

LIMITED ANGLE TORQUE MOTORS AND TACHOMETERS

Introduction



This catalogue is intended as a guide for the user to help select or specify a cog free brushless DC limited angle motor or a brushless limited angle tachometer. The size, weight and performance characteristics of the motors and tachometers shown in the data sheets are examples of typical applications. Should the requirements fall between the wide variety of sizes and performance characteristics available, Aeroflex will tailor a motor or generator for a specific need. This customization can include size variations, winding characteristics, performance characteristics and physical mounting requirements.

Limited Angle Brushless Motor Description

Limited angle brushless motors are single-phase machines which produce torque over a limited angle without the need for commutation. With a constant current, the torque will follow one of the curves shown in Figure 1 depending on the number of poles, torque constant, angle of regard, and winding distribution. These curves are for reference only and may vary slightly from model to model. Armature reaction effects (reduction of K_t as a function of the magnitude of current and angle) are not taken into consideration and will distort these theoretical torque vs angle curves.

The limited angle brushless motor is designed with slotless laminations. The lamination stack is constructed using smooth cylindrical laminations. Thus the rotor "sees" the same magnetic reluctance which is independent of rotor angle, hence no cogging torque. The windings can be either wound toroidally or can employ a surface winding technique. Most of the motors described in this catalogue are of the toroid variety. In some designs, where higher efficiency is needed, surface winding can be substituted.

The winding configuration is integrated with the magnetics of the rotor to give the back EMF wave forms shown in Figure 1. The windings are toroidally wound and generally potted to form a smooth cylindrical surface. For the surface wound limited angle torquers, the windings are mechanically captured by a non-conductive, non magnetic structure and then epoxy impregnated. The motors described have non-redundant windings. Redundant windings are available upon special request.

The rotors use either Alnico magnets, high energy product Samarium Cobalt or Neodymium-Boron-Iron magnets depending on the requirements. The motors are engineered to develop the maximum torque for the lowest power and the lowest weight for a given form factor. The motors use materials which meet the outgassing requirements for critical space applications.

Non-Standard laminations and materials are available for specific applications, which require lower viscous drag torque, higher torque per unit weight and or higher temperature operation.

Limited Angle Brushless Tachometer Description

These devices are designed and manufactured in an identical manner to the Limited Angel Torque motors. The major difference being that there is generally a greater amount of turns of finer wire to yield higher output sensitivity.

Performance Considerations

Most toothed motors have large copper areas available and large air gap flux densities to achieve a high torque to power ratio. The limited angle torque motor, in order to achieve the zero cog and flat torque vs. angle advantages, must necessarily have a large magnet air gap into which the windings can be set. This drops the available gap flux density and hence the limited angle cog free motors tend to be physically a bit larger than their toothed counterparts.

The motors have typically low drag torque (hysteresis of the lamination steel) and low inductance which keeps the electrical time constant low so that the motor will respond rapidly to dynamic requirements. The motors are highly linear (torque/current) from zero through continuous to peak torque levels. The motors run very quietly and smoothly, particularly at slow speeds where jitter free positioning is required.



Catalogue Details

The catalogue has motors ranging in size from 1 inch to 8 inches in diameter. Torques from fractional in-oz to integer ft-lb ranges are available. Special designs have been created up to 14 inches in diameter.

The catalogue has several indices which can be used to begin the selection process without thumbing through each individual data sheet.

Installation Requirements

The rare earth magnets used on the motors do not require a keeper and the rotor may be assembled or disassembled at will with no loss of performance. The rotors, however, contain very strong magnets, which can easily attract themselves to a foreign magnetic material or vice versa. Therefore, care should be exercised in handling these rotors during the installation process. Installation fixtures are recommended. The motors using Alnico magnets do require a keeper or the motor's performance will decrease by approximately 50%. The rotors should not be disassembled from the stator without such a keeper.

The stators are intended to be mounted inside of a smooth cylindrical housing on the host equipment. Individual mounting flanges can be manufactured and installed at Aeroflex if desirable. Fully housed motors with shaft extensions are available.

