ORIENTAL MOTOR
GENERAL CATALOG

B

5-PHASE STEPPING MOTOR AND DRIVER PACKAGE

CSK *Series*

αSTEP

UPK•W

UPK

UFK•W

PMU

RFK

CSK

PMC

UMK

CSK

Controllers

2 φ Stepping Motors

Low-Speed Synchronous Motors

Accessories

5 φ with AC Driver

5 φ with DC Driver

2 φ with Driver

5-PHASE STEPPING MOTOR AND DRIVER PACKAGE

CSK *Series*

1. High torque

The **PK** high torque motor was designed to produce high-torque in a compact frame size.

2. Low vibration

Because there is no noticeable resonance, smooth rotation is achieved. These package keep vibration and noise levels low.

3. Compact package

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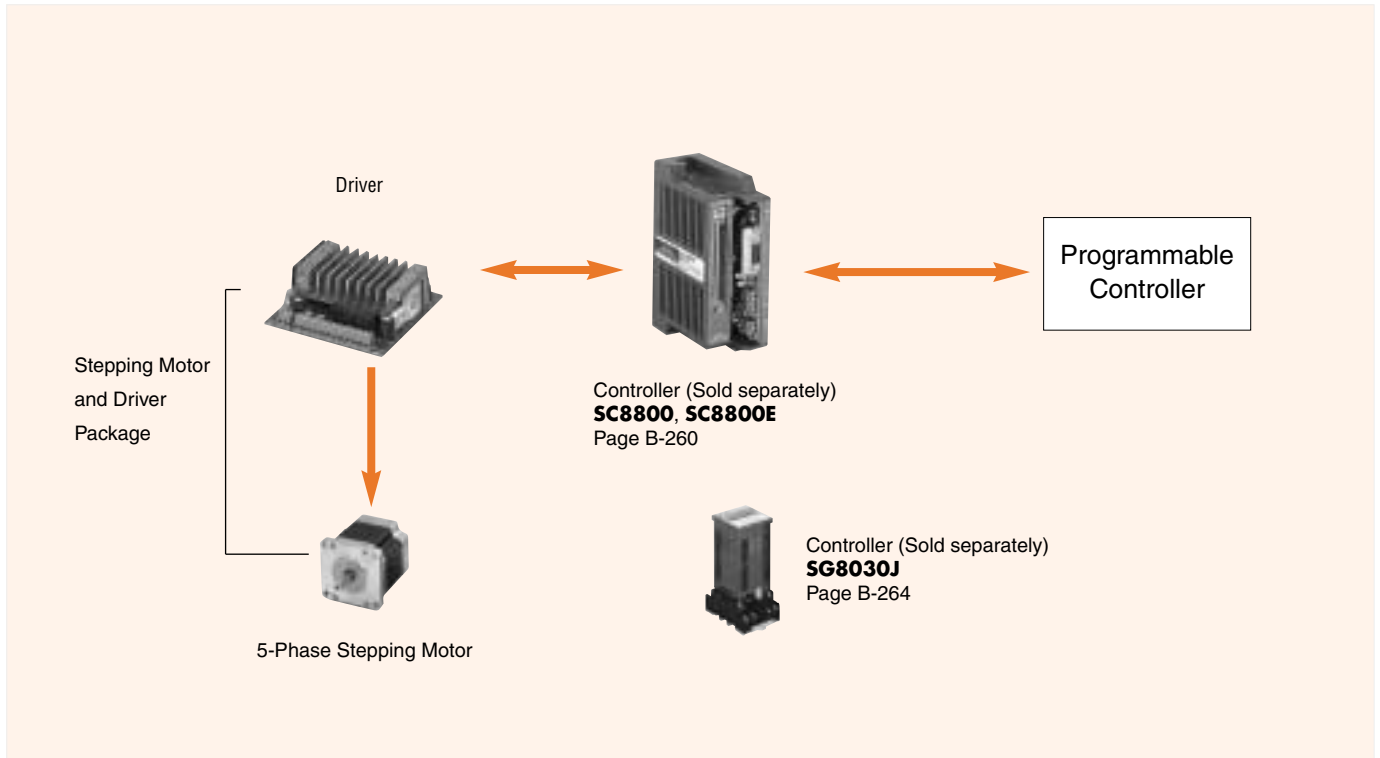
4. High resolution

The 5-phase stepping motors have 0.72° per step in full-step mode and 0.36° per step in half-step mode–2.5 times the resolution of a 2-phase stepping motor. This makes it possible for extremely accurate positioning.

5. TH geared type

The backlash-proof geared stepping motor features the compact body: What's more, these motors allow high permissible torque. They are optimal for applications in which large torque is required in tight spaces.

■ **CSK** SERIES SYSTEM CONFIGURATION

A compact stepping motor and driver are combined to provide
high-precision positioning with open loop control.

Driver

Programmable
Controller

Stepping Motor
and Driver
Package

Controller (Sold separately)
SC8800, **SC8800E**
Page B-260

Controller (Sold separately)
SG8030J
Page B-264

5-Phase Stepping Motor

■ **ACCESSORIES (Sold separately)**

Motor Mounting Bracket

Clean Damper

Flexible
Coupling

● Motor Mounting Brackets
Page B-298

● Clean Dampers
Page B-300

Effective at suppressing motor vibration and
improving performance.

● Flexible Couplings
Page B-301

MC Motor Couplings

Mounting bracket is cannot be
fitted to **TH** geared type.

Flexible coupling is cannot be fitted
to **TH** geared type.

CSK Series   Standard Type

Three sizes are available: **CSK54□** with a frame size of 1.65 in. (42mm) sq.; **CSK56□** 2.36 in. (60mm) sq.; and **CSK59□** 3.35 in. (85mm) sq.

| Package Model	Maximum Holding Torque	
	oz-in	N·m
CSK543-NATA (Single Shaft)	18	0.13
CSK543-NBTA (Double Shaft)	18	0.13
CSK544-NATA (Single Shaft)	24.9	0.18
CSK544-NBTA (Double Shaft)	24.9	0.18
CSK545-NATA (Single Shaft)	33.3	0.24
CSK545-NBTA (Double Shaft)	33.3	0.24
CSK564-NATA (Single Shaft)	58.3	0.42
CSK564-NBTA (Double Shaft)	58.3	0.42
CSK566-NATA (Single Shaft)	115	0.83
CSK566-NBTA (Double Shaft)	115	0.83
CSK569-NATA (Single Shaft)	230	1.66
CSK569-NBTA (Double Shaft)	230	1.66
CSK596-NATA (Single Shaft)	291	2.1
CSK596-NBTA (Double Shaft)	291	2.1
CSK599-NATA (Single Shaft)	569	4.1
CSK599-NBTA (Double Shaft)	569	4.1
CSK5913-NATA (Single Shaft)	874	6.3
CSK5913-NBTA (Double Shaft)	874	6.3

CSK Series   **TH** Geared Type

Five gear ratio are available: 3.6:1, 7.2:1, 10:1, 20:1 and 30:1. The low ratio allows output shaft speed to be reduced without reducing the input pulse frequency, thus enabling more precise resolution and smoother rotation at low speed.

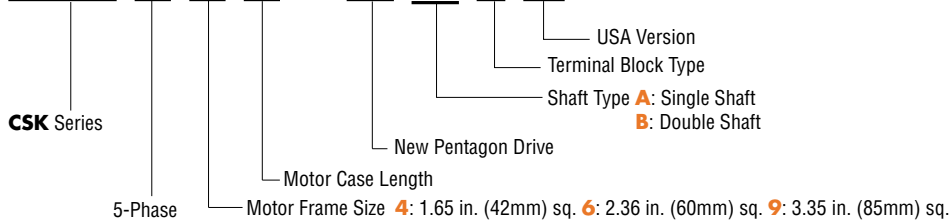| Package Model	Permissible Torque	
	lb-in	N·m
CSK543AA-TG3.6 (Single Shaft)	3.03	0.35
CSK543BA-TG3.6 (Double Shaft)	3.03	0.35
CSK543AA-TG7.2 (Single Shaft)	6.07	0.7
CSK543BA-TG7.2 (Double Shaft)	6.07	0.7
CSK543AA-TG10 (Single Shaft)	8.67	1
CSK543BA-TG10 (Double Shaft)	8.67	1
CSK543AA-TG20 (Single Shaft)	13	1.5
CSK543BA-TG20 (Double Shaft)	13	1.5
CSK543AA-TG30 (Single Shaft)	13	1.5
CSK543BA-TG30 (Double Shaft)	13	1.5
CSK564AA-TG3.6 (Single Shaft)	10.8	1.25
CSK564BA-TG3.6 (Double Shaft)	10.8	1.25
CSK564AA-TG7.2 (Single Shaft)	21.6	2.5
CSK564BA-TG7.2 (Double Shaft)	21.6	2.5
CSK564AA-TG10 (Single Shaft)	26	3
CSK564BA-TG10 (Double Shaft)	26	3
CSK564AA-TG20 (Single Shaft)	30.3	3.5
CSK564BA-TG20 (Double Shaft)	30.3	3.5
CSK564AA-TG30 (Single Shaft)	34.7	4
CSK564BA-TG30 (Double Shaft)	34.7	4

TH Gear
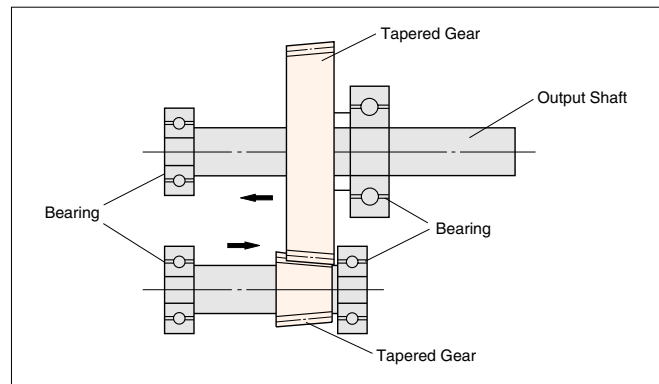
The structure of the final stage of the TH gear

Tapered gears are used at the final stage of the spur gear train.
As shown in the figure, two tapered gears contact and are designed to provide less backlash.

