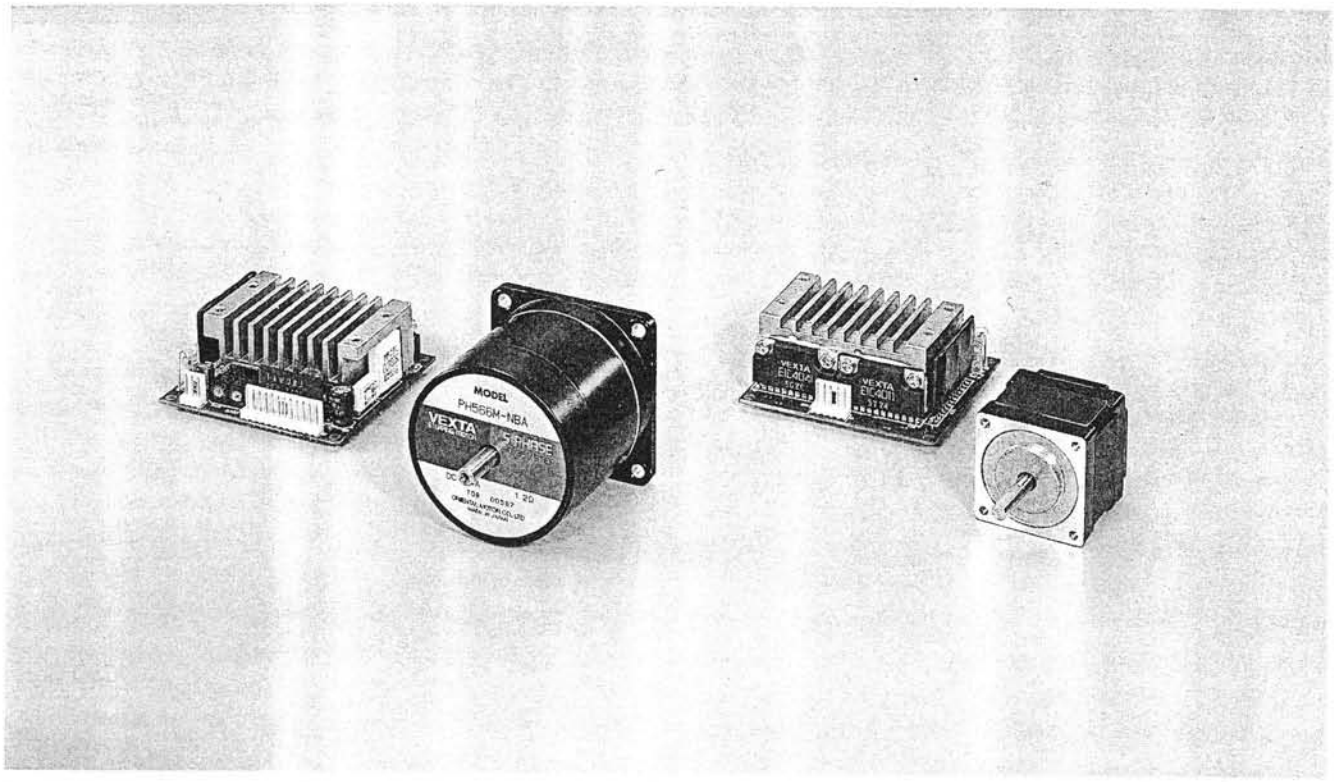
5-PHASE STEPPING MOTOR & DRIVER

CSD Series

PLC DIRECT | RE-GENERATION



1. High Resolution

The **CSD** High Resolution Version uses an M-Series 5-Phase step motor which has 100 teeth on the rotor and stator. This is double the standard 50 teeth and is what gives this version 1000 full-step mode and 2000 half-step mode steps per revolution.

By doubling the number of rotor and stator teeth, the number of steps per revolution is doubled.Because the high resolution is achieved mechanically instead of electrically, the accuracy, both loaded and unloaded, is doubled as well.

