KOLLMORGEN

DIRECT DRIVE DC TORQUE SERVO MOTORS

QT- Series Rare Earth Magnet Motors

www.motiontech.com.au

DIRECT DRIVE DC SERVO MOTORS

The Direct Drive DC Torque motor is a servo actuator which can be directly attached to the load it drives. It has a permanent magnet (PM) field and a wound armature which act together to convert electrical power to torque. This torque can then be utilized in positioning or speed control systems.

In general, torque motors are deigned for three different types of operation:

» High stall torque (“stand-still” operation) for positioning systems

» High torque at low speeds for speed control systems

» Optimum torque at high speed for positioning, rate, or tensioning systems

SUPERIOR QUALITY

With the widest range of standard and custom motion solutions, we collaborate with you to deploy rugged, battle-worthy systems engineered and built to meet your singular requirements. Kollmorgen provides direct drive servo motor solutions for the following applications:

» Weapons stations and gun turrets

» Missile guidance and precision-guided munitions

» Radar pedestals and tracking stations

» Unmanned ground, aerial and undersea vehicles

» Ground vehicles and sea systems

» Aircraft and spacecraft systems

» Camera gimbals

» IR countermeasure platforms

» Laser weapon platforms

Advantages of Direct Drive DC Torque Motors

Direct drive torque motors are particularly suited for servo system applications where it is desirable to minimize size, weight, power and response time, and to maximize rate and position accuracies.

Frameless motors range from 28.7mm (1.13in) OD weighing 1.4 ounces (.0875 lbs) to a 4067 N-m (3000 lb-ft) unit with a 1067mm (42in) OD and a 660.4mm (26in) open bore ID. Housed motors range from a one inch cube design with 0.049 N-m (7 oz-in) peak torque to any of the frameless motors housed to customer specifications with integral DC tachometers, resolvers, encoders and shaft configurations.

High Torque-to-Inertia Ratio at the Load

A direct drive motor provides the highest practical torque-to-inertia ratio where it counts—at the load. In a geared system, reflected output torque is proportional to the gear reduction while reflected output inertia is proportional to the square of the gear reduction. Thus, the torque-to-inertia ratio in a geared system is less than that of a direct drive system by a factor equal to the gear-train ratio. The higher torque-to-inertia ratio of direct drive motors makes them ideally suited for high acceleration applications with rapid starts and stops.

High Torque-to-Power Ratio

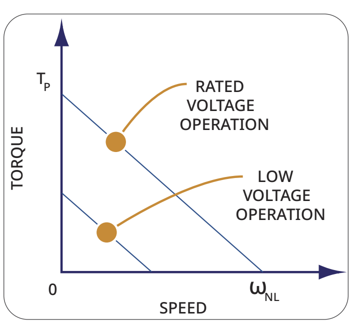
Most torque motors are designed with a large number of poles and a high volume of copper to achieve a high torque-to-power ratio. Thus, input power requirements are usually low.

Low Electrical Time Constant

Typical torque motor design features — such as high-level magnetic saturation of the armature core and the use of a large number of poles — keep armature inductance at a very low value. Consequently, the electrical time constant (the ratio of armature inductance to armature resistance) is very low, providing excellent command response at all operating speeds.

High Linearity

In a DC torque motor, torque increases directly with input current at all speeds and angular positions. The theoretical speed-torque characteristic is a set of parallel straight lines. This torque linearity is maintained even at low excitation, assuring no dead-band created by torque nonlinearities for all input currents up to the peak rating of the motor.



Reliability and Long Life

Basic simplicity and an absolute minimum of moving parts make a torque motor inherently reliable. Extensive design and production experience have placed Kollmorgen's motors in critical applications where high performance motion control is required for over fifty years. These include applications in all conditions and environments, ranging from thousands of feet underwater to years of unattended operation in outer space. Brushes are capable of operating in a hard vacuum (10^{-6} torr) with "high altitude" additives.

High Resolution

The direct drive use of torque motors allows them to position a shaft more precisely than a geared system. With typical gearing, the backlash contributes to a "dead zone" which falls in the region of the system null point and reduces positional accuracy. In a direct drive system, however, the positional accuracy is, in practice, limited only by the error-detecting transducer system.

Compact, Adaptable Design

Frameless torque motors are built to be "designed-in" as an integral part of a system, thus saving the weight and space associated with conventional motor frames or housings. This frameless design allows the motors to be mounted anywhere along the driven shaft. The "pancake" configuration (thin, compared to diameter) minimizes the volume required for mounting and offers a convenient packaging arrangement for combinations of torque motors and tachometer generators. Kollmorgen also supplies housed motors, complete with housing, shaft and bearings for use in similar applications.

SYSTEM PERFORMANCE CHARACTERISTICS

The same features which give torque motors an advantage over other types of servo actuators also allow the designer to obtain the following system performance characteristics.

HIGH SERVO SYSTEM STIFFNESS

The direct-drive torque motor is coupled directly to the load, thus eliminating gears and backlash errors. The resulting high coupling stiffness and associated high mechanical resonance frequency yield high servo system stiffness.

FAST RESPONSE

The low electrical time constant of torque motors allows torque to develop very rapidly when voltage is applied. This fast response is an important aid to servo system stiffness.

HIGH RESOLUTION

The direct-drive use of torque motors allows them to position a shaft more precisely than a geared system. With typical gearing, the backlash contributes to a “dead zone” which falls in the region of the system null point and reduces positional accuracy. In a direct-drive system, however, the positional accuracy is, in practice, limited only by the error-detecting transducer system.

