T60 Closed Loop Stepper Driver

User Manual

Pulse/rev Table

Pulse/rev	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

sw5:Motor DIR,off=CCW,on=CW
sw6:Pulse Filter,off=NO,on=YES
sw7:Pulse Mode,off=PUL/DIR,ON=CW/CCW
sw8:Run Mode,off=SERVO,on=STEPPER
DC:18V~68VDC

RS232　Setting　PWR/ALM

锐特技术 RTELLIGENT
Stepper Servo Driver
T60

Signal: PUL+ PUL- DIR+ DIR- ENA+ ENA- ALM+ ALM-
Encoder: EB+ EB- EA+ EA- VCC GND
Motor: A+ A- B+ B-
VDC: V+ V- NC

Shenzhen Rtelligent Mechanical Electrical Technology Co.,ltd

Contents

1. Product overview

Thank you for choosing Rtelligent T series digital stepper servo driver.

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

Based on TI's new 32-bit DSP processing chip platform, T series stepper servo driver uses the field oriented control (FOC) and vector field-weakening control algorithm in the servo driver, which has the performance of surpassing the ordinary stepper in all aspects.

● The built-in PID parameter adjustment function makes the motor better meet the application of different kinds of loads.

● The built-in field-weakening control algorithm makes the motor to reduce the magnetic field characteristics and keep the power at high speed.

● The built-in current vector control function makes the motor have the current characteristic of servo and low heating.

● The built-in micro-stepping command algorithm makes the motor can run while maintaining a stable and low vibration at various speeds.

● The encoder feedback with the built-in 4000 pulse resolution makes the positioning precision increase and never loses the step.

In conclusion, the servo control scheme combined with the characteristics of the stepper motor enables the T series stepper servo driver to better exert the performance of the stepper motor, which can replace the servo application of the same power. It is a new choice of optimal cost performance for automation equipment.

T60 driver can set subdivision and other parameters through DIP switch and debugging software. It has protection functions such as voltage, current and position, and adds alarm output interface. Its input and output control signals are optically isolated.

Power supply	24 –50 VDC
Control precision	4000 Pulse/r
Pulse mode	Direction & pulse, CW/CCW double pulse
Current control	Servo vector control algorithm
Micro-stepping settings	DIP switch settings, 15 options (or debugging software settings)
Speed range	Conventional 1200 ~ 1500rpm, up to 4000rpm
Resonance suppression	Automatically calculate the resonance point and inhibit the IF vibration
PID parameter adjustment	Test software to adjust motor PID characteristics
Pulse filtering	2MHz digital signal filter
Alarm output	Alarm output of over-current, over-voltage, position error, etc

We hope that our products with excellent performance can help you to complete the sports control program successfully.

Please read this technical manual before using the products.

2. Application environment and installation

2.1 Environmental requirement

Item	Rtelligent T60
Installation environment	Avoid dust, oil and corrosive environment
Vibration	0.5G（4.9m/s^2） Max
Operating temperature/humidity	0℃ ~ 45℃ / 90% RH or less (no condensation)
Storage and transportation temperature:	-10℃ ~ 70℃
Cooling	Natural cooling / away from the heat source
Waterproof grade	IP54