2. Exceptional Unloaded Accuracy

The **CSD** High Resolutlon versIon boasts improved accuracy because the high number of steps per revolution is created by doubling the number of rotor and stator teeth, instead of electrically by microstepping.Typical unloaded accuracy is better than ±2.7minutes (±0.045°).This is twice as accurate as other open loop step motor based solutions.

3. Ultra compact

Both the motor and driver are designed to be ultra-compact, making them perfect for reducing the size and weight of machines.

■ PRODUCTS NUMBER CODE

CSD 5 6 6 M - N □ P A

- A — USA Version
- P — Signal I/O P : photocoupler
- □ — Shaft Type A: Single Shaft, B: Double Shaft
- N — New Pentagon Drive
- M — M : High Resolution Type
- 6 — Motor Case Length
- 6 — Motor Frame Size 3: 38mm sq (1.50" sq), 6: 60mm sq (2.36" sq)
- 5 — 5-Phase
- CSD — 5-Phase Stepping Motor Unit **CSD** Series

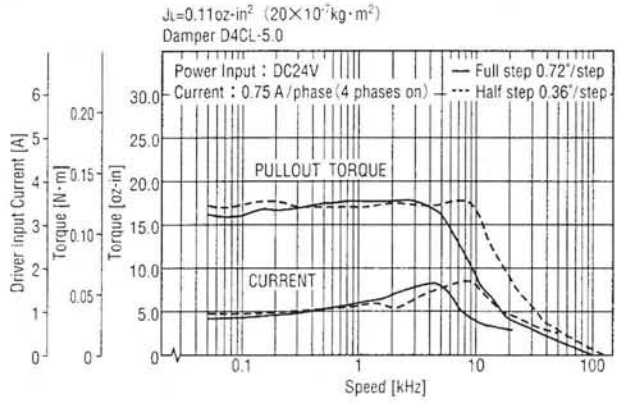
■ SPECIFICATIONS

Motor & Driver	Single Shaft / Double Shaft	CSD534M-NAPA / CSD534M-NBPA	CSD564M-NAPA / CSD564M-NBPA	CSD566M-NAPA / CSD566M-NBPA	CSD569M-NAPA / CSD569M-NBPA
Holding Torque	oz-in	13.8	22.2	48.6	95.8
	N · m	0.1	0.16	0.35	0.69
Rotor Inertia	oz-in^2	0.13	0.55	1.09	2.19
	kg · m^2	24×10^{-7}	100×10^{-7}	200×10^{-7}	400×10^{-7}
Rated Current	A/phase	0.75	1.4		
Step Angle		0.36°			
Insulation Class		Class B (266°F)			
Voltage		DC24V±10% 1.3A	DC24V±10% 2.1A		
Output Current	A/phase	0.75	1.4		
Excitation Mode		• Full Step (4 phase excitation): 0.36°/step • Half Step (4-5 phase excitation): 0.18°/step			
Input Signals — Input Signal Circuit		Photocoupler Input (optically isolated), Input Impedance: 220 ohm, Input Current 20mA max. H: 4~5V L: 0~0.5V Step Command Input			
Input Signals — • CW/CCW Pulse Input		Step Command Input:Motor moves one step for each pulse detected. Pulse width: 5 μ sec. minimum, Pulse rise/pulse fall time 2 μ sec.maximum, Motor moves at pulse rising edge. (Negative logic pulse input)			
Input Signals — • Direction-of-Rotation Input		Directional Input: A "High" signal causes the motor to rotate counter-clockwise for each pulse received at this terminal , A "Low" signal causes the motor to rotate clockwise.			
Input Signals — • Step-Angle Input		Full Step (0.36°) at H level Half Step (0.18°) at L level			
Input Signals — • Output-Current-OFF Input		At L level, the current to the motor is cut off and the shaft can be rotated by hand. At H level, the current set by RUN potentiometer is supplied to the motor.			
Input Signals — • Automatic-Current-Cutback Function		At L level, the Automatic-Current-Cutback at motor standstill function is disabled. At H level, the Automatic-Current-Cutback at motor standstill functionis activated. (approximately 100m sec. after motor motion stops)			
Output signals — Output Signal Circuit		Photocoupler, Open-Collector Output External use condition: 24V DC maximum, 10mA maximum			
Output signals — • Excitation-Timing Output		Signal is output every time the excitation sequence returns to step 0. (Photocoupler is ON) Full step: Signal is output every 10 pulses Half step: Signal is output every 20 pulses			
Functions		Automatic-Current-Cutback At Motor Standstill The output current is automatically reduced by 20%~75% approximately 100 m sec. after pulse rising edge.			
Driver Cooling Method		Natural Ventilation			
Weight	Motor lbs (kg)	0.48 (0.22)	1.11 (0.5)	1.65 (0.75)	2.87 (1.3)
	Driver lbs (kg)	0.29 (0.13)			
Insulation Resistance		100M ohm or more under normal ambient temperature and humidity when the megger reading between the windings and the frame is DC500V.			
Dielectric Strength		Under normal ambient temperature and humidity, sufficient to withstand 1.0kV at 60 Hz (.5kV for **CSD534** type) applied between the windings and the frame for one minute following a period of continuous operation.			
Ambient temperature	Motor	+14°F~+122°F			
	Driver	+32°F~+104°F			

