

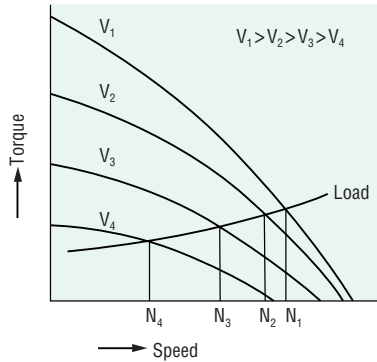
Torque Motors



Features

● The Speed Can Vary Widely, Depending on the Sloping Characteristics.

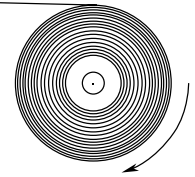
Torque motors have a high starting torque and sloping characteristics, allowing easy speed control simply by changing the voltage of the power supply. (The motor torque changes approximately proportionally to the square of the voltage.)



● Suitable for Winding Applications

In an application where an object is released continuously at a constant speed and wound up with constant tension, the torque must be doubled and the speed must be halved if the diameter of the winding spool is doubled.

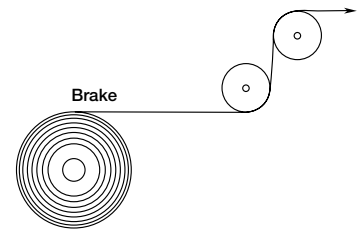
Constant Tension Wind Up



● Use as a Brake

By using the motor in the braking region of the speed-torque characteristics, it can serve as a brake.

Constant tension operation can be achieved by applying a DC voltage.



Safety Standards and CE Marking

Standards	Certification Body	Standards File No.	CE Marking
UL 1004 UL 2111 CSA C22.2 No.100 CSA C22.2 No.77	UL	E64197	Low Voltage Directives
EN 60950-1 EN 60034-1 EN 60034-5 IEC 60664-1			
GB 12350	CQC	2005010401150784 (3 W~20 W)	

● When the motor is approved under various safety standards, the model name on the nameplate is the approved model name.

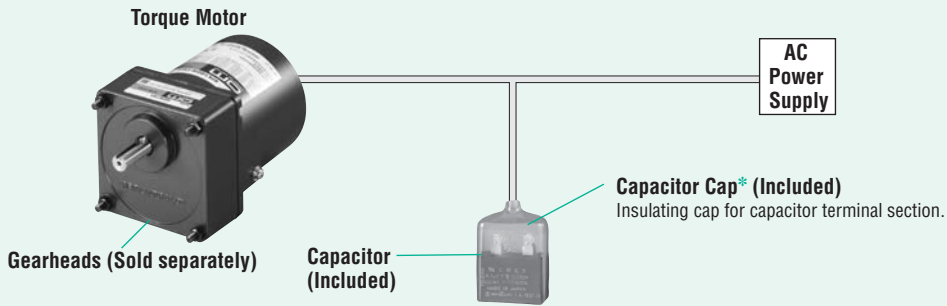
System Configuration



Mounting Brackets (Accessories)
(→ Page 121)



Flexible Couplings (Accessories)
(→ Page 123)



● **Example of System Configuration**
(Body)

Motor (Pinion Shaft) 4TK10GN-CW2E
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+

⊙: Required under this system.
(Sold separately) ○: Selectable according to necessity. Oriental Motor provides.

Long Life/Low Noise GN-S Gearhead	Mounting Bracket	Flexible Coupling
4GN25S	SOL4M5	MCL301012
⊙	○	○

*Capacitor cap is included.

● The system configuration shown above is an example. Other configurations are available. Decimal gearheads are also available.

Product Number Code

Motor

5 T K 20 GN - CW 2 E

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

①	Motor Frame Size	2: 60 mm 3: 70 mm 4: 80 mm 5: 90 mm
②	Motor Type	T: Torque Motors
③	Series	K: K Series
④	Output Power (W)	(Example) 20: 20 W
⑤	Motor Shaft Type	GN: GN Type Pinion Shaft A: Round Shaft
⑥	Power Supply Voltage	AW: Single-Phase 100 VAC, 110/115 VAC CW: Single-Phase 200 VAC, 220/230 VAC
⑦	2: RoHS-Compliant	
⑧	Included Capacitor	J: For Single-Phase 100 VAC, 200 VAC U: For Single-Phase 110/115 VAC E: For Single-Phase 220/230 VAC

● The **J**, **U** and **E** at the end of the model name indicate that the unit includes a capacitor. These letters are not listed on the motor nameplate.

When the motor is approved under various safety standards, the model name on the nameplate is the approved model name.

(Example) Model: **5TK20GN-CW2E**

→ Motor nameplate and product approved under various safety standards:

5TK20GN-CW2

Gearhead

5 GN 50 S

① ② ③ ④

①	Gearhead Frame Size	2: 60 mm 3: 70 mm 4: 80 mm 5: 90 mm
②	Type of Pinion	GN: GN Type Pinion
③	Gear Ratio	(Example) 50: Gear Ratio of 1:50 10X denotes the decimal gearhead of gear ratio 1:10
④	GN Type Pinion	S: Long Life/Low Noise GN-S Gearhead, RoHS-Compliant

Note:

A right-angle gearhead cannot be combined.

Product Line

Motor (RoHS)

Output Power	Model	
	Pinion Shaft Type	Round Shaft Type
3 W	2TK3GN-AW2J	2TK3A-AW2J
	2TK3GN-AW2U	2TK3A-AW2U
	2TK3GN-CW2J	2TK3A-CW2J
	2TK3GN-CW2E	2TK3A-CW2E
6 W	3TK6GN-AW2J	3TK6A-AW2J
	3TK6GN-AW2U	3TK6A-AW2U
	3TK6GN-CW2J	3TK6A-CW2J
	3TK6GN-CW2E	3TK6A-CW2E
10 W	4TK10GN-AW2J	4TK10A-AW2J
	4TK10GN-AW2U	4TK10A-AW2U
	4TK10GN-CW2J	4TK10A-CW2J
	4TK10GN-CW2E	4TK10A-CW2E
20 W	5TK20GN-AW2J	5TK20A-AW2J
	5TK20GN-AW2U	5TK20A-AW2U
	5TK20GN-CW2J	5TK20A-CW2J
	5TK20GN-CW2E	5TK20A-CW2E

Gearhead (Sold Separately) (RoHS)

Applicable Motor Output Power (Pinion Shaft Type)	Gearhead Model	Gear Ratio
3 W	2GN□S	3, 3.6, 5, 6, 7.5, 9, 12.5, 15, 18, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180
	2GN10XS (Decimal gearhead)	
6 W	3GN□S	3, 3.6, 5, 6, 7.5, 9, 12.5, 15, 18, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180
	3GN10XS (Decimal gearhead)	
10 W	4GN□S	3, 3.6, 5, 6, 7.5, 9, 12.5, 15, 18, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180
	4GN10XS (Decimal gearhead)	
20 W	5GN□S	3, 3.6, 5, 6, 7.5, 9, 12.5, 15, 18, 25, 30, 36, 50, 60, 75, 90, 100, 120, 150, 180
	5GN10XS (Decimal gearhead)	

● Enter the gear ratio in the box (□) within the model name.

