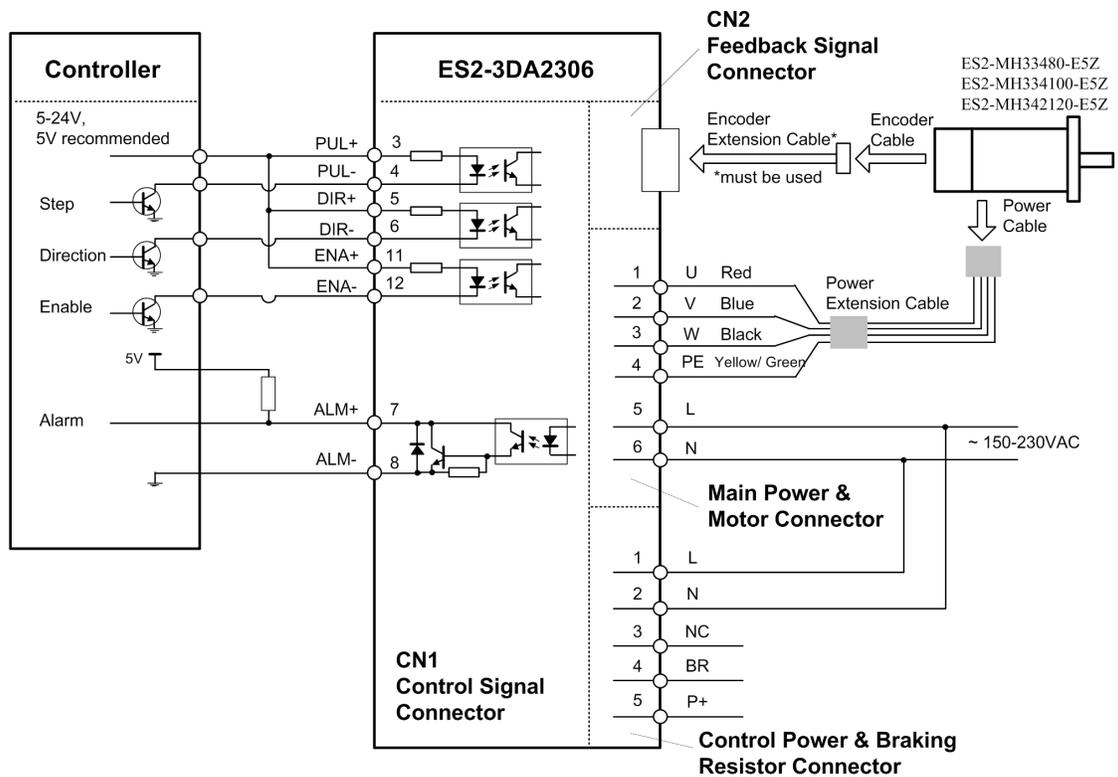
### 4.1.2 Control Signal Wiring



Connections to controller of differential output



Connection to controller of sinking output



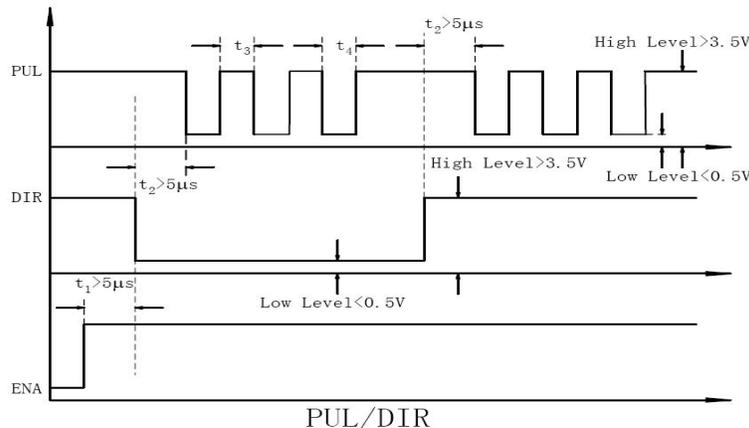
Connection to controller of sourcing output

## Wiring Notes

- In order to improve anti-interference performance of the drive, it is recommended to use twisted pair shield cable.
- To prevent noise incurred in PUL/DIR signal, pulse/direction signal wires and motor wires should not be tied up together. It is better to separate them by at least 10 cm, otherwise the disturbing signals generated by motor will easily disturb pulse direction signals, causing motor position error, system instability and other failures.
- If a power supply serves several drives, separately connecting the drives is recommended instead of daisy-chaining.
- It is prohibited to pull and plug power connector while the drive is powered ON, because there is high current flowing through motor coils (even when motor is at standstill). Pulling or plugging power connector with power on will cause extremely high back-EMF voltage surge, which may damage the drive.

