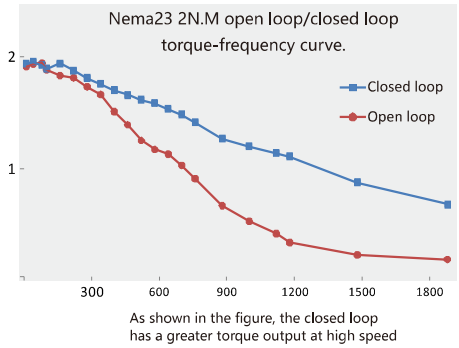
Overview of Stepper Servo

Stepper servo is a control motor scheme featuring high speed, high torque, high precision, low vibration, low heating and no loss of step, which is formed based on the common open loop stepper motor in combination with position feedback and servo algorithm.

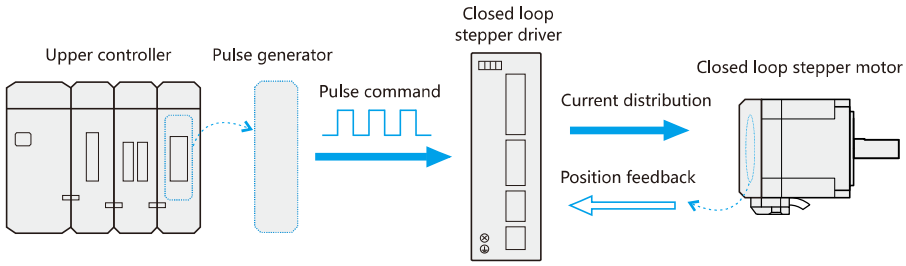
Stepper servo motor, a photoelectric encoder is installed on the output shaft behind the open-loop motor to form position feedback.

Stepper servo driver processes the encoder position feedback to achieve more precise current and position control.



As shown in the figure, the closed loop has a greater torque output at high speed

Block diagram of stepper servo system



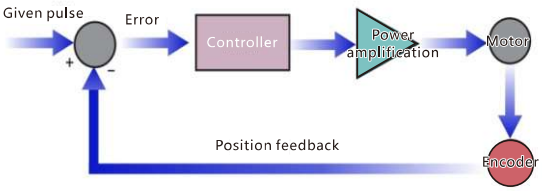
Features of stepper servo

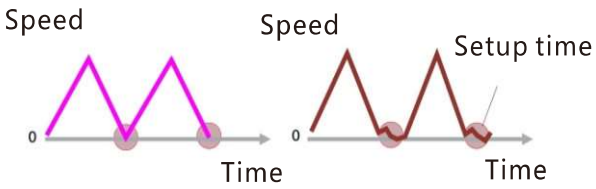
No loss of step

The photoelectric encoder feeds back the position of the motor and compares it with the driver command. Adjust the current and calibrate the position based on the position error information to prevent loss of steps.

Fast response

The stepper motor features the rotator in synchronization with the given pulse to achieve fast positioning, applicable to short-range fast positioning. The traditional servo system acquires position information slowly and requires a long setup time.



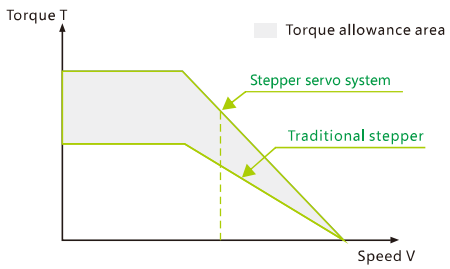


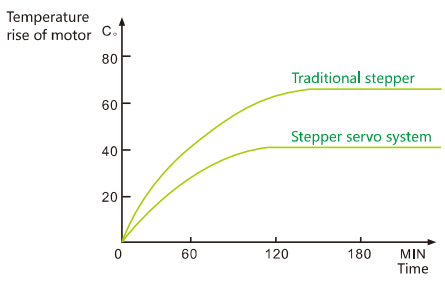
High torque

The common stepper usually requires reserving 30% of torque allowance to prevent loss of steps. The closed loop stepper can use 100% of the motor torque to improve the efficiency. The closed loop stepper adjusts the current and phase in the case of overload,so as to keep the current motor torque maximal.

Low heating

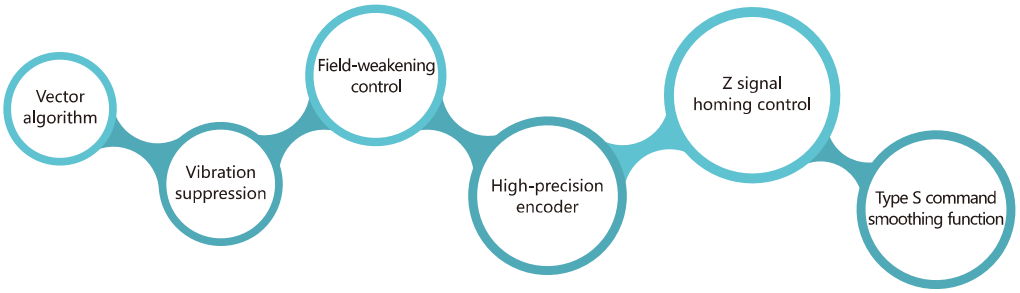
The common stepper system operates at a fixed current. The closed loop stepper driver system adjusts the current to reduce heating and improve the rate of energy utilization based on the load fluctuation.