Specifications

● 3 W, 6 W, 10 W (RoHS)



Model		Rating at Locked Rotor	Voltage	Frequency	Starting Torque	Max. Output Power	Speed at Max. Output	Torque at Max. Output	Current at Max. Output	Input Power at Max. Output	Capacitor	
Pinion Shaft Type	Round Shaft Type											VAC
TP	2TK3GN-AW2J	2TK3A-AW2J	5 minutes	100	50	70	3	750	39	0.42	40	7.0
					60	70	3.5	900	38	0.48	45	
			Continuous	50	50	18	0.8	750	10	0.21	10	
					60	20	1	900	11	0.30	14	
TP	2TK3GN-AW2U	2TK3A-AW2U	5 minutes	110	60	70	3.5	900	38	0.42	45	6.0
										115		
			Continuous	60	60	25	1.2	900	13	0.26	15	
TP	2TK3GN-CW2J	2TK3A-CW2J	5 minutes	200	50	70	3	750	39	0.210	40	1.8
					60	70	3.5	900	38	0.230	45	
			Continuous	100	50	18	0.8	750	10	0.105	10	
					60	20	1	900	11	0.150	15	
TP	2TK3GN-CW2E	2TK3A-CW2E	5 minutes	220	50	70	3	750	39	0.220	45	1.5
										230		
			Continuous	115	60	70	3.5	900	38	0.215	45	
										230		
TP	3TK6GN-AW2J	3TK6A-AW2J	5 minutes	100	50	140	6	750	78	0.64	60	11
					60	140	7.5	900	82	0.63	60	
			Continuous	50	50	40	1.6	750	21	0.31	15	
					60	45	2	900	23	0.45	20	
TP	3TK6GN-AW2U	3TK6A-AW2U	5 minutes	110	60	150	8	900	87	0.60	65	9.0
										115		
			Continuous	60	60	55	2.6	900	28	0.37	20	
TP	3TK6GN-CW2J	3TK6A-CW2J	5 minutes	200	50	140	6	750	78	0.340	60	3.0
					60	140	7.5	900	82	0.340	65	
			Continuous	100	50	40	1.6	750	21	0.165	15	
					60	45	2	900	23	0.245	25	
TP	3TK6GN-CW2E	3TK6A-CW2E	5 minutes	220	50	140	6	750	78	0.390	70	2.5
										230		
			Continuous	115	60	150	8	900	87	0.320	70	
										230		
TP	4TK10GN-AW2J	4TK10A-AW2J	5 minutes	100	50	220	10	750	130	0.76	70	14
					60	210	12	900	130	0.88	85	
			Continuous	50	50	60	2.3	750	30	0.40	20	
					60	65	2.8	900	30	0.54	25	
TP	4TK10GN-AW2U	4TK10A-AW2U	5 minutes	110	60	210	12	900	130	0.74	80	11
										115		
			Continuous	60	60	70	3.3	900	35	0.45	25	
TP	4TK10GN-CW2J	4TK10A-CW2J	5 minutes	200	50	220	10	750	130	0.38	70	3.5
					60	210	12	900	130	0.43	85	
			Continuous	100	50	60	2.3	750	30	0.19	19	
					60	65	2.8	900	30	0.27	25	
TP	4TK10GN-CW2E	4TK10A-CW2E	5 minutes	220	50	220	10	750	130	0.41	80	3.0
										230		
			Continuous	115	60	210	12	900	130	0.39	80	
										230		
					50	65	2.8	750	35	0.18	20	
										60	70	

● The **J**, **U** and **E** at the end of the model name indicate that the unit includes a capacitor. These letters are not listed on the motor nameplate.

When the motor is approved under various safety standards, the model name on the nameplate is the approved model name.

TP: Contains a built-in thermal protector. If a motor overheats for any reason, the thermal protector is opened and the motor stops.

When the motor temperature drops, the thermal protector closes and the motor restarts. Be sure to turn the motor off before inspecting.

● 20 W (RoHS)



Model		Rating at Locked Rotor	Voltage VAC	Frequency Hz	Starting Torque mN·m	Max. Output Power W	Speed at Max. Output Power r/min	Torque at Max. Output Power mN·m	Current at Max. Output Power A	Input Power at Max. Output Power W	Capacitor μ F
Pinion Shaft Type	Round Shaft Type										
TP 5TK20GN-AW2J	5TK20A-AW2J	5 minutes	100	50	350	20	750	260	1.00	90	18
				60	300	20	900	220	1.18	115	
		Continuous	50	50	80	4	750	50	0.50	25	
				60	85	4	900	45	0.69	34	
TP 5TK20GN-AW2U	5TK20A-AW2U	5 minutes	110	60	350	23	900	250	1.00	110	14
			115						1.02	115	
		Continuous	60	60	100	5.5	900	60	0.58	34	
				60	100	5.5	900	60	0.58	34	
TP 5TK20GN-CW2J	5TK20A-CW2J	5 minutes	200	50	350	20	750	260	0.57	105	4.5
				60	300	20	900	220	0.55	105	
		Continuous	100	50	80	4	750	50	0.24	24	
				60	85	4	900	45	0.31	30	
TP 5TK20GN-CW2E	5TK20A-CW2E	5 minutes	220	50	350	20	750	260	0.63	120	4.0
									0.68	130	
									0.53	115	
		Continuous	115	60	350	20	900	220	60	0.54	120
										0.26	29
										0.30	34

● The **J**, **U** and **E** at the end of the model name indicate that the unit includes a capacitor. These letters are not listed on the motor nameplate.

When the motor is approved under various safety standards, the model name on the nameplate is the approved model name.