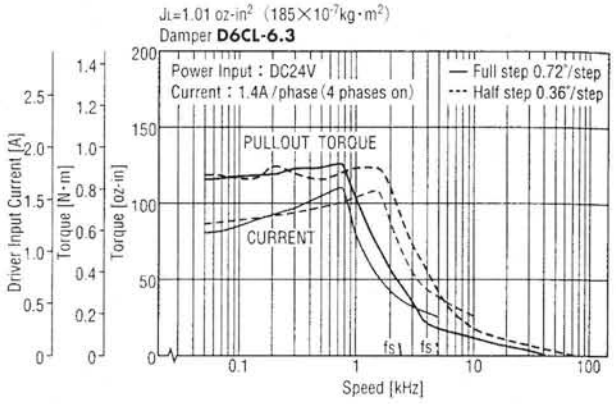
- The value given for holding torque is the value when operated with the dedicated driver with rated current and 5-phase excitation.
- Current indicated in voltage is the value for maximum input value when applying load to the motor.

SPEED vs. TORQUE CHARACTERISTICS

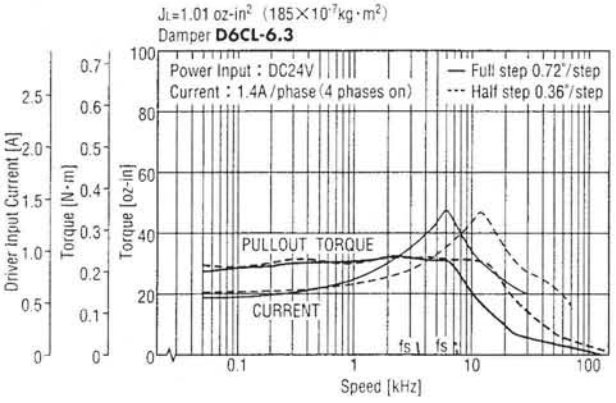
CSD534M-NBPA



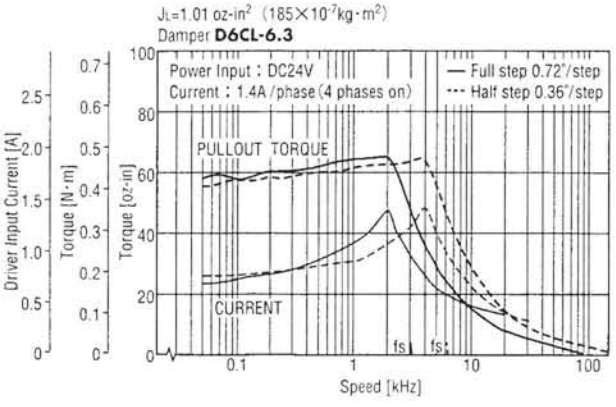
CSD569M-NBPA



CSD564M-NBPA



CSD566M-NBPA



Motor Accessories

Motor Mounting Brackets: Page B-234

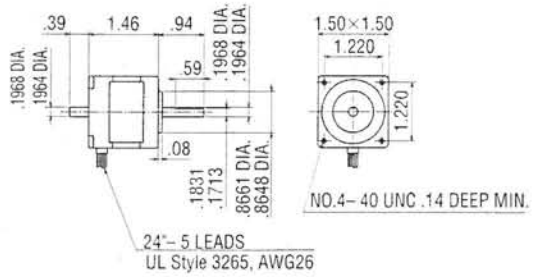
Notes:

1. Pay attention to heat dissipation from motor and driver. In particular, remember that the motor will produce a considerable amount of heat under certain conditions. Be sure to keep the temperature of the motor case under 212°F(100°C).