The rotors have inner diameters as specified in the catalogue. These can be mounted onto the customer's hub as needed. Individual side plates can be added or custom hubs can be machined to customer requirements.



Explanation of Size and Winding Parameters

Continuous Torque - The continuous torque value is given so that the motor will not exceed 130° C when in a 20 °C environment with this torque continually applied.

Peak Torque - The motors can achieve these levels for short periods of time. The wire current handling capability and the magnetic saturation of the steel have all been considered in this rating.

Peak Current - The current required to generate the Peak Torque of the motor. It is peak voltage divided by motor resistance at 20° C.

Peak Power - The peak current squared times the motor resistance at 20° C.

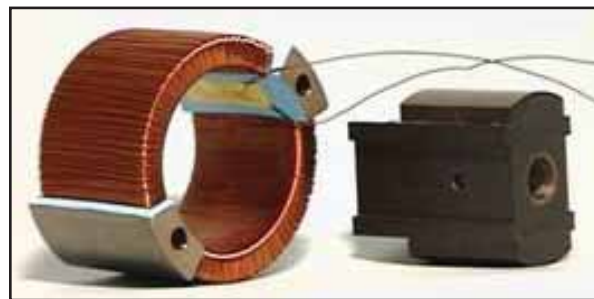
Km - Motor Constant - A figure of merit which characterizes the size of a motor with respect to the amount of torque vs. amount of power available. It is mathematically the peak torque divided by the square root of peak power or it is the torque constant (Kt) divided by the square root of motor resistance (R).

Poles - The number of poles has been chosen with consideration towards peak torque and angle of regard.

Inertia - The moment of inertia of the motor rotor about the axis of rotation.

Weight - The weight of the combined rotor and stator without leads.

Voltage Peak Torque - The nominal voltage required to generate the peak torque when the winding temperature is 20° C. It is nominally Peak current times R. Since the motor torque is proportional to current, as the motor heats the resistance increases causing the current to drop for a constant voltage source. This should be considered in designing the drive system.



Kt - Torque Constant - The amount of torque developed for a given current.

R - Motor Resistance - The 20° C resistance of the motor.

Part Number Description

P = Pancake

H = Housed

K = Rare Earth Magnet

F = Flanged

Y or W denotes a two-pole device. If there is no Y or W included in the part number, this indicates a 4 or more pole motor.

