



5-Phase Stepping Motor Unit

# CSK Series

- Standard Type
- TH Geared Type

# OPERATING MANUAL

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with EMC directive	

Thank you for purchasing an Oriental Motor product.

This Operating Manual describes product handling procedures and safety precautions.

- Please read it thoroughly to ensure safe operation.
- Always keep the manual where it is readily available.

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# Introduction

This product is designed to be incorporated into general industrial machinery, and must not be used for other purposes.

The driver power supply to be used should be a DC power supply where the primary and secondary sides are provided with reinforced insulation.

It should be noted that we are not responsible for any damages caused by ignoring this warning.

## For EC directives

If correspondence between the European low voltage directive and EMC directive is required, take the following steps:

### ■ For Low voltage directive

Since this product is based on 24VDC power input, it is outside the application scope of low voltage directive, but install and connect this product as follows.

- Install this product in the equipment built-in type enclosure.
- The driver power supply to be used should be a DC power supply where the primary and secondary sides are provided with reinforced insulation.

### ■ For EMC directive

Users should confirm the compliance of their equipment using this product with EMC directives by themselves.

### ■ Applicable standards (Recognized by UL for CSA standards)

	Applicable standards	Certification body	Standard file No.
Stepping motor	UL1004, UL519	UL	File No. E64199
	CSA C22.2 No.77 CSA C22.2 No.100		
Driver	UL508C	UL	File No. E171462
	CSA C22.2 No.14		
	UL1950	UL	File No. E208200
	CSA C22.2 No.950		

- Approval conditions for UL1950: Class III equipment, SELV circuit, Pollution degree 2
- PK54□ type does not comply with CSA standards.
- CSD5828N-T and PK59□ types are not recognized by UL.

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# Safety precautions

Only qualified personnel should work with the product.

Use the product correctly after thoroughly reading the section “Safety precautions.”

The precautions described below are intended to prevent danger or injury to the user and other personnel through safe, correct use of the product. Use the product only after carefully reading and fully understanding these instructions.

## **Warning**

Handling the product without observing the instructions that accompany a “Warning” symbol may result in serious injury or death.

## **Caution**

Handling the product without observing the instructions that accompany a “Caution” symbol may result in injury or property damage.

## **Note**

The items under this heading contain important handling instructions that the user should observe to ensure safe use of the product.

## **Warning**

### **General**

- Do not use the product in explosive or corrosive environments, in the presence of flammable gases, locations subjected to splashing water, or near combustibles. Doing so may result in fire or injury.
- Assign qualified personnel the task of installing, wiring, operating/controlling, inspecting and troubleshooting the product. Failure to do so may result in fire or injury.

### **Installation**

- Install the motor and driver in their enclosures in order to prevent injury.

### **Connection**

- Keep the driver’s input-power voltage within the specified range to avoid fire.
- The driver power supply to be used should be a DC power supply where the primary and secondary sides are provided with reinforced insulation. Otherwise, an electric shock may occur.
- Connect the cables securely according to the wiring diagram in order to prevent fire.
- Do not forcibly bend, pull or pinch the cable. Doing so may fire.

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## **Operation**

- Turn off the driver power in the event of a power failure, or the motor may suddenly start when the power is restored and may cause injury or damage to equipment.
- When you want to use the motor in a vertical application, take position holding measures. When the power is turned off, the motor will lose the holding brake force. The movable part will drop and possibly cause injury to personal and damage to the equipment.
- Do not turn the output current off input to “ON” while the motor is operating. The motor will stop and lose its holding ability, which may result in injury or damage to equipment.

## **Repair, disassembly and modification**

- Do not disassemble or modify the motor or driver. This may cause injury. Refer all such internal inspections and repairs to the branch or sales office from which you purchased the product.

## **Caution**

### **General**

- Do not use the motor and driver beyond their specifications, or injury or damage to equipment may result.
- Do not touch the motor or driver during operation or immediately after stopping. The surfaces are hot and may cause a burn.

### **Transportation**

- Do not hold the motor output shaft or motor cable. This may cause injury.

### **Installation**

- Keep the area around the motor and driver free of combustible materials in order to prevent fire or a burn.
- To prevent the risk of damage to equipment, leave nothing around the motor and driver that would obstruct ventilation.
- The motor and driver should be firmly secured on the metallic plate in order to prevent personal injury or equipment damage.
- Provide a cover over the rotating parts (output shaft) of the motor to prevent injury.

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## **Operation**

- Use a motor and driver only in the specified combination. An incorrect combination may cause a fire.
- To avoid injury, remain alert during operation so that the motor can be stopped immediately in an emergency.
- Before supplying power to the driver, turn all control inputs to the driver to “OFF.” Otherwise, the motor may start suddenly and cause injury or damage to equipment.
- Make sure that the output power off input of the driver is turned on if you want to move the motor shaft directly (e.g. for manual positioning). This caution is to prevent personal injury.
- When an abnormality is noted, stop the operation immediately, or fire or injury may occur.

## **Disposal**

- When disposing of the motor or driver, treat them as ordinary industrial waste.

# Components

## ■ Standard type

Unit model		Motor model		Driver model
Single shaft	Double shaft	Single shaft	Double shaft	
<b>CSK543-NATA</b>	<b>CSK543-NBTA</b>	PK543NAWA	PK543NBWA	CSD5807N-T
<b>CSK544-NATA</b>	<b>CSK544-NBTA</b>	PK544NAWA	PK544NBWA	
<b>CSK545-NATA</b>	<b>CSK545-NBTA</b>	PK545NAWA	PK545NBWA	
<b>CSK564-NATA</b>	<b>CSK564-NBTA</b>	PK564NAWA	PK564NBWA	CSD5814N-T
<b>CSK566-NATA</b>	<b>CSK566-NBTA</b>	PK566NAWA	PK566NBWA	
<b>CSK569-NATA</b>	<b>CSK569-NBTA</b>	PK569NAWA	PK569NBWA	
<b>CSK596-NATA</b>	<b>CSK596-NBTA</b>	PK596-NAA	PK596-NBA	CSD5828N-T
<b>CSK599-NATA</b>	<b>CSK599-NBTA</b>	PK599-NAA	PK599-NBA	
<b>CSK5913-NATA</b>	<b>CSK5913-NBTA</b>	PK5913-NAA	PK5913-NBA	

- Operating manual

## ■ TH geared type

Unit model		Motor model		Driver model
Single shaft	Double shaft	Single shaft	Double shaft	
<b>CSK543AA-TG3.6</b>	<b>CSK543BA-TG3.6</b>	PK543NAWA-T3.6	PK543NBWA-T3.6	CSD5807N-T
<b>CSK543AA-TG7.2</b>	<b>CSK543BA-TG7.2</b>	PK543NAWA-T7.2	PK543NBWA-T7.2	
<b>CSK543AA-TG10</b>	<b>CSK543BA-TG10</b>	PK543NAWA-T10	PK543NBWA-T10	
<b>CSK543AA-TG20</b>	<b>CSK543BA-TG20</b>	PK543NAWA-T20	PK543NBWA-T20	
<b>CSK543AA-TG30</b>	<b>CSK543BA-TG30</b>	PK543NAWA-T30	PK543NBWA-T30	
<b>CSK564AA-TG3.6</b>	<b>CSK564BA-TG3.6</b>	PK564NAWA-T3.6	PK564NBWA-T3.6	CSD5814N-T
<b>CSK564AA-TG7.2</b>	<b>CSK564BA-TG7.2</b>	PK564NAWA-T7.2	PK564NBWA-T7.2	
<b>CSK564AA-TG10</b>	<b>CSK564BA-TG10</b>	PK564NAWA-T10	PK564NBWA-T10	
<b>CSK564AA-TG20</b>	<b>CSK564BA-TG20</b>	PK564NAWA-T20	PK564NBWA-T20	
<b>CSK564AA-TG30</b>	<b>CSK564BA-TG30</b>	PK564NAWA-T30	PK564NBWA-T30	

- Motor mounting screws
  - CSK543:** 4-No.8-32UNC. length 0.39in. (10mm) 4pc.
  - CSK564:** 4-No.8-32UNC. length 0.71in. (18mm) 4pc.
- Operating manual

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# Operating precautions

## (1) Heat generation

- Under some operating conditions, the motor and driver can generate intense heat. Use the product so that the temperature, when it is mounted in a unit does not exceed 212°F (100°C) for the motor case and 176°F (80°C) [CSD5828N-T: 194°F (90°C)] for the driver heat sink.
- \*Motor and driver temperature can be lowered by improving operating conditions such as the operating current, current at motor standstill, speed, duty cycle, etc. The driver should be installed on a thermally conductive metal plate or have forced-air cooling.