TP: Contains a built-in thermal protector. If a motor overheats for any reason, the thermal protector is opened and the motor stops.

When the motor temperature drops, the thermal protector closes and the motor restarts. Be sure to turn the motor off before inspecting.

General Specifications

● 3 W, 6 W, 10 W, 20 W

Item	Specifications
Insulation Resistance	100 M Ω or more when 500 VDC megger is applied between the windings and the frame after rated motor operation under normal ambient temperature and humidity.
Dielectric Strength	Sufficient to withstand 1.5 kV at 50 Hz or 60 Hz applied between the windings and the frame for 1 minute after rated motor operation under normal ambient temperature and humidity.
Temperature Rise	Temperature rise of windings are 80°C or less measured by the resistance change method after rated motor operation under normal ambient temperature and humidity, with connecting a gearhead or equivalent heat radiation plate*.
Insulation Class	Class B (130°C)
Overheat Protection	Built-in thermal protector (automatic return type) 3W type open: 130°C \pm 5°C, close: 90°C \pm 15°C Other type open: 130°C \pm 5°C, close: 82°C \pm 15°C
Ambient Temperature	Single-Phase 50 VAC, Single-Phase 100 VAC, Single-Phase 200 VAC: -10°C~+50°C (nonfreezing) Single-Phase 60 VAC, Single-Phase 110 VAC, Single-Phase 115 VAC, Single-Phase 220 VAC, Single-Phase 230 VAC: -10°C~+40°C (nonfreezing)
Ambient Humidity	85% or less (noncondensing)
Degree of Protection	IP20

* Heat radiation plate (Material: Aluminum)

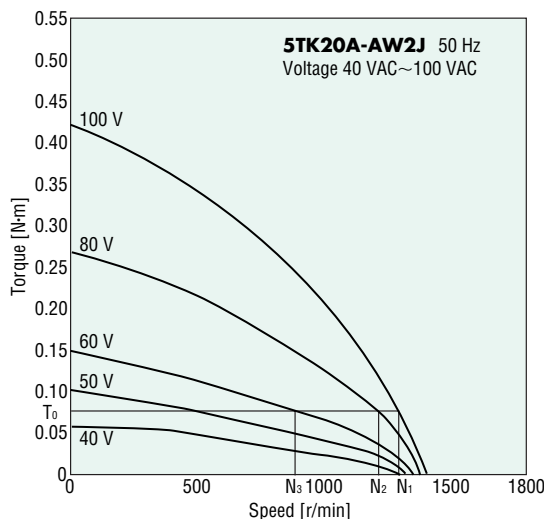
Motor Type	Size (mm)	Thickness (mm)
3 W Type	115×115	5
6 W Type	125×125	
10 W Type	135×135	
20 W Type	165×165	

How to Read Speed – Torque Characteristics

The motor torque changes approximately proportion to the square of the voltage. When the voltage supplied to the motor is changed, speed – torque curves with a sloping characteristics (torque is highest at zero speed and decreases steadily with increasing speed) shifts to that of the corresponding voltage.

When the voltage is changed to 100 VAC, 80 VAC and 60 VAC while the load torque is T_0 , the motor rotates at the speeds N_1 , N_2 and N_3 respectively. Thus, the speed can be changed easily by varying the voltage.

When choosing a torque motor, first determine the required torque and speed. Then select a motor using the speed – torque characteristics curves to determine whether the motor should be operated under continuous duty or limited duty. When used under locked rotor conditions, only the torque factor is considered. The temperature rise of the motor may cause a problem during continuous operation. In this case, choose a motor with an output power large enough for continuous operation and adjust the voltage to control the torque and speed.



Voltage Control of Torque Motors

The method most commonly used to control voltage is by phase control using a triac. As shown in Fig. 1, by changing the phase angle " α " at which the triac switches, the input voltage is controlled as represented by the phase angle areas of the graph.

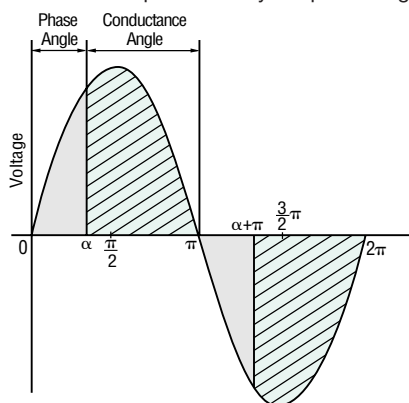


Fig. 1 Phase Control

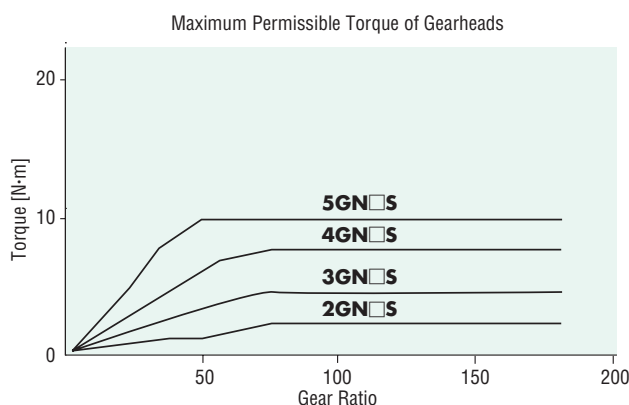
Gearmotor – Torque Table

Due to the sloping characteristics, torque motors can be operated over a wide speed range, from locked rotor condition to the maximum speed. The permissible torque when a gearhead and a decimal gearhead are directly connected can be calculated according to the following formula, using the speed and torque determined from the speed – torque characteristics.

Speed of gearhead output shaft $N_G = \text{Motor speed} \times 1/\text{gearhead gear ratio}$

Output torque of gearhead $T_G = \text{Motor torque} \times \text{Gearhead gear ratio} \times \text{Gearhead efficiency}$

The output torque of the gearhead must be lower than the maximum permissible torque.