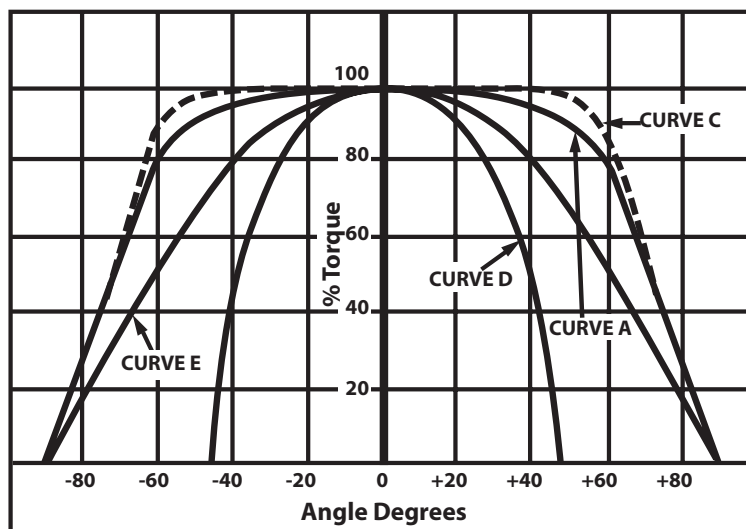


Figure 1: Performance Curves

LIMITED ANGLE TORQUE MOTORS AND TACHOMETERS

TQ10 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ10Y-15B	0.85	20	0.2	120	1.4	55	1.2	0.962	0.350	0.125	A
TQ10W-15	1	19	0.2	60	1.7	55	1.2	0.962	0.350	0.125	–
TQ10Y-15C	1	19	0.4	60	1.7	55	–	0.962	0.350	0.125	–
TQ10Y-10PV	1.3	18	0.5	120	2.5	65	1	1	0.350	no shaft bore	A
TQ10W-10F	1.3	11	0.5	120	3	60	–	1	0.350	0.125 shaft	A
TQ10W-10P	1.3	11	0.5	120	3	60	–	1	0.350	0.125 shaft	–
TQ10Y-10P	1.3	16	0.5	120	2.5	60	1	1	0.350	0.125	A
TQ10Y-10PA	1.3	16	0.5	120	2.5	60	1	1	0.350	0.125	A
TQ10Y-10PL	1.3	23	0.5	15	2.2	65	1.2	1	0.350	0.125	–
TQ10Y-10PO	1.3	12	0.5	120	3	60	1	1	0.350	0.125	A
TQ10Y-10S	1.3	12	0.5	120	3	60	1	1	0.350	0.125	A
TQ10Y-12PK	1.3	18	0.5	120	2.5	65	1	1	0.350	0.125	A
TQ10Y-12PVK	1.3	18	0.5	120	2.5	65	1	1	0.350	no shaft bore	A
TQ10Y-18	1.3	21	0.25	60	2	50	1.2	0.962	0.350	0.125	–
TQ10Y-21	1.3	21	0.25	60	2	48	–	0.962	0.350	0.125	–
TQ10Y-61	1.3	23	0.3	60	2	55	1.2	0.962	0.350	0.125	–
TQ10Y-17	1.5	22	0.3	60	1.6	25	–	0.962	0.350	0.125	–
TQ10Y-17A	1.5	22	0.6	60	1.6	25	1.2	0.962	0.350	0.125	–
TQ10Y-60	1.5	22	0.4	60	1.6	25	–	0.962	0.350	0.125	–
TQ10Y-13	1.6	22	0.3	60	2	100	–	0.962	0.350	0.125	–
TQ10Y-17P	1.8	21	0.5	60	2	26	–	1	0.350	0.125	–
TQ10Y-38P	1.8	20	0.5	120	0.94	5.5	1.2	1	0.350	0.125	A
TQ10Y-34P	1.9	21	0.5	120	0.9	4.8	1.2	1	0.350	0.118	A
TQ10Y-35P	6	120	1.4	120	1.1	4.1	2.2	1	0.700	0.125	–
TQ10Y-34PK	1.7	21	0.5	120	0.9	6	1.2	1	0.350	0.118	A
TQ10Y-33PA	1.4	19	0.6	120	4.2	175	1	1	0.350	0.125	A
*2TQ10W-14PA	4.5	55	1.5	120	2.15	12.5	–	1	1.400	0.125 shaft	A
TQ10Y-2P	6	107	1.5	120	5.8	100	2	1	0.700	0.125	A
TQ10Y-2PA	6	107	1.5	120	5.8	100	2	1	0.700	0.125	A
TQ10Y-2PK	6	88	1.7	120	6.4	100	2	1	0.700	0.125	A
TQ10Y-2PC	6	112	1.5	26	5.8	105	1.5	1	0.700	0.125	–
TQ10Y-2PE	6	107	1.5	120	5.8	100	1.9	1	0.700	0.125	–
TQ10Y-2S	6	107	1.5	120	5.8	100	2	1	0.700	0.125	A
TQ10Y-2SA	6	107	1.5	120	5.8	100	2	1	0.700	0.125	A
TQ10Y-4	6	93	1.5	120	1.6	6.6	2	0.96	0.700	0.125	A
TQ10Y-4F	6	93	1.5	120	1.6	6.6	2	1	0.700	0.125	A
TQ10Y-4K	6	93	1.5	120	1.6	6.6	2	0.96	0.700	0.125	A
TQ10Y-4P	6	93	1.5	120	1.6	6.6	2	1	0.700	0.125	A
TQ10Y-4S	6	93	1.5	120	1.6	6.6	2	1	0.70	0.125	A
TQ10Y-5PKA	6	129	1.5	120	1.8	12	2	1	0.700	0.125	A
TQ10Y-8PK	6	83	1.5	120	0.93	2	2	1	0.700	0.118	A
TQ10Y-11	–	–	–	60	2.5	140	1	0.962	0.350	0.125	–

*Redundant

Note: When motors have mounting flanges, outer diameter posted is for motor body only. All motors can be made to accommodate a variety of hub configurations for securing shaft.