## 4.2 Sequence Chart of Control Signals

In order to avoid some fault operations and deviations, PUL, DIR and ENA should abide by some rules, shown as following diagram:



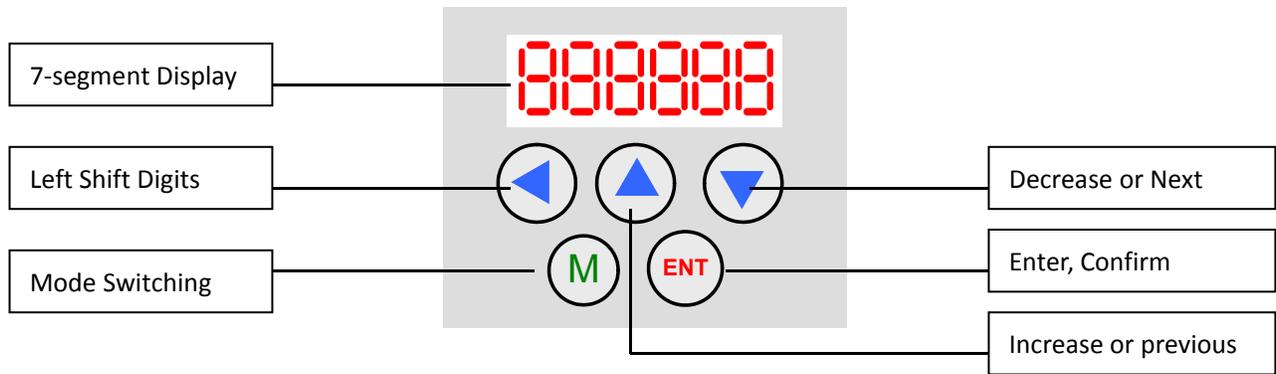
### Remark:

- $t_1$ : ENA must be ahead of DIR by at least 5s. Usually, ENA+ and ENA- are NC (not connected). See “Connector P1 Configurations” for more information.
- $t_2$ : DIR must be ahead of PUL effective edge by 5s to ensure correct direction;
- $t_3$ : Pulse width not less than 2.5s;
- $t_4$ : Low level width not less than 2.5s.