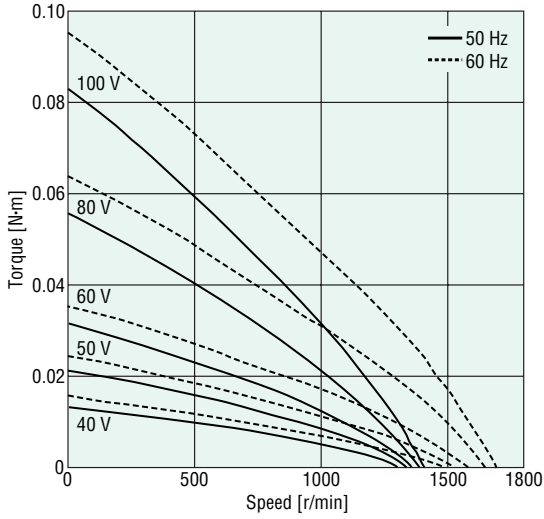
Gearhead Model	Gearhead Gear Ratio	Gearhead Efficiency
2GN□S	3~18	81%
3GN□S		73%
4GN□S	25~36	73%
5GN□S		66%

● Gearheads and decimal gearheads are sold separately.

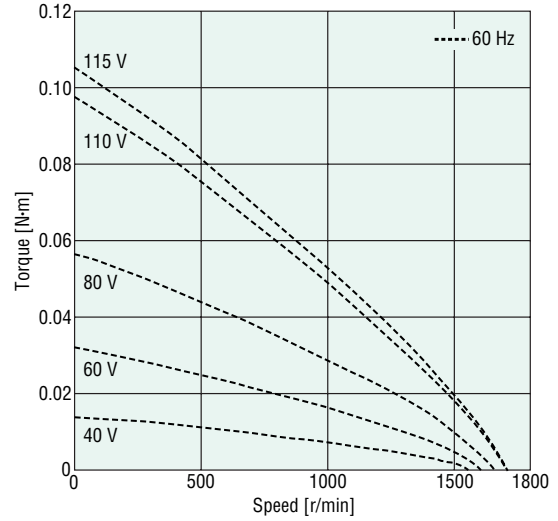
● Enter the gear ratio in the box (□) within the model name.

Speed – Torque Characteristics (Reference Values)