2.2 Driver installation dimensions
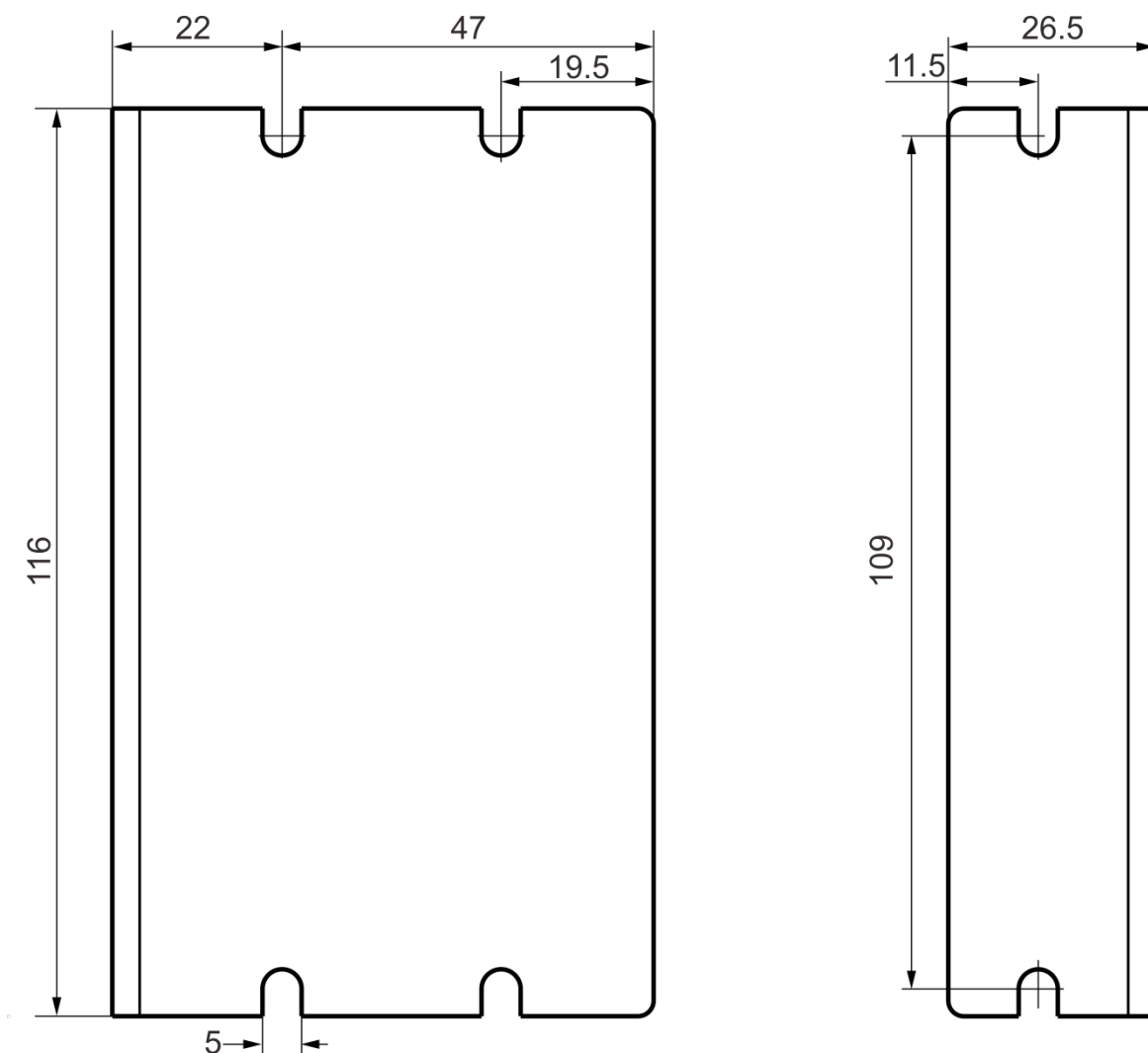
2.3 Driver installation requirements

Please install the driver vertically or horizontally, with its front facing forward, top facing upward to facilitate cooling.

During assembly, avoid drillings and other foreign matters falling inside the driver.

During assembly, please use M3 screw to fix.

When there is vibration source (such as a driller) close to the installation position, please use a vibrating absorber or a vibration resistant rubber gasket.

When multiple drivers are installed in the control cabinet, please pay attention to reserve enough space for sufficient heat dissipation. If necessary, you can configure cooling fans to ensure good heat dissipation conditions in the control cabinet.