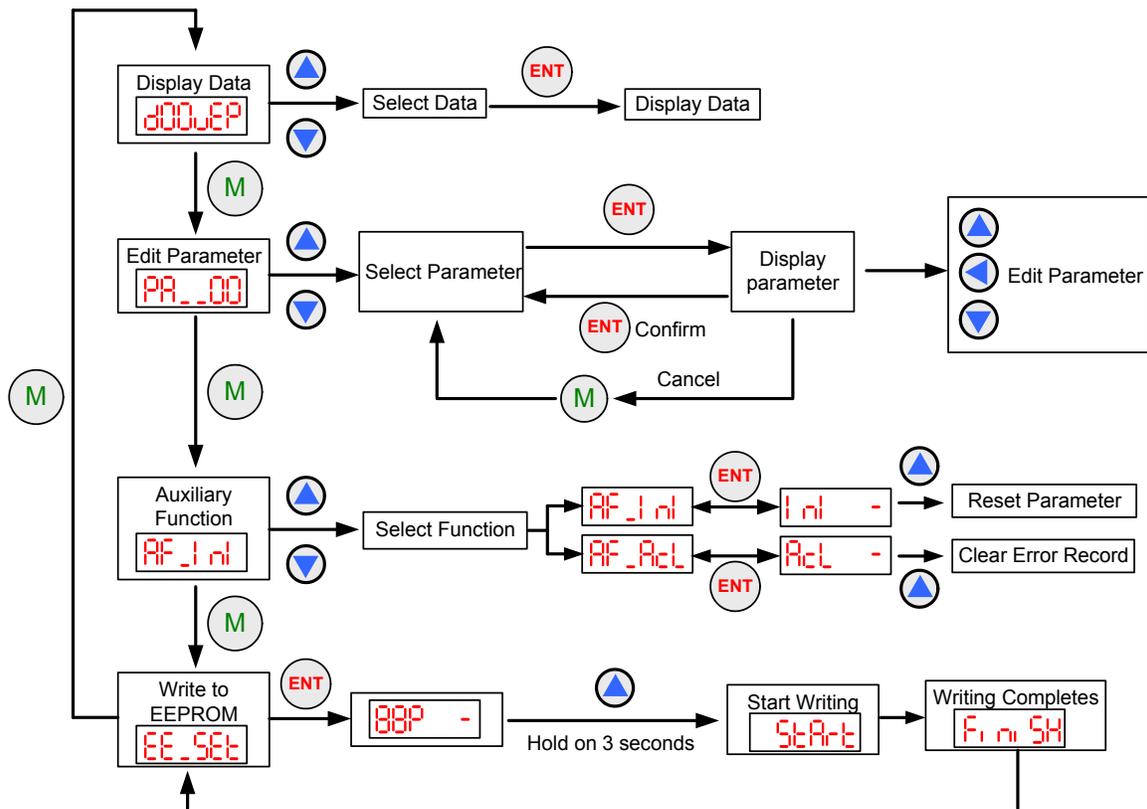
## 4.3 Configuring ES2-3DA2306

### 4.3.1 Configuring ES2-3DA2306 by the on-board HMI

Users can configure the drive via the on-board HMI in the front panel. This HMI includes six 7-segment digits and five keys for users operation as follows. [More detailed descriptions of the parameters on the panel are presented in section 4.3.2](#)



There are 4 operation modes in the on-board HMI. Users can switch between these modes by pressing the “Mode” key. The following figure illustrates the operation procedure of this on-board HMI.



Operation Procedure of the on-board HMI

### Display Data Mode

This mode is active initially at drive’s power-up. In this mode, users can check the monitoring data as shown in the following table.

Display Code	Name	Description
	“L “	Low order digits display.
	“H “	High order digits display.

	“d00uEP”	Position error which is the difference between command and feedback. Press “  ” to switch between low and high order digits display.
	“d01SPF”	Actual feedback motor speed in RPM.
	“d02SPr”	Reference motor speed in RPM.
	“d03PLF”	Actual feedback position in pulses.
	“d04PLr”	Reference position in pulses.
	“d05iP”	Reference current (peak) in mA.
	“d06Err”	Error code: 0001----Over-current protection activated 0002----Over-voltage protection activated 0008----Brake protection activated 0020----Position error exceeds the limit 000d----Encoder cable error
	“d07 Pn”	Bus voltage which is 1/10 of the actual value.
	“d08 no”	Drive version number.

### 4.3.2 Configuring ES2-3DA2306 by the ProTuner

Leadshine also provide the tuning software named ProTuner to configure the parameter of ES2-3DA2306.

#### Parameter list

NO.		Definition	Property	Default value	Range	Description
ProTuner	Panel					
15	0	Current loop Kp	R/W	0	0—65535	Invalid
16	1	Current loop Ki	R/W	0	0—65535	Invalid
124	2	Tuning proportionality for Current loop	R/W/S	50	0—200	Unit: %. This parameter can be modified
<b>30053</b>	<b>3</b>	<b>Position Loop Kp</b>	<b>R/W/S</b>	<b>230</b>	<b>0—10000</b>	
<b>30055</b>	<b>4</b>	<b>Speed loop Ki</b>	<b>R/W/S</b>	<b>50</b>	<b>0—10000</b>	
<b>30054</b>	<b>5</b>	<b>Speed loop Kp</b>	<b>R/W/S</b>	<b>400</b>	<b>0—10000</b>	
30058	6	Torque feed- forward	R/W/S	0	0—1000	Invalid