Stepper Servo Driver

Based on the new 32-bit DSP platform, and adopting the field oriented control(FOC) and field-weakening control algorithm design, T series stepper servo driver surpasses the performance of common steppers comprehensively.



Description of stepper servo functions

Current: The maximum current is set inside the driver, and the current is adjusted in real time during operation without additional settings.

Speed and torque: According to the torque-frequency curve of the closed-loop stepper motor, it is recommended that the maximum speed of the stepper servo be about 1000rpm (with load), which is equivalent to the torque output of the open-loop stepper at 600rpm.

Motor connection: The stepper servo needs to match the motor phase with the encoder, so the sequence of the motor cables is fixed, and it needs to adjust the DIP switches to reverse the motor direction.

Out-of-tolerance alarm: The counting position of the encoder is too different from the input pulse, which is generally caused by incorrect wiring, overspeed or overload.

Naming of stepper servo driver

T 60 + - □

1 2 3 4

1. T series stepper servo driver
2. Base number (60/86)
   60 denotes driving a motor base below 60mm
3. Multi-function upgrade
4. Non-standard code

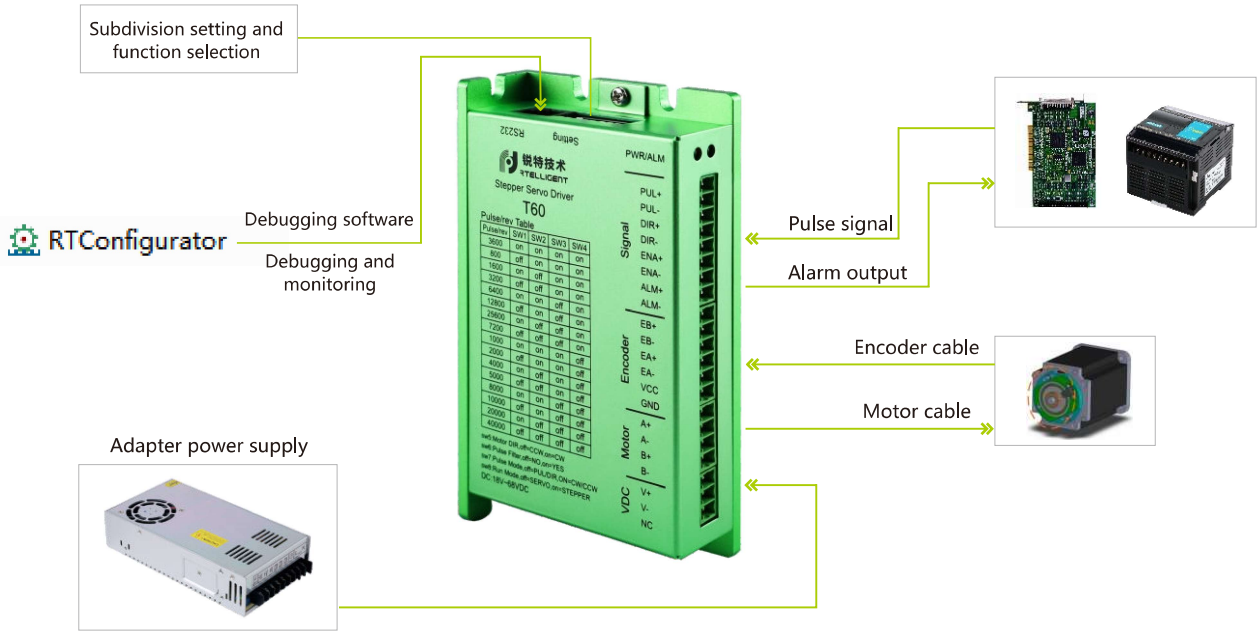
Technical specifications

Model	Peak current	Weight	Input voltage range	Size	Micro-stepping level number	Pulse level	Matching motor
T42	2.5A	250g	24-48VDC	116×69×26.5mm	800-40000	3.3-24V	20、28、42
T60	6.0A	250g	24-48VDC	116×69×26.5mm	800-40000	3.3-24V	57、60
T60PLUS	6.0A	300g	24-48VDC	116×69×26.5mm	800-40000	24V	57、60
T86	7.0A	650g	18-80VAC	151×97×52mm	800-40000	3.3-24V	86
DS86	7.2A	800g	18-80VAC	151×141×47mm	200-65535	3.3-24V	86
NT110	8.0A	1400g	110-230VAC	151×141×47mm	200-65535	3.3-24V	3 phase 86/110