## (2) Motor/driver combinations

- Do not use the motor/driver assembly you have purchased in other combinations.

## (3) Handling the motor

- Never disassemble the motor or loosen the screws. Once the motor has been disassembled or the installation screws loosened, performance drops markedly.
- The surface temperature of the motor and driver is extremely high while the power is turned on and immediately after the power is turned off, so be sure not to touch them.

## (4) Turning the power on

- Repeatedly turning the power on and off rapidly can damage the driver. Wait two to three minutes after turning the power off before turning it back on again. To temporarily free the motor output shaft, use the all windings off function.

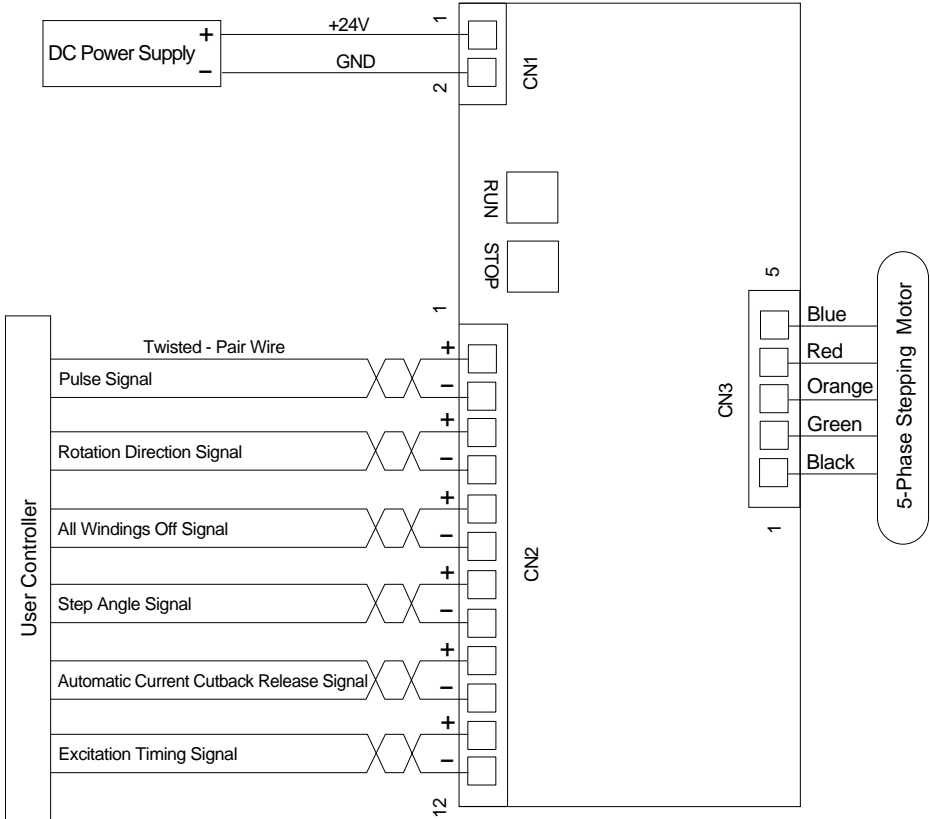
# Connections

## (1) Connection diagram

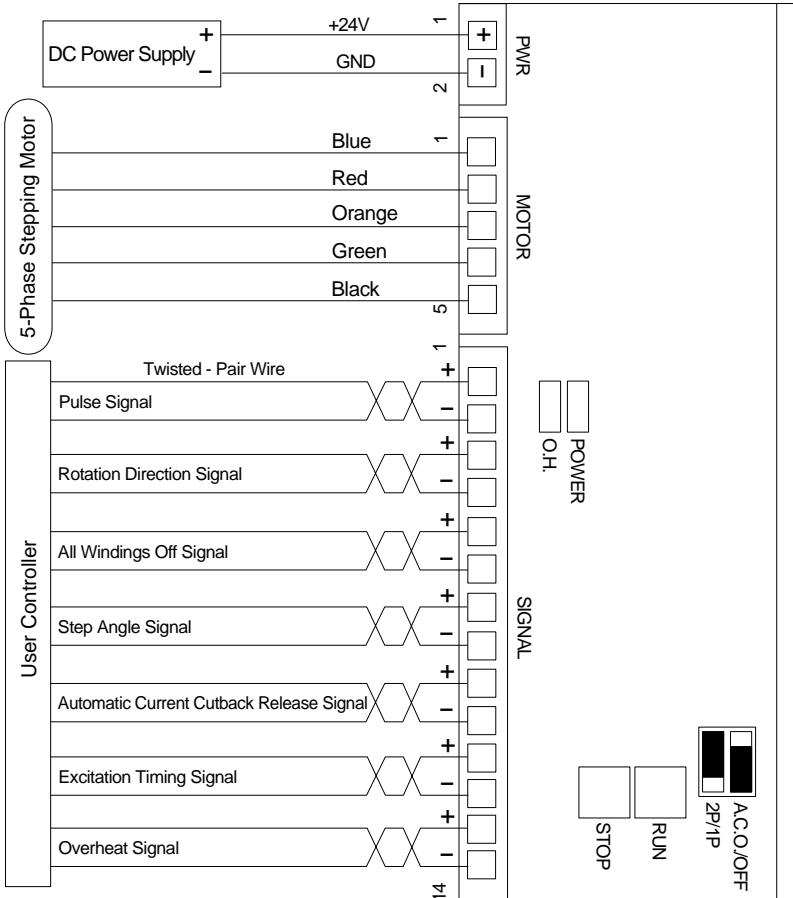
CSK54□ type

CSK56□ type

CSD5807N-T, CSD5814N-T







**Connections to the terminal block**

- Use electrical wire of AWG18 or less. Use AWG18 ~ AWG20 for the power supply line.
- Remove 0.2in. (5.5mm) of the insulation from the end of the lead wires before connecting them. Removing more than the recommended insulation may cause shorting of neighboring leads.

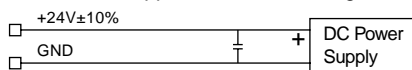
**Precautions on connection**

- Use twisted-pair wire for signal lines and keep them as short as possible.
- Signal lines should be kept away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.
- If noise generated by the motor lead wires causes problems, try shielding the motor lead wires with conductive tape or wire mesh.

**Before turning on the power**

- Always check the polarity of the power line (arranged +, - left to right as seen facing the terminal block).

**Note:** For operations involving sudden deceleration or the driving of large inertial loads, connect a capacitor of 1,000μF or more to suppress the motor's regenerative voltage.



## (2) Power and signal inputs

CSK54□ type

CSK56□ type

Terminal	Name of signals		Functions	Electrical characteristics
CN1	+ 24V	Power Input	<ul style="list-style-type: none"> <li>Connect + and GND wires of 24VDC.</li> </ul>	24V±10% <b>CSK54□</b> : 1.3A maximum <b>CSK56□</b> : 2.1A maximum
	GND			
CN2	PULSE +	Pulse Signal	<ul style="list-style-type: none"> <li>The motor rotates one step on falling edge of positive logic pulse input. The direction of rotation depends on the input of rotation direction input explained below.</li> </ul>	Photocoupler OFF: 0 ~ 0.5V Photocoupler ON: 4 ~ 5V Pulse width: 5μs minimum Pulse rise/pulse fall time: 2μs maximum Pulse duty: 50% maximum Input impedance: 220Ω Input current: 20mA maximum
	PULSE -			
	DIR. +	Rotation Direction Signal	<ul style="list-style-type: none"> <li>Photocoupler ON: CW</li> <li>Photocoupler OFF: CCW</li> </ul>	
	DIR. -			
	A.W.OFF +	All Windings Off Signal	<ul style="list-style-type: none"> <li>When at “photocoupler is ON”, the current to the motor stops, allowing the motor shaft to be rotated by hand.</li> </ul>	
	A.W.OFF -			
	FULL/HALF+	Step Angle Signal	<ul style="list-style-type: none"> <li>Photocoupler ON: HALF Step</li> <li>Photocoupler OFF: FULL Step</li> </ul>	
	FULL/HALF-			
	C.D.INH +	Automatic Current Cutback Release Signal	<ul style="list-style-type: none"> <li>Photocoupler ON: Automatic Current Cutback Release</li> </ul>	
	C.D.INH -			
TIMING +	Excitation Timing Signal	<ul style="list-style-type: none"> <li>A signal is output whenever the motor excitation sequence returns to step “0” in synchronization with the input pulse signal (output transistor is ON).</li> <li>A signal is output every 10 pulses in full step mode and every 20 pulses in half step mode.</li> </ul>	24VDC maximum 10mA maximum Photocoupler, open-collector output	
TIMING -				

In this operating manual, **CSK54□** indicates that motor frame size is 1.65in. (42mm) sq. and **CSK56□** indicates that it is 2.36in. (60mm) sq.