1	7	Pulse /Rev	R/W/S	1600	200—20000	Motor runs a round needs pulse
29	8	Encoder resolution	R/W/S	4000	200—51200	Four multiplying frequency for 1000 line encoder
30	9	Position following error	R/W/S	1000	1—6000	Unit: pulse
30007	10	Lock Shaft Current Percentage( power on)	R/W/S	40	0—100	The percent of Maximum current. it is effective when NO.30015 setting is 3.
27	11	Percent of closed loop current	R/W	80	1—100	Invalid
30006	12	Soft Start Time(power on)	R/W/S	8	1—20	Unit: 100ms。 Reduce the vibration when power up or Enable
9	13	Pulse filter enable	R/W	1	0—1	Invalid
30001	14	Command Pulse Filter Time	R/W/S	30	1—600	Unit: 0.05ms
6	15	Enable level	R/W/S	1	0—1	0: High 1: Low
30003	16	Fault Output Level	R/W/S	0	0—1	0: High 1: Low
49	17	Pulse input mode	R/W/S	0	0—1	<b>0: Pulse + Direction</b> <b>1: CW/CCW</b>
50	18	Pulse active edge	R/W/S	0	0—1	0: Rising Edge 1: Following Edge
51	19	Motor Running Direction	R/W/S	1	0—1	0: Forward 1: Backward
19	20	Bandwidth	R/W/S	0	0—1	Invalid
NA	21	Acceleration	R/W	200	1~2000	These parameters are effective when running the motor with HMI panel
	22	Speed	R/W	60	1~3000	
	23	Distance	R/W	100	1~65535	
	24	Running times	R/W	1	1~65535	
	25	Start direction	R/W	1	0/1	
	26	Running interval time	R/W	100	1~65535	
	27	Enable for reciprocating motion	R/W	1	0/1	
	28	Start Stop	R/W	0	0/1	
24	29	Open/Closed -loop Mode selection	R/W/S	1	0—1	0: Open loop 1: Closed loop
NA	30	Auto tuning	R/W	0	0—1	Invalid

	31	Resonance compensation	R/W	0	0—1000	Invalid
7	32	Choosing Shaft Locking in Disable	R/W/S	0	0—1	0: Unlock 1: Lock
57	33	Reset fault by enable input	R/W/S	0	0—1	0-Disable 1-Enable
30008	34	Choosing Winding Short of Lower Bridge Arm	R/W/S	0	0—1	0-No winding short 1-Winding short
30004	35	Pend port output function	R/W/S	0	0—1	0: Pend output 1: brake output
30005	36	Pend port output level	R/W/S	0	0—1	0: High 1: Low
30059	37	Gravity Compensation	R/W/S	0	0—1	Invalid
30056	38	Limit for speed loop Ki	R/W/S	15	0—80	
30090	39	Occupied parameter1	R/W/S	15	0—127	Invalid
30091	40	Occupied parameter2	R/W/S	32	0—64	Invalid
30009	41	Voltage Percentage in Power Off	R/W/S	0	0—100	Invalid
<b>59</b>	<b>42</b>	<b>Motor model</b>	<b>R/W/S</b>	<b>11</b>	<b>0—100</b>	11: ES-MH33480 12: ES-MH334100 13: ES-MH334120
85	43	Pend output pulse limit value	R/W/S	4	0—100	Unit: pulse
30000	44	Delay for vibration removing of software	R/W/S	3	0—100	Unit: 1ms
<b>134</b>	<b>45</b>	<b>Velocity loop Kp in high speed</b>	<b>R/W/S</b>	<b>700</b>	<b>0—10000</b>	
30092	46	Occupied parameter3	R/W/S	48	0—64	Invalid
30011	47	Time Constant for Over Voltage Detection	R/W/S	2	0—20	Unit: 100ms
30014	48	Voltage Limited Value for Enabling Brake Resistor	R/W/S	400	110-420	Unit: V
30013	49	Brake Resistor Enable	R/W/S	1	0—1	0: Disable 1: Enable
<b>30015</b>	<b>50</b>	<b>Motion model</b>	<b>R/W/S</b>	<b>0</b>	<b>0—9</b>	<b>0-3: interpolation motion</b> <b>4-5: point to point motion</b>
128	51	Position Loop Filter Frequency	R/W/S	6	0—31	The actual range is 0-12
129	52	Speed Loop Filter Frequency	R/W/S	0	0—31	The actual range is 0-12
30063	53	High Speed Loop Filter Frequency	R/WS	3	0—31	The actual range is 0-12
132	54	Speed Loop Sampling Frequency	R/W/S	4	0—31	The actual range is 0-12