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3. Driver Port and Connection

3.1 Port function description

Function	Grade	Definition	Remarks
Power supply input	V+	Input to the positive pole of the DC power supply	DC 24~50V
	V-	Input to the negative pole of the DC power supply	
	NC	Not connected/undefined	
Motor connection	A+	Positive terminal of phase-A winding	Red (42 red)
	A-	Negative terminal of phase-A winding	Blue (42 green)
	B+	Positive terminal of phase-B winding	Green (42 blue)
	B-	Negative terminal of phase-B winding	Black (42 yellow)
Encoder connection	EB+	Positive terminal of Encoder phase B	Green
	EB-	Negative terminal of Encoder phase B	Yellow
	EA+	Positive terminal of Encoder phase A	Brown
	EA-	Negative terminal of Encoder phase A	White
	VCC	Encoder working power 5V positive	Red
	GND	Encoder working power 5V ground terminal	Blue
Pulse connection	PUL+	Pulse input interface	3.3 ~ 24V level compatible
	PUL-		
	DIR+	Direction input interface	
	DIR-		
Enable terminal	ENA+	Enable control interface	
	ENA-		
Alarm output	ALM+	Alarm output interface	24V, below 40mA
	ALM-		

3.2 Power supply input

The power supply of the driver is DC power, and the input voltage range is between 24V~ 50V.

Do not mistakenly connect the power supply to the NC pin, and do not reversely connect the polarity of the input power! ! !

Power selection reference:

Voltage:

Stepper motor has the characteristics of torque decrease with the increase of motor speed, and the input voltage will affect the amplitude of high-speed torque reduction. Properly increasing the voltage of the input power supply can increase the output torque of the motor at high speed.

Stepper servo has a higher speed and torque output than ordinary stepper. Therefore, if you want to get better high-speed performance, you need to increase the power supply voltage of the driver.

Current:

The working process of the driver is to convert the input high-voltage and low-current power supply into the low-voltage and high-current at both ends of the motor winding. In actual use, the appropriate power supply should be selected according to the motor model, load torque and other factors.

The effects of regeneration voltage:

When the stepper motor is working, it also retains the characteristics of the generator. When decelerating, the kinetic energy accumulated by the load will be converted into electrical energy and superimposed on the driver circuit and input power supply.

Pay attention to the setting of acceleration and deceleration time to protect the driver or power supply.

When the driver is powered off, you will see the driver's LED indicator on when the load is pulled to make the motor move, which is also affected by this.

3.3 Encoder connection

The T60 encoder is A/B differential output and is connected in the corresponding order when used.

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

Rtelligent is equipped with a certain length of encoder cable, Please purchase extension cables of different lengths according to the installation needs.

3.4 Motor connection

The matching motor of the T60 driver is the corresponding T series stepper servo motor, and its

corresponding motor connection order is fixed and unique.

	57/60 Motor	42 Motor
A+	Red	Red
A-	Blue	Green
B+	Green	Blue
B-	Black	Yellow
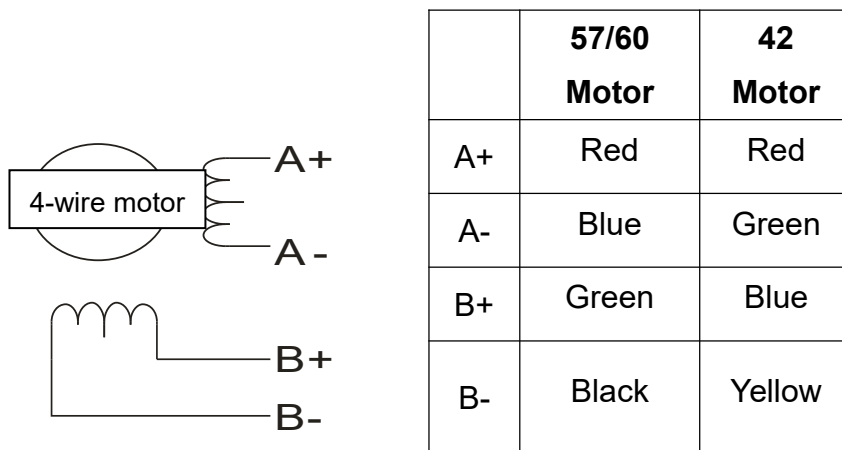
3.5 Control signal connection

3.5.1 PUL, DIR Port: connection for pulse command

The standard T series driver signal interface is in the form of pulse, and T60 can receive two kinds of pulse command signals.

The upper controller can be the pulse signal generating device, such as PLC, MCU, control card and controller.