■ PRODUCT NUMBER CODE

CSK 5 6 6 – N ☐ T A

- USA Version
- Terminal Block Type
- Shaft Type **A**: Single Shaft **B**: Double Shaft
- New Pentagon Drive
- Motor Case Length
- Motor Frame Size **4**: 1.65 in. (42mm) sq. **6**: 2.36 in. (60mm) sq. **9**: 3.35 in. (85mm) sq.
- 5-Phase
- **CSK** Series

■ SPECIFICATIONS STANDARD TYPE

Package Model		CSK543-NATA	CSK544-NATA	CSK545-NATA	CSK564-NATA	CSK566-NATA	CSK569-NATA
	Single Shaft	CSK543-NATA	CSK544-NATA	CSK545-NATA	CSK564-NATA	CSK566-NATA	CSK569-NATA
	Double Shaft	CSK543-NBTA	CSK544-NBTA	CSK545-NBTA	CSK564-NBTA	CSK566-NBTA	CSK569-NBTA
Maximum Holding Torque	oz-in	18	24.9	33.3	58.3	115	230
	N · m	0.13	0.18	0.24	0.42	0.83	1.66
Rotor Inertia	oz-in^2	0.192	0.296	0.372	0.96	1.53	3.06
	kg· m^2	35×10^{-7}	54×10^{-7}	68×10^{-7}	175×10^{-7}	280×10^{-7}	560×10^{-7}
Rated Current	A /phase	0.75			1.4		
Basic Step Angle		0.72˚					
Insulation Class		Class B [266°F (130°C)]					
Power Source		DC24V±10% 1.3A Maximum			DC24V±10% 2.1A Maximum		
Output Current	A /phase	0.75			1.4		
Excitation Mode		● Full Step (4 phase excitation): 0.72°/step ● Half Step (4-5 phase excitation): 0.36°/step					

Input Signals	Input Signal Circuit	Photocoupler input, Input resistance 220Ω, Input current 20mA maximum Signal voltage Photocoupler ON: +4～+5V, Photocoupler OFF: 0～+0.5V
	● Pulse Signal	Step command pulse signal, Pulse width: 5µs minimum, Pulse rise/fall: 2µs maximum Motor moves when the photocoupler state changes from ON to OFF.
	● Rotation Direction Signal	Rotation direction signal Photocoupler ON: CW, Photocoupler OFF: CCW
	● Step Angle Signal	Full Step (0.72˚) at "photocoupler ON" Half Step (0.36˚) at "photocoupler OFF"
	● All Windings Off Signal	When in the "photocoupler ON" state, the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current level set by the RUN switch is supplied to the motor.
	● Automatic Current Cutback Release Signal	When in the "photocoupler ON" state, the "Automatic Current Cutback" function at motor standstill is disabled. When in the "photocoupler OFF" state, the "Automatic Current Cutback" function at motor standstill is activated (approximately 100ms after motor stops).
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24V DC maximum, 10mA maximum
	● Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses

Functions		Automatic current cutback					
Driver Cooling Method		Natural Ventilation					
Weight (Mass)	Motor lb. (kg)	0.47 (0.21)	0.6 (0.27)	0.78 (0.35)	1.33 (0.6)	1.77 (0.8)	2.87 (1.3)
	Driver lb. (kg)	0.31 (0.14)					
Insulation Resistance	Motor	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.					
Dielectric Strength	Motor	Sufficient to withstand 1.0kV (0.5kV for **CSK54**☐type), 60Hz applied between the motor coils and casing for one minute, under normal temperature and humidity.					
Ambient Temperature Range	Motor	+14°F～+122°F (−10°C～+50°C)					
	Driver	+32°F～+104°F (0°C～+40°C)					

●Maximum holding torque refers to the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation). Use this value to compare motor torque performance. When using the motor with the dedicated driver, the driver's "Automatic Current Cutback" function at motor standstill reduces maximum holding torque by approximately 50%.

●The power source input current value represents the maximum current. (The input current varies according to the pulse frequency.)

Note: Do not measure insulation resistance or perform the dielectric strength test while the motor and driver are connected.

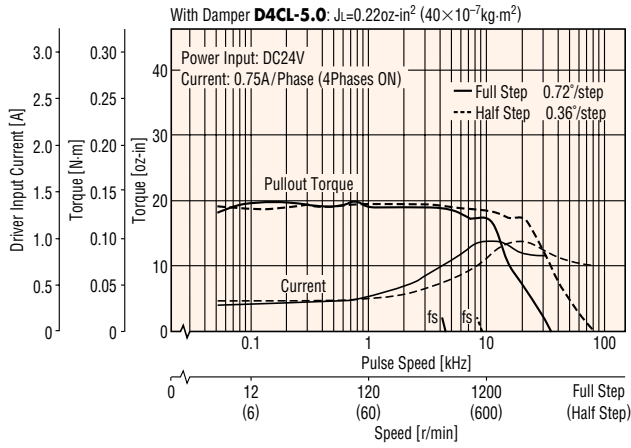## ■ SPECIFICATIONS STANDARD TYPE

Package Model	Single Shaft	CSK596-NATA	CSK599-NATA	CSK5913-NATA
	Double Shaft	CSK596-NBTA	CSK599-NBTA	CSK5913-NBTA
Maximum Holding Torque	oz-in	291	569	874
	N · m	2.1	4.1	6.3
Rotor Inertia	oz-in^2	7.66	14.8	21.9
	kg· m^2	1400×10^{-7}	2700×10^{-7}	4000×10^{-7}
Rated Current	A/phase		2.8	
Basic Step Angle			0.72˚	
Insulation Class			Class B [266°F (130°C)]	
Power Source			DC24V±10% 4A	
Output Current	A/phase		2.8	
Excitation Mode			● Full Step (4 phase excitation): 0.72°/step ● Half Step (4-5 phase excitation): 0.36°/step	

Input Signals	Input Signal Circuit	Photocoupler input, Input resistance 220Ω, Input current 20mA maximum Signal voltage Photocoupler ON: +4～+5V, Photocoupler OFF: 0～+0.5V
	● Pulse Signal (CW Pulse Signal)	Step command pulse signal (CW step command signal at 2-pulse input mode) Pulse width: 5µs minimum, Pulse rise/fall: 2µs maximum Motor moves when the photocoupler state changes from ON to OFF.
	● Rotation Direction Signal (CCW Pulse Signal)	Rotation direction signal Photocoupler ON: CW, Photocoupler OFF: CCW (CCW step command signal at 2-pulse input mode Pulse width: 5µs minimum, Pulse rise/fall: 2µs maximum Motor moves when the photocoupler state changes from ON to OFF.)
	● Step Angle Signal	Full Step (0.72˚) at "photocoupler ON" Half Step (0.36˚) at "photocoupler OFF"
	● All Windings Off Signal	When in the "photocoupler ON" state, the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current level set by the RUN switch is supplied to the motor.
	● Automatic Current Cutback Release Signal	When in the "photocoupler ON" state, the "Automatic Current Cutback" function at motor standstill is disabled. When in the "photocoupler OFF" state, the "Automatic Current Cutback" function at motor standstill is activated (approximately 100ms after motor stops).
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24V DC maximum, 10mA maximum
	● Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses
	● Overheat Signal	The signal is output when the internal temperature of the driver rises above approximately 194°F (90°C). (Photocoupler: ON) The motor stops automatically if the automatic current off function is ON.

Functions		Automatic current cutback, All windings off, Pulse input mode switch		
Driver Cooling Method		Natural Ventilation		
Weight (Mass)	Motor lb. (kg)	3.75 (1.7)	6.18 (2.8)	8.38 (3.8)
	Driver lb. (kg)	0.56 (0.25)		
Insulation Resistance		100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.		
Dielectric Strength		Sufficient to withstand 1.0kV, 60Hz applied between the motor coils and casing for one minute, under normal temperature and humidity.		
Ambient Temperature Range	Motor	+14°F～+122°F (−10°C～+50°C)		
	Driver	+32°F～+104°F (0°C～+40°C)		

●Maximum holding torque refers to the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation). Use this value to compare motor torque performance. When using the motor with the dedicated driver, the driver's "Automatic Current Cutback" function at motor standstill reduces maximum holding torque by approximately 50%.