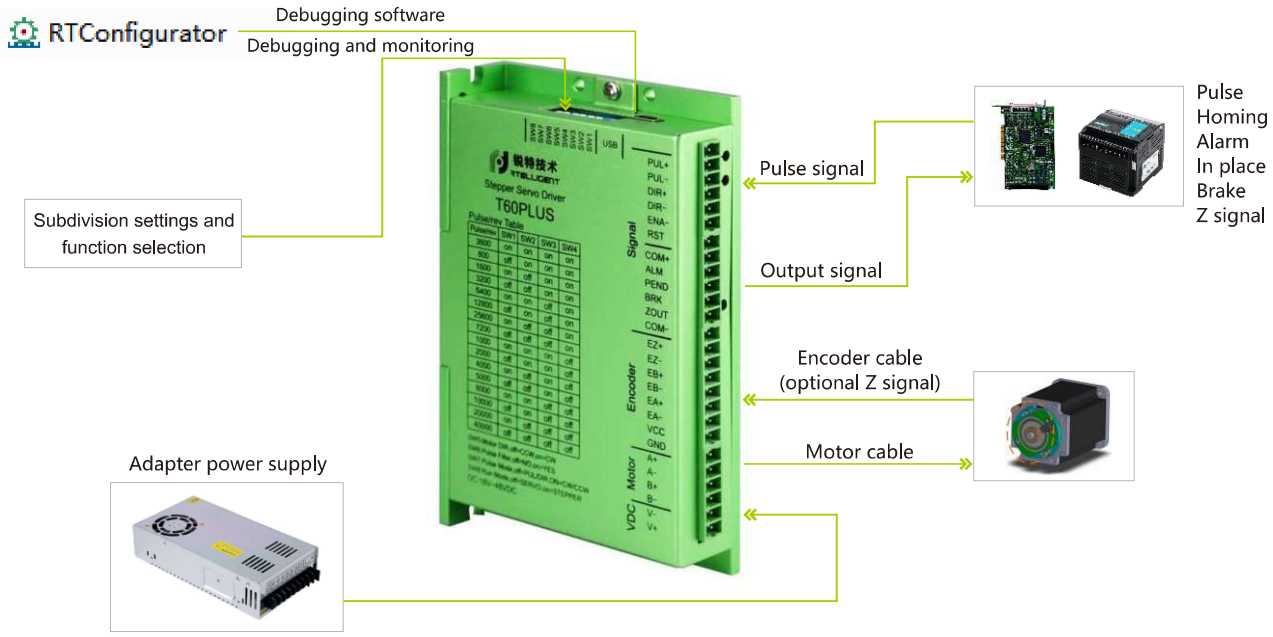
Driver working status LED indication

LED status	Driver status	Troubleshooting
Green indicator is on for a long time	Driver not enabled	
Green indicator is flickering	Driver working normally	
One green indicator and one red indicator	Driver overcurrent	Check connection and repair the driver
One green indicator and two red indicators	Driver input power overvoltage	Check the voltage of input power
One green indicator and three red indicators	The internal voltage of the driver is wrong	Driver faults
One green indicator and four red indicators	Tracking error exceeds limits	Check the connection sequence, and confirm the load and speed
One green indicator and five red indicators	Encoder phase error	Check connection, and the encoder faults

Sketch diagram of the configuration of T series

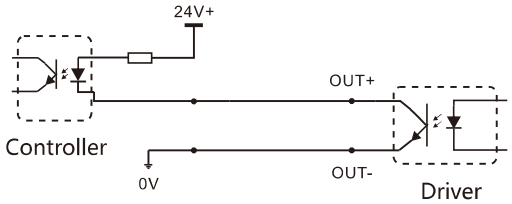


Sketch diagram of the configuration of TPLUS series



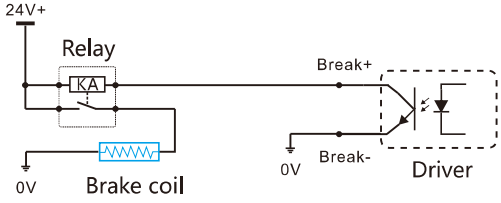
Output signal wiring example

Alarm/in-place signal wiring example



OUT is ALM or Pend, pay attention to connecting current limiting resistor in series

Brake signal wiring example



Brake is the brake control signal, which is set by software. Do not connect the brake coil reversely (red +, black -)

Model combination list

Motor base	Model	Rated torque N.m	Matching driver	Encoder cable	Power extension cable
20	20A30EC	0.014	T42-20	C1-030	C2-030(Optional)
	20A42EC	0.02	T42-20	C1-030	C2-030(Optional)
28	28A34EC	0.06	T42-28	C1-030	C2-030(Optional)
	28A45EC	0.1	T42-28	C1-030	C2-030(Optional)
42	42AM06ED	0.6	T42	B1-030	C2-030(Optional)
	42AM08ED	0.8	T42	B1-030	C2-030(Optional)
57	57AM13ED	1.3	T60(T60PLUS)	B1-030	C2-030(Optional)
	57AM23ED	2.3	T60(T60PLUS)	B1-030	C2-030(Optional)
	57AM26ED	2.6	T60(T60PLUS)	B1-030	C2-030(Optional)
	57AM30ED	3.0	T60(T60PLUS)	B1-030	C2-030(Optional)
60	60AM22ED	2.2	T60(T60PLUS)	B1-030	C2-030(Optional)
	60AM30ED	3.0	T60(T60PLUS)	B1-030	C2-030(Optional)
	60AM40ED	4.0	T60(T60PLUS)	B1-030	C2-030(Optional)
86	86AM45ED	4.5	T86(DS86)	B1-030	C2-030(Optional)
	86AM65ED	6.5	T86(DS86)	B1-030	C2-030(Optional)
	86AM85ED	8.5	T86(DS86)	B1-030	C2-030(Optional)
	86AM120ED	12.0	T86(DS86)	B1-030	C2-030(Optional)
3 phase 86	86B8EH	8	NT110	SES8-030A	SMS-030
	86B10EH	10	NT110	SES8-030A	SMS-030
3 phase 110	110B12EH	12	NT110	SES8-030A	SMS-030
	110B20EH	20	NT110	SES8-030A	SMS-030

Cable is 3 meters as standard, other specifications please specify when ordering
Please choose PLUS series driver with Z signal homing and output function for motor with Z signal.