2. The holding torque is reduced by the automatic current cutback function at motor standstill.

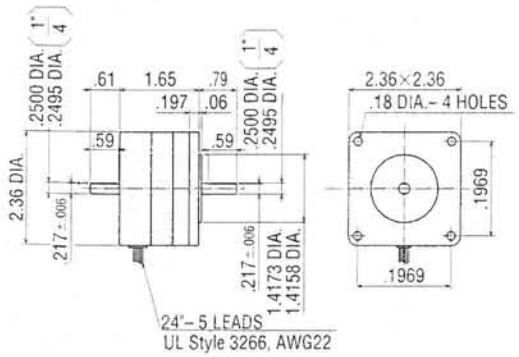
DIMENSIONS

MOTOR unit = inch

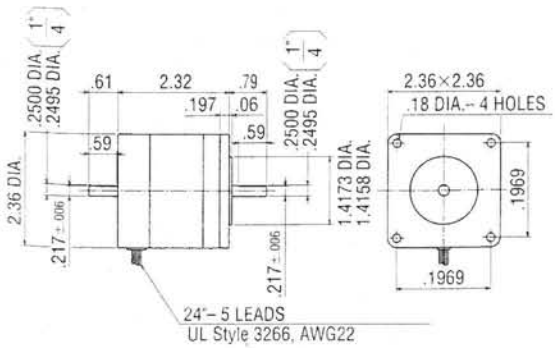
CSD534M-NAPA (Single shaft)
Motor Model:PX534M-NAA Weight 0.48lbs(0.22kg)/Driver Model: CSD5807N-P
CSD534M-NBPA (Double shaft)
Motor Model:PX534M-NBA Weight 0.48lbs(0.22kg)/Driver Model: CSD5807N-P



CSD564M-NAPA (Single shaft)
Motor Model: PH566M-NAA Weight 1.1lbs(0.5kg)/Driver Model: CSD5814N-P
CSD564M-NBPA (Double shaft)
Motor Model: PH566M-NBA Weight 1.1lbs(0.5kg)/Driver Model: CSD5814N-P