**CSK59□ type**

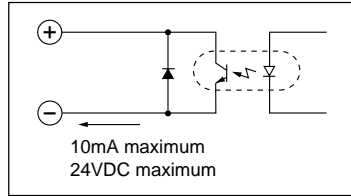
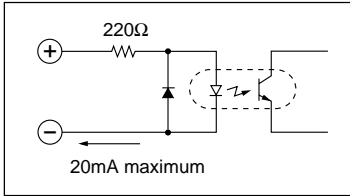
Terminal	Name of signals		Functions	Electrical characteristics
CN1	+ 24V	Power Input	<ul style="list-style-type: none"> <li>Connect + and GND wires of 24VDC.</li> </ul>	4A maximum
	GND			
CN3	PULSE +	Pulse Signal	<ul style="list-style-type: none"> <li>The motor rotates one step on falling edge of positive logic pulse input. The direction of rotation depends on the input of rotation direction input explained below.</li> </ul>	Photocoupler OFF: 0 ~ 0.5V Photocoupler ON: 4 ~ 5V Pulse width: 5μs minimum Pulse rise/pulse fall time: 2μs maximum Pulse duty: 50% maximum Input impedance: 220Ω Input current: 20mA maximum
	PULSE -			
	DIR. +	Rotation Direction Signal	<ul style="list-style-type: none"> <li>Photocoupler ON: CW</li> <li>Photocoupler OFF: CCW</li> </ul>	
	DIR. -			
	A.W.OFF +	All Windings Off Signal	<ul style="list-style-type: none"> <li>When at “photocoupler is ON”, the current to the motor stops, allowing the motor shaft to be rotated by hand.</li> </ul>	
	A.W.OFF -			
	FULL/HALF+	Step Angle Signal	<ul style="list-style-type: none"> <li>Photocoupler ON: HALF Step</li> <li>Photocoupler OFF: FULL Step</li> </ul>	
	FULL/HALF-			
	C.D.INH +	Automatic Current Cutback Release Signal	<ul style="list-style-type: none"> <li>Photocoupler ON: Automatic Current Cutback Release</li> </ul>	
	C.D.INH -			
TIMING +	Excitation Timing Signal	<ul style="list-style-type: none"> <li>A signal is output whenever the motor excitation sequence returns to step “0” in synchronization with the input pulse signal (output transistor is ON).</li> <li>A signal is output every 10 pulses in full step mode and every 20 pulses in half step mode.</li> </ul>	24VDC maximum 10mA maximum Photocoupler, open-collector output	
TIMING -				
O.H. +	Overheat Signal	<ul style="list-style-type: none"> <li>A signal is output when the driver’s radiation plate exceeds 194°F (90°C).</li> </ul>		
O.H. -				

# Input/output signals

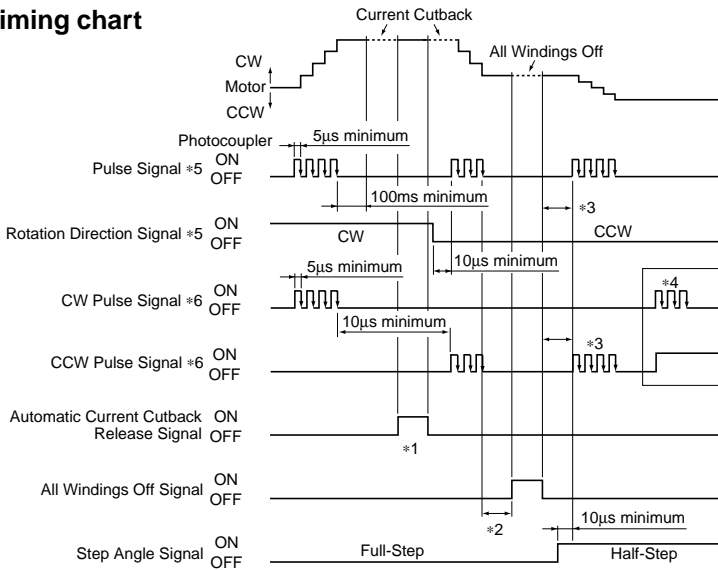
## (1) Input/output signal circuit

Pulse Input  
 Rotation Direction Pulse Input  
 All Windings Off Input  
 Full/Half Step Input  
 Automatic Current Cutback Release

Excitation Timing Output  
 Overheat Output (CSD5828N-T only)



## (2) Timing chart



- \*1: When the signal is in the "photocoupler ON" state, the "Automatic Current Cutback" function is deactivated. Always set it in the "photocoupler OFF" state when the pulse signal is stopped.
- \*2: It is recommended to wait a period of time to allow the motor oscillations to end before inputting the "All Windings Off" signal. This time varies with the load inertia, the load torque and the starting pulse rate, etc. The signal input must be stopped before the motor stops.
- \*3: Do not input pulse signals immediately after switching the "All Windings Off" signal into the "photocoupler OFF" state, as this will affect the motor's start-up characteristics. Ordinarily, the interval should be around 100ms.
- \*4: The motor will not operate properly when inputting a pulse signal while either the CW or CCW pulse is in the "photocoupler ON" state.
- \*5: When the 1-pulse input mode is selected
- \*6: When the 2-pulse input mode is selected

# Adjusting the driver output current

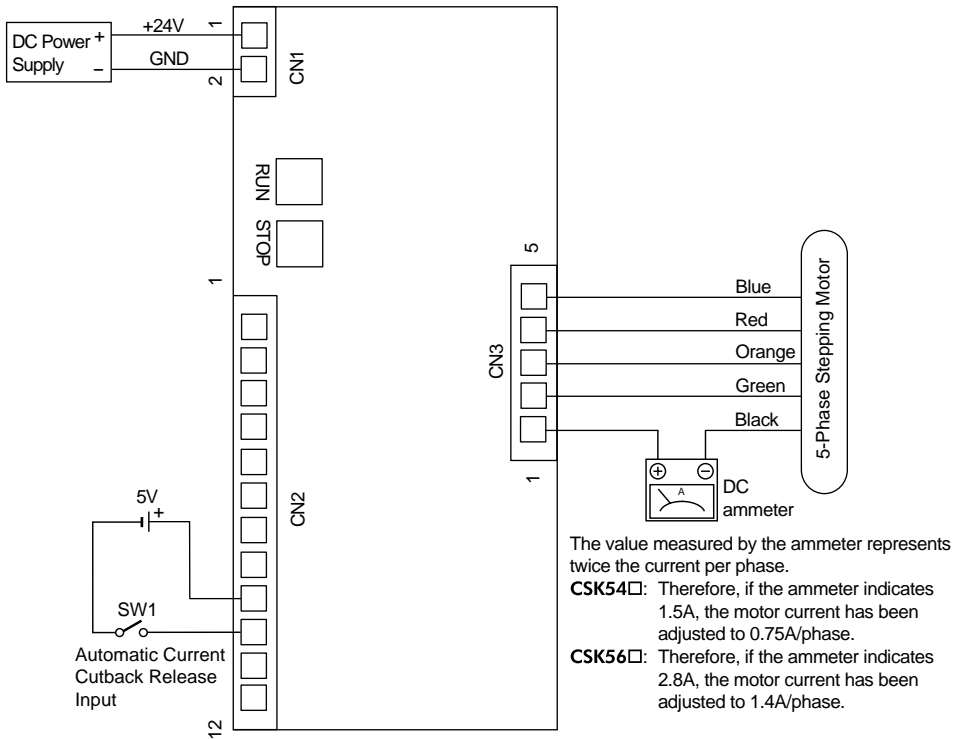
The output current to the motor is adjusted at the time of shipping to match the motor used, so the driver can be used straight from the box.

Procedures for lowering the output current to reduce the heat generation and vibration are described below.