30064	55	Tuning proportionality for Speed loop gain in running	R/W/S	100	0—200	
83	56	Self-test Enable	R/W/S	0	0—1	0-Disable, 1-Enable(for special application)
<b>56</b>	<b>57</b>	<b>Fault Detection Enable (bit operation)</b>	<b>R/W/S</b>	<b>4739</b>	<b>0—65535</b>	<b>1: Enable 0: Disable bit0: Over current bit1: Over voltage Bit7: Position following error Bit9: Brake output Bit12: Encoder cable broken</b>
30002	58	ALM output function	R/W/S	1	1—5	1- Fault,2~5-Reserved
30010	59	Over Voltage Value	R/W/S	440	0—500	Unit: V
30012	60	Times For Over Current Jitters Elimination	R/W/S	6	0—50	Current jitters times limited before outputting over current error
17	61	Current loop Kc	R/W	0	0—32767	Invalid
125	62	Motor back EMF coefficient	R/W/S	0	0—32767	Invalid
126	63	Weak magnetic coefficient 0	R/W/S	0	0—255	Invalid
127	64	Weak magnetic coefficient 01	R/W/S	0	0—255	Invalid
133	65	Position loop KpH	R/W/S	120	0—10000	
30051	66	Rigidity	R/W/S	0	0—31	Invalid
30052	67	Inertia ratio	R/W/S	100	100—10000	Invalid
<b>30057</b>	<b>68</b>	<b>Speed feed-forward</b>	<b>R/W/S</b>	<b>10</b>	<b>0—32</b>	
30060	69	Time for position 3 <sup>rd</sup> gain	R/W/S	0	0—1000	Invalid
30061	70	Position 3 <sup>rd</sup> gain ratio	R/W/S	0	0—1000	Invalid
30062	71	Motor pole	R/W/S	50	2—100	Invalid
30093	72	Occupied paramete4	R/W/S	0	0—255	Invalid
30094	73	Occupied paramete5	R/W/S	0	0—255	Invalid
30095	74	Occupied paramete6	R/W/S	0	0—255	Invalid
30096	75	Occupied paramete7	R/W/S	0	0—255	Invalid
30097	76	Occupied paramete8	R/W/S	0	0—255	Invalid

300098	77	Occupied paramete9	R/W/S	0	0—255	Invalid
30099	78	Occupied paramete10	R/W/S	0	0—255	Invalid

**Notice!**

The sequence of parameters in ProTuner is different from HMI panel. For example, the speed loop kp is NO.5 on HMI panel, but NO.30054 in the ProTuner.

**Key Parameters**

NO. in Protuner	NO. on HMI panel	Position Loop Kp	Range	unit	default
<b>30053</b>	<b>3</b>			0—10000	-
You can determine the response of the positional control system. Higher the gain of position loop you set, faster the positioning time you can obtain. Note that too high setup may cause vibration. Set a value as large as possible base on the machine without shout.					

NO. in Protuner	NO. on HMI panel	Speed loop Ki	Range	unit	default
<b>30055</b>	<b>4</b>			0—10000	-
You can set up the integration time constant of speed loop, Smaller the set up, faster you can dog-in deviation at stall to 0. Set a value as small as possible base on the machine without vibration.					

NO. in Protuner	NO. on HMI panel	Speed loop Kp	Range	unit	default
<b>30054</b>	<b>5</b>			0—10000	-
You can determine the response of the velocity loop. In order to increase the response of overall servo system by setting high velocity loop gain. However, too high setup may cause vibration. Set a value as large as possible base on the machine without shout.					

NO. in Protuner	NO. on HMI panel	Pulse /Rev.	Range	unit	default
<b>1</b>	<b>7</b>			200—65535	-
Pulse per Revolution.					

NO. in Protuner	NO. on HMI panel	Encoder resolution	Range	unit	default
<b>29</b>	<b>8</b>			200—20000	-
The encoder of easy servo motor from Leadshine is 1000, 2500, 5000PPR, so If you use these motors, the value must be 4000, 10000, 20000 respectively. <b>5000 PPR</b> encoder is recommended for the better performance and easier tuning.					

NO. in Protuner	NO. on HMI panel	Position following error	Range	unit	default
<b>30</b>	<b>9</b>			1—65535	-

The tolerance for position following error, if the error is over this value of setting, drive will display ERR20 .

NO. in Protuner	NO. on HMI panel	<b>Lock Shaft Current Percentage( power on)</b>	Range	unit	default
<b>30007</b>	<b>10</b>		1—100	0.1A	40

The current uses for locking the motor shaft when, it is effective only when NO.30015 in ProTuner is set to 3or 4. And if the parameter No.24 in ProTuner is set to 0 (Open-loop), this current will be peak current for motor.