Motor cable

B1-030

C2-030

B1 - is the encoder extension cable, 6-core high-flexibility twisted-pair shielded cable, can be bent over 5 million times
Color definition:

EB+	EB-	EA+	EA-	VCC	GND
Green	Yellow	Brown	White	Red	Blue

C2 - is the motor power extension cable, 4-core high-flex cable, can be bent over 5 million times
Color definition:

A+	A-	B+	B-
Red	Blue	Green	Black

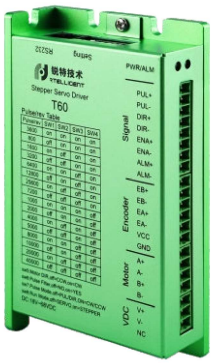
CES8-030

CES8 - is Z signal encoder extension cable, 8-core high-flexibility twisted pair shielded cable
Color definition:

EB+	EB-	EA+	EA-	VCC	GND
Green	Green&black	Blue	Blue&black	Red	Black

EZ+	EZ-
Yellow	Yellow&black

T60/T42



Based on the 32-bit DSP platform, provided with vector control technology and servo demodulation function internally and in combination with feedback from the encoder of closed loop motor, T60 stepper servo driver enables the stepper servo system to feature low noise, low heating, no loss of step and higher application speed, able to improve performance of the intelligent equipment system comprehensively.

- Pulse mode: monopulse/double-pulse.
- Signal level: 3.3-24V compatible; serial resistance not necessary for the application of PLC.
- Power voltage: 24-48 DC, and 36 or 48V recommended.
- Typical applications: Auto-screwdriving machine, servo dispenser, wire-stripping machine, labeling machine, medical detector, electronic assembly equipment etc.

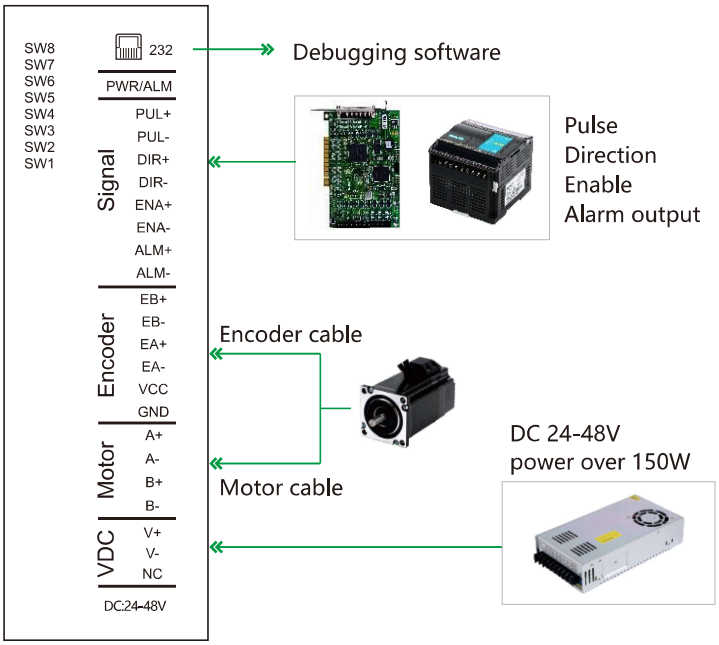
T60/T42 wiring diagram

Control signal		
PUL	Pulse	3.3-24V compatible; serial resistance not necessary for the application of PLC.
DIR	Direction	
ENA	Enable	
ALM	Alarm output	Open collector, max current 150mA

Encoder connection					
EB+	EB-	EA+	EA-	Vcc	Gnd
Encoder phase B output		Encoder phase A output		Encoder power supply /provided by the driver	

Motor connection				
A+	A-	B+	B-	The motor wires need to correspond one by one Cannot be exchanged
Motor A+	Motor A-	Motor B+	Motor B-	

Power supply -- DC		
V-	Power supply negative	24-48VDC power over 150W
V+	Power supply positive	
NC	Undefined	



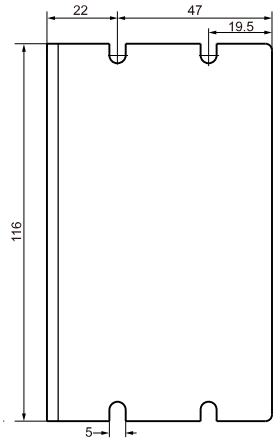
Function selection

SW5	Running direction	on	Forward
		off	Backward
SW6	Command smoothing	on	Effective S type speed reduction
		off	Ineffective S type speed reduction
SW7	Pulse mode	on	Double-pulse CW/CCW
		off	Monopulse PUL&DIR
SW8	Open/closed loop	on	Open loop mode
		off	Closed loop mode