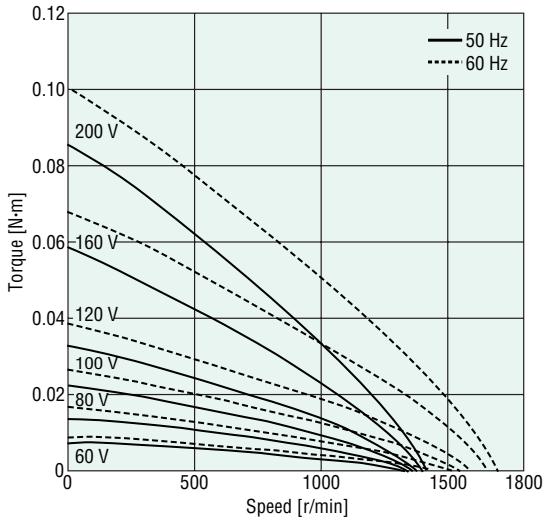
2TK3GN-AW2J, 2TK3A-AW2J



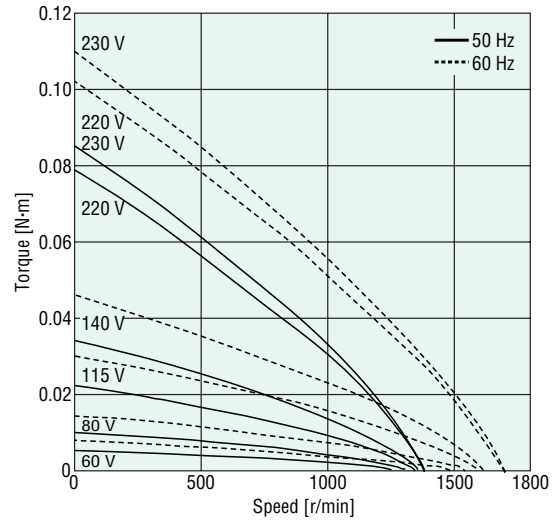
2TK3GN-AW2U, 2TK3A-AW2U



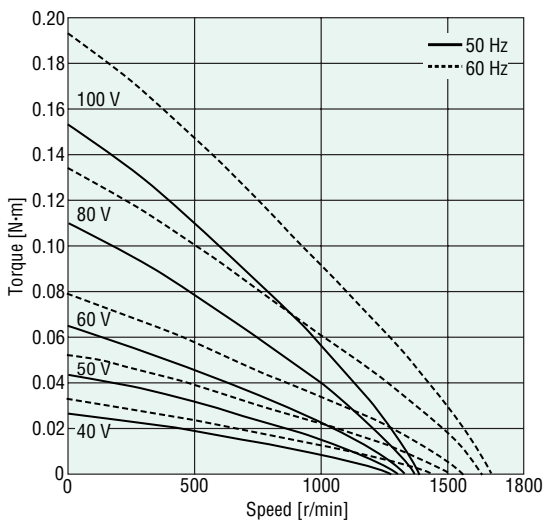
2TK3GN-CW2J, 2TK3A-CW2J



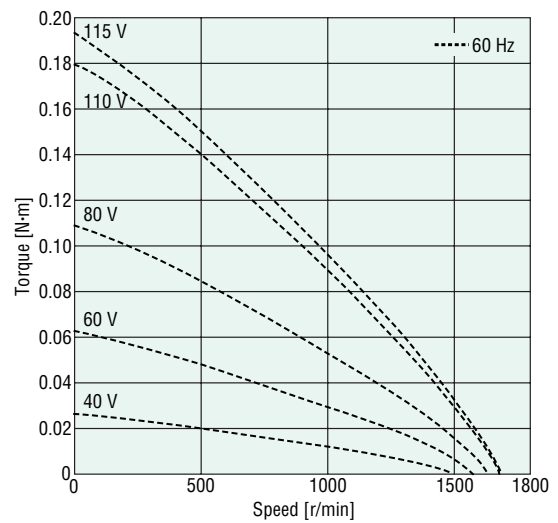
2TK3GN-CW2E, 2TK3A-CW2E



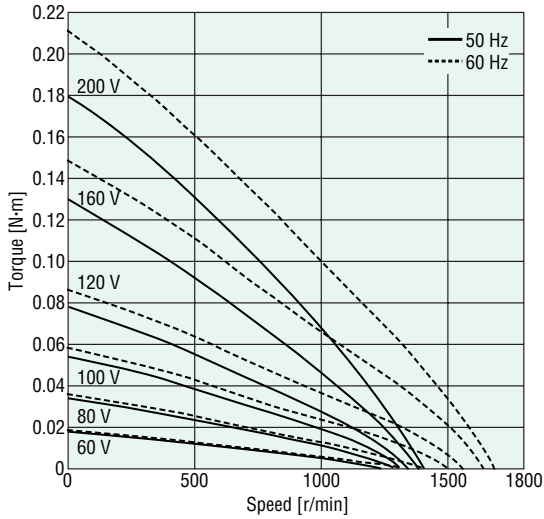
3TK6GN-AW2J, 3TK6A-AW2J



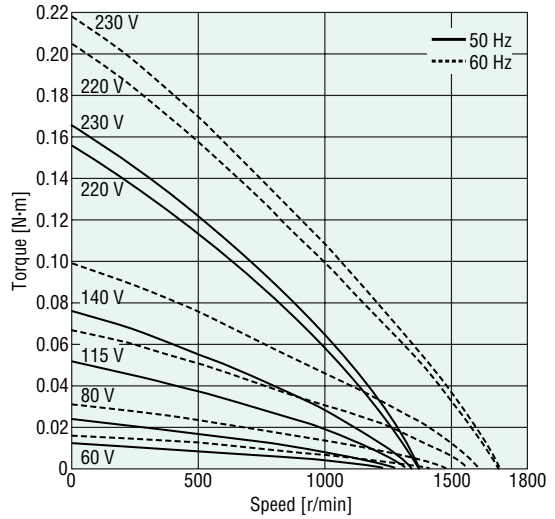
3TK6GN-AW2U, 3TK6A-AW2U



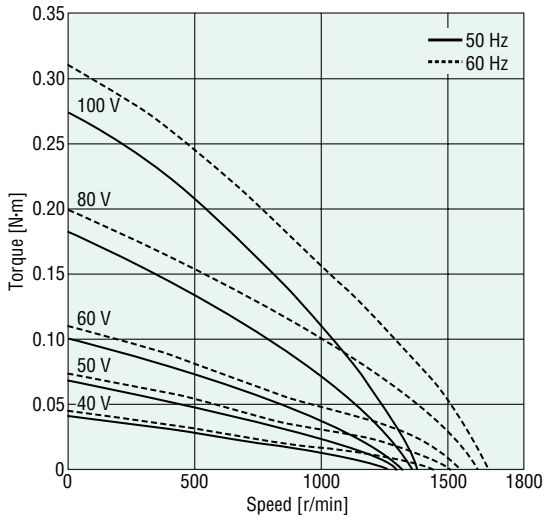
3TK6GN-CW2J, 3TK6A-CW2J



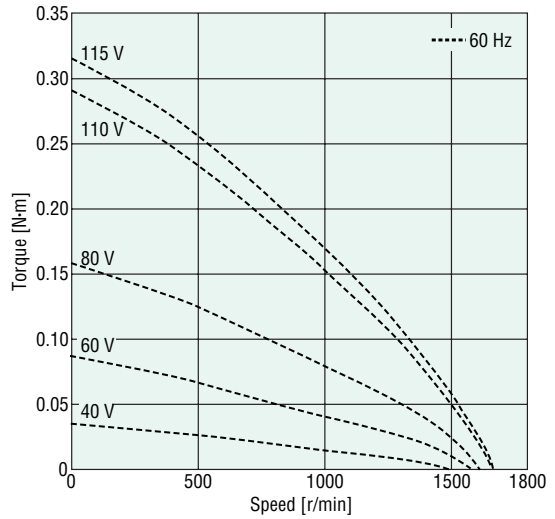
3TK6GN-CW2E, 3TK6A-CW2E



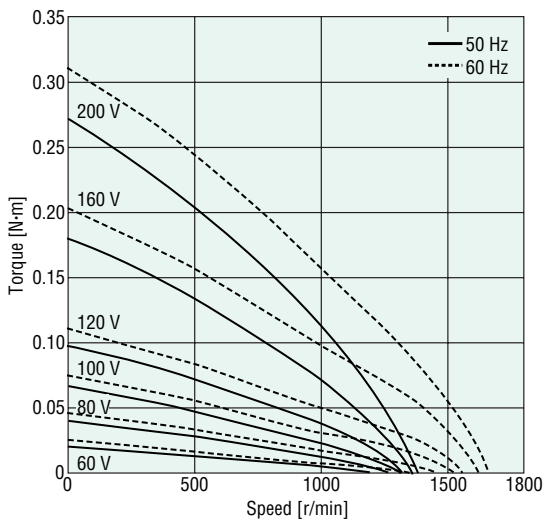
4TK10GN-AW2J, 4TK10A-AW2J



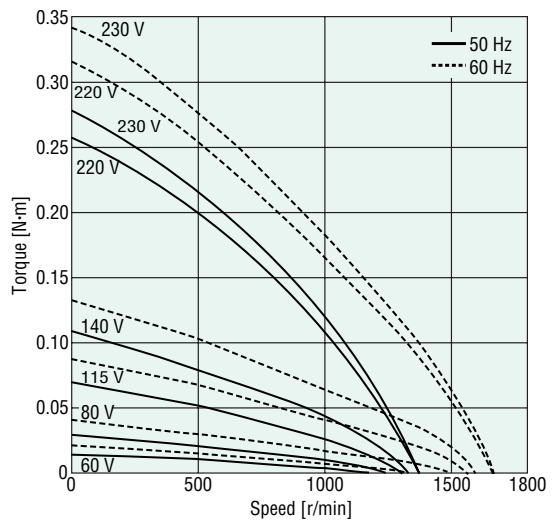
4TK10GN-AW2U, 4TK10A-AW2U



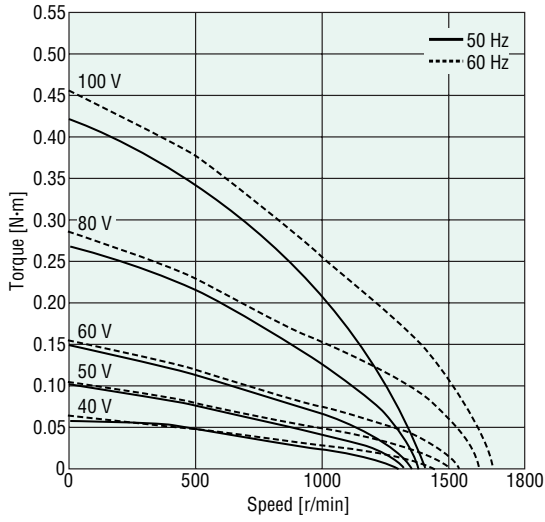
4TK10GN-CW2J, 4TK10A-CW2J



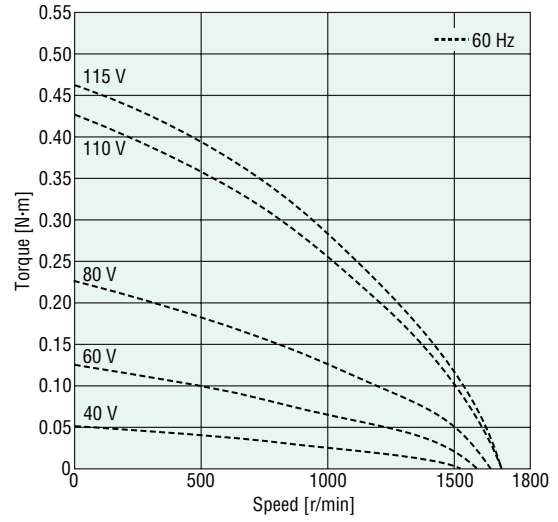
4TK10GN-CW2E, 4TK10A-CW2E



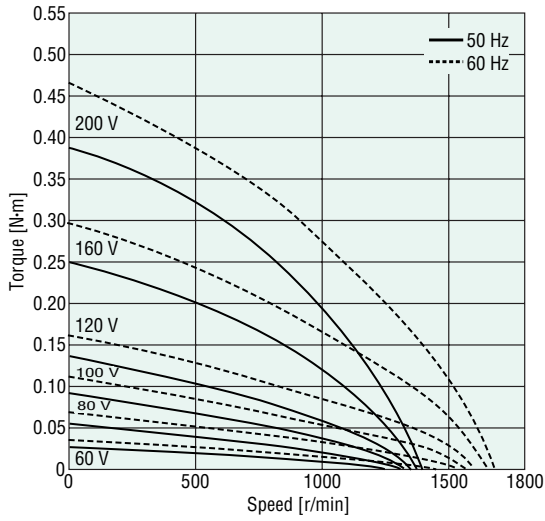
5TK20GN-AW2J, 5TK20A-AW2J



