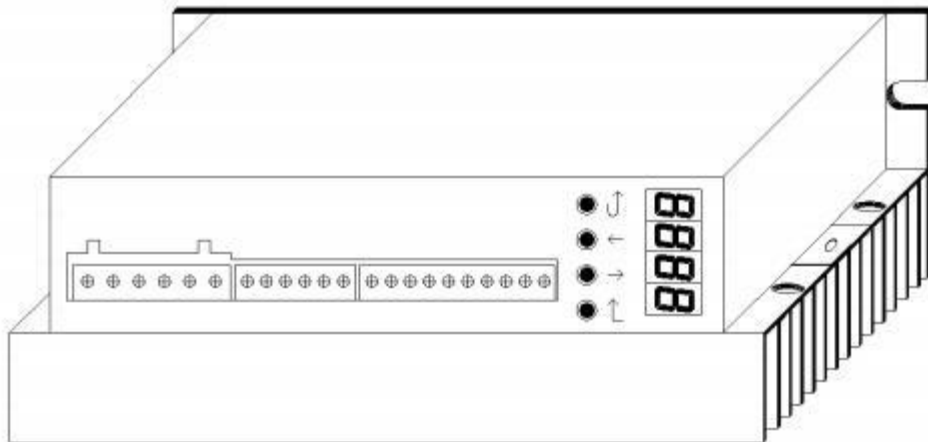# A new generation of digital stepping-in closed-loop drive

user's manual

[Read this manual carefully before use to avoid damage to the drive]

Focus on stepping, servo and motion control

catalogue

First, the introduction

A new generation of DSP digital stepping closed-loop drive, using advanced vector closed-loop control technology, completely overcome the traditional open ring stepping motor step problems, and significantly improve the high speed performance of the stepping motor, reduce the degree of heating and reduce the motor vibration, further improve the equipment working speed and accuracy, reduce the energy consumption of equipment. In addition, when the motor appears continuous overload, the driver will output the alarm signal, with the same reliability as the AC servo system. The fitted motor installation size is fully compatible with the traditional (57 / 60) and 86 series stepper motors. The traditional open-loop stepper drive scheme can be seamlessly upgraded, which has a high cost advantage over the AC servo system.

This drive is suitable for a variety of small and medium-sized automation equipment and instruments, such as: woodworking carving machine, wire harness machining machine, laser cutting machine, high-speed plotter, small CNC machine tools, automatic assembly equipment, etc. The application effect is particularly excellent in the equipment requiring low noise, smooth operation and high speed response.

technical feature

U uses a new 32-bit motor control dedicated DSP chip;

u Advanced vector type closed-loop control technology;

u LED Digital tube display with key operation, intuitive and clear, easy to operate;

U Static current and dynamic current can be set arbitrarily (within the 0---8.2A range);

U adaptive drive (57 / 60) and 86 series hybrid closed-loop stepper motor;

U photoelectric isolation signal input / output;

U pulse response frequency up to 200KHz;

U provides 16 general segmentation options, up to 256 segments (51200 pulse / turn);

U provides an electronic gear (any subdivision value) matching with the various pulse sources;

U has overcurrent, overheat, overvoltage and tracking error error protection;

u Position control mode and speed control mode are optional;

# 2. Electrical, mechanical, and environmental indicators

2.1 Electrical indicators

parameter	least value	representative value	crest value	unit
Continuous output current	0	-	8.2	A
Input power supply voltage (DC)	+24	-	+ 110	V dc
Input power supply voltage (AC)	18	-	80	A C
Logical input current	7	10	20	m A
impulse frequency	0	-	200	kHz
insulation resistance	500			M Ω
Provide the encoder current			50	m A