●The power source input current value represents the maximum current. (The input current varies according to the pulse frequency.)
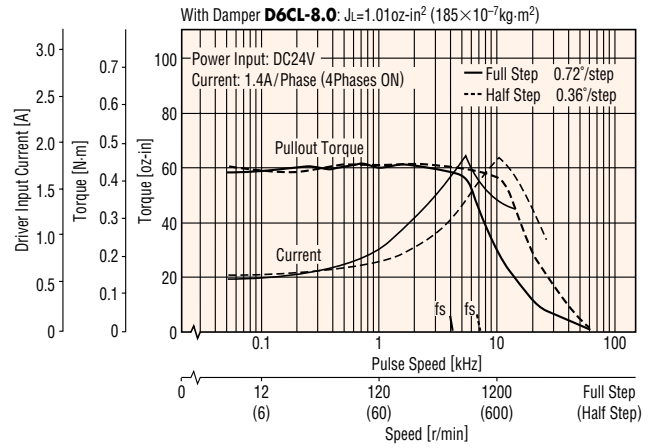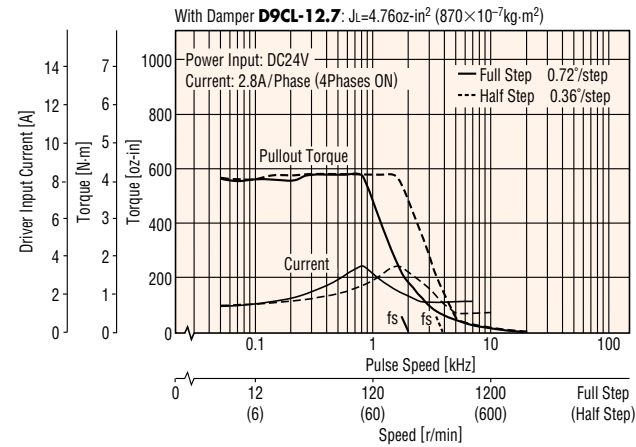
CSK543-NBTA

With Damper **D4CL-5.0**: JL=0.22oz-in² (40×10⁻⁷kg·m²)

CSK564-NBTA

With Damper **D6CL-8.0**: JL=1.01oz-in² (185×10⁻⁷kg·m²)

CSK544-NBTA

With Damper **D4CL-5.0**: JL=0.22oz-in² (40×10⁻⁷kg·m²)

CSK566-NBTA

With Damper **D6CL-8.0**: JL=1.01oz-in² (185×10⁻⁷kg·m²)

CSK545-NBTA

With Damper **D4CL-5.0**: JL=0.22oz-in² (40×10⁻⁷kg·m²)

CSK569-NBTA

With Damper **D6CL-8.0**: JL=1.01oz-in² (185×10⁻⁷kg·m²)

Note:

●Pay attention to heat dissipation from the motor and driver. 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).
●When using the motor with the dedicated driver, the driver's "Automatic Current Cutback" function at motor standstill reduces maximum holding torque by approximately 50%.

■ SPEED vs. TORQUE CHARACTERISTICS

fs: Maximum Starting Pulse Rate

CSK596-NBTA

CSK599-NBTA

CSK5913-NBTA

Note:

● Pay attention to heat dissipation from the motor and driver. 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).

● When using the motor with the dedicated driver, the driver's "Automatic Current Cutback" function at motor standstill reduces maximum holding torque by approximately 50%.

●**Motor**

CSK543-NATA (Single shaft)
Motor Model: PK543-NAA Weight 0.47lb. (Mass 0.21kg)
CSK543-NBTA (Double shaft)
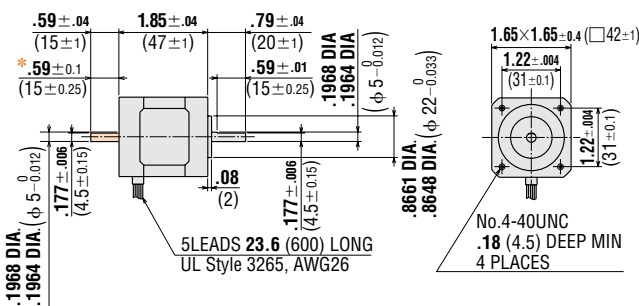Motor Model: PK543-NBA Weight 0.47lb. (Mass 0.21kg)
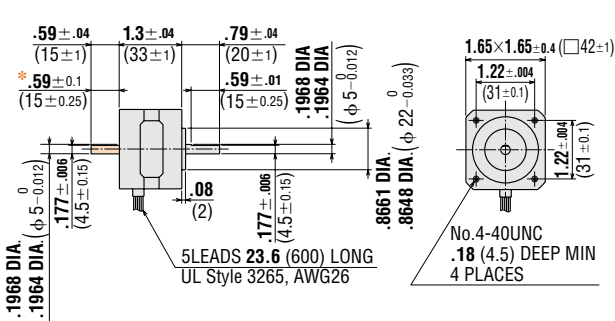
*** .59±.01 (15±0.25) indicates the length of milling on motor shaft.

CSK544-NATA (Single shaft)
Motor Model: PK544-NAA Weight 0.6lb. (Mass 0.27kg)
CSK544-NBTA (Double shaft)
Motor Model: PK544-NBA Weight 0.6lb. (Mass 0.27kg)
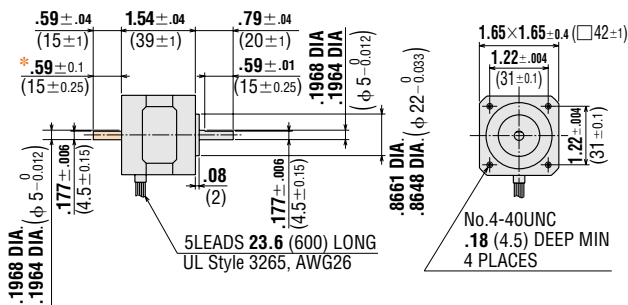
*** .59±.01 (15±0.25) indicates the length of milling on motor shaft.

CSK545-NATA (Single shaft)
Motor Model: PK545-NAA Weight 0.78lb. (Mass 0.35kg)
CSK545-NBTA (Double shaft)
Motor Model: PK545-NBA Weight 0.78lb. (Mass 0.35kg)

*** .59±.01 (15±0.25) indicates the length of milling on motor shaft.

●These external appearance drawings are for double shaft models. For
  single shaft, ignore the colored areas.
●See page B-36 for information on motor installation.

CSK564-NATA (Single shaft)
Motor Model: PK564-NAA Weight 1.33lb. (Mass 0.6kg)
CSK564-NBTA (Double shaft)
Motor Model: PK564-NBA Weight 1.33lb. (Mass 0.6kg)
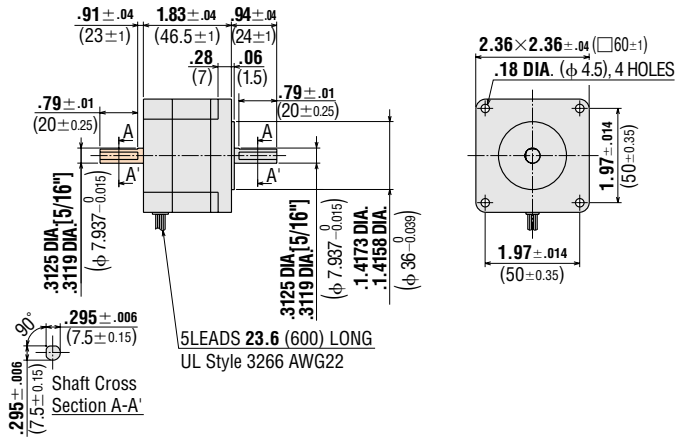
CSK566-NATA (Single shaft)
Motor Model: PK566-NAA Weight 1.77lb. (Mass 0.8kg)
CSK566-NBTA (Double shaft)
Motor Model: PK566-NBA Weight 1.77lb. (Mass 0.8kg)
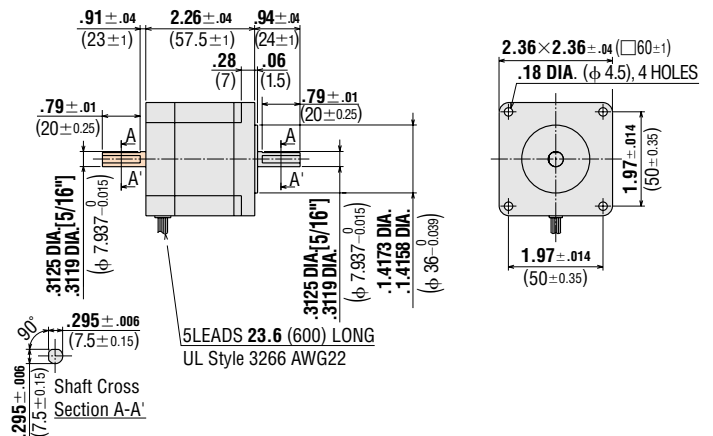
CSK569-NATA (Single shaft)
Motor Model: PK569-NAA Weight 2.87lb. (Mass 1.3kg)
CSK569-NBTA (Double shaft)
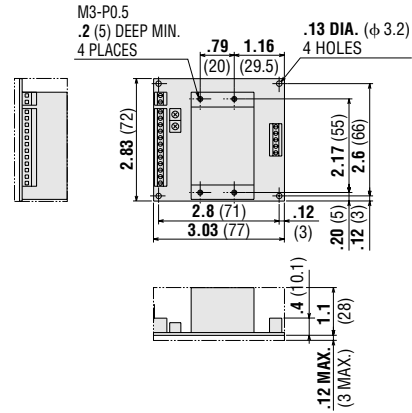Motor Model: PK569-NBA Weight 2.87lb. (Mass 1.3kg)
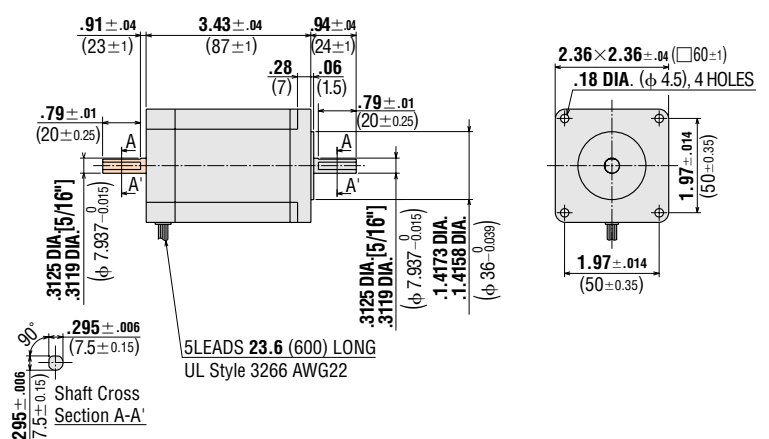
CSK596-NATA (Single shaft)
Motor Model: PK596-NAA Weight 3.75lb. (Mass 1.7kg)
CSK596-NBTA (Double shaft)
Motor Model: PK596-NBA Weight 3.75lb. (Mass 1.7kg)
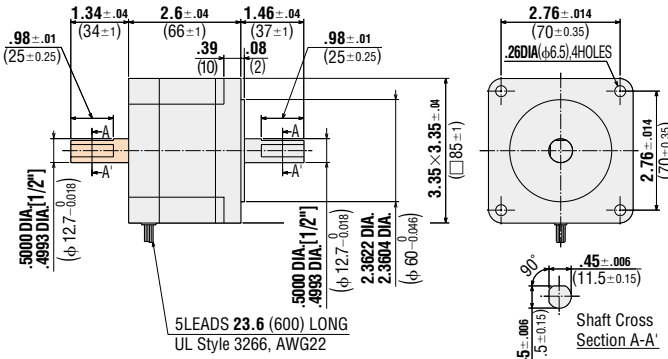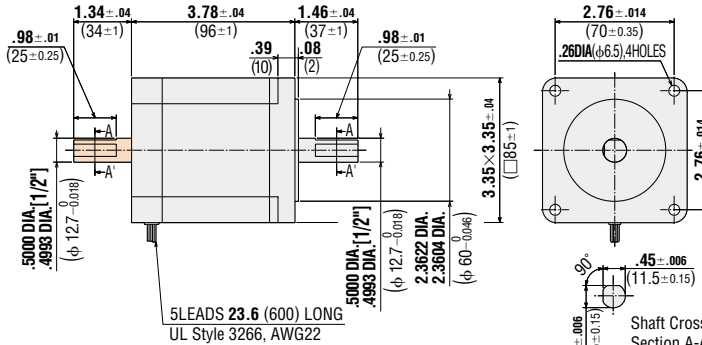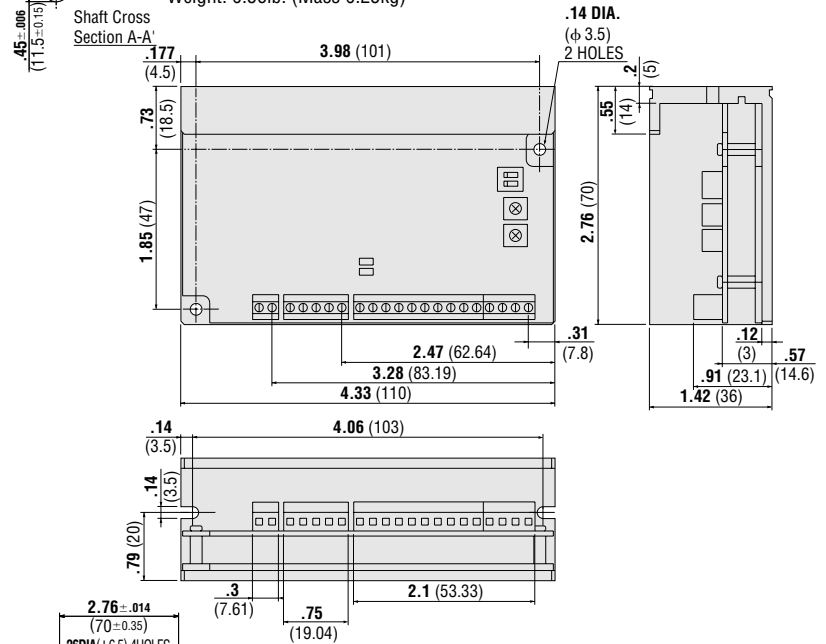