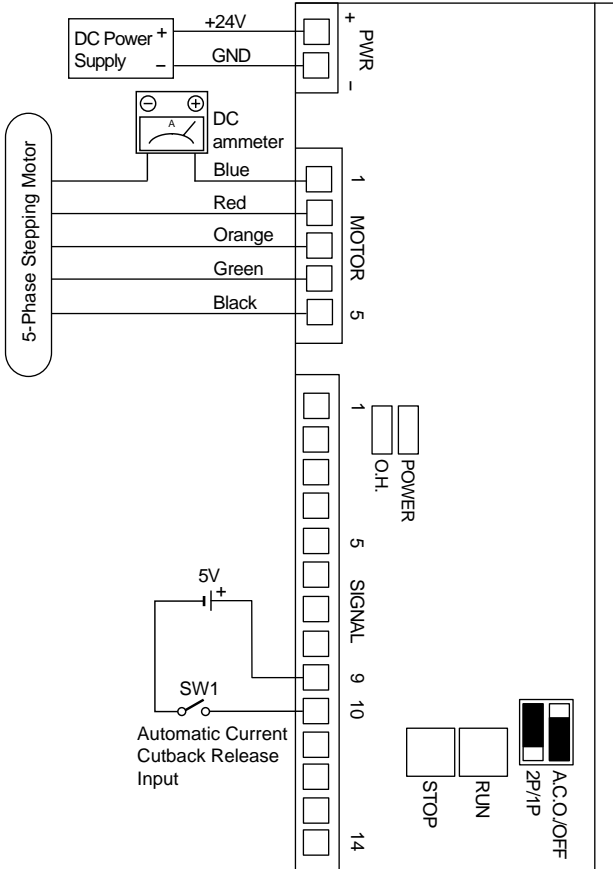
## (1) Connections

CSD5807N-T

CSD5814N-T

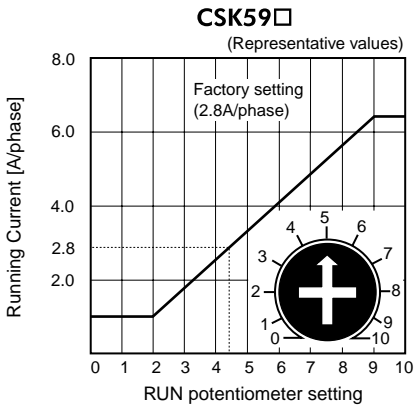
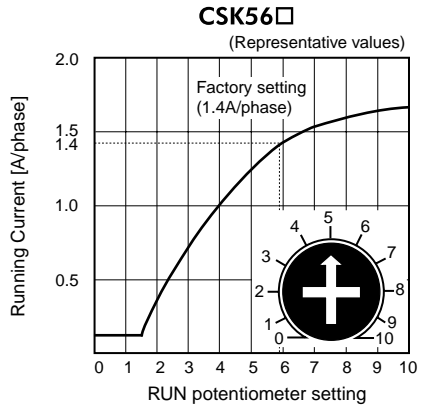
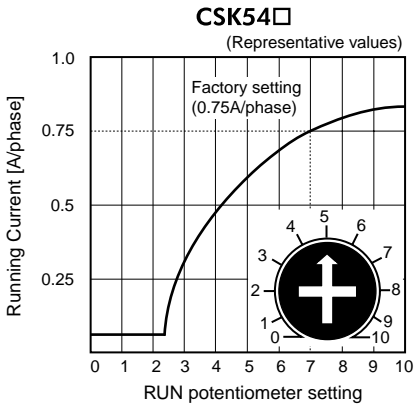


CSD5828N-T



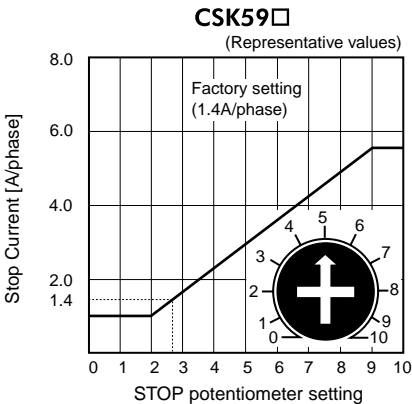
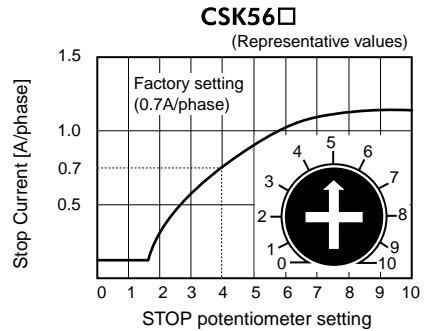
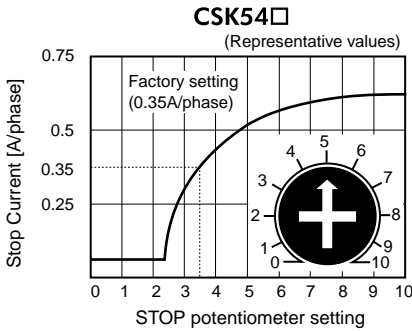
The value measured by the ammeter represents twice the current per phase.

## (2) Adjusting the running current



1. Turn on SW1 to disable the automatic current cutback at standstill function.
2. Do not input any other signal, (A.W.OFF, PULSE, DIR., etc.)
3. After hooking-up the motor and ammeter to the driver as shown in the figure above, apply 24VDC.
4. Set the run current value by adjusting the RUN potentiometer.  
Turning the RUN potentiometer counterclockwise reduces the operating current.  
Use the driver within the rated current. Failure to do so may damage the driver.

### (3) Adjusting the stop current



1. After hooking-up the motor and ammeter to the driver as shown in the figure, apply 24VDC.
2. Turn off SW1 to enable the automatic current cutback function.
3. Set the stop current value by adjusting the STOP potentiometer.
4. The STOP current has been adjusted at the factory to 50% of the run current.

**Note:** The current should be adjusted when the driver is not receiving any other input signals. The current value is changed with each input of a pulse.



# Installation

## (1) Precautions on installation

Install motors and drivers in places that meet following conditions.

- Install motors on good heat-conducting metal plates such as steel or aluminum, etc.
- Free from dust, oil mist, salt or corrosive gas.
- Free from excessive vibration or shock.
- Leave at least 0.98in. (25mm) of open space between each side of the driver and any other apparatus or structures.
- In cases where the drivers are located close to large electrical noise sources such as high voltage lines, high voltage machines or power units, etc., take steps to prevent noise interference, either by inserting noise filters or connecting the driver to a separate circuit.
- Good ventilation
- Forced cooling by a cooling fan or attaching the heat sink of the driver to a good heat conducting metal plate is recommended when the temperature of driver heat sink exceeds 176°F (80°C). [CSD5828N-T: 194°F (90°C)]
- Ambient temperature is +32°F ~ +104°F (0°C ~ +40°C).
- Take care that pieces of conductive material (metal filings or pins, etc.) do not enter the driver.

## (2) Installing the motor

### ■ How to install the motor

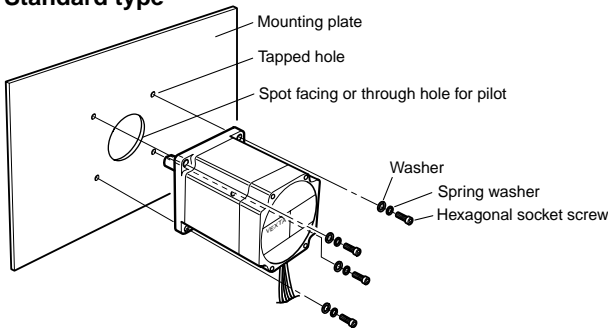
Install the motor onto an appropriate flat metal plate having excellent vibration resistance and heat conductivity.

When installing the motor, secure it with four bolts (not supplied) through the four mounting holes provided.

Leave no gap between the motor and plate.

Optional motor mounting brackets are available (sold separately).

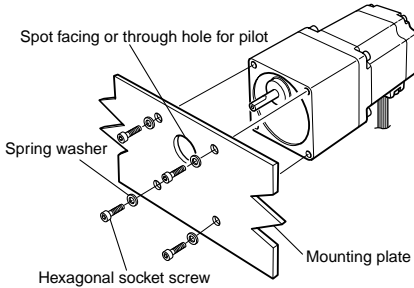
### Standard type



Frame size	Bolt size	Tightening torque
1.65in. (42mm)	M3	142oz-in (1N·m)
2.36in. (60mm)	M4	284oz-in (2N·m)
3.35in. (85mm)	M5	426oz-in (3N·m)

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## TH geared type



Frame size	Bolt size	Tightening torque
1.65in. (42mm)	M3	142oz-in (1N·m)
2.36in. (60mm)	M4	284oz-in (2N·m)

### (3) Installing a load

When connecting a load to the motor, align the centers of the motor's output shaft and load shaft.

#### ■ Coupling

Align the centers of the motor's output shaft and load shaft in a straight line.

#### ■ Using a belt drive

Align the motor's output shaft and load shaft parallel with each other, and position both pulleys so that the line connecting their centers is at a right angle to the shafts.