LIMITED ANGLE TORQUE MOTORS AND TACHOMETERS

TQ11 – TQ17 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ11W-2	6	52	0.1*	45	7	71	–	1.178	1.247	0.125	–
TQ12W-2	6	66	0.9**	90	2.2	9.2	2.2	1.178	0.610	0.125	–
TQ12-10PK	5.7	30	1.6	16	4.3	17	–	1.1875	0.350	0.250	–
TQ17W-34	7.3	35	4	50	7	32	3.6	1.63	0.700	0.187	–

*@110C, 1.5V ; **@110C, 5V

TQ18 – TQ19 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ18W-65PK	2.2	7	–	84	7	69	–	1.7187	0.750	0.250	–
TQ18W-39FA	2.5	20	1.8	120	7.5	130	3	1.875	0.350	0.250	A
TQ18W-30PV	3	32	1.5	120	3.2	36	–	1.7187	0.350	0.187	A
TQ18W-37FA	3	30	1.5	120	2.8	26	3.8	2.343	1.718	0.187	A
TQ18W-37P	3	30	1.5	120	2.8	26	3.8	1.7187	0.350	0.187	A
TQ18-25PC	4	12	2	50	9	60	2.5	1.7187	0.350	0.250	–
TQ18-26P	5	23	3	50	5.5	27	2.5	1.7187	0.350	0.250	–
TQ18-45P	5	27	2.8	50	7.9	66	3	1.7187	0.350	0.250	–
TQ18-25P	5.6	23	3	50	9	60	3	1.7187	0.350	0.250	–
TQ18-25PE	5.6	23	3	10	9	60	3	1.7187	0.350	0.250	–
TQ18-25PG	5.6	37	2.4	40	7.2	60	3	1.7187	0.350	0.250	–
TQ18W-23FA	7.6	43	3.8	120	8	48	4	2.343	0.700	0.250	A
TQ18-65SA	8	27	15	30	11	35	4	1.7187	0.700	0.250	–
TQ18W-23F	8	43	4	120	8.5	48	4	2.343	0.700	0.250	A
TQ18W-23FD	8	43	4	120	8.5	48	4	2.343	0.700	0.187	A
TQ18W-23P	8	43	4	120	8.5	48	3.5	1.7187	0.700	0.187	A
TQ18W-35P	8	35	4	120	2.2	2.7	3.8	1.7187	0.700	0.187	A
TQ18-28P	10	47	5	50	3.3	5	4	1.7187	0.600	0.250	D
TQ18-11P	12	35	5.7	50	7	12	4	1.7187	0.700	0.250	–
TQ18-11PK	12	35	5.7	50	7	12	4	1.7187	0.700	0.250	–
TQ18-11FA	18	75	8	5	7.5	12	5	2.1	0.770	0.250	–
TQ18-1PA	18	68	8	50	30	190	4	1.7187	0.700	0.250	–
TQ18-47P	18	81	8	50	10	25	3.8	1.7187	0.700	0.250	–
TQ18-9PV	18	61	8	50	6.3	7.5	4	1.7187	0.700	0.250	–
TQ18-31P	20	85	6	50	12	30	3.8	1.7187	0.700	0.250	–
TQ18-40P	20	87	8	50	9.7	20.5	4	1.7187	0.700	0.250	–
TQ18-48P	20	105	8	50	16	67	3.8	1.7187	0.700	0.250	–
TQ18-70K	20	40	7	20	10	10	–	1.75	0.600	0.187	–
TQ19W-5PKA	–	–	–	–	6.75	18.6	4	1.875	0.925	0.281	–

Note: When motors have mounting flanges, outer diameter posted is for motor body only. All motors can be made to accommodate a variety of hub configurations for securing shaft.