2.2 Use environment and parameters

cooling-down method	With cooling fan cooling (radiator temperature over 40℃, fan starts operation)	
service environment	Use occasion	Try to avoid dust, oil mist and corrosive gases
	temperature	- 10℃－50℃
	humidity	40－90%RH
	shake	5.9 m /s^{2}Max
Save the	-20℃－+80℃	

temperature	
weight	650 grams

.32 Mechanical installation size (in mm)
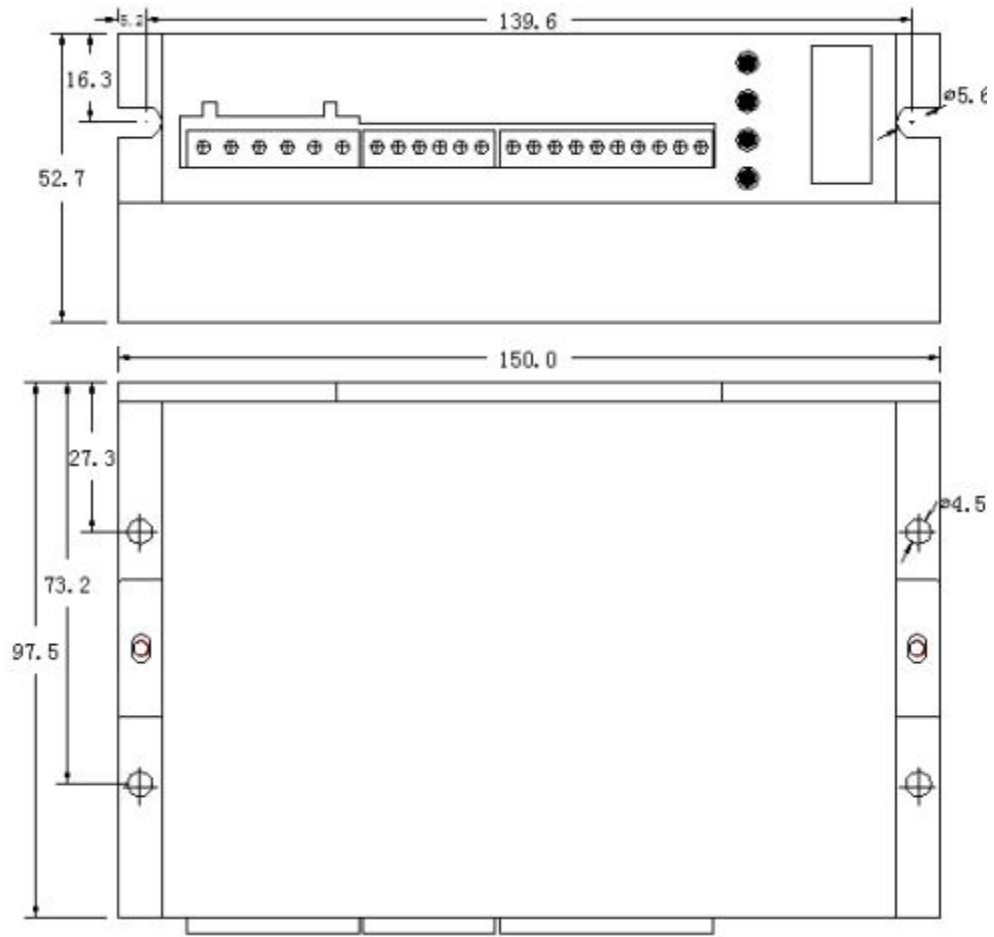
Note: Keep the drive heat dissipation good

(1) The reliable working temperature of the drive is usually within 60C, and the working temperature of the motor is within 80C;

(2) When installing the drive, please try to use the upright side installation, far away from the heat source, can not block the air duct of the fan. If necessary, install a heat dissipation and ventilation fan on the electrical cabinet installing the drive to make the electrical cabinet

External air convection ensures that the drives operate within a reliable operating temperature range.