#### ■ Using a gear drive

Align the motor's output shaft and gear shaft parallel with each other, and let the gears mesh at the center of the tooth widths.

#### Note

- When coupling the load to the motor, pay attention to the centering of the shafts, belt tension, parallelism of the pulleys, and so on.  
Securely tighten the coupling and pulley set screws.
- Be careful not to damage the output shaft or the bearings when installing a coupling or pulley to the motor's output shaft.
- Do not modify or machine the motor's output shaft.  
Doing so may damage the bearings and destroy the motor.

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#### (4) Overhung load and thrust load

The overhung load on the motor's output shaft or gear output shaft must be kept within the permissible values listed below. The thrust load must not exceed the motor's mass.

Unit type	Distance from the tip of motor's output shaft [inch (mm)]				
	(0) 0	0.2 (5)	0.39 (10)	0.59 (15)	0.79 (20)
<b>CSK54</b> □ type	4.5lb. (20N)	5.6lb. (25N)	7.6lb. (34N)	11lb. (52N)	-
<b>CSK56</b> □ type	14lb. (63N)	17lb. (75N)	21lb. (95N)	29lb. (130N)	43lb. (190N)
<b>CSK59</b> □ type	59lb. (260N)	65lb. (290N)	77lb. (340N)	88lb. (390N)	108lb. (480N)

**Note:** Failure due to fatigue may occur if the motor's bearings and output shaft are subject to repeated loading by an overhung or thrust load that is in excess of the permissible limit.

## (5) Installing the driver

### ■ How to install the driver

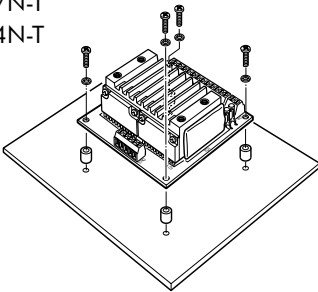
Install the driver on a flat metal plate having excellent vibration resistance and heat conductivity. When installing the driver in the device, mount it vertically or horizontally. Installing the driver under conditions other than this could reduce its heat radiation effect. The items shown below are necessary in order to mount the driver. (The items are not included and must be provided by the customer.)

The tightening torque of the mounting screw is 71oz-in (0.5N·m).

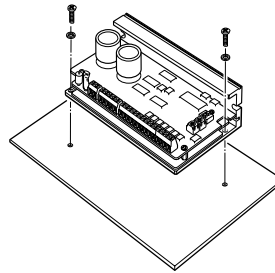
Driver model	CSD5807N-T CSD5814N-T	CSD5828N-T
M3 screws	4 pieces	2 pieces
M3 type spring washers	4 pieces	2 pieces
M3 type nuts (Not necessary if tapped holes are provided by the customer.)	4 pieces	2 pieces
Spacers [0.39in. (10mm) or more]	4 pieces	Unnecessary

### Horizontal installation

CSD5807N-T  
CSD5814N-T

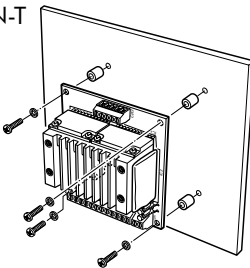


CSD5828N-T

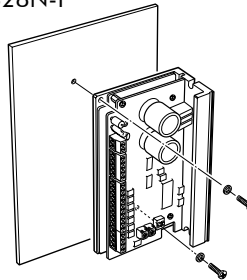


### Vertical installation

CSD5807N-T  
CSD5814N-T



CSD5828N-T



### Note

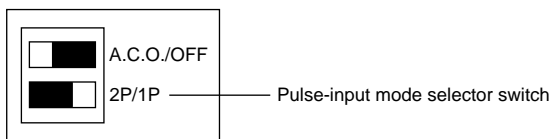
- Use mounting screws whose length does not exceed the mounting plate's thickness plus 5mm, since longer screws may contact the electronic components.
- The driver may generate a significant amount of heat, depending on the conditions of use.
- Install the CSD5828N-T on a metal plate having the following minimum dimensions, 4.3in. (110mm) × 4.3in. (110mm).

# Setting

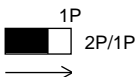
## ■ Pulse input modes

Either the 1-pulse or 2-pulse input mode may be selected in accordance with the controller used.

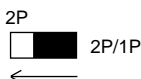
Factory setting [1P: 1-Pulse Input Mode]



- When the motor is to be controlled through the pulse signal and the rotating-direction signal that specifies the motor's direction of rotation, set the pulse-input mode selector switch to "1P."



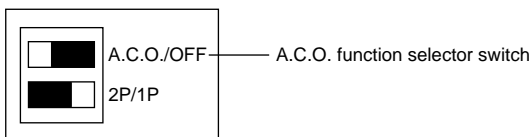
- When the motor is to be controlled through 2-pulse signal input via the CW pulse signal and CCW pulse signal, set the pulse-input mode selector switch to "2P."



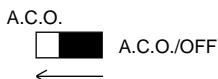
## ■ Automatic current off function

When the temperature of the driver's heat sink reaches 194°F (90°C), an overheat signal is automatically output and reduces the output current to the motor to zero.

Factory setting [A.C.O.: Automatic current off]



- To reduce the motor current to zero after an overheat signal, set the switch to the "A.C.O." position.



- To allow the motor to continue operating after an overheat signal, set the switch to the "OFF" position.



# Troubleshooting

Check the unit once again before requesting service.

When the stepping motor is not functioning properly, perform the following checks and take the following measures.

If the motor continues to malfunction, please call your nearest Oriental Motor Sales Office.

Problem	Check points	Measures
Motor is not energized. (The motor shaft rotates easily by hand.)	• Power Supply	• Check that the power is connected.
	• All Windings Off input	• When the all windings off input signal is "photocoupler ON", the motor ceases to be energized (has no holding torque).
	• Motor	• Check that the motor and driver are connected properly.
	• RUN and STOP potentiometers	• These potentiometers are used to adjust the output current to motor. (If they have been turned too far down, return them to their factory settings and then check the results.)
Motor does not rotate. Motor rotates in the opposite direction.	• Check the above points.	
	• Pulse input or direction Input	• Check the connections, voltage and waveform of pulse signals.
	• In 20:1 and 30:1 reduction gear ratio models, the gear output shaft rotates in the opposite direction to the motor shaft.	
Motor is not functioning properly.	• Check the above points.	
	• Are the motor and the load properly centered? Is the load too large?	• Re-tighten the coupling screws or check with the load disengaged.
Motor does not move far enough.	• Does the actual motor step angle conform with the motor step angle required by the device?	• Check the setting of the step angle switch on the driver.
	• Are the pulse generator settings for the input pulse number appropriate for the amount of motor movement?	• Check the settings.

Problem	Check points	Measures
The motor loses synchronism during acceleration (or during operation).	• Is the all windings off signal input?	• Disable the input
	• Is the starting pulse too high?	• Lower the rate and check the results.
	• Is the acceleration/ deceleration time too short?	• Lengthen the time and check the results.
	• Is there enough current capacity in the power supply?	• Change to a power supply with a capacity of 2.1A or more and recheck. (Then select the right power supply capacity.)
	• Is there any effect from external electrical noise?	• Check the motor movement independently, without operating any other apparatus which could be potential sources of noise.
There is excessive vibration.	• There may be excessive gearmotor output torque.	• Try reducing the motor running current.
	• Try changing the pulse rate.	• If the vibration is reduced after changing the pulse rate, the problem might lie in the resonance of the motor. Try changing the pulse rate or step angle.
The motor or the driver is excessively hot. [The temperature should be less than 212°F (100°C) at motor case and 185°F (85°C) at driver.]*	• The motor has been operating for too long.	• Shorten the motor operating time or lengthen its rest time.
	• Stop potentiometer setting is high.	• Lower the current setting at motor current cut back.
	• Is the stop potentiometer in the maximum position?	• Current cannot be lowered when this potentiometer is in MAX position. Turn this potentiometer to the left. (Adjust to the optimal value by making reference to page 16.)
The automatic current cutback function does not work.	• After conclusion of the pulse, is the pulse signal returned to photocoupler OFF?	• When the pulse signal is maintained at the "photocoupler ON", the current cannot be lowered. Be sure to return the pulse signal to the "photocoupler OFF".

\* For UL and CSA standards, insulation is Class A [221°F (105°C)].  
 Keep the temperature of the motor case below 167°F (75°C).  
 For other standards insulation is Class B [266°F (130°C)].  
 Keep the temperature of the motor case below 212°F (100°C).