Pulse and direction (PUL + DIR)	Reverse / Forward
Double pulse (CW +CCW)	Forward / Reverse
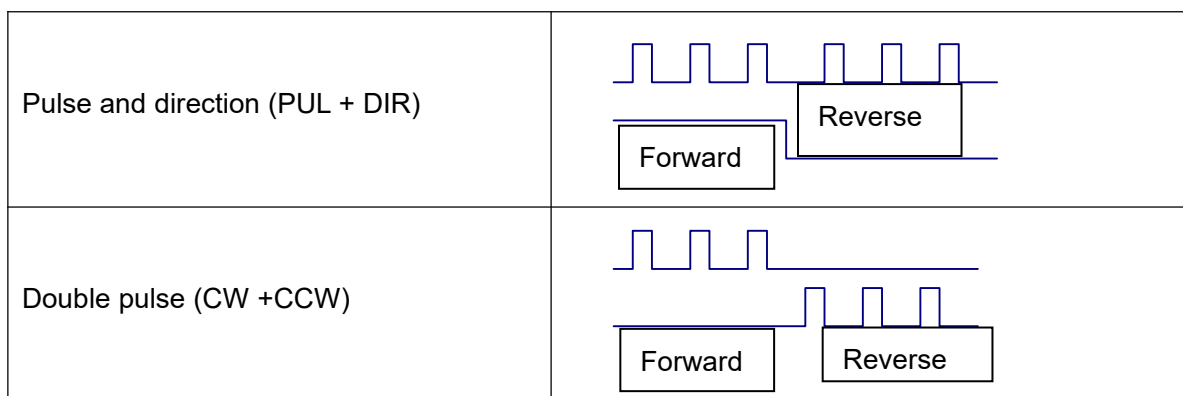
3.5.2 ENA port: enable/disable

When the internal optocoupler is off, the driver outputs current to the motor;

When the internal optocoupler is on, the driver will cut off the current of each phase of the motor to make the motor free, and the step pulse will not be responded.

When the motor is in an error state, it is automatically turned off. The level logic of the enable signal can be set to the opposite.

3.5.3 ALM port: alarm output

The ALM port is used to output the operating status of the driver to an external control circuit. When the driver is in the error state and the normal working state, ALM outputs different optocoupler levels.
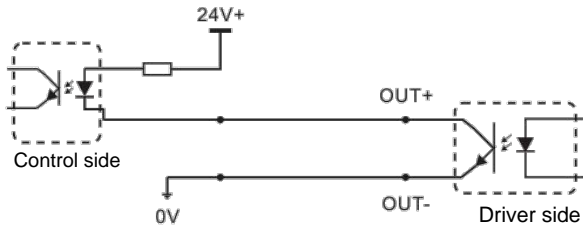
OUT is ALM or Pend, pay attention to connecting current limiting resistor in series
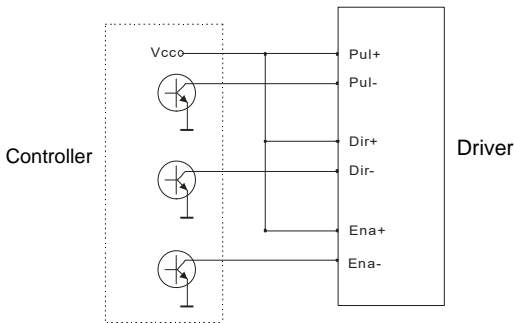
Rtelligent provides solutions for dedicated brake controllers, examples are as follows:
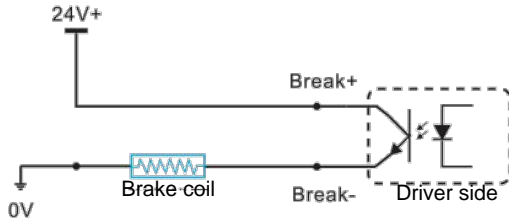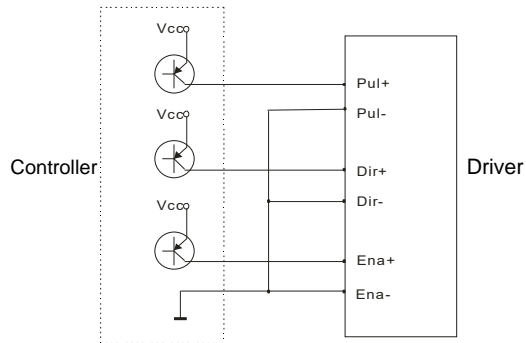