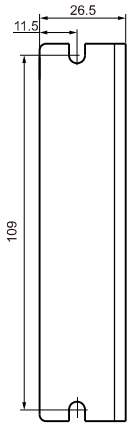
Micro-stepping setting

Steps/revolution	SW1	SW2	SW3	SW4
3600	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on
25600	on	off	off	on
51200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
40000	off	off	off	off

Installation dimensions

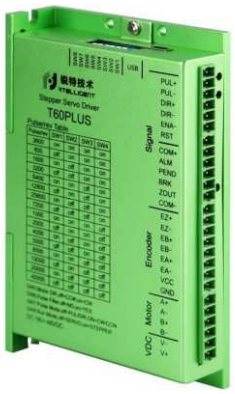


Front installation



Side installation

T60PLUS



T60PLUS stepper servo driver has the input and output functions of the encoder Z signal, and the Z signal homing function is integrated (input start homing signal, the driver automatically completes the Z signal return to the origin)T60PLUS driver integrates M-USB communication port, which is convenient for debugging related parameters.

- Pulse mode: monopulse/double-pulse (3.3~24V)
- Signal level: input COM+/output COM- (below 24V)
- Power voltage: 24-48V DC power supply, 36 or 48V recommended.
- Typical applications: auto-screwdriving machine, servo dispenser, wire-stripping machine, labeling machine, medical detector, electronic assembly equipment etc.

T60PLUS wiring diagram

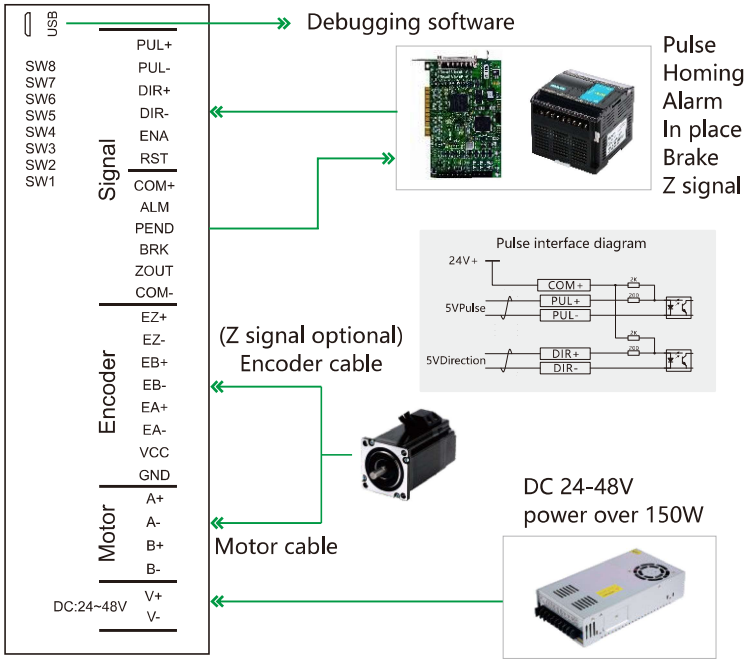
Control signal		
PUL+/PUL-	Pulse	5V differential input 24V can be connected to common anode COM+
DIR+/DIR-	Direction	
ENA	Enable negative	The function of common terminal voltage below 24V can be set by debugging software
RST	Alarm clear negative	
COM+	Common input	

Control output		
ALM	Alarm output	Common cathode output, 24V available
PEND	Output in place	
BRK	Brake control	
ZOUT	Z output	
COM-	Common output	

Encoder wiring					
EB+	EB-	EA+	EA-	Vcc	Gnd
Encoder phase B output		Encoder phase A output		Encoder power supply/ provided by the driver	
EZ+	EZ-	Z-phase signal is optional and can be left unconnected.			
Encoder phase Z input					

Motor wiring				
A+	A-	B+	B-	The motor wires need to correspond one by one Cannot be exchanged
Motor A+	Motor A-	Motor B+	Motor B-	

Power supply--DC:		
V-	Power supply negative	24-48VDC power over 150W
V+	Power supply positive	



Function selection

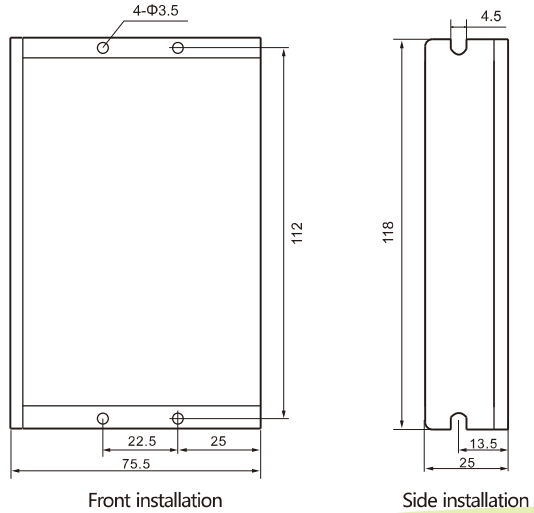
SW5	Running direction	on	Forward
		off	Backward
SW6	Command smoothing	on	Effective S type speed reduction
		off	Ineffective S type speed reduction

SW7	Pulse mode	on	Double-pulse CW/CCW
		off	Monopulse PUL&DIR
SW8	Open/closed loop	on	Open loop mode
		off	Closed loop mode

Micro-stepping setting

Steps/revolution	SW1	SW2	SW3	SW4
3600	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on
25600	on	off	off	on
7200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
40000	off	off	off	off

Installation dimensions



T86

Based on the new 32-bit DSP platform, provided with vector control technology and servo demodulation function internally and in combination with feedback from the encoder of closed loop motor, T86 stepper servo driver enables the stepper servo system to feature low noise, low heating, no loss of step and higher application speed, able to improve performance of the intelligent equipment system comprehensively.