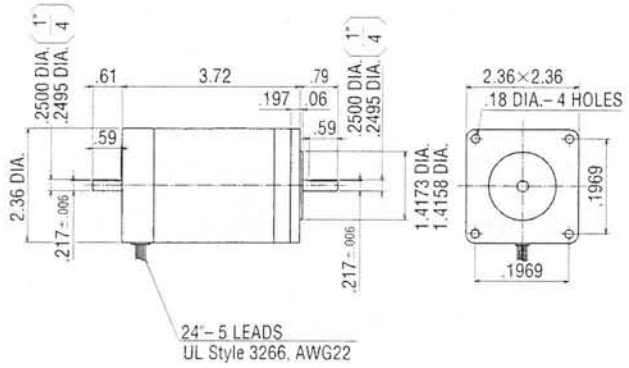
CSD566M-NAPA (Single shaft)
Motor Model: PH569M-NAA Weight 1.66lbs(0.75kg)/Driver Model: CSD5814N-P
CSD566M-NBPA (Double shaft)
Motor Model: PH569M-NBA Weight 1.66lbs(0.75kg)/Driver Model: CSD5814N-P



* This external appearance drawing is of a double-shaft model.
For a single shaft, ignore the colored areas.

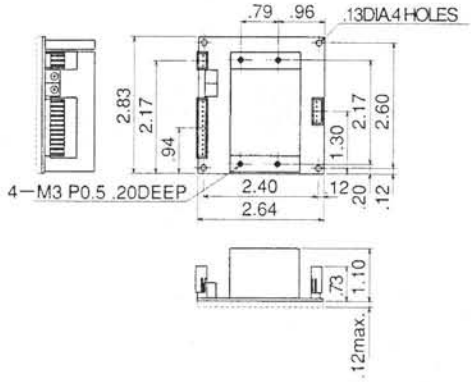
See page [B-40] for information on motor installation.

CSD569M-NAPA (Single shaft)
Motor Model:PH569M-NAA Weight 2.87lbs(1.3kg)/Driver Model: CSD5814N-P
CSD569M-NBPA (Double shaft)
Motor Model:PH569M-NBA Weight 2.87lbs(1.3kg)/Driver Model: CSD5814N-P



Driver unit = inch

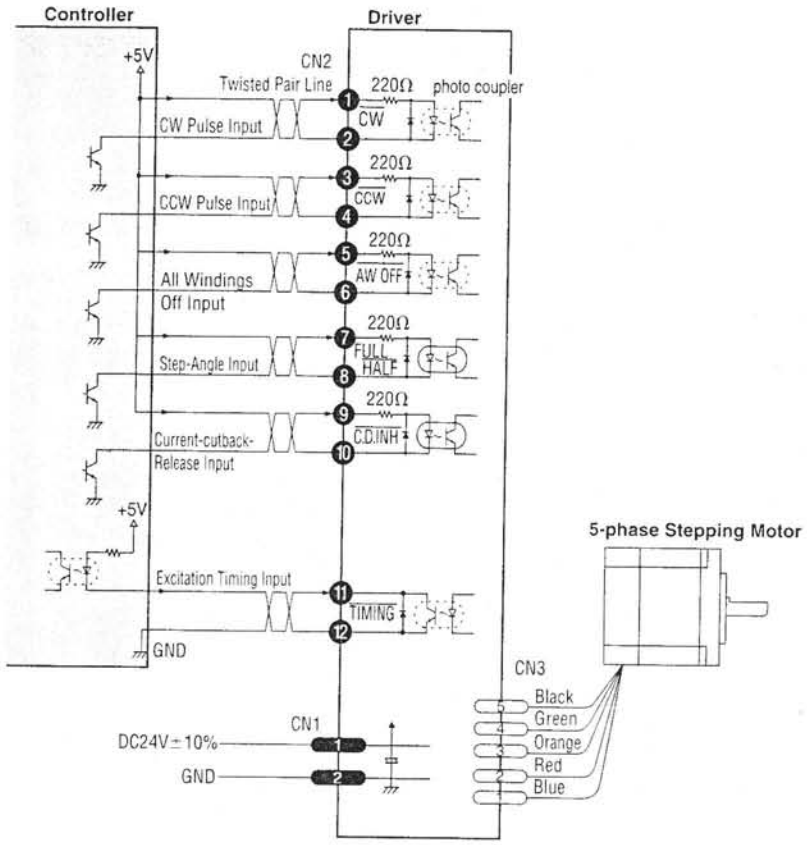
Motor Model: CSD5807N-P, CSD5814N-P Weight 0.29lbs (0.13kg)



See page [B-39] for information on driver installation.