Break is the brake control signal, which is set by software.
Do not connect the brake coil reversely (red +, black one)
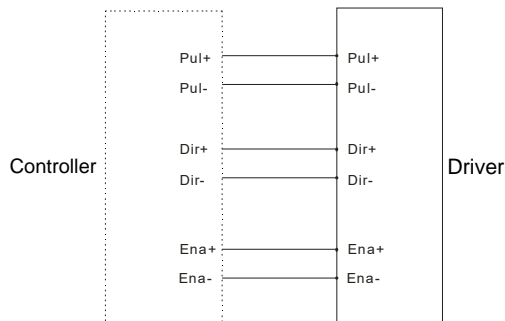
3.5.4 Examples for control signal connection
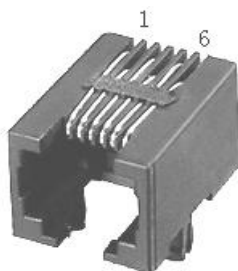
Common Anode
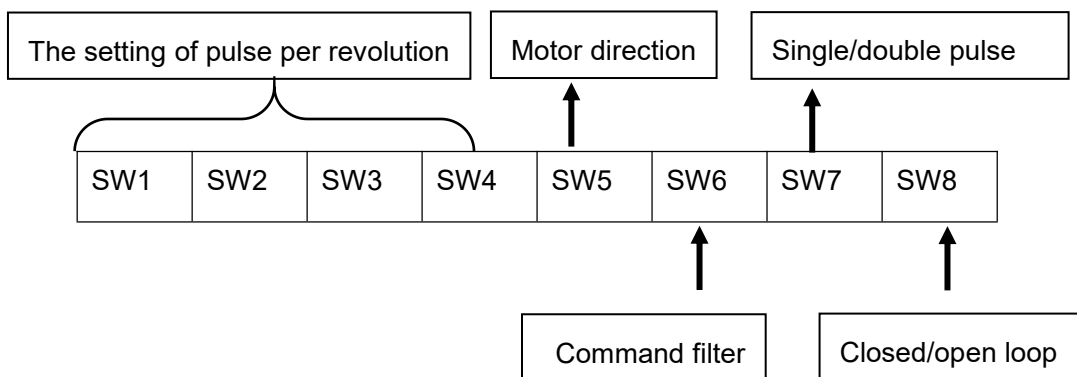

Common Cathode

Difference

3.6 RS232 serial port

S/N	Symbol	Description
1	NC	
2	+5V	Positive terminal of power supply
3	TxD	RS232 transmitting terminal
4	GND	Ground terminal of power supply
5	RxD	RS232 receiving terminal
6	NC	

RS232 serial port is used to connect T60 testing software and change other related operating parameters of driver.

4. The setting of DIP switches and operating parameters

The setting of pulse per revolution				Motor direction		Single/double pulse	
SW1	SW2	SW3	SW4	SW5	SW6	SW7	SW8

Command filter → SW6

Closed/open loop → SW8

4.1 The setting of pulse per revolution

Steps/revolution	SW1	SW2	SW3	SW4	Remarks
3600	on	on	on	on	
800	off	on	on	on	
1600	on	off	on	on	
3200	off	off	on	on	The DIP switch is turned to the "Default" state and the testing software can freely change other subdivisions.
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	

DIP SW1, SW2, SW3, SW4 are used to set the pulse per revolution required by the motor.

Motor speed = command pulse frequency ÷ pulse per revolution

Motor stroke = number of command pulses ÷ pulse per revolution

4.2 Motor direction selection

DIP SW5 is used to set the running direction of the motor under the initial pulse.