- Pulse mode: monopulse/double-pulse.
- Signal level: 3.3-24V compatible; serial resistance not necessary for the application of PLC.
- Power voltage: 24-100V DC or 18-80V AC, 48V AC recommended.
- Typical applications: welding machine, servo dispenser, wire-stripping machine, labeling machine, carving machine, electronic assembly equipment etc.

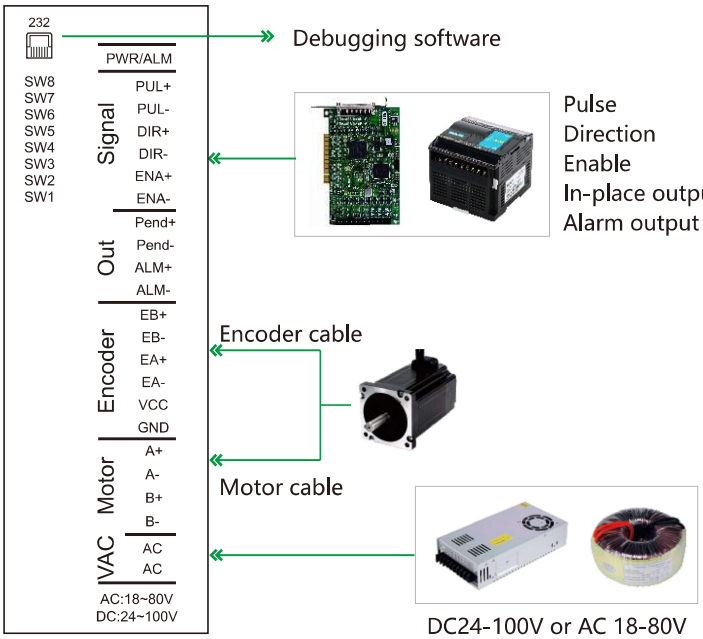
T86 wiring diagram

Control signal		
PUL	Pulse	3.3-24V compatible; serial resistance not necessary for the application of PLC.
DIR	Direction	
ENA	Enable	
ALM	Alarm output	Open collector, max current 150mA
Pend	In-place output	Open collector, max current 150mA

Encoder connection					
EB+	EB-	EA+	EA-	Vcc	Gnd
Encoder phase B output		Encoder phase A output		Encoder power supply /provided by the driver	

Motor connection				
A+	A-	B+	B-	The motor wires need to correspond one by one Cannot be exchanged
Motor A+	Motor A-	Motor B+	Motor B-	

Power supply -- DC		
AC	Power supply	No distinction between V+ , V- power over 150W
AC	Power supply	



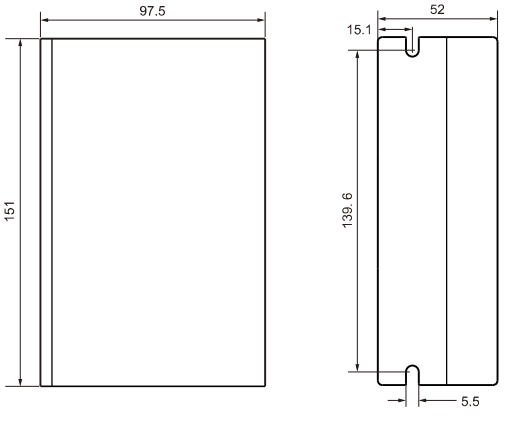
Function selection

SW5	Running direction	on	Forward
		off	Backward
SW6	Command smoothing	on	Effective S type speed reduction
		off	Ineffective S type speed reduction
SW7	Pulse mode	on	Double-pulse CW/CCW
		off	Monopulse PUL&DIR
SW8	Open/closed loop	on	Open loop mode
		off	Closed loop mode

Micro-stepping setting

Steps/revolution	SW1	SW2	SW3	SW4
3600	on	on	on	on
800	off	on	on	on
1600	on	off	on	on
3200	off	off	on	on
6400	on	on	off	on
12800	off	on	off	on
25600	on	off	off	on
7200	off	off	off	on
1000	on	on	on	off
2000	off	on	on	off
4000	on	off	on	off
5000	off	off	on	off
8000	on	on	off	off
10000	off	on	off	off
20000	on	off	off	off
40000	off	off	off	off