3. Introduction of the drive port and wiring

.13-port definition, lead color description

A, Motor and power input ports

Terminal number	symbol	name	Leader-line color description
1	A＋	Phase A motor winding +	white
2	A－	Phase A motor winding-	green
3	B＋	Phase B motor winding +	blue
4	B－	Phase B Motor Winding-	black
5	A C	power input	AC 18~ 80V/DC24-110V
6	A C	power input	

Note: The motor lines are not interchangeable

B. Input port of the encoder signal

Terminal number	symbol	name	Leader-line color description
1	EB＋	The Motor encoder phase B has a positive input	yellow
2	EB－	Motor Encoder Phase B with a negative input	green
3	EA＋	Positive input to the motor encoder, phase A	black
4	EA－	Motor Encoder phase A negative input	blue
5	V CC	Encoder power supply + 5V input	red
6	E G ND	Encoder, power source ground	white

C. Control the signal port

| Terminal number	symbol	name	explain
1	PU＋	Pulse positive input	Signal source + 5 to 24 V can be driven
2	PU－	Pulse negative input	
3	DR＋	Direction is input	Signal source + 5 to 24 V can be driven
4	DR－	Direction negative input	
5	ENA＋	The motor enables a positive input	Motor position when the signal is valid

6	ENA —	The motor enables a negative input	In the free state, do not lock the machine
7	P end +	Input signal is positive output	Drive the output signal to the host machine after the motor is in place
8	P end —	In-place signal is negative output	
9	ALM +	The alarm signal is in the positive output	The put signal to the upper engine
10	ALM —	Negative output of the alarm signal	

Note: When the drive fails, the ENA signal is valid and the drive will clear all faults.

3.2 Circuit diagram of the control signal interface

控制器　　　　驱动器　　　　控制器　　　　驱动器

共阳极接法　　　　　　　共阴极接法
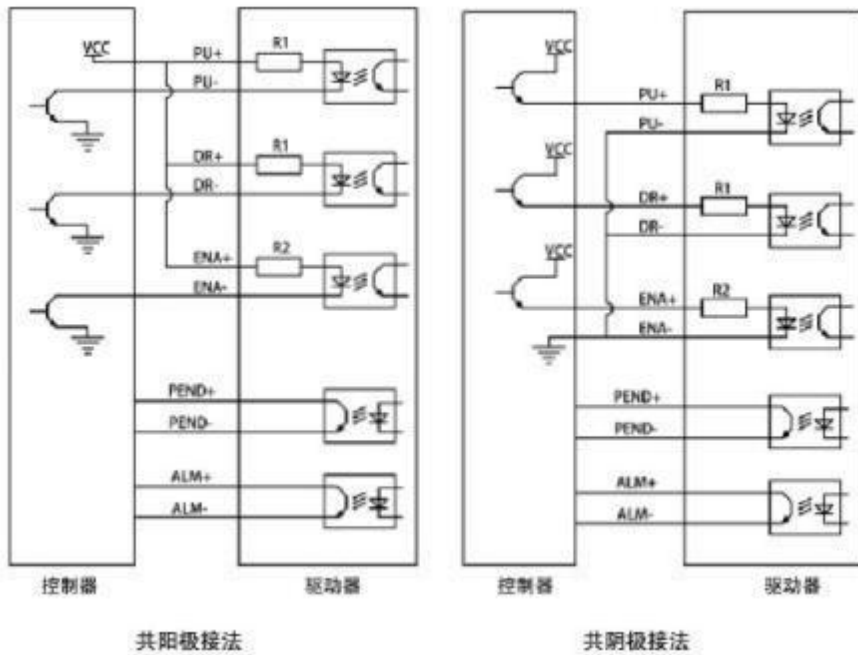
3.3 Time sequence diagram of the input signal waveform
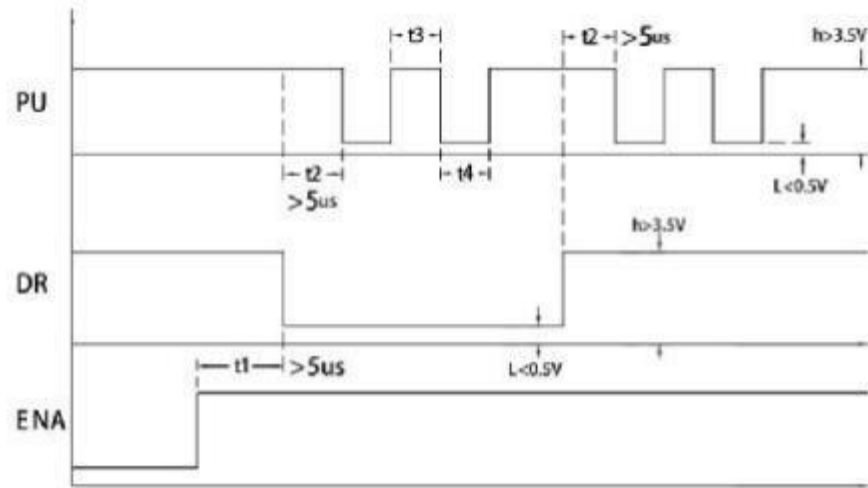
IV. Parameter setting