# Specifications

## ■ Standard type

Unit Model		Single Shaft Double Shaft	<b>CSK543-NATA</b> <b>CSK543-NBTA</b>	<b>CSK544-NATA</b> <b>CSK544-NBTA</b>	<b>CSK545-NATA</b> <b>CSK545-NBTA</b>
Motor Unit	Motor Model	Single Shaft Double Shaft	PK543NAWA PK543NBWA	PK544NAWA PK544NBWA	PK545NAWA PK545NBWA
	Maximum Holding Torque	oz-in (N·m)	18 (0.13)	24.9 (0.18)	3.33 (0.24)
	Rotor Inertia	oz-in <sup>2</sup> (kg·m <sup>2</sup> )	0.192 (35 × 10 <sup>-7</sup> )	0.296 (54 × 10 <sup>-7</sup> )	0.372 (68 × 10 <sup>-7</sup> )
	Rated Current	A/phase	0.75		
	Mass	lb. (kg)	0.47 (0.21)	0.6 (0.27)	0.78 (0.35)
	Basic Step Angle	0.72°			
	Insulation Resistance	100MΩ or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500VDC.			
	Dielectric Strength	Under normal ambient temperature and humidity, sufficient to withstand 0.5kV at 50Hz applied between the windings and the frame for one minute following a period of continuous operation.			
	Insulation Class	Class B [266°F (130°C)] UL/CSA: Class A [221°F (105°C)]			
	Ambient Temperature	+14°F ~ +122°F (-10°C ~ +50°C)			
Driver Model	CSD5807N-T				
Power Source	24VDC±10% 1.3A maximum				
Output Current	0.75A/phase				
Excitation Mode	Full step: 0.72°/step (4 phase excitation) Half step: 0.36°/step (4-5 phase excitation)				
Driver Unit Input/Output Signals	Pulse Input	1-pulse input, Photocoupler input, Input impedance 220Ω, Input current 20mA maximum Pulse width 5μs minimum, Pulse rise/pulse fall time 2μs maximum, Pulse duty 50% maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V			
	All Windings Off Input	Photocoupler input Input impedance 220Ω, Input current 20mA maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V			
	Full/Half Step Input				
	Automatic Current Cutback Release Input				
	Excitation Timing Output	Photocoupler open collector output, 24VDC maximum, 10mA maximum			
Mass	lb. (kg)	0.31 (0.14)			
Ambient Temperature	+32°F ~ +104°F (0°C ~ +40°C)				

**Note:** The value given for holding torque is the value operated with rated current and 5 phase excitation.



Unit Model		Single Shaft Double Shaft	<b>CSK564-NATA</b> <b>CSK564-NBTA</b>	<b>CSK566-NATA</b> <b>CSK566-NBTA</b>	<b>CSK569-NATA</b> <b>CSK569-NBTA</b>
Motor Unit	Motor Model	Single Shaft Double Shaft	PK564NAWA PK564NBWA	PK566NAWA PK566NBWA	PK569NAWA PK569NBWA
	Maximum Holding Torque	oz-in (N-m)	58.3 (0.42)	115 (0.8)	230 (1.66)
	Rotor Inertia	oz-in <sup>2</sup> (kg-m <sup>2</sup> )	0.96 (175 × 10 <sup>-7</sup> )	1.53 (280 × 10 <sup>-7</sup> )	3.06 (560 × 10 <sup>-7</sup> )
	Rated Current	A/phase	1.4		
	Mass	lb. (kg)	1.33 (0.6)	1.77 (0.8)	2.87 (1.3)
	Basic Step Angle	0.72°			
	Insulation Resistance	100MΩ or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500VDC.			
	Dielectric Strength	Under normal ambient temperature and humidity, sufficient to withstand 1.0kV at 50Hz applied between the windings and the frame for one minute following a period of continuous operation.			
	Insulation Class	Class B [266°F (130°C)] UL/CSA: Class A [221°F (105°C)]			
	Ambient Temperature	+14°F ~ +122°F (-10°C ~ +50°C)			
Driver Model	CSD5814N-T				
Power Source	24VDC±10% 2.1A maximum				
Output Current	1.4A/phase				
Excitation Mode	Full step: 0.72°/step (4 phase excitation) Half step: 0.36°/step (4-5 phase excitation)				
Driver Unit Input/Output Signals	Pulse Input	1-pulse input, Photocoupler input, Input impedance 220Ω, Input current 20mA maximum Pulse width 5μs minimum, Pulse rise/pulse fall time 2μs maximum, Pulse duty 50% maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V			
	All Windings Off Input	Photocoupler input			
	Full/Half Step Input	Input impedance 220Ω, Input current 20mA maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V			
	Automatic Current Cutback Release Input	Photocoupler open collector output, 24VDC maximum, 10mA maximum			
	Excitation Timing Output	Photocoupler open collector output, 24VDC maximum, 10mA maximum			
Mass	lb. (kg)	0.31 (0.14)			
Ambient Temperature	+32°F ~ +104°F (0°C ~ +40°C)				

**Note:** The value given for holding torque is the value operated with rated current and 5 phase excitation.

Unit Model		Single Shaft Double Shaft	<b>CSK596-NATA</b> <b>CSK596-NBTA</b>	<b>CSK599-NATA</b> <b>CSK599-NBTA</b>	<b>CSK5913-NATA</b> <b>CSK5913-NBTA</b>	
Motor Unit	Motor Model	Single Shaft Double Shaft	PK596-NAA PK596-NBA	PK599-NAA PK599-NBA	PK5913-NAA PK5913-NBA	
	Maximum Holding Torque	oz-in (N-m)	291 (2.1)	569 (4.1)	874 (6.3)	
	Rotor Inertia	oz-in <sup>2</sup> (kg-m <sup>2</sup> )	7.66 (1400 × 10 <sup>-7</sup> )	14.8 (2700 × 10 <sup>-7</sup> )	21.9 (4000 × 10 <sup>-7</sup> )	
	Rated Current	A/phase	2.8			
	Mass	lb. (kg)	3.75 (1.7)	6.18 (2.8)	8.38 (3.8)	
	Basic Step Angle		0.72°			
	Insulation Resistance		100MΩ or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500VDC.			
	Dielectric Strength		Under normal ambient temperature and humidity, sufficient to withstand 1.0kV at 50Hz applied between the windings and the frame for one minute following a period of continuous operation.			
	Insulation Class		Class B [266°F (130°C)] UL/CSA: Class A [221°F (105°C)]			
	Ambient Temperature		+14°F ~ +122°F (-10°C ~ +50°C)			
Driver Unit	Driver Model		CSD5828N-T			
	Power Source		24VDC±10%			
	Output Current		2.8A/phase			
	Excitation Mode		Full step: 0.72°/step (4 phase excitation) Half step: 0.36°/step (4-5 phase excitation)			
	Input/Output Signals	Pulse Input		1-pulse input, Photocoupler input, Input impedance 220Ω, Input current 20mA maximum Pulse width 5μs minimum, Pulse rise/pulse fall time 2μs maximum, Pulse duty 50% maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V		
		All Windings Off Input		Photocoupler input		
		Full/Half Step Input		Input impedance 220Ω, Input current 20mA maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V		
		Automatic Current Cutback Release Input		Photocoupler open collector output, 24VDC maximum, 10mA maximum		
		Excitation Timing Output		Photocoupler open collector output, 24VDC maximum, 10mA maximum		
	Mass	lb. (kg)	0.56 (0.25)			
Ambient Temperature		+32°F ~ +104°F (0°C ~ +40°C)				