The "off" means that the motor direction is counterclockwise when inputting the initial pulse;

The "on" means that the motor direction is clockwise when inputting the initial pulse.

※ The initial pulse is the testing pulse used when developing the driver software; Please refer to the actual running direction of the motor.

4.3 Pulse filtering function selection

DIP SW6 is used to set the pulse filtering function of driver.

The "off" means the pulse filtering function is off;

The "on" means the pulse filtering function is on.

※ The pulse filtering function is the filtering action by the driver upon the input commands. When the filtering function is on, the driver will smoothen the input pulse command, which can make the motor operation acceleration and deceleration softer, but this will also cause certain delay of the pulse command.

Filtering time setting: The default time of filtering function is 6.4ms, and the software can change the time below the 25.6ms. The set value x50us is equal to the actual time.

4.4 Pulse mode selection

DIP SW7 is used to set the pulse command mode of drivers.

The "off" means pulse + direction (single pulse) mode; the "on" means double pulse mode.

4.5 Open/closed loop selection

DIP SW8 is used to set the driver control mode.

The "off" means the closed loop control mode;

The "on" means the open loop control mode and can be used to test the motor.

5. Driver working status LED indication

LED status		Driver status
🟢	Green indicator is on for long time	Driver not enabled
🟢🟢	Green indicator is flickering	Driver working normally
🟢🔴	One green indicator and one red indicator	Driver overcurrent
🟢🔴🔴	One green indicator and two red indicators	Driver input power overvoltage
🟢🔴🔴🔴	One green indicator and three red indicators	The internal voltage of the driver is wrong
🟢🔴🔴🔴🔴	One green and four red indicators	Tracking error exceeds limits
🟢🔴🔴🔴🔴🔴	One green and five red indicators	Encoder phase error

6. Common faults and troubleshooting

Phenomenon	Possible situations	Solutions
Motor does not work	Power indicator is off	Check the power supply circuit for normal power supply
	The motor rotor is locked but the motor does not work	Pulse signal is weak; increase the signal current to 7-16mA
	The speed is too slow	Select the right micro-stepping

	Driver is protected	Solve the alarm and re-power
	Enable signal problem	Pull up or disconnect the enable signal
	Command pulse is incorrect	Check whether the upper computer has pulse output
The steering of motor is wrong	The rotary direction of motor is reverse	Adjust the DIP SW5
	The motor cable is disconnected	Check the connection
	The motor has only one direction	Pulse mode error or DIR port damaged
Alarm indicator is on	The motor connection is wrong	Check the motor connection
	The motor connection and encoder connection are wrong	Check the sequence of encoder connection
	The voltage is too high or too low	Check the power supply
The position or speed is wrong	The signal is disturbed	Eliminate interference for reliable grounding
	The command input is incorrect	Check the upper computer instructions to ensure the output is correct
	The setting of Pulse per revolution is wrong	Check the DIP switch status and correctly connect the switches
	Encoder signal is abnormal	Replace the motor and contact the manufacturer
The driver terminal burned up	Short circuit between terminals	Check power polarity or external short circuit
	Internal resistance between terminals is too large	Check whether there is any solder ball due to excessive addition of solder on the wire connections
The motor is out of tolerance	Acceleration and deceleration time is too short	Reduce command acceleration or increase driver filtering parameters
	Motor torque is too low	Select the motor with high torque
	The load is too heavy	Check the load weight and quality and adjust the mechanical structure
	The current of power supply is too low	Replace the appropriate power supply

Appendix A. Guarantee Clause

A.1 Warranty period: 12 months

We provide quality assurance for one year from the date of delivery and free maintenance service for our products during the warranty period.

A.2 Exclude the following:

■ Improper connection, such as the polarity of the power supply is reversed and insert/pull the motor connection when the power supply is connected.

■ Beyond electrical and environmental requirements.

■ Change the internal device without permission.

A.3 Maintenance process

For maintenance of products, please follow the procedures shown below:

(1) Contact our customer service staff to get the rework permission.

(2) The written document of the driver failure phenomenon is attached to the goods, as well as the contact information and mailing methods of the sender.

Mailing address:

Post code:

Tel.:

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