●**Driver**

Driver: CSD5807N-T (For **CSK54**□ models)
　　　　 CSD5814N-T (For **CSK56**□ models)
Weight: 0.31lb. (Mass 0.14kg)
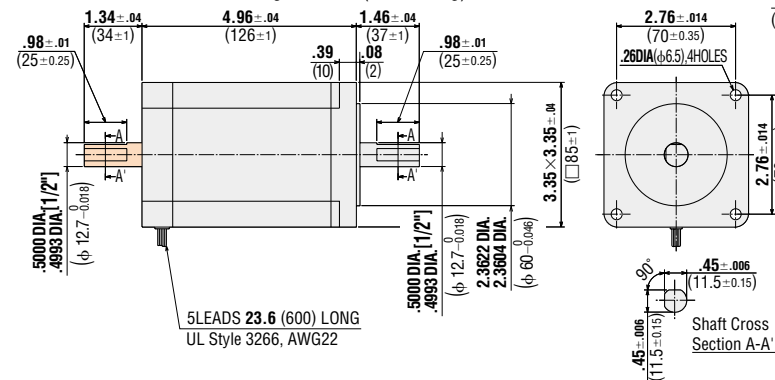

CSK599-NATA (Single shaft)
Motor Model: PK599-NAA Weight 6.18lb. (Mass 2.8kg)
CSK599-NBTA (Double shaft)
Motor Model: PK599-NBA Weight 6.18lb. (Mass 2.8kg)

Driver: CSD5828N-T (For **CSK59**□ models)
Weight: 0.56lb. (Mass 0.25kg)

CSK5913-NATA (Single shaft)
Motor Model: PK5913-NAA Weight 8.38lb. (Mass 3.8kg)
CSK5913-NBTA (Double shaft)
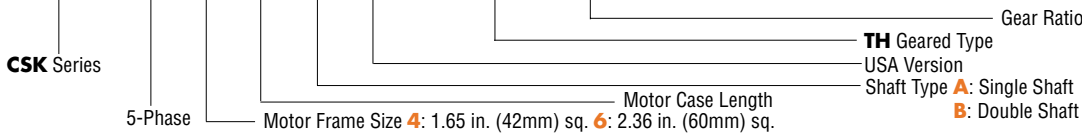Motor Model: PK5913-NBA Weight 8.38lb. (Mass 3.8kg)

●See page B-38 for information on driver installation.

●These external appearance drawings are for double shaft models. For single shaft, ignore the colored areas.
●See page B-36 for information on motor installation.

■ PRODUCT NUMBER CODE

CSK 5 6 4 A A – TG 7.2

- **CSK** Series
- 5-Phase
- Motor Frame Size **4**: 1.65 in. (42mm) sq. **6**: 2.36 in. (60mm) sq.
- Motor Case Length
- Shaft Type **A**: Single Shaft **B**: Double Shaft
- USA Version
- **TH** Geared Type
- Gear Ratio

■ SPECIFICATIONS TH GEARED TYPE

Package Model	Single Shaft	CSK543AA-TG3.6	CSK543AA-TG7.2	CSK543AA-TG10	CSK543AA-TG20	CSK543AA-TG30
	Double Shaft	CSK543BA-TG3.6	CSK543BA-TG7.2	CSK543BA-TG10	CSK543BA-TG20	CSK543BA-TG30
Maximum Holding Torque	lb-in	3.03	6.07	8.67	13	13
	N·m	0.35	0.7	1	1.5	1.5
Rotor Inertia	oz-in^2 (kg·m^2)	0.192 (35×10^{-7})				
Rated Current	A/phase	0.75				
Basic Step Angle		0.2°	0.1°	0.072°	0.036°	0.024°
Gear Ratio		3.6:1	7.2:1	10:1	20:1	30:1
Permissible Torque	lb-in	3.03	6.07	8.67	13	13
	N·m	0.35	0.7	1	1.5	1.5
Permissible Thrust Load	lb. (N)	3.3 (1.5)				
Permissible Overhung Load	lb. (N)	4.4 (2.0)				
Backlash	Arcmin (deg)	45 (0.75°)	25 (0.417°)	25 (0.417°)	15 (0.25°)	15 (0.25°)
Permissible Speed Range (Gear Output Shaft Speed)	Full Step	0~15000Hz (0~500r/min)	0~15000Hz (0~250r/min)	0~15000Hz (0~180r/min)	0~15000Hz (0~90r/min)	0~15000Hz (0~60r/min)
	Half Step	0~30000Hz (0~500r/min)	0~30000Hz (0~250r/min)	0~30000Hz (0~180r/min)	0~30000Hz (0~90r/min)	0~30000Hz (0~60r/min)
Insulation Class		Class B [266°F (130°C)]				
Power Source		DC24V±10% 1.3A Maximum				
Output Current	A/phase	0.75				
Excitation Mode	Full Step	0.2°/step	0.1°/step	0.072°/step	0.036°/step	0.024°/step
	Half Step	0.1°/step	0.05°/step	0.036°/step	0.018°/step	0.012°/step

Input Signals	Input Signal Circuit	Photocoupler input, Input resistance 220Ω, Input current 20mA maximum Signal voltage Photocoupler ON: +4~+5V, Photocoupler OFF: 0~+0.5V
	● Pulse Signal	Step command pulse signal, Pulse width: 5µs minimum, Pulse rise/fall: 2µs maximum Motor moves when the photocoupler state changes from ON to OFF.
	● Rotation Direction Signal	Rotation direction signal Photocoupler ON: CW, Photocoupler OFF: CCW
	● Step Angle Signal	Full Step (0.72°) when "photocoupler ON" Half Step (0.36°) when "photocoupler OFF"
	● All Windings Off Signal	When in the "photocoupler ON" state, the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current level set by the RUN switch is supplied to the motor.
	● Automatic Current Cutback Release Signal	When in the "photocoupler ON" state, the "Automatic Current Cutback" function at motor standstill is disabled. When in the "photocoupler OFF" state, the "Automatic Current Cutback" function at motor standstill is activated (approximately 100ms after motor stops).
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24V DC maximum, 10mA maximum
	● Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses

Functions		Automatic current cutback
Driver Cooling Method		Natural Ventilation
Weight (Mass)	Motor lb. (kg)	0.73 (0.33)
	Driver lb. (kg)	0.31 (0.14)
Insulation Resistance	Motor	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.
Dielectric Strength	Motor	Sufficient to withstand 1.0kV (0.5kV for **CSK54□** type), 60Hz applied between the motor coils and casing for one minute, under normal temperature and humidity.
Ambient Temperature Range	Motor	+14°F~+122°F (−10°C~+50°C)
	Driver	+32°F~+104°F (0°C~+40°C)

- ●Maximum holding torque refers to the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation). Use this value to compare motor torque performance. When using the motor with the included driver, the driver's "Automatic Current Cutback" function at motor standstill reduces maximum holding torque by approximately 50%.
- ●The power source input current value represents the maximum current. (The input current varies according to the pulse frequency.)
- ●Permissible torque is the maximum value of the mechanical strength of the gear unit. Use the product with a total torque (load and acceleration) less than the permissible torque.
- ●Permissible overhung load indicates the maximum value measured at 0.39 in. (10mm) from the tip of the gear output shaft.
- ●The direction of rotation for the motor and that of the gear output shaft are the same for the gear ratios of 3.6:1, 7.2:1 or 10:1. They are opposite for 20:1 or 30:1 ratio types.
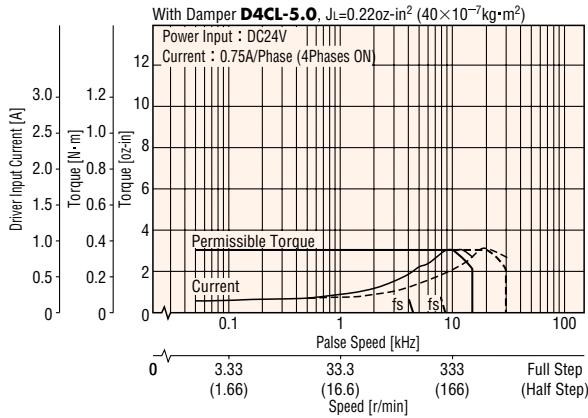
■ SPECIFICATIONS TH GEARED TYPE

Package Model	Single Shaft	CSK564AA-TG3.6	CSK564AA-TG7.2	CSK564AA-TG10	CSK564AA-TG20	CSK564AA-TG30
	Double Shaft	CSK564BA-TG3.6	CSK564BA-TG7.2	CSK564BA-TG10	CSK564BA-TG20	CSK564BA-TG30
Maximum Holding Torque	lb-in	10.8	21.6	26	30.3	34.7
	N·m	1.25	2.5	3	3.5	4
Rotor Inertia	oz-in² (kg·m²)	0.96 (175×10⁻⁷)				
Rated Current	A/phase	1.4				
Basic Step Angle		0.2˚	0.1˚	0.072˚	0.036˚	0.024˚
Gear Ratio		3.6:1	7.2:1	10:1	20:1	30:1
Permissible Torque	lb-in	10.8	21.6	26	30.3	34.7
	N·m	1.25	2.5	3	3.5	4
Permissible Thrust Load	lb. (N)	8.81 (40)				
Permissible Overhung Load	lb. (N)	22 (100)				
Backlash	Arcmin (deg)	35 (0.584˚)	15 (0.25˚)	15 (0.25˚)	10 (0.167˚)	10 (0.167˚)
Permissible Speed Range (Gear Output Shaft Speed)	Full Step	0~15000Hz (0~500r/min)	0~15000Hz (0~250r/min)	0~15000Hz (0~180r/min)	0~15000Hz (0~90r/min)	0~15000Hz (0~60r/min)
	Half Step	0~30000Hz (0~500r/min)	0~30000Hz (0~250r/min)	0~30000Hz (0~180r/min)	0~30000Hz (0~90r/min)	0~30000Hz (0~60r/min)
Insulation Class		Class B [266°F (130°C)]				
Power Source		DC24V±10% 2.1A Maximum				
Output Current	A/phase	1.4				
Excitation Mode	Full Step	0.2˚/step	0.1˚/step	0.072˚/step	0.036˚/step	0.024˚/step
	Half Step	0.1˚/step	0.05˚/step	0.036˚/step	0.018˚/step	0.012˚/step

Input Signals	Input Signal Circuit	Photocoupler input, Input resistance 220Ω, Input current 20mA maximum Signal voltage Photocoupler ON: +4~+5V, Photocoupler OFF: 0~+0.5V
	● Pulse Signal	Step command pulse signal, Pulse width: 5μs minimum, Pulse rise/fall: 2μs maximum Motor moves when the photocoupler state changes from ON to OFF.
	● Rotation Direction Signal	Rotation direction signal Photocoupler ON: CW, Photocoupler OFF: CCW
	● Step Angle Signal	Full Step (0.72˚) when "photocoupler ON" Half Step (0.36˚) when "photocoupler OFF"
	● All Windings Off Signal	When in the "photocoupler ON" state, the current to the motor is cut off and the motor shaft can be rotated manually. When in the "photocoupler OFF" state, the current level set by the RUN switch is supplied to the motor.
	● Automatic Current Cutback Release Signal	When in the "photocoupler ON" state, the "Automatic Current Cutback" function at motor standstill is disabled. When in the "photocoupler OFF" state, the "Automatic Current Cutback" function at motor standstill is activated (approximately 100ms after motor stops).
Output Signals	Output Signal Circuit	Photocoupler, Open-Collector Output External use condition: 24V DC maximum, 10mA maximum
	● Excitation Timing Signal	The signal is output every time the excitation sequence returns to the initial stage "0". (Photocoupler: ON) Full step: signal output every 10 pulses, Half step: signal output every 20 pulses
Functions		Automatic current cutback
Driver Cooling Method		Natural Ventilation
Weight (Mass)	Motor lb. (kg)	2.1 (0.95)
	Driver lb. (kg)	0.31 (0.14)
Insulation Resistance	Motor	100MΩ minimum under normal temperature and humidity, when measured by a DC500V megger between the motor coils and the motor casing.
Dielectric Strength	Motor	Sufficient to withstand 1.0kV, 60Hz applied between the motor coils and casing for one minute, under normal temperature and humidity.
Ambient Temperature Range	Motor	+14°F~+122°F (−10°C~+50°C)
	Driver	+32°F~+104°F (0°C~+40°C)

● Maximum holding torque refers to the holding torque at motor standstill when the rated current is supplied to the motor (5 phase excitation). Use this value to compare motor torque performance. When using the motor with the included driver, the driver's "Automatic Current Cutback" function at motor standstill reduces maximum holding torque by approximately 50%.

● The power source input current value represents the maximum current. (The input current varies according to the pulse frequency.)

● Permissible torque is the maximum value of the mechanical strength of the gear unit. Use the product with a total torque (load and acceleration) less than the permissible torque.

● Permissible overhung load indicates the maximum value measured at 0.39 in. (10mm) from the tip of the gear output shaft.

● The direction of rotation for the motor and that of the gear output shaft are the same for the gear ratios of 3.6:1, 7.2:1 or 10:1. They are opposite for 20:1 or 30:1 ratio types.
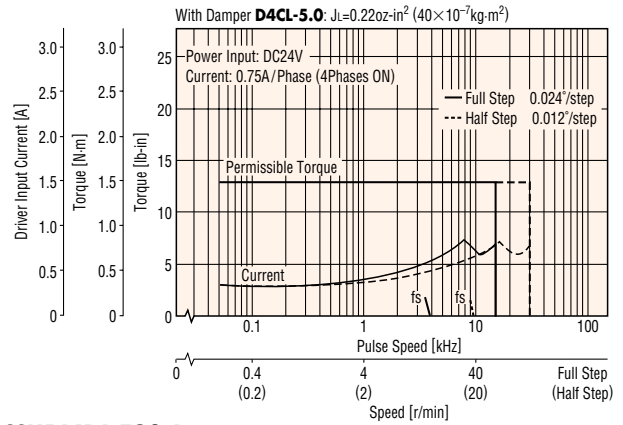
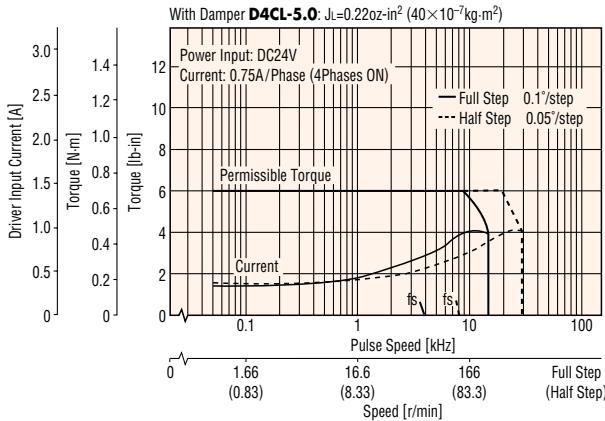# ■ SPEED vs. TORQUE CHARACTERISTICS