WIRING DIAGRAMS

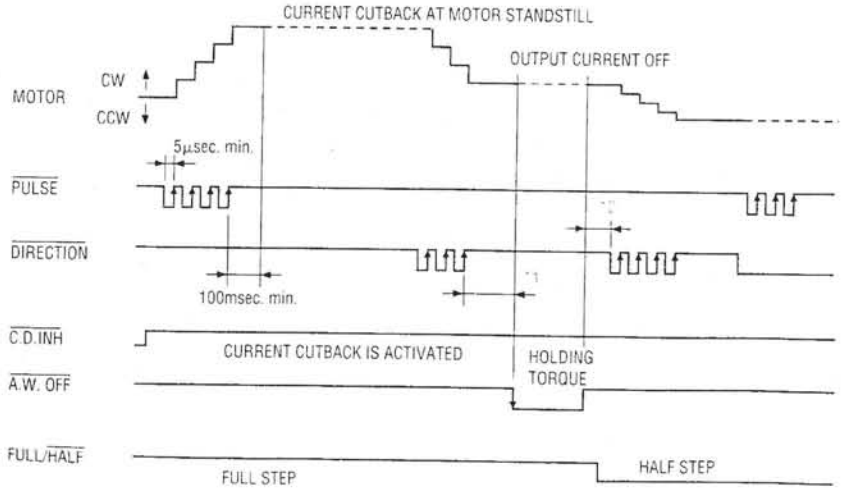
Use connector CN1, CN2 and CN3 when connecting.



Notes regarding wiring

1. Use twisted-pair wire of 3×10^{-4} in.^{2} (0.2mm^2) or thicker and 6.6 feet (2m) or iess in length for the signal line.
2. Use wire 7.8×10^{-4} in.^{2} (0.5mm^2)or thicker for motor lines (when extended) and power supply lines, and use 1.1×10^{-3} in.^{2} (0.75mm^2) or thicker for the wire for the grounding line.
3. Use spot grounding for the grounding of the driver and external controller.
4. Signal lines should be kept away at least 1 feet (0.3m) from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.

Timing Chart



CW Pulse Input

When a negative logic pulse is input to the CW ⊖ terminal, the motor will rotate clockwise.

CCW Pulse Input

When a negative logic pulse is input to the CCW ⊖ terminal, the motor will rotate counter clockwise.

All Windings Off (AW. Off) Input

When the All Windings Off (AW. OFF) signal is at L level (photocoupler: ON), no current is sent to the motor (holding torque is released) and the motor shaft can be moved by the external force. Use this function when the motor shaft needs to be turned or positioned by hand. While the motor is in operation the signal should always be set to H level.

Step Angle (FULL/HALF) Input

When the Step Angle (FULL/$\overline{\text{HALF}}$) signal is at the L level (photocoupler: ON) half-step mode (0.18°/step) has been selected; when it is at the H level, full-step mode (0.36°/step) has been selected.

Current-cutback-Release Input (C.D.INH)

When the current-cutback (C.D.INH) signal is at the L level (photocoupler: ON) the automatic-current-cutback at motor standstill function is not activated.

Excitation-Timing (Timing) Output

A signal is output in synchronization with the input pulse every time the excitation sequence returns to step "0".
The excitation sequence is completed for each 7.2° the motor shaft moves.
The timing output will turn ON every 10 pulses in full-step mode (0.36°/step) and every 20 pulses in half-step mode (0.18°/step).

DC24V

Use a power supply with a current capacity that exceeds the value of 'voltage' in the specification table.