**Note:** The value given for holding torque is the value operated with rated current and 5 phase excitation.

## ■ TH geared type

Unit Model		Single Shaft	CSK543AA-TG3.6	CSK543AA-TG7.2	CSK543AA-TG10
		Double Shaft	CSK543BA-TG3.6	CSK543BA-TG7.2	CSK543BA-TG10
Motor Unit	Motor Model	Single Shaft	PK543NAWA-T3.6	PK543NAWA-T7.2	PK543NAWA-T10
		Double Shaft	PK543NBWA-T3.6	PK543NBWA-T7.2	PK543NBWA-T10
	Maximum Holding Torque	lb-in (N·m)	3.03 (0.35)	6.07 (0.7)	8.67 (1)
	Rotor Inertia	oz-in <sup>2</sup> (kg·m <sup>2</sup> )	0.192 (35 × 10 <sup>-7</sup> )		
	Rated Current	A/phase	0.75		
	Mass	lb. (kg)	0.73 (0.33)		
	Basic Step Angle		0.2°	0.1°	0.072°
	Permissible Torque	lb-in (N·m)	3.03 (0.35)	6.07 (0.7)	8.67 (1)
	Permissible Thrust Load	lb. (N)	3.3 (1.5)		
	Permissible Overhung Load	lb. (N)	4.4 (2.0)		
	Backlash	Minute	45 (0.75°)	25 (0.417°)	
	Insulation Resistance		100MΩ or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500VDC.		
	Dielectric Strength		Under normal ambient temperature and humidity, sufficient to withstand 0.5kV at 50Hz applied between the windings and the frame for one minute following a period of continuous operation.		
	Insulation Class		Class B [266°F (130°C)] UL/CSA: Class A [221°F (105°C)]		
	Ambient Temperature		+14°F ~ +122°F (-10°C ~ +50°C)		
	Driver Model		CSD5807N-T		
Power Source		24VDC±10% 1.3A maximum			
Output Current		0.75A/phase			
Excitation Mode		Full step: 0.72°/step (4 phase excitation) Half step: 0.36°/step (4-5 phase excitation)			
Driver Unit	Input/Output Signals	Pulse Input	1-pulse input, Photocoupler input, Input impedance 220Ω Input current 20mA maximum, Pulse width 5μs minimum Pulse rise/pulse fall time 2μs maximum, Pulse duty 50% maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V		
		All Windings Off Input	Photocoupler input		
		Full/Half Step Input	Input impedance 220Ω, Input current 20mA maximum		
		Automatic Current Cutback Release Input	Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V		
		Excitation Timing Output	Photocoupler open collector output, 24VDC maximum, 10mA maximum		
Mass	lb. (kg)	0.31 (0.14)			
Ambient Temperature		+32°F ~ +104°F (0°C ~ +40°C)			

**Note:** The value given for holding torque is the value operated with rated current and 5 phase excitation.

Unit Model		Single Shaft Double Shaft	<b>CSK543AA-TG20</b> <b>CSK543BA-TG20</b>	<b>CSK543AA-TG30</b> <b>CSK543BA-TG30</b>	
Motor Unit	Motor Model	Single Shaft Double Shaft	PK543NAWA-T20 PK543NBWA-T20	PK543NAWA-T30 PK543NBWA-T30	
	Maximum Holding Torque	lb-in (N·m)	13 (1.5)		
	Rotor Inertia	oz-in <sup>2</sup> (kg·m <sup>2</sup> )	0.192 (35 × 10 <sup>-7</sup> )		
	Rated Current	A/phase	0.75		
	Mass	lb. (kg)	0.73 (0.33)		
	Basic Step Angle		0.036°	0.024°	
	Permissible Torque	lb-in (N·m)	13 (1.5)		
	Permissible Thrust Load	lb. (N)	3.3 (1.5)		
	Permissible Overhung Load	lb. (N)	4.4 (2.0)		
	Backlash	Minute	15 (0.25°)		
	Insulation Resistance		100MΩ or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500VDC.		
	Dielectric Strength		Under normal ambient temperature and humidity, sufficient to withstand 0.5kV at 50Hz applied between the windings and the frame for one minute following a period of continuous operation.		
	Insulation Class		Class B [266°F (130°C)] UL/CSA: Class A [221°F (105°C)]		
	Ambient Temperature		+14°F ~ +122°F (-10°C ~ +50°C)		
	Driver Unit	Driver Model		CSD5807N-T	
		Power Source		24VDC±10% 1.3A maximum	
		Output Current		0.75A/phase	
Excitation Mode			Full step: 0.72°/step (4 phase excitation) Half step: 0.36°/step (4-5 phase excitation)		
Input/Output Signals		Pulse Input		1-pulse input, Photocoupler input, Input impedance 220Ω Input current 20mA maximum, Pulse width 5μs minimum Pulse rise/pulse fall time 2μs maximum, Pulse duty 50% maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V	
		All Windings Off Input		Photocoupler input	
		Full/Half Step Input		Input impedance 220Ω, Input current 20mA maximum	
		Automatic Current Cutback Release Input		Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V	
		Excitation Timing Output		Photocoupler open collector output, 24VDC maximum, 10mA maximum	
Mass		lb. (kg)	0.31 (0.14)		
Ambient Temperature		+32°F ~ +104°F (0°C ~ +40°C)			

**Note:** The value given for holding torque is the value operated with rated current and 5 phase excitation.

Unit Model		Single Shaft	<b>CSK564AA-TG3.6</b>	<b>CSK564AA-TG7.2</b>	<b>CSK564AA-TG10</b>	
		Double Shaft	<b>CSK564BA-TG3.6</b>	<b>CSK564BA-TG7.2</b>	<b>CSK564BA-TG10</b>	
Motor Unit	Motor Model	Single Shaft	PK564NAWA-T3.6	PK564NAWA-T7.2	PK564NAWA-T10	
		Double Shaft	PK564NBWA-T3.6	PK564NBWA-T7.2	PK564NBWA-T10	
	Maximum Holding Torque	lb-in (N·m)	10.8 (1.25)	21.6 (2.5)	26 (3)	
	Rotor Inertia	oz-in <sup>2</sup> (kg·m <sup>2</sup> )	0.96 (175 × 10 <sup>-7</sup> )			
	Rated Current	A/phase	1.4			
	Mass	lb. (kg)	2.1 (0.95)			
	Basic Step Angle		0.2°	0.1°	0.072°	
	Permissible Torque	lb-in (N·m)	10.8 (1.25)	21.6 (2.5)	26 (3)	
	Permissible Thrust Load	lb. (N)	8.81 (40)			
	Permissible Overhung Load	lb. (N)	22 (100)			
	Backlash	Minute	35 (0.584°)	15 (0.25°)		
	Insulation Resistance		100MΩ or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500VDC.			
	Dielectric Strength		Under normal ambient temperature and humidity, sufficient to withstand 0.5kV at 50Hz applied between the windings and the frame for one minute following a period of continuous operation.			
	Insulation Class		Class B [266°F (130°C)] UL/CSA: Class A [221°F (105°C)]			
	Ambient Temperature		+14°F ~ +122°F (-10°C ~ +50°C)			
	Driver Model		CSD5814N-T			
Power Source		24VDC±10% 2.1A maximum				
Output Current		1.4A/phase				
Excitation Mode		Full step: 0.72°/step (4 phase excitation) Half step: 0.36°/step (4-5 phase excitation)				
Driver Unit	Input/Output Signals	Pulse Input	1-pulse input, Photocoupler input, Input impedance 220Ω Input current 20mA maximum, Pulse width 5μs minimum Pulse rise/pulse fall time 2μs maximum, Pulse duty 50% maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V			
		All Windings Off Input	Photocoupler input			
		Full/Half Step Input	Input impedance 220Ω, Input current 20mA maximum			
		Automatic Current Cutback Release Input	Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V			
		Excitation Timing Output	Photocoupler open collector output, 24VDC maximum, 10mA maximum			
Mass	lb. (kg)	0.31 (0.14)				
Ambient Temperature		+32°F ~ +104°F (0°C ~ +40°C)				

**Note:** The value given for holding torque is the value operated with rated current and 5 phase excitation.

Unit Model		Single Shaft Double Shaft	<b>CSK564AA-TG20</b> <b>CSK564BA-TG20</b>	<b>CSK564AA-TG30</b> <b>CSK564BA-TG30</b>	
Motor Unit	Motor Model	Single Shaft Double Shaft	PK564NAWA-T20 PK564NBWA-T20	PK564NAWA-T30 PK564NBWA-T30	
	Maximum Holding Torque	lb-in (N·m)	30.3 (3.5)	34.7 (4)	
	Rotor Inertia	oz-in <sup>2</sup> (kg·m <sup>2</sup> )	0.96 (175 × 10 <sup>-7</sup> )		
	Rated Current	A/phase	1.4		
	Mass	lb. (kg)	2.1 (0.95)		
	Basic Step Angle		0.036°	0.024°	
	Permissible Torque	lb-in (N·m)	30.3 (3.5)	34.7 (4)	
	Permissible Thrust Load	lb. (N)	8.81 (40)		
	Permissible Overhung Load	lb. (N)	22 (100)		
	Backlash	Minute	10 (0.167°)		
	Insulation Resistance		100MΩ or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is 500VDC.		
	Dielectric Strength		Under normal ambient temperature and humidity, sufficient to withstand 0.5kV at 50Hz applied between the windings and the frame for one minute following a period of continuous operation.		
	Insulation Class		Class B [266°F (130°C)] UL/CSA: Class A [221°F (105°C)]		
	Ambient Temperature		+14°F ~ +122°F (-10°C ~ +50°C)		
	Driver Unit	Driver Model		CSD5814N-T	
		Power Source		24VDC±10%	2.1A maximum
Output Current			1.4A/phase		
Excitation Mode			Full step: 0.72°/step (4 phase excitation) Half step: 0.36°/step (4-5 phase excitation)		
Input/Output Signals		Pulse Input		1-pulse input, Photocoupler input, Input impedance 220Ω Input current 20mA maximum, Pulse width 5μs minimum Pulse rise/pulse fall time 2μs maximum, Pulse duty 50% maximum Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V	
		All Windings Off Input		Photocoupler input	
		Full/Half Step Input		Input impedance 220Ω, Input current 20mA maximum	
		Automatic Current Cutback Release Input		Photocoupler OFF: 0 ~ 0.5V, Photocoupler ON: 4 ~ 5V	
		Excitation Timing Output		Photocoupler open collector output, 24VDC maximum, 10mA maximum	
Mass		lb. (kg)	0.31 (0.14)		
Ambient Temperature		+32°F ~ +104°F (0°C ~ +40°C)			