NO. in Protuner	NO. on HMI panel	<b>Soft Start Time(power on)</b>	Range	unit	default
<b>30006</b>	<b>12</b>		1—30	100ms	8

The time for output current increasing from 0 to Maximum. if the motor with load, it need a suitable time setting to find a balance point to reduce vibration when power on or motor enable.

NO. in Protuner	NO. on HMI panel	<b>Command Pulse Filter Time</b>	Range	unit	default
<b>3001</b>	<b>14</b>		0—600	0.05ms	30

Smoothing the command pulse, higher value will reduce the vibration when the motor is beginning run and increase the largest motor startup frequency.

NO. in Protuner	NO. on HMI panel	<b>Motor model</b>	Range	unit	default
<b>59</b>	<b>42</b>		0--100		11

11: ES-MH33480  
 12: ES-MH334100  
 13: ES-MH334120  
 Set correctly codebase on the motor model you are using. Not to be recommended connecting other motors.

NO. in Protuner	NO. on HMI panel	<b>Speed loop Kp in high speed</b>	Range	unit	default
<b>134</b>	<b>45</b>		0—10000	-	700

If the motor needs to run up to 1000RPM, Set a value as large as possible base on the machine without shout.

NO. in Protuner	NO. on HMI panel	<b>Motion model</b>	Range	unit	default
<b>30015</b>	<b>50</b>		0--9		0

0-3: interpolation motion  
 4-5: point to point motion  
 This parameter setting depend on the application, if it is used for interpolation application, such as engraving, laser cutting, milling, and so on, it can be set 0-3; if used for point to point application, like SCARA arm or STM, it can be set 4-5.

NO. in Protuner	NO. on HMI panel	Speed Loop Sampling Frequency	Range	unit	default
132	54		0--31		4
Smoothing the speed loop overshoot, higher value will reduce the vibration when the speed loop Kp is large enough.					

NO. in Protuner	NO. on HMI panel	Speed feed-forward	Range	unit	default
30057	68		0--32		10
Higher value will reduce the following position error when the motor running in high speed.					

## 6 Frequently Asked Questions

In the event that your drive doesn't operate properly, the first step is to identify whether the problem is electrical or mechanical in nature. The next step is to isolate the system component that is causing the problem. As part of this process you may have to disconnect the individual components that make up your system and verify that they operate independently. It is important to document each step in the troubleshooting process. You may need this documentation to refer back to at a later date, and these details will greatly assist our Technical Support staff in determining the problem should you need assistance.

Many of the problems that affect motion control systems can be traced to electrical noise, controller software errors, or mistake in wiring.

### Problem Symptoms and Possible Causes

Symptoms	Possible Problems
<b>Motor is not rotating</b>	No power
	Encoder resolution setting is wrong
	Fault condition exists
	The drive is disabled
<b>Motor rotates in the wrong direction</b>	The direction signal level is reverse
<b>The drive in fault</b>	Power supply voltage beyond drive's input range
	Something wrong with motor coil
	Wrong connection
<b>Erratic motor motion</b>	Control signal is too weak
	Control signal is interfered
	Something wrong with motor coil
	Motor is undersized for the application
	Acceleration is set too high
<b>Excessive motor and drive heating</b>	Power supply voltage too low
	Inadequate heat sinking / cooling
	Load is too high

## **7 Warranty**

### **Twelve Month Warranty**

Leadshine Technology Co., Ltd. warrants its products against defects in materials and workmanship for a period of 12 months from shipment out of factory. During the warranty period, Leadshine will either, at its option, repair or replace products which proved to be defective.

### **Exclusions**

The above warranty does not extend to any product damaged by reasons of improper or inadequate handlings by customer, improper or inadequate customer wirings, unauthorized modification or misuse, or operation beyond the electrical specifications of the product and/or operation beyond environmental specifications for the product.

### **Obtaining Warranty Service**

To obtain warranty service, please contact your seller to obtain a returned material authorization number (RMA) before returning product for service.

### **Shipping Failed Products**

If your product fail during the warranty period, please contact your seller for how and where to ship the failed product for warranty or repair services first, you can also e-mail customer service at [tech@leadshine.com](mailto:tech@leadshine.com) to obtain a returned material authorization number (RMA) before returning product for service. Please include a written description of the problem along with contact name and address.