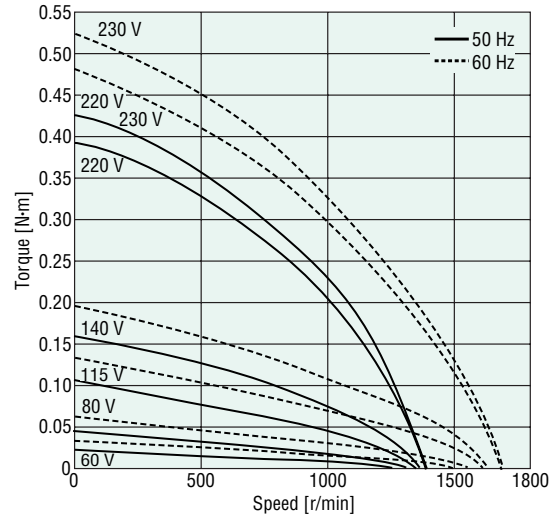
5TK20GN-AW2U, 5TK20A-AW2U



5TK20GN-CW2J, 5TK20A-CW2J



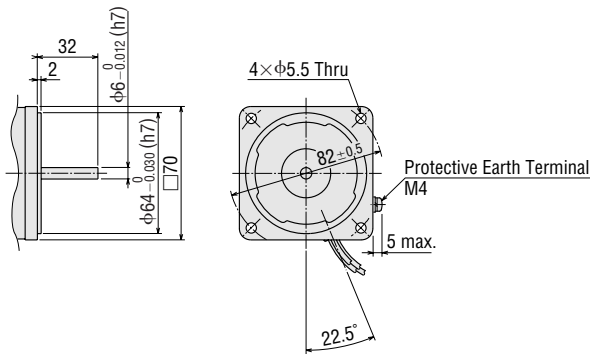
5TK20GN-CW2E, 5TK20A-CW2E



◇ Shaft Section of Round Shaft Type

3TK6A-AW2
3TK6A-CW2

The mass and motor's dimensions (excluding the shaft section) are the same as those of the pinion shaft type.



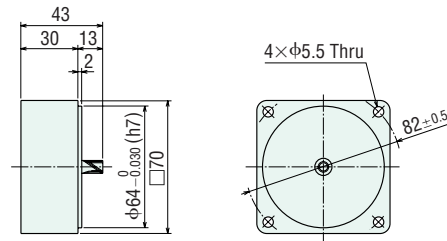
◇ Decimal Gearhead

Can be connected to **3TK6GN** type.

3GN10XS

Mass: 0.3 kg

CAD A009



● 10 W

◇ Motor/Gearhead

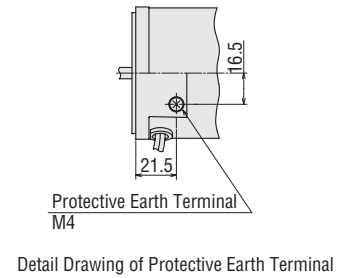
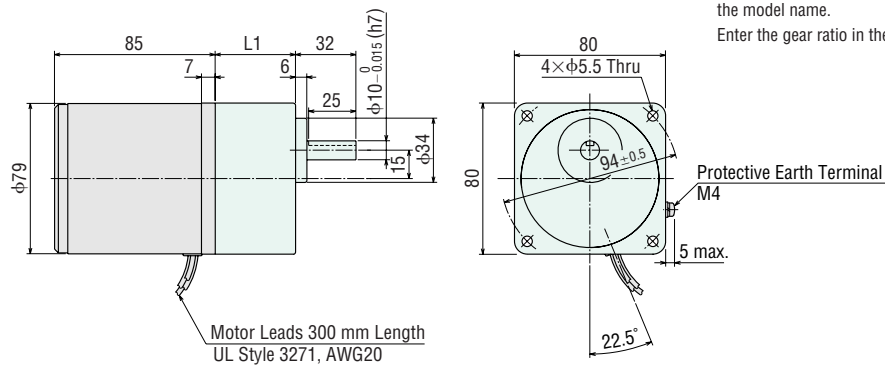
Mass: Motor 1.5 kg

Gearhead 0.65 kg

Motor Model	Gearhead Model	Gear Ratio	L1	CAD
4TK10GN-AW2	4GN □S	3~18	32	A449A
4TK10GN-CW2		25~180	42.5	A449B

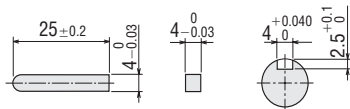
● Specify the type of the capacitor to be included by entering **J**, **U** or **E** in the box (□) within the model name.