LIMITED ANGLE TORQUE MOTORS AND TACHOMETERS

TQ22 – TQ23 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ22-1	24	41	6	60	12	10.2	9	2.125	0.925	0.236	–
TQ22-8	24	39	10	30	13	11.3	10	2.125	0.930	0.188	–
TQ22-5	28	54	7	30	12	10	10	2.125	0.925	0.250	–
TQ23W-13PA	32	75	27	120	24	40	11	2.25	1.200	0.250	A
TQ23W-4PA	36	95	27	120	10	7.3	9.2	2.25	1.000	0.250	–

TQ25 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ25W-5V	7	35	3.5	120	2	2.9	3.5	2.375	0.500	0.250	–
TQ25W-12PA	8	9	2	120	22	67	8	2.5	1.000	0.250	B
TQ25W-12PD	8	8	2	120	24	67	8	2.5	1.000	0.250	–
TQ25-10P	11	12	8	50	16	26	4	2.5	0.500	0.375	D
TQ25-10PA	11	12	8	50	16	26	4	2.5	0.500	0.250	D
TQ25W-4PKA	12.6	60	6.7	120	21	165	3.5	2.5	0.500	0.625	B
TQ25W-11P	15	67	8	120	8.2	20	4	2.5	0.500	0.250	B
TQ25W-14PA	15	62	8	120	6	9.86	4	2.5	0.500	0.250	–
TQ25W-2F	15	60	8	120	15	60	4	2.5	0.500	0.250	–
TQ25W-2P	15	60	8	120	15	60	4	2.5	0.500	0.250	–
TQ25W-15PA	16	66	8	120	3.9	3.95	4	2.5	0.500	0.250	B
TQ25-7F	18	60	7.5	50	12	24	–	2.5	0.500	0.380	–
TQ25W-4P	18	86	9	120	25	165	4	2.5	0.500	0.250	–
TQ25-16PKA	22	80	10	50	14.3	34	6	2.5	0.500	0.625	D
TQ27W-1	25	60	15	50	10	9	–	2.625	0.500	0.250	–
TQ25-9PC	27	70	15	50	7.5	5.4	6	2.5	0.500	0.375	D
TQ25-23PA	30	65	15	50	25.5	47	6	2.5	0.500	0.250	D
TQ25-36PAK	30	63	15	50	12	10	–	2.53	0.500	0.250	D
TQ25-6PD	30	63	15	50	12	10	6	2.5	0.500	0.375	D
TQ25-6PH	30	63	10	50	12	10	6	2.5	0.500	0.250	D
TQ25-6PL	30	63	10	50	12	10	6	2.5	0.500	0.250	–
TQ25-11PA	30	63	15	50	16	18	6	2.375	0.500	0.375	D
TQ25-6PM	30	63	10	50	12	10	6	2.499	0.500	0.250	D
TQ25-9P	30	67	15	50	8.5	5.4	6	2.5	0.500	0.250	D
TQ25-9PA	30	67	15	50	8.5	5.4	6	2.5	0.500	0.375	D
TQ25W-13P	33	100	16	120	5.2	2.5	7	2.5	1.000	0.250	C
TQ25W-13PA	33	113	16	120	4.8	2.4	7	2.5	1.000	0.250	C
TQ25W-1F	33	128	11	120	18	38	8	2.5	1.000	0.250	C
TQ25W-1PC	33	128	11	120	18	38	7	2.5	1.000	0.250	C
TQ25-42PK	35	61	12	80	20	20	6	2.53	0.500	0.250	–
TQ25-28PK	38	100	10	40	10	7	–	2.5	0.500	2.500	–
TQ25-37PKA	40	95	10	30	–	15	6	2.5	0.500	0.625	–
TQ25-26PA	52	96	40	50	11	4.3	7	2.5	1.000	0.250	D
TQ25-14PA	80	180	25	50	9	2.24	13	2.5	1.000	0.250	D
TQ25-25PA	80	223	25	50	27	25.4	13	2.5	1.000	0.250	D
TQ25-2P	80	140	25	50	27	16	13	2.5	1.000	0.250	–

Note: When motors have mounting flanges, outer diameter posted is for motor body only. All motors can be made to accommodate a variety of hub configurations for securing shaft.