⟵↓↑⟵ The operation panel of the drive is composed of 4 LED digital displays and 4 keys,,,, which are used to display various states and parameter settings of the system.

Key-function description table

key	function declaration
⤺	Exit, cancel the operation; used to return to the previous page and end the parameter input status
↓	Use to adjust the data of the current bit
↑	Shishift for data bits during page turning and value change
↵	Enter the parameter modification mode, the parameter modification confirmation, long press for 3s

Each time the current drive will display the version number, and the status of the current drive (standby speed 0, the current fault code when there is a fault). When the drive enters the normal operation mode, display the number of turns of the current motor (RPM / min) in real time. When the motor reverses, the fault alarm, display the corresponding fault code.

4.1 Parameter function description

The drive provides two sets of parameters for the user to operate, including P0 parameters are used to set several conventional parameters (such as subdivision, lock electromechanical flow, motor type, etc.), and P 1 parameters are used to set the performance parameter index values of the drive, as shown in the table below

.1.14. Parameter functions table

parameter	name	Parameter range	explain
P 000	P 1 group parameter value password	1	To modify the performance parameters of the system
P 001	Subdivision selection	SEt , 2--256	16 files of general subdivision, 1 file of arbitrary subdivision
P 002	Motor running direction selection	0、1	Motor positive and reverse setting
P 003	Motor type selection	57 、86	(57 / 60), 86 flange motor
P 004	Position overrange limit value	1--9999	System default is 4000
P 005	Plock lock lock percentage	0~100%	System default is 50%
P 006	Frequdivision molecule of electronic gear		This value cannot be set to 0, the default to 1
P 007	Electronic gear division of frequency and denominator		This value cannot be set to 0, the default to 1
P 020	Input pulse number is 4 bits lower	~	Use to display the cumulative total number of external input pulses and view the
P 021	Input pulse	~	

	number is 4 bits higher		upper and lower eight bits separately.
P 100	Percent of running current	10---120%	*
P 101	Current ring proportional coefficient	1--1000	**Factory setting, no modification**
P 102	The current ring integration coefficient	1--1000	**Factory setting, no modification**
P 103	Current ring damping coefficient	1--1000	**Factory setting, no modification**
P 104	The velocity ring proportional coefficient	1--1000	*
P 105	The velocity loop integration coefficient	1--1000	*
P 106	Position ring proportion coefficient	1--1000	*
P 107	Speed-loop feed-forward coefficient	1--100	*
P 108	Inside the drive enables	0、1	*
P 109	The velocity ring damping coefficient	1— 100	*
P 110	Input and output, and the level setting	Corresponding to the bit of 0 / 1	See the setting table for details

P111	positioning accuracy	1-50	The ault is 1 and localization error is ± 1 pulse
P 112	Resonance coefficient	1-12	The default value is to 6
P 200	Run mode selection	0、1	Position mode is 0, and speed mode is 1
P 201	Speed setting	Default is 60	Speed mode, driver speed rpm
P 202	Add deceleration time	100ms	Speed mode, acceleration and deceleration time, and ms