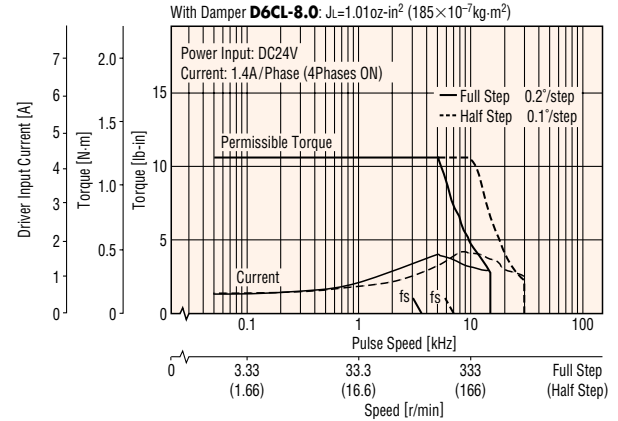fs: Maximum Starting Pulse Rate

CSK543BA-TG3.6

With Damper **D4CL-5.0**, JL=0.22oz-in² (40×10⁻⁷kg·m²)

Power Input : DC24V
Current : 0.75A/Phase (4Phases ON)

Permissible Torque

Current

fs fs

CSK543BA-TG30

With Damper **D4CL-5.0**: JL=0.22oz-in² (40×10⁻⁷kg·m²)

Power Input: DC24V
Current: 0.75A/Phase (4Phases ON)

Full Step   0.024°/step
Half Step   0.012°/step

Permissible Torque

Current

fs fs

CSK543BA-TG7.2

With Damper **D4CL-5.0**: JL=0.22oz-in² (40×10⁻⁷kg·m²)

Power Input: DC24V
Current: 0.75A/Phase (4Phases ON)

Full Step   0.1°/step
Half Step   0.05°/step

Permissible Torque

Current

fs fs

CSK564BA-TG3.6

With Damper **D6CL-8.0**: JL=1.01oz-in² (185×10⁻⁷kg·m²)

Power Input: DC24V
Current: 1.4A/Phase (4Phases ON)

Full Step   0.2°/step
Half Step   0.1°/step

Permissible Torque

Current

fs fs

CSK543BA-TG10

With Damper **D4CL-5.0**: JL=0.22oz-in² (40×10⁻⁷kg·m²)

Power Input: DC24V
Current: 0.75A/Phase (4Phases ON)

Full Step   0.072°/step
Half Step   0.036°/step

Permissible Torque

Current

fs fs

CSK564BA-TG7.2

With Damper **D6CL-8.0**: JL=1.01oz-in² (185×10⁻⁷kg·m²)

Power Input: DC24V
Current: 1.4A/Phase (4Phases ON)

Full Step   0.1°/step
Half Step   0.05°/step

Permissible Torque

Current

fs fs

CSK543BA-TG20

With Damper **D4CL-5.0**: JL=0.22oz-in² (40×10⁻⁷kg·m²)

Power Input: DC24V
Current: 0.75A/Phase (4Phases ON)

Full Step   0.036°/step
Half Step   0.018°/step

Permissible Torque

Current

fs fs

CSK564BA-TG10

With Damper **D6CL-8.0**: JL=1.01oz-in² (185×10⁻⁷kg·m²)

Power Input: DC24V
Current: 1.4A/Phase (4Phases ON)

Full Step   0.072°/step
Half Step   0.036°/step

Permissible Torque

Current
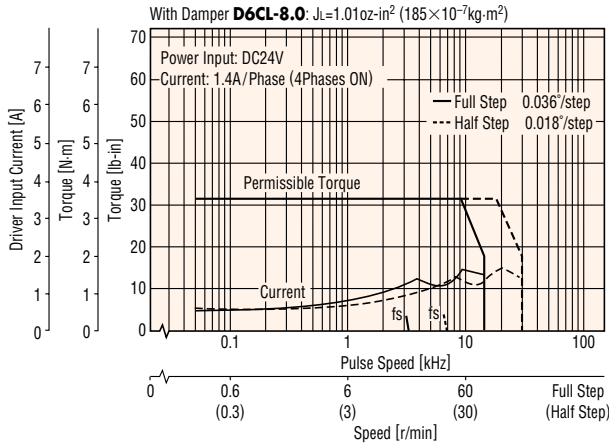
fs fs

Note:

●Pay attention to heat dissipation from the motor and driver. 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).
●When using the motor with the dedicated driver, the driver's "Automatic Current Cutback" function at motor standstill reduces maximum holding torque by approximately 50%.
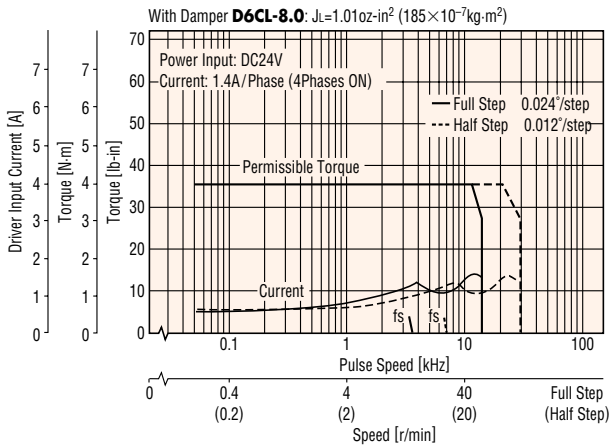
■ SPEED vs. TORQUE CHARACTERISTICS

fs: Maximum Starting Pulse Rate

CSK564BA-TG20

With Damper **D6CL-8.0**: J_L=1.01oz-in^2 (185×10^{-7}kg·m^2)

CSK564BA-TG30

With Damper **D6CL-8.0**: J_L=1.01oz-in^2 (185×10^{-7}kg·m^2)

Note:
- Pay attention to heat dissipation from the motor and driver. 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).
- When using the motor with the dedicated driver, the driver's "Automatic Current Cutback" function at motor standstill reduces maximum holding torque by approximately 50%.

■ PRECAUTIONS

When using the **CSK TH** geared type, please note the following:

1. Do not exceed the maximum permissible torque:

Permissible torque represents the maximum value of the mechanical strength of the gear unit. Be sure to keep the total value of acceleration/deceleration torque and load (friction) torque at the shaft under the permissible torque value. If torque exceeding the permissible torque is applied, the gear unit may fail.

2. Do not exceed the permissible speed range:

Do not exceed the maximum output speed of the gearhead indicated in the specifications on page B-185 and B-186. The speed affects the life of the gearhead.

3. Consider backlash in bi-directional positioning:

Backlash is the free rotation angle (i.e., play) of the output shaft when the input section of the reduction gear is fixed. The **CSK TH** geared type is a highly accurate gear for positioning. **CSK564TG** models provides 35 arc minutes (for gear ratio 3.6:1),15 arc minutes (for gear ratios 7.2:1 and 10:1) and 10 arc minutes (for gear ratios 20:1 and 30:1). If there is a problem with backlash in positioning in both directions, be sure to stop the motor in one direction. (In **CSK543TG** models, backlash is 45 arc minutes, 25 arc minutes and 15 arc minutes, respectively, for the above gear ratios.)

4. The direction of gear-shaft rotations differs according to gear ratios:

The direction of motor shaft rotation and gear shaft rotation according to the gear ratio applied:
Gear ratio - 3.6:1, 7.2:1 or 10:1 - Same as motor shaft
Gear ratio - 20:1 or 30:1 - Opposite of motor shaft

■ DIMENSIONS   scale 1/4, unit = inch (mm)

● Gearmotor

CSK543AA-TG3.6 (Single shaft) Motor Model: PK543ANA-TG3.6
CSK543AA-TG7.2 (Single shaft) Motor Model: PK543ANA-TG7.2
CSK543AA-TG10 (Single shaft) Motor Model: PK543ANA-TG10
CSK543AA-TG20 (Single shaft) Motor Model: PK543ANA-TG20
CSK543AA-TG30 (Single shaft) Motor Model: PK543ANA-TG30
CSK543BA-TG3.6 (Double shaft) Motor Model: PK543BNA-TG3.6
CSK543BA-TG7.2 (Double shaft) Motor Model: PK543BNA-TG7.2
CSK543BA-TG10 (Double shaft) Motor Model: PK543BNA-TG10
CSK543BA-TG20 (Double shaft) Motor Model: PK543BNA-TG20
CSK543BA-TG30 (Double shaft) Motor Model: PK543BNA-TG30
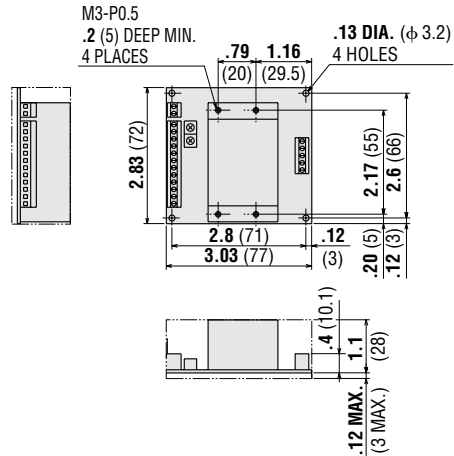Weight 0.73lb. (Mass 0.33kg)
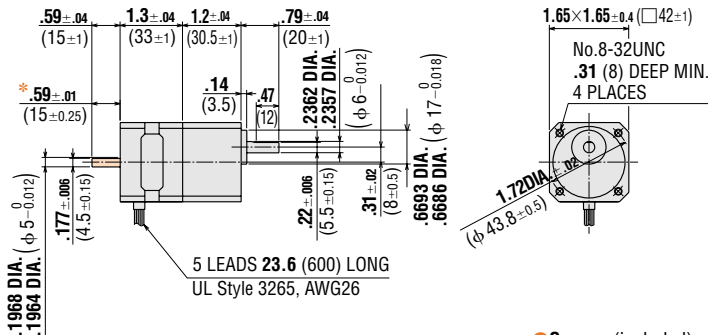
●Screws (included)
4-No.8-32 UNC. length .39 (10)

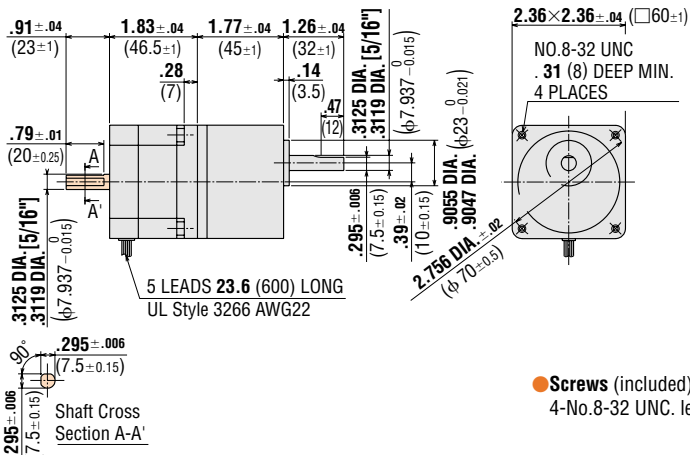***** .59±.01 (15±0.25) indicates the length of milling on motor shaft.