LIMITED ANGLE TORQUE MOTORS AND TACHOMETERS

TQ34 – TQ35 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ34W-24P	27	50	11	120	15	15	13	3.313	0.625	0.6250	–
TQ34W-30PA	33	60	26	120	13.6	10	21	3.312	0.625	0.3125	–
TQ34W-34P	33	94	21.5	120	7	4.25	21	3.312	0.625	0.2365	C
TQ35W-4PD	33	110	20	120	5.5	3	20	3.5	0.750	0.3750	C
TQ34W-8P	35	75	25	120	18.3	19.5	13	3.312	0.625	0.3750	C
TQ34-19V	40	130	10	50	15	18	13	3.209	0.5	0.3750	D
TQ34W-1PD	40	65	30	120	21	18	13	3.313	0.625	0.3750	C
TQ34W-28PB	40	70	30	120	17	12.5	21	3.437	0.656	0.3125	C
TQ34W-28PA	40	70	30	120	17	12.5	21	3.312	0.625	0.3125	C
TQ35W-2FA	45	230	9	120	18	37	–	3.5	0.750	0.250	–
TQ35W-2P	45	230	9	120	18	37	18	3.5	0.760	0.1855	–
TQ34-21PKA	50	95	11	30	20	15	13	3.313	0.625	0.6250	–
TQ35W-2PC	50	230	16	120	20	37	17.6	3.5	0.750	0.7500	C
TQ35W-4PC	56	250	16	60	6.3	3.1	18.6	3.5	0.750	1.0000	–
TQ35W-5PC	56	280	17	120	14	17	18.6	3.5	0.750	1.0000	–
TQ34W-20PA	70	70	17	120	20	5.6	23	3.312	1.125	0.3875	–
TQ34-14PA	80	135	28	50	80	135	16	3.375	0.6	0.2500	D
TQ34W-12P	80	150	60	120	28	18	23	3.312	1.125	0.3750	–
TQ34W-12PD	80	220	48	120	12	5	–	3.312	1.125	0.800	C
TQ34W-25P	80	100	60	120	13	2.6	23	3.312	1.125	0.2500	–
TQ34W-25PA	80	170	60	120	10	2.6	23	3.312	1.125	0.3750	–
TQ34W-26PA	80	120	20	120	49	45	24	3.313	1.125	0.500	–
TQ34-47PA	130	250	40	50	26	9.9	16	3.375	0.725	0.375	D
TQ34-47PAK	130	250	40	50	26	9.9	20	3.375	0.725	0.375	D
TQ34-4P	130	210	40	50	45	25	16	3.375	0.725	0.3750	D
TQ34-4PA	130	210	40	50	45	25	16	3.375	0.725	0.5000	D
TQ34-4PC	130	210	40	50	45	25	16	3.375	0.725	0.375	D
TQ34-4PE	130	210	40	50	45	25	16	3.375	0.725	0.250	D
TQ34-4PFR	130	160	40	50	38	13	16	3.375	0.725	0.250	D
TQ36W-1PA	160	200	70	60	25	4.5	48	3.515	1.752	0.250	–
TQ34N-1PAK	190	310	60	40	54	25	–	3.375	0.780	0.5005	–

Note: When motors have mounting flanges, outer diameter posted is for motor body only. All motors can be made to accommodate a variety of hub configurations for securing shaft.