Note: The default current ring parameters, speed ring parameters and position ring parameters of the driver are the best parameters of the supporting motor, which the customer generally does not need to modify. If the customer application environment is special, the belt * parameters can be modified under the guidance of professional personnel to achieve the best use effect. Some parameters are modified as shown below:

P 104	The velocity ring proportional coefficient	The larger the set value, the higher the gain, and the greater the rigidity.
P 105	The velocity loop integration coefficient	The smaller the set value, the faster the integration speed, the stronger the system resistance deviation, the greater the rigidity, too small is easy to produce overshoot.
P 106	Position ring proportion coefficient	A smaller set point, a higher gain, greater rigidity, and faster position tracking. But too small values may cause motor oscillation or overshoot.

P 107	Speed-loop feed-forward coefficient	The larger the set value, the faster the tracking speed, and the more the rigidity Large, with a maximum value of 100.
P111	positioning accuracy	The ault is 1 and localization error is ± 1 pulse. The larger the value, the larger the positioning error; the larger the value, the resonance.
P 112	Resonance coefficient	The default value is set to 6. Under the same rigidity, the smaller the value, the more likely the positioning time Short, more prone to resonance; the larger the value, the longer the positioning time, Are not prone to resonance. Special applications can be modified appropriately.

4.1.2 Internal drive breakdown table (values inside P001)

Fine score	S Et	2	4	5	8	10	16	20	25
Fine score	32	40	50	64	100	128	200	256	

pay attention to:

1. When calculating the pulse equivalent, please use the fine fraction 200 in Table 1.24.1 to get the unit of pulse

Subdivision value of the rush / turn.

2. The closed-loop drive system cannot simply change the running direction
   of the motor by replacing the motor line. If the running direction of the
   motor is not consistent with the given direction, the value in the
   parameter P 002 should be changed to change the direction.

3. When the subdivision value selected in the P 001 is SEt, the driver
subdivision is defined by the electronic gear variable.

The unit pulse command input to the drive can be defined, and the
drive pulse command generated by the upper controller does not need to
consider the gear ratio, deceleration ratio, or the number of motor
encoder lines of the transmission system. Can be easily matched with
various pulse sources to reach the user
Ideal control resolution (angle / pulse).

computational formula:

P ×G =N×C×4

P: Number of pulses of the input instruction

G: Electronic gear ratio:

$$G = \frac{\text{componentfrequentcomponentson}}{\text{componentfrequentcomponentmother}}$$

N: number of motor rotation
C: Number of photoelectric encoder lines / turn, this system C
=1000

For example, when the upper controller output command pulse is 6000, the
motor rotates by 1 turn

$$G = = = \frac{N*C*4}{P} \quad \frac{1*1000*4}{6000} \quad \frac{2}{3}$$

Then the parameter P006 is set to 2, and P007 is set to 3. The above results
are obtained through mathematical reduction calculation, and the minimum
common divisor is taken as far as possible. The recommended range of the
electronic gear ratio is:

$$\frac{1}{20} \leq G \leq 20$$

↵ In standby state, press ″″ for 3 seconds to enter P parameter setting mode, and display the first parameter P 001

↓↑↵↵(Subdivided selection), press and click to turn the page to select the P parameter type to change. For example, if you need to change the segmentation value, in display P001 state, again press ″″ key to enter the current segmentation value, long press ″″ key after 3 seconds into the modified state, the current segmentation value flashing, by ″″, ″″ key to select the required segmentation value, long press ″″ key 3 seconds to confirm, the value stop flashing, segmentation change complete, press ″″ key to return.↓↑↵↩

↓↑ P 001 Subdivision parameters, P002 motor running direction selection and P003 motor type selection of these 3 types of parameters have done the drive inside the corresponding value, only through the ″″, ″″ key page to select the required value. The users of P 004 and P005 parameter content can set any value according to the needs of the device. When entering the corresponding setting interface, select the number of bits to be changed (bits, tens, hundreds, and thousand bits) by pressing the key, and then adjust the data size of the bit (0 to 9 changes).↑↓