CSK564AA-TG3.6 (Single shaft) Motor Model: PK564ANA-TG3.6
CSK564AA-TG7.2 (Single shaft) Motor Model: PK564ANA-TG7.2
CSK564AA-TG10 (Single shaft) Motor Model: PK564ANA-TG10
CSK564AA-TG20 (Single shaft) Motor Model: PK564ANA-TG20
CSK564AA-TG30 (Single shaft) Motor Model: PK564ANA-TG30
CSK564BA-TG3.6 (Double shaft) Motor Model: PK564BNA-TG3.6
CSK564BA-TG7.2 (Double shaft) Motor Model: PK564BNA-TG7.2
CSK564BA-TG10 (Double shaft) Motor Model: PK564BNA-TG10
CSK564BA-TG20 (Double shaft) Motor Model: PK564BNA-TG20
CSK564BA-TG30 (Double shaft) Motor Model: PK564BNA-TG30
Weight 2.09lb. (0.95kg)

Shaft Cross Section A-A'

●Screws (included)
4-No.8-32 UNC. length .71 (18)

● Driver

Driver: CSD5807N-T (For **CSK543TG** models)
          CSD5814N-T (For **CSK564TG** models)
Weight: 0.31lb. (Mass 0.14kg)

● These external appearance drawings are of double shaft model.
   For a single shaft, ignore the colored areas.
See page B-36 for information on motor installation, and page B-38 for information on driver installation.

■ LIST OF MOTOR AND DRIVER COMBINATIONS

| Type | Package model | Stepping motor | | Driver |
		Model	Current A/phase	Model
STANDARD	**CSK543-N☐TA** **CSK544-N☐TA** **CSK545-N☐TA**	PK543-N☐A PK544-N☐A PK545-N☐A	0.75	CSD5807N-T
	CSK564-N☐TA **CSK566-N☐TA** **CSK569-N☐TA**	PK564-N☐A PK566-N☐A PK569-N☐A	1.4	CSD5814N-T
	CSK596-N☐TA **CSK599-N☐TA** **CSK5913-N☐TA**	PK596-N☐A PK599-N☐A PK5913-N☐A	2.8	CSD5828N-T
TH GEARED	**CSK543☐A-TG3.6** **CSK543☐A-TG7.2** **CSK543☐A-TG10** **CSK543☐A-TG20** **CSK543☐A-TG30**	PK543☐NA-TG3.6 PK543☐NA-TG7.2 PK543☐NA-TG10 PK543☐NA-TG20 PK543☐NA-TG30	0.75	CSD5807N-T
	CSK564☐A-TG3.6 **CSK564☐A-TG7.2** **CSK564☐A-TG10** **CSK564☐A-TG20** **CSK564☐A-TG30**	PK564☐NA-TG3.6 PK564☐NA-TG7.2 PK564☐NA-TG10 PK564☐NA-TG20 PK564☐NA-TG30	1.4	CSD5814N-T

Enter **A** (single shaft) or **B** (double shaft) in the ☐ within the model numbers.

■ WIRING DIAGRAMS

● **CSK54□**, **CSK56□** Models
● **CSK543TG**, **CSK564TG** Models
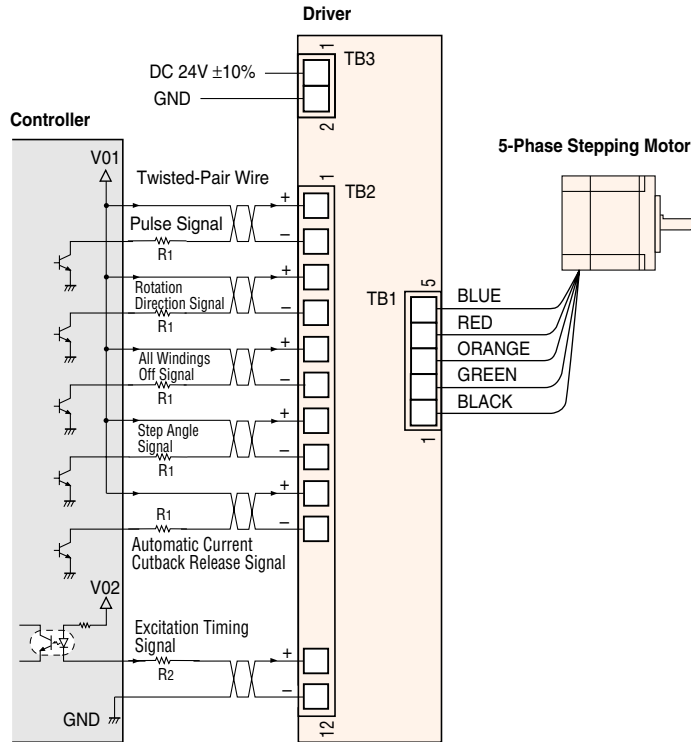
Note:
● Keep the voltage Vo1 and Vo2 between DC 5V and DC 24V.
  When they are equal to DC 5V, the external resistances R1 and R2 are not neccessory. When they are above DC 5V, connect R1 to keep the current below 20mA, and connect R2 to keep the current below 10mA.
● Use twisted-pair wire of 3.1×10^{-4} in.^{2} (0.2mm^2) or thicker and 6.6 feet (2m) or less in length for the signal line.
● Use wire 7.8×10^{-4} in.^{2} (0.5mm^2) or thicker for motor lines (when extended) and power supply lines, and use 1.2×10^{-3} in.^{2} (0.75mm^2) or thicker for the grounding wire.
● Use spot grounding to ground of the driver and external controller.
● Signal lines should be kept at least 3.94 in. (10cm) away from power lines (power supply lines and motor lines). Do not bind the signal line and power line together.

■ Timing Chart
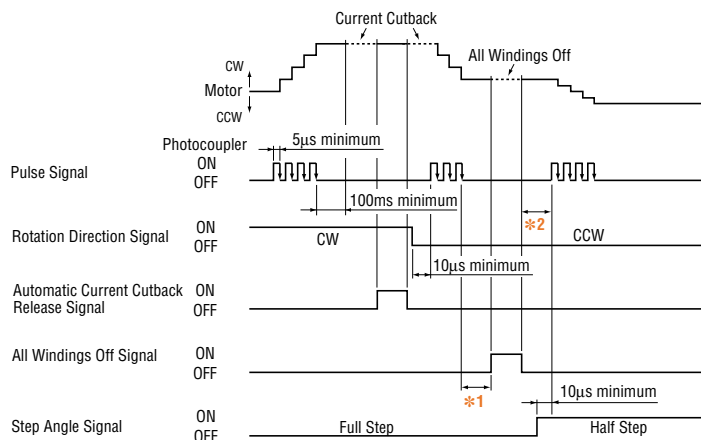
■ Input/Output Signal

● **Pulse Input**

"Pulse" signal is input to the PULSE − terminal. The direction of rotation is determined by the following rotation direction signal.

● **Rotation Direction Input**

The "Rotation Direction" signal is input to the DIRECTION − terminal.
"Photocoupler ON" : CW
"Photocoupler OFF" : CCW

● **All Windings Off (AW. OFF) Input**

When the "All Windings Off" (AW. OFF) signal is in the "photocoupler ON" state, the current to the motor is cut off and motor holding torque is reduced to zero. The motor output shaft can then be rotated freely by hand.
This signal is used when moving the motor by external force or the manual home position.

● **Step Angle (FULL/HALF) Input**

When the "Step Angle" (FULL/HALF) signal is in the "photocoupler ON" state, half step mode (0.36˚/step) has been selected; when the FULL/HALF signal is in the "photocoupler OFF" state, full step mode (0.72˚/step) has been selected.

● **Automatic Current Cutback Release (C.D.INH) Input**

When the "Automatic Current Cutback" release (C.D.INH) signal is in the "photocoupler ON" state, the "Automatic Current Cutback" function is not activated.

● **Excitation Timing (TIMING) Output**

The signal is output once each time the excitation sequence returns to step "0" in synchronization with input pulses. The excitation sequence is designed to complete one cycle as the motor shaft rotates 7.2˚. A signal is output every 10 pulses in full step mode (0.72˚/step) and every 20 pulses in half step mode (0.36˚/step).

Note: 10µs or more is the standard interval time for switching from CW to CCW. Note that the interval time greatly varies according the motor and load inertia.