Enter the gear ratio in the box (□) within the model name.



◇ Key and Key Slot

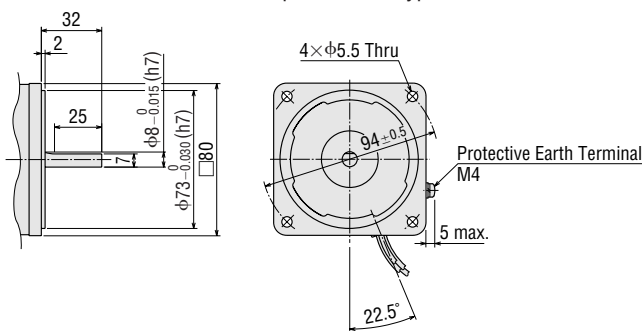
(The key is included with the gearhead)



◇ Shaft Section of Round Shaft Type

4TK10A-AW2
4TK10A-CW2

The mass and motor's dimensions (excluding the shaft section) are the same as those of the pinion shaft type.



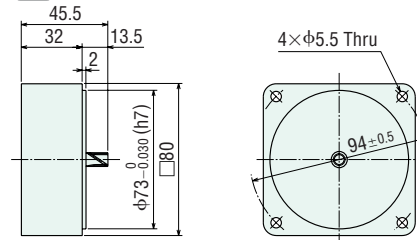
◇ Decimal Gearhead

Can be connected to **4TK10GN** type.

4GN10XS

Mass: 0.4 kg

CAD A013



● 20 W

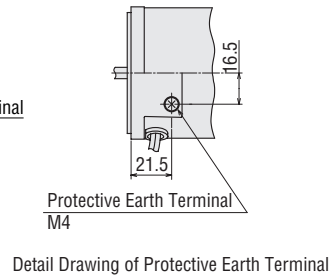
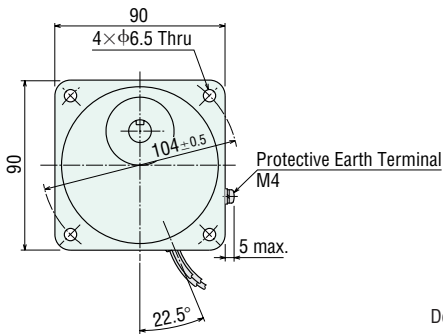
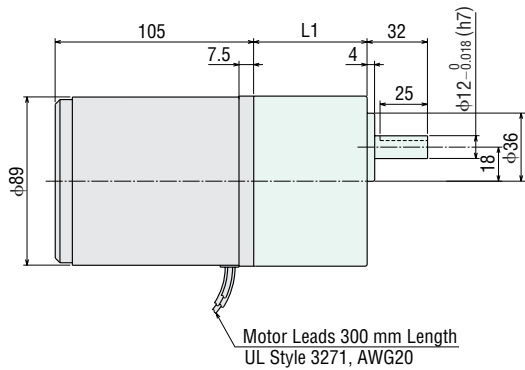
◇ Motor/Gearhead

Mass: Motor 2.5 kg
Gearhead 1.5 kg

Motor Model	Gearhead Model	Gear Ratio	L1	CAD
5TK20GN-AW2 <input type="checkbox"/>	5GN <input type="checkbox"/> S	3~18	42	A452A
5TK20GN-CW2 <input type="checkbox"/>		25~180	60	A452B

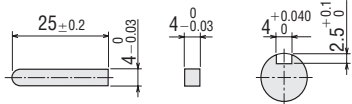
● Specify the type of the capacitor to be included by entering **J**, **U** or **E** in the box () within the model name.

Enter the gear ratio in the box () within the model name.



◇ Key and Key Slot

(The key is included with the gearhead)

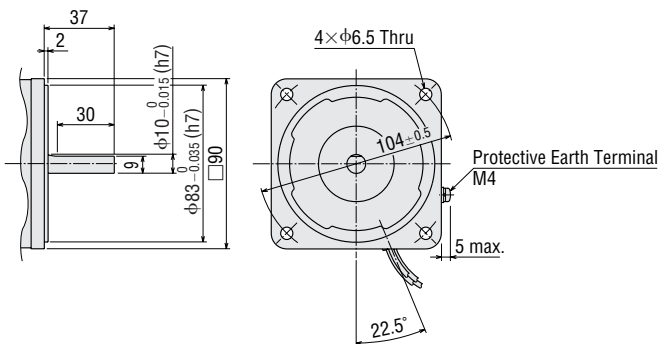


◇ Shaft Section of Round Shaft Type

5TK20A-AW2

5TK20A-CW2

The mass and motor's dimensions (excluding the shaft section) are the same as those of the pinion shaft type.



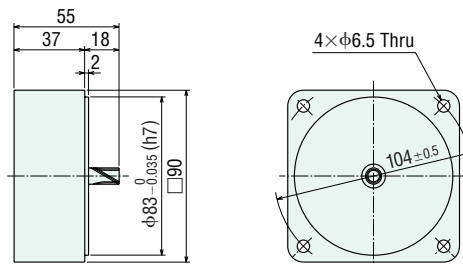
◇ Decimal Gearhead

Can be connected to **5TK20GN** type.