LIMITED ANGLE TORQUE MOTORS AND TACHOMETERS

TQ40 – TQ45 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ43N-1PKA	20	26	5	20	50	165	–	4.25	0.375	2.875	–
TQ40W-12PA	40	28	20	120	25	10.5	28	4	0.900	0.500	A
TQ40W-22PA	55	220	11	120	35	89	30	4	0.850	1.000	A
TQ45-2PA	100	75	36	70	66	32	24	4.5	0.750	0.525	D
TQ45-3PA	100	130	38	70	30	12	24	4.5	0.750	0.525	D
TQ45W-1PA	100	80	38	70	42	14	24	4.5	0.750	0.525	D
TQ40W-4PA	110	220	44	120	11	2.2	30	4	0.850	1.000	A
TQ40W-11PA	150	250	60	120	22	5.2	30	4	0.850	0.500	A
TQ40W-11PC	150	240	60	120	22	5.2	30	4	0.850	0.800	A
TQ40W-11PE	150	240	60	120	22	5.2	30	4	0.850	0.375	A
TQ40W-11PF	150	240	60	120	22	5.2	30	4	0.850	1.000	A
TQ40W-11PG	150	240	60	120	22	5.2	30	4	0.850	0.375	A
TQ40W-4P	150	270	60	120	12	1.7	30	4	0.850	0.375	A
TQ40W-4PC	150	270	60	120	12	1.7	30	4	0.850	0.875	A
TQ40-6PK	160	75	40	45	95	25	–	4	0.656	1.750	–
TQ40W-1PA	160	185	85	120	22	3.5	47	4	1.500	0.375	C
TQ40W-1PC	160	80	85	120	34	3.5	47	4	1.500	2.790	C
TQ40N-5FKA	200	155	50	20	28	3	–	4.05	1.100	0.500	–
TQ40W-16PKA	260	200	120	120	18.8	1	51	4	1.500	0.500	A
TQ40W-1P	260	250	120	120	31	3.5	51	4	1.500	0.375	A
TQ40W-1PB	260	250	120	120	31	3.5	51	4	1.500	0.500	A
TQA40-1PA	280	155	150	120	45	4	–	4.25	1.600	0.375	A
TQ40N-3KPA	400	170	100	30	70	5.3	–	4.125	1.068	2.000	–
TQA40-7P	1520	500	750	45	125	3.3	208	4.25	5.500	0.500	–

TQ50 – TQ56 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ50-1P	0.83	76	0.2	20	0.31	10.6	–	4.5	1.235	0.984	–
TQ52W-1PA	1.25	100	1.1	90	0.31	6.2	–	5.125	1.500	0.750	A
TQ52W-1PE	1.25	101	1.1	90	0.31	6.2	–	5.125	1.500	0.563	A
TQ52-2PG	2.6	250	1	20	0.57	12	–	5.187	1.250	0.840	D
TQ52W-7FB	2.6	400	1	120	0.57	19	–	5.125	1.250	0.750	–
TQ52W-4P	2.86	500	1.1	120	0.27	4.4	–	5.125	1.500	0.750	–
TQ55-1FA	3	173	1.5	50	0.52	5.2	10	5.5	2.500	1.000	D
TQ55-1P	3	173	1.5	50	0.52	5.2	10	5.5	2.500	1.000	D
TQ52-2P	3.64	490	1	20	0.57	12	5	5.187	1.250	0.984	–
TQ56-2P	4.2	255	1.4	50	0.32	1.48	9.8	5.625	2.000	1.000	–
TQ56-2P	4.2	255	1.5	50	0.32	1.48	9.8	5.625	2.000	1.000	–
TQ56-1P	5.6	376	1.5	14	0.78	7.3	9.8	5.625	2.000	1.000	–
TQ56-1P	5.6	470	1.5	15	0.7	7.3	9.8	5.625	2.000	1.000	–

Note: When motors have mounting flanges, outer diameter posted is for motor body only. All motors can be made to accommodate a variety of hub configurations for securing shaft.