**Note:** The value given for holding torque is the value operated with rated current and 5 phase excitation.

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# Installing and wiring in compliance with EMC directive

## (1) Introduction

### The EMC directive (89/336EEC and 92/31/EEC)

Stepping motors from ORIENTAL MOTOR are designed to be a built in component. The EMC directive requires that the customer's equipment incorporated with this product should comply with the EMC directive.

This product is in compliance with the EMC directive, provided the procedures specified in "Example of motor and driver installation and wiring" on page 32 are followed. Be sure to read this section before installing the motor in your equipment.

Final compliance of the equipment to the EMC directive varies according to the configuration, wiring, layout, and level of hazard of other control systems and electrical components used with the motor and driver.

This requires the customers to conduct the EMC measures of their equipment for verification.

### Applicable standards

#### ■ CSK54□ type, CSK56□ type

EMI	Emission Tests	EN50081-2: 1993
	Radiated Emission Test	EN55011: 1998
EMS	Immunity Tests	EN50082-2: 1995
	Radiation Field Immunity Test	EN61000-4-3: 1996 ENV50204: 1995
	Fast Transient/Burst Immunity Test	EN61000-4-4: 1995
	Conductive Noise Immunity Test	EN61000-4-6: 1996

#### ■ CSK59□ type

EMI	Emission Tests	EN50081-2: 1993
	Radiated Emission Test	EN55011: 1998
EMS	Immunity Tests	EN50082-2: 1995
	Radiation Field Immunity Test	EN61000-4-3: 1996 ENV50204: 1995
	Electro Static Discharge	EN61000-4-2: 1995/Amendment 1/1998
	Fast Transient/Burst Immunity Test	EN61000-4-4: 1995
	Conductive Noise Immunity Test	EN61000-4-6: 1996

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## (2) Installation and wiring procedures according to the EMC directive

It is essential to take effective measures against the EMI from this product to the peripheral control systems and the EMS of this product. Otherwise, a serious adverse effect may be given to the equipment functions.

The following installation and wiring procedures ensure compliance of this product to the EMC directive (applicable standards as specified on page 29).

### Power supply

These products use the DC power supply input specifications.

Use the optimum DC power supply (switched power supply or the like) that conforms with the EMC directive.

Also, when using a transformer for the power supply, always connect a mains filter on the input side of the transformer.

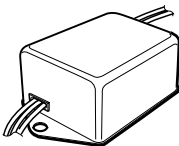
### Connection of mains filter for power line

To prevent the noise generated from the driver being transferred to the outside through the power supply transformer, connect a mains filter to the AC input line of the power supply transformer.

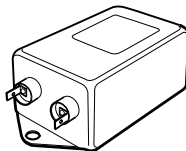
Use FN250-12/07 by Schaffner Electronik AG, 10ESK1 by CORCOM, ZAG2210-11S by TDK or their equivalent as the mains filter.

Install the mains filter as close as possible to the driver. Use cable clamps or similar tools to fix the input cable and output cable. The input cables and output cables to be firmly ensured that they will not be separated from the surface of the enclosure. Connect the grounding terminal of the mains filter to the grounding point in the shorter distance. Do not connect the AC input cable (AWG18: 0.75mm<sup>2</sup> or more) and mains filter output cables in parallel to each other. Otherwise, the noise in the enclosure may be connected directly with the power cable through the floating capacity. This may result in the effects reduced of the mains filter.

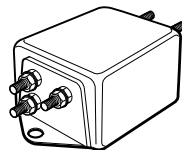
### ■ Mains filter



FN250-12/07 by Schaffner Electronik



10ESK1 by CORCOM



ZAG2210-11S by TDK

### Grounding method

To ensure that potential difference will not occur, connect the driver, motor and mains filter to the grounding point in the shorter distance by the use of a larger grounding cable. Use a large uniform conductive surface for the grounding point.



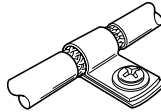
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## Connection of signal cable

High quality braided-screen cable of AWG24 (0.2mm<sup>2</sup>) or more should be used for signal cabling, and connect it to a controller in the shorter distance.

For some products, such braided-screen cable is available as an option. Please inquire at your nearest Oriental Motor sales office.

To earth the braided-screen, use such clamps as metallic cable clamps which can be in contact with the circumference of the braided-screen cable. Cable clamps on the braided-screen cable should be installed as close to the cable end as possible as per illustrated. On of the braided-screen cable, as illustrated. Connect the earth wire to the adequate grounding point.

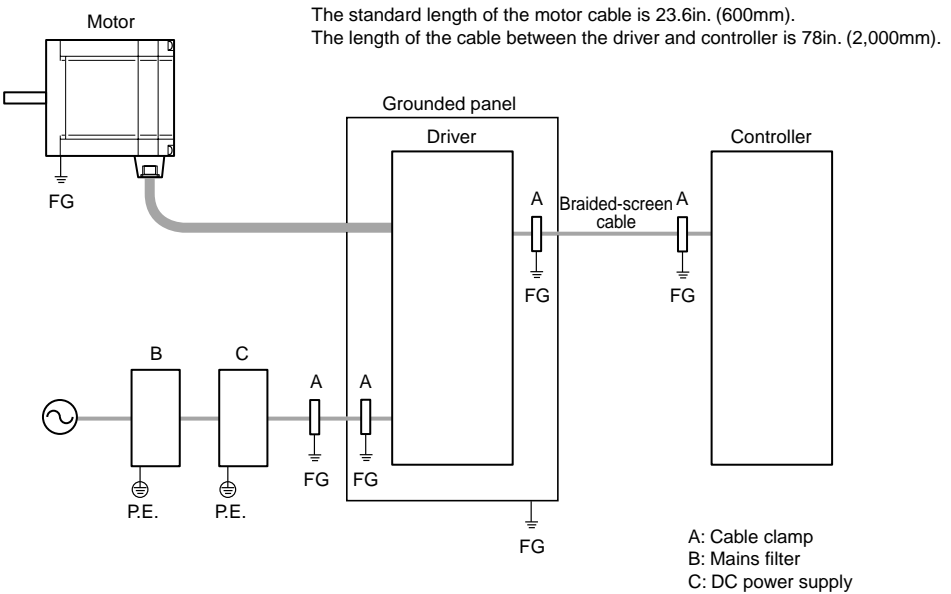


Cable clamp

## Others

- To ensure that potential difference will not occur between the motor/driver and peripheral control system equipment, earth the cable directly to the grounding point.
- When the relay and magnetic switch are used together, make sure that the surge is absorbed by the mains filter and CR circuit.
- The length of the cables should be as short as possible; do not use long cables with the excess portion wound in a bundle.
- Keep the power cables such as the motor cable and power cable away from the signal cables and connect them separately from each other as far as possible (For example, keep them 100 to 200mm apart from each other.). Signal cables should only cross the path of motor or power cables at right angle. The AC input cable and output cable of the mains filter should be kept away from each other.

### (3) Example of motor and driver installation and wiring



### (4) Precautions concerning static electricity

Static electricity can make the driver malfunction or destroy it. Handle the driver carefully when its power is on.

Always use an insulated screwdriver when adjusting the motor current with the driver's internal control (VR) or switch.

When using a driver mounted on the current check terminals, adjust the current in the following manner.

1. Switch off the driver power supply.
2. Insert the tester into the current check terminals.
3. Switch on the driver power supply.
4. Adjust the current by adjusting the internal control (VR) with an insulated screwdriver.
5. Switch off the driver power supply, then remove the tester.

**Note:** Do not approach or touch the driver with the power on.



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