↓↑**Note: In this mode, press ″″, ″″ to only display P000 to P 007, the parameter modification is completed and saved, power-on, the modified parameter value will work!**

4.2.2. Setting of the system parameter value P1 group

↵↓↓↵↵↓↑↵In the standby state, Long press the ″″ key for 3 seconds into the P parameter setting mode, Show the first parameter, P001, Then press ″″ to display P000, Press the ″″ key to enter, Show the value 0 of P000, Long press ″″ key for 3 seconds into the modified state (single digit flashing), Press ″″ to change the value to 1 (″″ key for shift operation), Press the ″″ button for 3 seconds, P1 group of parameter value password modified successfully, The operation interface jumps directly back to the interface displaying P001, At this time to modify P 1 group parameters only press ″″, ″″ keys to turn the page to a P 1 parameter interface to modify,

Modifications were then made, Press the ″″ key for 3 seconds after the parameter is modified.↓↑↵

4.2.3 P000, parameter description

P 000 For the control parameters, the specific value will correspond to the specific function, and the default drive power parameter is ″0000″. The following table lists the functions corresponding to the specific value.

P000 parameter settings	function declaration
"0001"	Set to "0001" to view P100, subsequent parameters
"1111"	Drive restore factory default parameters
"0100"	The software opens the drive fan
"0101"	Show motor real-time speed (drive power default)
"0102"	Real-time display of the drive internal DC bus voltage

"0103"	Internal temperature values of the drive in real time
"0104"	Display the position error in real-time
"0105"	Query the drive production date
"0106"	View the drive history fault, the number 1 is the latest fault
"0200"	The drives enters the self-test mode

Note: The P 000 is set to "0200", the driver enters the self-test mode, the default motor speed is 60 rpm rotation, "", "" keys can reduce and increase the speed, the speed range is-300~ + 300 rpm, the digital tube displays the motor speed in real time, and "" key cancels the test mode. ↓↑↰

.44.2 P110, parameter description

P 110 Set the input and output IO port level, with the default parameter value of "0000", described as follows:

highest order	The ENA enable level	0: external low level enable; 1: external high level enable
Sub-high	obligate	
Second low	Send, in level	0: high resistance, low resistance; 1: low resistance, high resistance in place
lowest order	The ALM fault level	0: normal high resistance, fault low resistance; 1: normal low resistance, fault high resistance

4.3 Drive alarm code

When the drive fault alarm occurs, the corresponding fault code will be flashed, if there are multiple alarms

Born, will be shown in turn.

4.3 Alarm code list

Alarm code	The name of the alarm	The alarm content
Er 01	excess current	The motor current is too large
Er 02	exceed the speed limit	Motor speed exceeds maximum limit (maximum 3000 rpm)
Er 03	The position is too poor	The positional deviation counter value exceeds the set value
Er 04	The drive is overheated	Drive temperature above set (80C)
Er 05	DC overpressure	Main circuit input voltage exceeds the set point
Er 06	EPROM Error	EPR OM Error in reading and writing
Er 07	Encoder failure	Encoder wiring error
Er 08	Motor connection failure	Motor wiring is wrong or the motor wiring is broken

4.4 Drive speed mode setting

The drive setting can be set to speed mode, with P200 set to "1", the drive runs at speed pattern. P 201, In speed mode, set the speed of the motor, turn rpm. In P202 speed mode, let it be Fixed addition and deceleration time, in unit ms.

impulse /PU	direction /DR	content
0	0	The motor stops running
0	1	The motor runs according to the speed set by the P 201, and makes changes by PU / DR (P 002 can change the direction)
1	0	
1	1	The motor stops running

5. Product warranty terms

1. One-year warranty period

The company provides one-year warranty from the date of shipment, during the warranty period Free repair service.

2. Not included in the warranty

● Improper wiring, such as the power cord connected to the motor wire port and live unplug

● Change the internal devices without permission

● Use beyond the electrical and environmental requirements

● Environmental heat dissipation is too poor