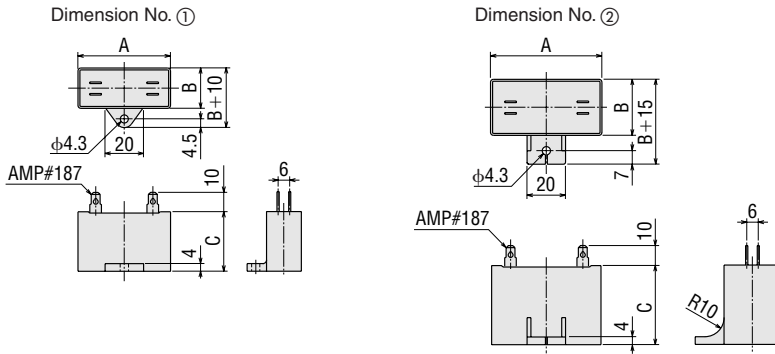
5GN10XS

Mass: 0.6 kg

CAD A022



◇ Capacitor (Included with the motors)



◇ Capacitor Dimensions (mm)

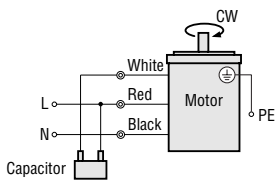
Model		Capacitor Model	A	B	C	Mass (g)	Dimension No.	Capacitor Cap
Pinion Shaft Type	Round Shaft Type							
2TK3GN-AW2J	2TK3A-AW2J	CH70CFAUL2	48	19	29	36	①	Included
2TK3GN-AW2U	2TK3A-AW2U	CH60CFAUL2	38	21	31	40	①	
2TK3GN-CW2J	2TK3A-CW2J	CH18BFAUL	38	21	31	35	①	
2TK3GN-CW2E	2TK3A-CW2E	CH15BFAUL	38	21	31	35	①	
3TK6GN-AW2J	3TK6A-AW2J	CH110CFAUL2	58	21	31	50	①	
3TK6GN-AW2U	3TK6A-AW2U	CH90CFAUL2	48	22.5	31.5	45	①	
3TK6GN-CW2J	3TK6A-CW2J	CH30BFAUL	58	21	31	50	①	
3TK6GN-CW2E	3TK6A-CW2E	CH25BFAUL	48	21	31	45	①	
4TK10GN-AW2J	4TK10A-AW2J	CH140CFAUL2	58	22	35	61	①	
4TK10GN-AW2U	4TK10A-AW2U	CH110CFAUL2	58	21	31	50	①	
4TK10GN-CW2J	4TK10A-CW2J	CH35BFAUL	58	22	35	55	①	
4TK10GN-CW2E	4TK10A-CW2E	CH30BFAUL	58	21	31	50	①	
5TK20GN-AW2J	5TK20A-AW2J	CH180CFAUL2	58	29	41	95	②	
5TK20GN-AW2U	5TK20A-AW2U	CH140CFAUL2	58	22	35	61	①	
5TK20GN-CW2J	5TK20A-CW2J	CH45BFAUL	58	23.5	37	73	②	
5TK20GN-CW2E	5TK20A-CW2E	CH40BFAUL	58	23.5	37	70	②	

■ Connection Diagrams

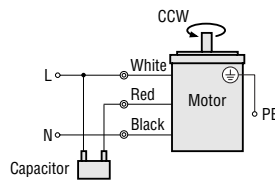
- The direction of motor rotation is as viewed from the shaft end of the motor. CW represents the clockwise direction, while CCW represents the counterclockwise direction.
- Connection diagrams are also valid for the equivalent round shaft type.
- Specify the type of the capacitor to be included by entering **J**, **U** or **E** in the box (□) within the model name.

2TK3GN-AW2□, 2TK3GN-CW2□, 3TK6GN-AW2□, 3TK6GN-CW2□
4TK10GN-AW2□, 4TK10GN-CW2□, 5TK20GN-AW2□, 5TK20GN-CW2□

Clockwise



Counterclockwise



PE: Protective Earth

Common Specifications

Permissible Overhung Load and Permissible Thrust Load of Motor

Permissible Overhung Load

Motor		Permissible Overhung Load N	
Motor Frame Size □ (mm)	Output Shaft Diameter φ (mm)	Distance from Shaft End	
		10 mm	20 mm
42	5	40	—
60	6	50	110
70	6	40	60
80	8	90	140
	10	110	120
90	10	140	200
	12	240	270

Permissible Thrust Load

Avoid thrust loads as much as possible. If thrust load is unavoidable, keep it to half or less of the motor mass.

Permissible Overhung Load and Permissible Thrust Load of Gearheads

Model	Gear Ratio	Maximum Permissible Torque N·m	Permissible Overhung Load N		Permissible Thrust Load N
			10 mm from Shaft End	20 mm from Shaft End	
0GN□K	3~180	1.0	20	—	15
2GN□S	3~18	3.0	50	80	30
	25~180		120	180	
3GN□S	3~18	5.0	80	120	40
	25~180		150	250	
4GN□S	3~18	8.0	100	150	50
	25~180		200	300	
5GN□S	3~18	10	250	350	100
	25~180		300	450	
5GE□S	3~9	20	400	500	150
	12.5~18		450	600	
	25~180		500	700	

Permissible Load Inertia for Gearhead J

When a high load inertia (J) is connected to a gearhead, high torque is exerted instantaneously on the gearhead when starting up in frequent, discontinuous operations (or when stopped by an electromagnetic brake, or when stopped instantaneously by a brake pack). Excessive impact loads can cause the gearhead or motor damage.

The table below gives values for permissible load inertia on the motor shaft. Use the motor and gearhead within these parameters. The permissible inertial load value shown for three-phase motors is the value when reversing after a stop.

The permissible load inertia (J) on the gearhead output shaft is calculated with the following equation.

The life of the gearhead when operating at the permissible inertial load with instantaneous stops of the motors with electromagnetic brakes, brake packs or speed control motors is at least 2 million cycles.

Permissible Load Inertia for Gearhead Output Shaft

Gear ratio 1/3~1/50 $J_G = JM \times i^2$ J_G : Permissible load inertia for gearhead output shaft J ($\times 10^{-4}$ kg·m²)

Gear ratio 1/60 or higher $J_G = JM \times 2500$ J_M : Permissible load inertia at the motor shaft J ($\times 10^{-4}$ kg·m²)

i : Gear ratio (Example: $i=3$ means the gear ratio of 1/3)

Permissible Load Inertia at the Motor Shaft

No. of Phase	Motor Frame Size	Output Power	Permissible Load Inertia at the Motor Shaft J ($\times 10^{-4}$ kg·m ²)
Single-Phase	□ 42 mm	1 W, 3 W	0.016
	□ 60 mm	3 W*, 6 W	0.062
	□ 70 mm	6 W*, 15 W	0.14
	□ 80 mm	10 W*, 25 W	0.31
		20 W*, 40 W	0.75
	□ 90 mm	60 W	1.1
		90 W	1.1
Three-Phase	□ 60 mm	6 W	0.062
	□ 80 mm	25 W	0.31
	□ 90 mm	40 W	0.75
		60 W	1.1
		90 W	1.1

* Output power for torque motors