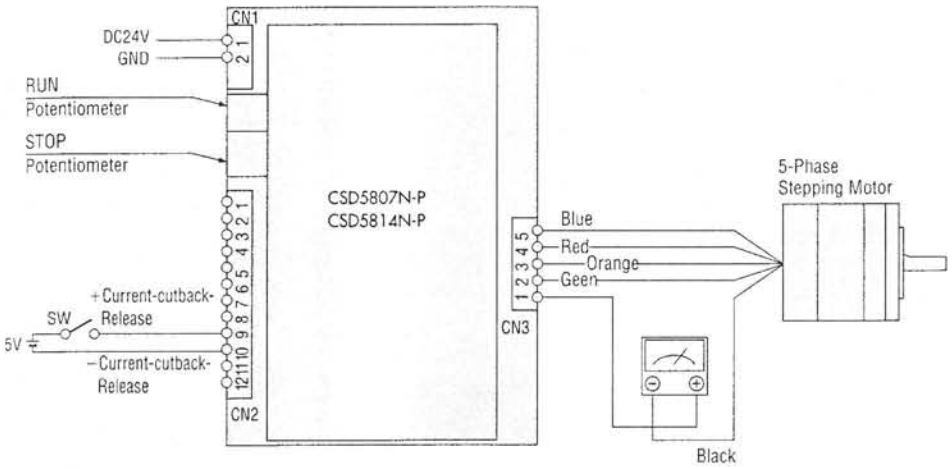
*1 It is recommended to wait a period of time before inputting the A.W.O signal to allow the motor oscillations to end. This time varies with the load inertia, the load torque and the starting pulse rate. Signal input must be stopped before the motor stops.

*2 Never input a step pulse signal immediately after switching the A.W.O signal to "H" level or the motor may lose synchronism. In general, an interval of 100m sec. (minimum) is required.

Method of Adjustment

The rated output current is set at the factory. When it is necessary to change the current setting, follow the procedures described below.

Connecting an ammeter
Connect a DC ammeter between the motor and pin ① of connector CN3 as shown in the diagram below.



- After connecting the DC ammeter to the motor, turn on the power. (The excitation status at this point is fixed: power on reset.)
- When the power is turned on, the motor enters a 4 phase excitation state, and +directional current flows to the blue motor lead wire. (Even if 4-5phase excitation has been selected, the motor enters a 4 phase excitation state when the power is turned on. Adjust the current in this state.)

Cautions:
1. Do not input a pulse signal.
2. Set the output-current-off (H.OFF) signal to the H level (it is at the H level when open).
3. The current at motor standstill changes when the RUN current is adjusted.

1. Adjusting The Motor RUN Current

Set Current-cutback-Release (C.D.INH) signal to L level (SW: ON) when adjusting the RUN current.

(1) Adjust the motor RUN current with the RUN potentiometer. It can be adjusted from 0.1 A/phase to 1.4 A/phase.
(2) The motor operating current is set for rated current 1.4 A/phase at the time of shipping, but it can be readjusted using the RUN potentiometer. The operating current can be lowered to suppress temperature rise in the motor/driver, or lower operating current in order to allow a margin for motor torque or to reduce vibration.

Note: The motor RUN current should be less than the motor rated current.

2. Adjusting The Current At Motor Standstill

Set Current-cutback-Release (C.D.INH) signal at H level (SW: OFF) when adjusting the current while the motor is stopped.

(1) Adjust the current at motor standstil with the STOP potentiometer. It can be adjusted
CSD5807N-P: 0.1A/phase~0.56A/phase
CSD5814N-P: 0.1A/phase~1.05A/phase
(2) At the time of shipping, the current at motor standstill is set for 0.7 A. The STOP potentiometer can be used to readjust the current at motor standstill to the current value required to produce enough holding torque.

$$\text{Holding Torque [oz–in (N·m)]} = \frac{\text{Rated Holding Torque [oz–in (N·m)]} \times \text{Current at motor standstill}}{\text{Motor Rated Current (1.4)}}$$