Installation dimensions



Side installation

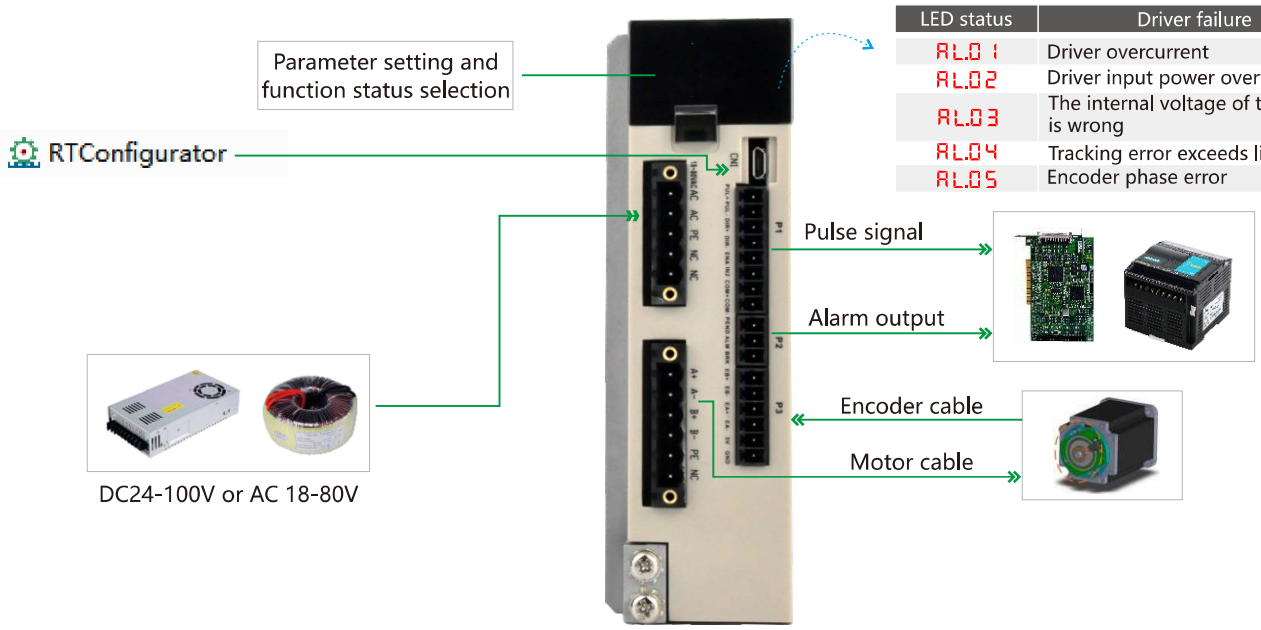
DS86

Based on the new 32-bit DSP platform, provided with vector control technology and servo demodulation function internally, DS86 stepper servo driver enables the stepper servo system to feature low noise, low heating.

DS86 is used to drive two-phase closed-loop stepper motors base below 86mm.

- Pulse mode: monopulse/double-pulse
- Signal level:3.3-24V compatible; serial resistance not necessary for the application of PLC.
- Power voltage:24-100V DC or 18-80V AC, 75V AC recommended.
- Typical applications: welding machine, wire-stripping machine, labeling machine, carving machine, electronic assembly equipment etc.

Driver interface description



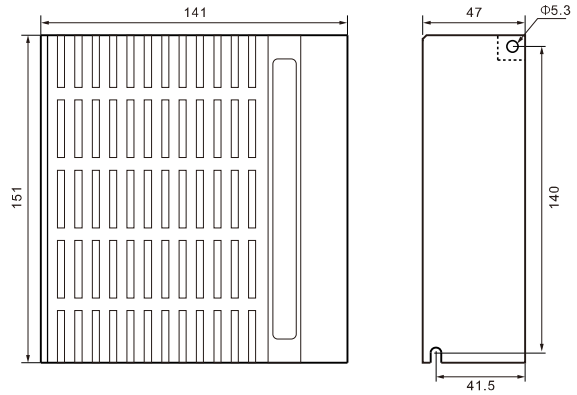
LED status	Driver failure
AL.01	Driver overcurrent
AL.02	Driver input power overvoltage
AL.03	The internal voltage of the driver is wrong
AL.04	Tracking error exceeds limits
AL.05	Encoder phase error

Parameter setting and instruction:

Parameter setting ways:
1.Connect with PC computer through USB interface.
Set parameter by debugging software.
2. Set parameter by the DS86 setting buttons

Buttons	Instruction
Ⓜ	MOD : return to the previous menu, cancelation of operation
▲	UP: menu selection, data setting
▼	DOWN : menu selection, data setting
Ⓢ	SET : enter

Installation dimensions



Parameter setting

Driver's parameters setting are PA-00 to PA-40

No.	Name	Range	Default	Description
00	Control mode	[0,2]	1	0: Open loop running; 1: Servo 1; 2: Servo 2
01	Micro-stepping	[200,65535]	1600	The pulse number that needed by motor running one round
02	Maximum current	[100,7000]	7000	The maximum current needs to match the corresponding motor
03	Basic current percentage	[1,100]	50	
04	Encoder resolution	[500,65535]	4000	
05	Position error alarm threshold	[100,65535]	4000	Set alarm threshold of tracking error
06	Runing direction	[0,1]	0	0:Forward 1:Backward
07	Command filtering	[1,512]	128	Delay time=setting valueX50us During interpolation movement, set to 1.
08	Pulse mode	[0,1]	0	0:Pulse + direction 1:Double pulse
09	Pulse effective edge	[1,512]	128	0:Up edge 1:Down edge
10	Enable level	[0,1]	0	0:Opening 1: Closing