LIMITED ANGLE TORQUE MOTORS AND TACHOMETERS

TQ64 – TQ74 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ74W-4	3.3	170	1.6	30	0.33	1.7	8	7.375	1.166	0.812	D
TQ74W-7F	3.3	180	1.45	110	0.96	15	13	7.312	1.692	1.000	A
TQ65W-1PA	3.65	180	1.8	90	0.41	2.3	15.75	6.5	3.000	1.188	–
TQ64W-5PC	3.9	230	2.9	90	0.39	2.3	16	6.235	2.300	1.500	–
TQ74W-5	4.2	300	1.5	110	0.96	15	10	7.31	1.44	1	A
TQ64-1P	4.5	230	3.38	30	0.39	1.72	14	6.375	2.300	1.187	D
TQ74-4PA	4.5	280	3.38	30	0.33	1.5	8	7.375	1.530	1.750	–
TQ64W-6P	5	281	2.7	120	0.9	9.1	16	6.235	2.300	1.188	A
TQ74W-3	7	350	4.5	30	0.66	2.95	19	7.38	2.29	0.812	D
TQ74W-6	7.8	350	2.5	110	0.62	2.2	27	7.312	3.44	1	A

TQ80 – TQ160 Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
TQ82W-1	4	450	2.5	120	0.48	6.4	12	8.190	1.380	0.820	C
TQ82-4FA	6	600	4	50	1.17	23	11	8.187	1.500	1.500	–
TQ140W-1P	17	670	12	120	1.5	5.2	64	14	3.000	1.4985 shaft	–
TQ140W-2P	17	400	12	120	2	5.2	64	14	3.000	1.500	–
TQ140W-1	18	580	17	120	1.7	5.2	60	14	3.000	1.500	C
TQ120-1PA	22	302	18	40	3.1	6	–	12.5	2.250	2.000	D
TQ120-2P	22	265	18	50	2.05	2.3	48.5	12.5	2.250	2.000	D
TQ160-2F	30	350	15	30	2.5	2.25	–	16	2.500	3.250	D
Tq120-2FA	50	1368	18	50	2.05	2.3	40	13.63	2.250	2.000	D

V Series

Basic Part No.	Peak Torque (in. oz.)	Peak Power (watts)	Continuous Torque (in. oz.)	Angular Excursion (degrees)	Torque Sensitivity (in-oz/amp)	Resistance at 25°C (ohms)	Weight (oz)	Outer Diameter (inch)	Width (inch)	Inner Diameter (Inch)	Torque Curve
V10Y-22	1.5	20	0.5	80	2.4	50	1	0.96	0.350	0.125	E
V10Y-30	3.8	46	1.2	80	4.5	64	2	0.96	0.700	0.125	E
V18Y-43	4	21	2.4	50	6.5	55	3	1.63	0.350	0.250	D
V18Y-44	10	59	4.6	50	9	48	4	1.63	0.700	0.250	D
V18Y-40	2.7	29	1.4	120	3.7	54	3	1.63	0.350	0.187	C
V18Y-41	6.7	69	2.8	120	5.7	50	4	1.63	0.700	0.187	C
V25-8	20	36	11	50	20	36	6	2.375	0.500	0.250	D
V25-9	52	96	23	50	27	26	12	2.375	1.000	0.250	D
V25Y-5	10	38	6	120	10	38	4	2.375	0.500	0.250	C
V25Y-6	28	108	12	120	14	27	7	2.375	1.000	0.250	C
V34-21	78	124	33	50	37	28	16	3.21	0.725	0.375	D
V34-26	180	223	86	50	40	11	30	3.21	1.400	0.375	D
V34Y-22	23	37	18	120	20	28	13	3.21	0.625	0.375	C
V34Y-27	54	80	38	120	20	11	24	3.21	1.125	0.375	C
V40-9	185	190	90	50	57	18	28	3.9	0.850	0.375	D
V40-8	315	217	190	50	71	11	55	3.9	1.500	0.375	D
V40Y-10	100	123	50	11	36	16	26	3.9	0.850	0.375	A
V40Y-4	210	194	100	110	50	11	51	3.9	1.500	0.375	A
V52Y-17	315	248	150	110	60	9	80	5	1.500	0.750	A
V52-12	510	288	240	50	85	8	90	5	1.500	0.750	D
V62Y-1	850	283	475	80	75	2.2	224	6	2.300	1.187	E

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