*1 It is recommended to wait a period of time to allow the motor oscillations to end before inputting the A.W.O signal. This time varies with the load inertia, the load torque and the starting pulse rate. The signal input must be stopped before the motor stops.
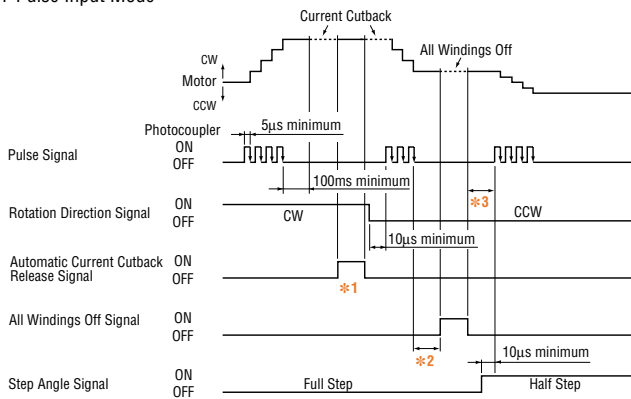
*2 Never input a step pulse signal immediately after switching the "All Windings Off" signal to "H" level or the motor may lose synchronism. In general, an interval of 100m sec. (minimum) is required.
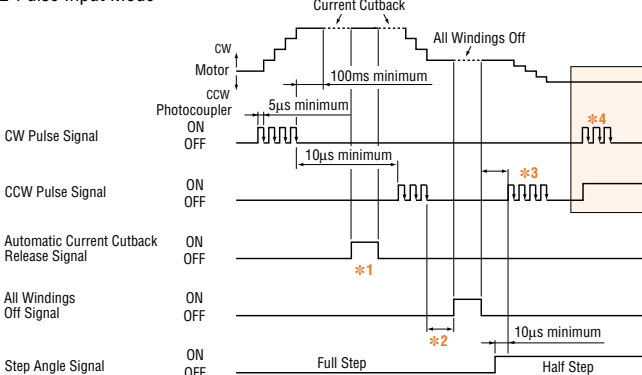
● CSK59□ Model
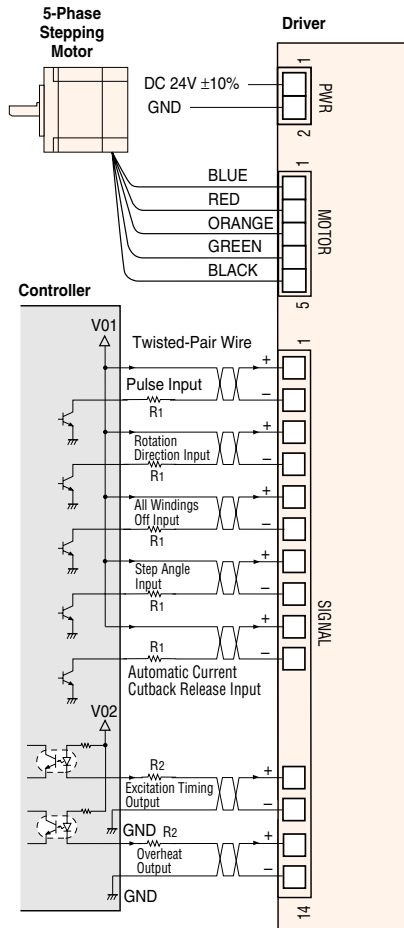
■ Timing Chart

● 1-Pulse Input Mode

● 2-Pulse Input Mode

■ Input/Output Signal

● Pulse Input

1-Pulse Input Mode
Pulse Signal
"Pulse" signal is input to the P./CW – terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step. The direction of rotation is determined by the following rotation direction signal.
Rotation Direction Signal
The "Rotation Direction" signal is input to D./CCW – terminal.
A "photocoupler ON" signal input commands a clockwise direction rotation. A "photocoupler OFF" signal input commands a counter-clockwise direction rotation.

2-Pulse Input Mode
CW Pulse Signal
"Pulse" signal is input to the P./CW – terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the clockwise direction.
CCW Pulse Signal
"Pulse" signal is input to the D./CCW – terminal. When the photocoupler state changes from "ON" to "OFF", the motor rotates one step in the counterclockwise direction.

● Overheat (O.HEAT) Output

The overheat signal is output to protect the driver from heat damage if the internal temperature of the driver rises above 194˚F (90˚C).
At the same time this signal is output, the O.H.LED on the circuit board lights.
The O.HEAT signal is automatically turned off when the temperature of the driver heat sink falls. (The O.HEAT signal returns to the "photocoupler OFF" state, and O.H.LED goes off.)

Note: Except for the above, signals are the same as those for the **CSK54**□ and **CSK56**□. (See Page B-191.)

Note:
● Keep the voltage Vo1 and Vo2 between DC 5V and DC 24V.
  When they are equal to DC 5V, the external resistances R1 and R2 are not neccessory. When they are above DC 5V, connect R1 to keep the current below 20mA, and connect R2 to keep the current below 10mA.
● Use twisted-pair wire of 3.1×10^{-4}in^2(0.2mm^2) or thicker and 6.6 feet (2m) or less in length for the signal line.
● The suitable wire size for the CN1 and CN2 connectors is between AWG20 and 26. Use wires rated at AWG20 (0.5mm^2) for the power line.
● Signal lines should be kept at least 3.94 in. (10cm) 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 wire causes problem, try shielding of the motor lead wires with conductive tape or wire mesh.

*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. Signal input must be stopped before the motor stops.

*3 Do not input pulse signals immediately after switching the "All Windings Off" input 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.

■ ADJUSTING THE OUTPUT CURRENT
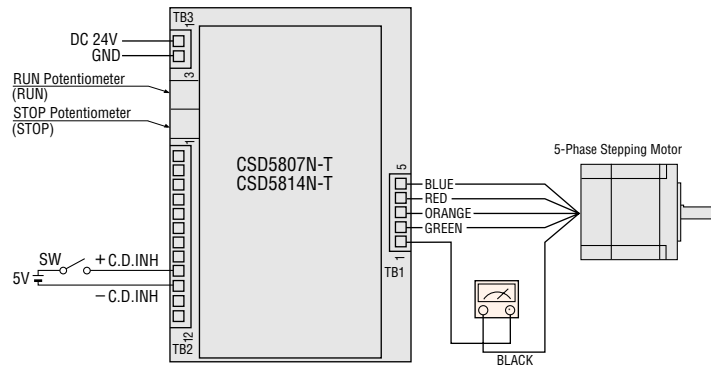
1. Adjustment Method

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

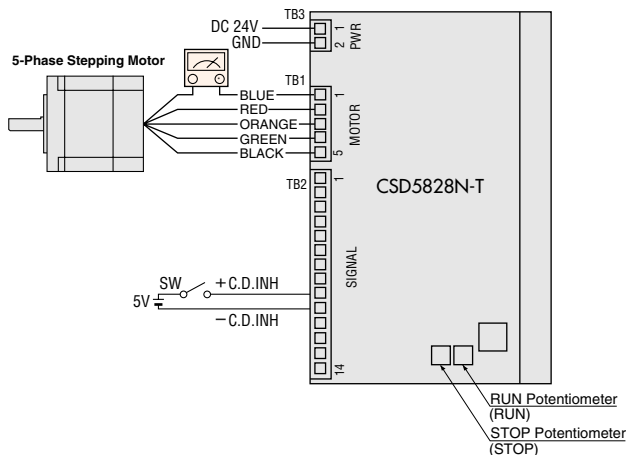**Connecting an ammeter**

● **CSK54□, CSK56□** Models
● **CSK543□A-TG□, CSK564□A-TG□** Models

Connect a DC ammeter between the motor and terminal ① of TB1 connector as shown below.

● **CSK59□** Model

Connect a DC ammeter between the motor and terminal ① of the MOTOR connector as shown 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 positive current flows through the blue motor lead wire. (Even if 4-5 phase excitation has been selected, the motor enters a 4 phase excitation state when the power is turned on. Adjust the current in this state.)
● The value measured by the ammeter represents the total current in two phases. The current for one phase is equivalent to half of the ammeter value. (When setting the current to 1.0A/phase, adjust the current level until the ammeter reads 2.0A.)

2. Adjusting the Motor Operating Current

Set the "Automatic Current Cutback" release (C.D.INH) signal to the "photocoupler ON" state (SW: ON) when adjusting the RUN current.

(1) Adjust the motor RUN current with the RUN potentiometer.
Adjusting Range   CSD5807N-T: 0.1A/phase~0.75A/phase
CSD5814N-T: 0.1A/phase~1.4A/phase
CSD5828N-T: 1.0A/phase~2.8A/phase
(2) The motor operating current is set for rated current (CSD5807N-T: 0.75A/phase, CSD5814N-T: 1.4A/phase, CSD5828N-T: 2.8A/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.

3. Adjusting the Current at Motor Standstill

Set the "Automatic Current Cutback" release (C.D.INH) signal to the "photocoupler OFF" state (SW: OFF) when adjusting the current while the motor is stopped.

(1) Adjust the current at motor standstill with the STOP potentiometer.
Adjusting Range   CSD5807N-T: 0.1A/phase~0.56A/phase
CSD5814N-T: 0.1A/phase~1.05A/phase
CSD5828N-T: 0.7A/phase~2.3A/phase

(2) At the time of shipping, the current at motor standstill is set for half the rated current. (CSD5807N-T: 0.375A/phase, CSD5814N-T: 0.7A/phase, CSD5828N-T: 1.4A/phase). The STOP potentiometer can be used to readjust the current at motor standstill to the current value required to produce enough holding torque.

$$\text{Holding Torque} = \frac{\text{Rated Holding Torque} \times \text{Current at Motor Standstill [A]}}{\text{Motor Rated Current [A]}}$$