NT110

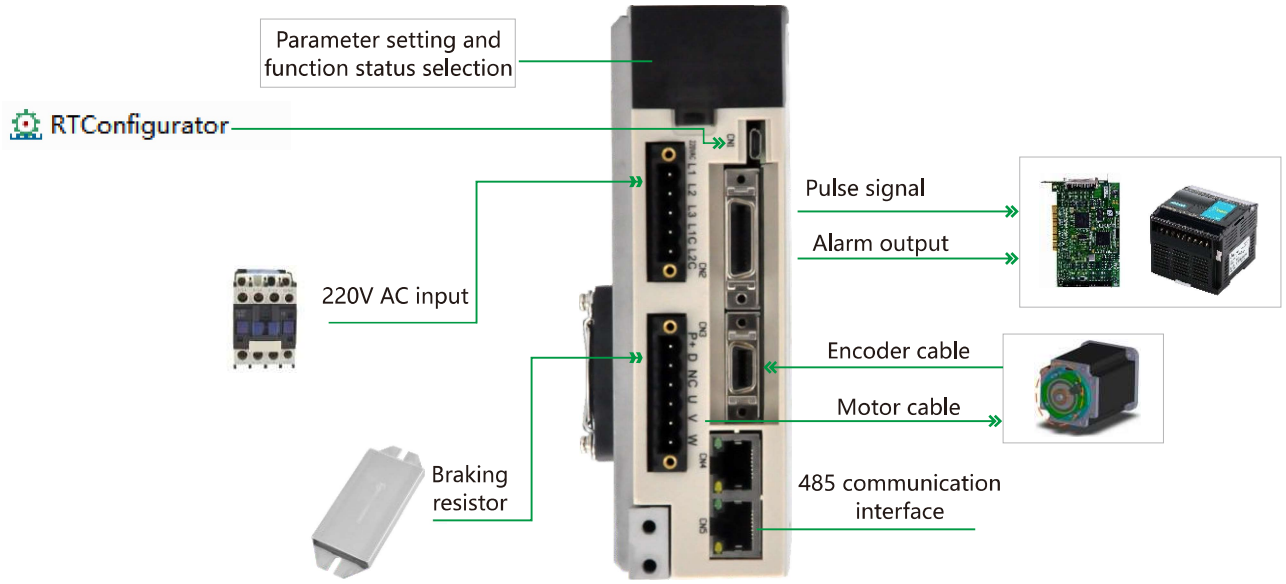
Based on the new 32-bit DSP platform, provided with vector control technology and servo demodulation function internally, NT110 3 phase stepper servo driver enables the stepper servo system to feature low noise, low heating.

NT110 has 485 communication function, please refer to 485 communication part for related information.

NT110 is used to drive three-phase closed loop flange 110mm and 86mm stepper motors.

- Pulse mode: monopulse/double-pulse/orthogonal pulse.
- Signal level: 3.3-24V compatible; serial resistance not necessary for the application of PLC.
- Power voltage:110-230V AC, 220V AC recommended.
- Typical applications: welding machine, wire-stripping machine, labeling machine, carving machine, electronic ssembly equipment etc.machine, electronic assembly equipment etc.

Driver interface description

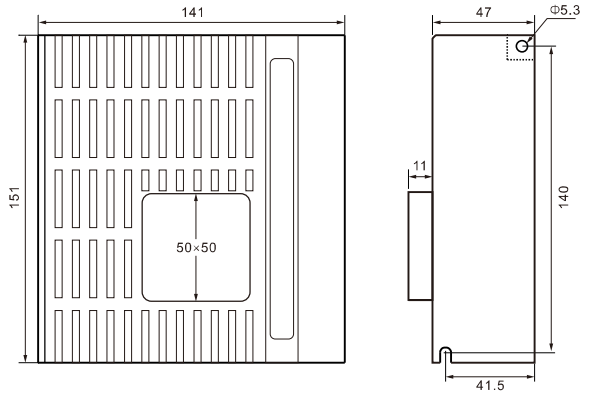


Parameter setting and instruction:

Parameter setting ways:
1. Connect with PC computer through USB interface.
Set parameter by debugging software.
2. Set parameter by the NT110 setting buttons

Buttons	Instruction
Ⓜ	MOD : return to the previous menu, cancelation of operation
▲	UP: menu selection, data setting
▼	DOWN : menu selection, data setting
Ⓢ	SET : enter

Installation dimensions



Parameter setting

Driver's parameters setting are PN000 to PN499

No.	Name	Range	Default	Description
PN022	Control mode	[0,2]	1	0: Open loop running; 1: Servo 1; 2: Servo 2
PN024	Micro-stepping	[200,65535]	4000	The pulse number that needed by motor running one round
PN045	Maximum current	[100,7000]	7000	The maximum current needs to match the corresponding motor
PN046	Basic current percentage	[1,100]	50	
PN040	Encoder resolution	[500,65535]	4000	
PN041	Position error alarm threshold	[100,65535]	4000	Set alarm threshold of tracking error
PN023	Runing direction	[0,1]	0	0:Forward 1:Backward
PN028	Command filtering	[1,512]	128	Delay time=setting valueX50us During interpolation movement, set to 1.
PN017	Pulse source	[0,1]	1	0:Internal pulse control 1:External pulse input
PN019	Input pulse mode	[0,1,2,3]	0	0:Pulse + direction/↑ 1:Pulse + direction/↓ 2:Double-pulse 3:Orthogonal pulse
PN060	Input port settings	[0~63]	36	36:Enable control is effective at low level