LOW SPEEDS WITH HIGH ACCURACY

Because of the high coupling stiffness and high resolution of direct-drive torque motors, it is possible to achieve high accuracy at low speeds. An example is a table for testing rate and integrating gyros. This table has a speed range of 0.017 to 100 rpm with absolute instantaneous accuracy over this speed range of 0.1 percent.

SMOOTH, QUIET OPERATION

Torque motors exhibit smooth, quiet operation when they are run at low speeds. They typically have a large number of slots per pole to reduce cogging and allow for smooth operation.

QT- Series Direct Drive
DC Servo Motors

Motor Selection

Frameless or Housed?

Housed motors have a traditional configuration including frame, bearings, and shaft. In use, the housed motor shaft is coupled to the system element being driven. Housed motors are ideal for use in harsh environments or other applications requiring totally closed units.

The frameless motor concept was developed to meet the need for motors with a large hole through the center. This need is still one of the main reasons that the large diameter, narrow width frameless configuration is often selected over the traditional housed configuration. The large rotor bore can be used as a route for lead wires, as a mounting area for other hardware such as tachometer generators or resolvers, or as an optical path.

Frameless motors are built to be "designed in" as an integral part of the system hardware. They are generally supplied as three separate components: stator (field) assembly, rotor (armature) assembly and brush ring or brush segment assembly (See examples on the following page). The frameless motor can be integrated into the customer hardware rather than coupling a motor shaft to the element being driven. This allows significant savings in space and weight over housed motors by eliminating the motor housings, bearings and shaft. Also, since the frameless motor can be mounted on the driven shaft, the coupling stiffness is improved. The backlash normally associated with couplings or gear trains is eliminated from the drive system.

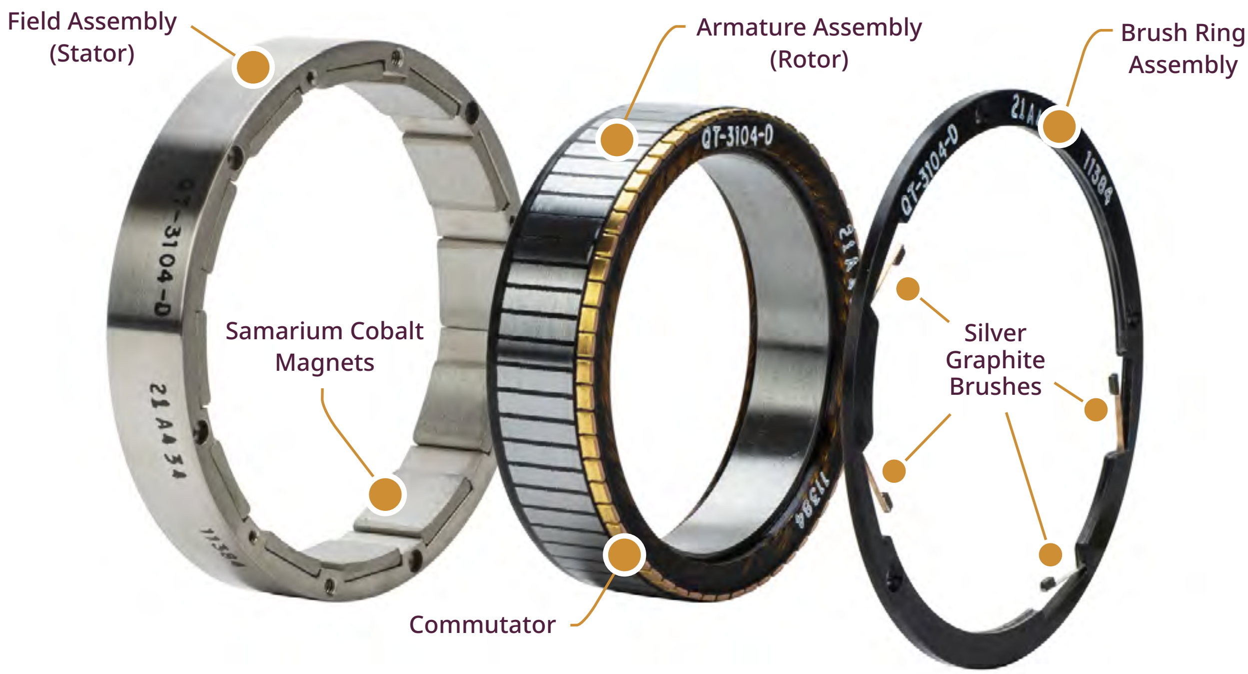
Torque Motor or Servomotor?

A torque motor is typically described as having a "pancake" configuration, i.e., a large diameter and a narrow width. This configuration generally has a large number of poles to increase the torque available in a given volume. This large number of poles, however, also causes more commutation arcing as speed increases than for a motor with few poles. Torque motors are most commonly used in positioning and slow-speed rate applications where commutation is not a limitation. A servomotor is characterized by a long, small diameter configuration. Lengthening a motor while maintaining a small diameter allows a significant increase in torque while minimizing the increase in rotor inertia. The end result is an improved mechanical time constant and, therefore, improved motor response. Servomotors are most commonly used in running applications where good high-speed commutation is demanded and where the lowest rotor inertia is required for rapid accel/decel applications.

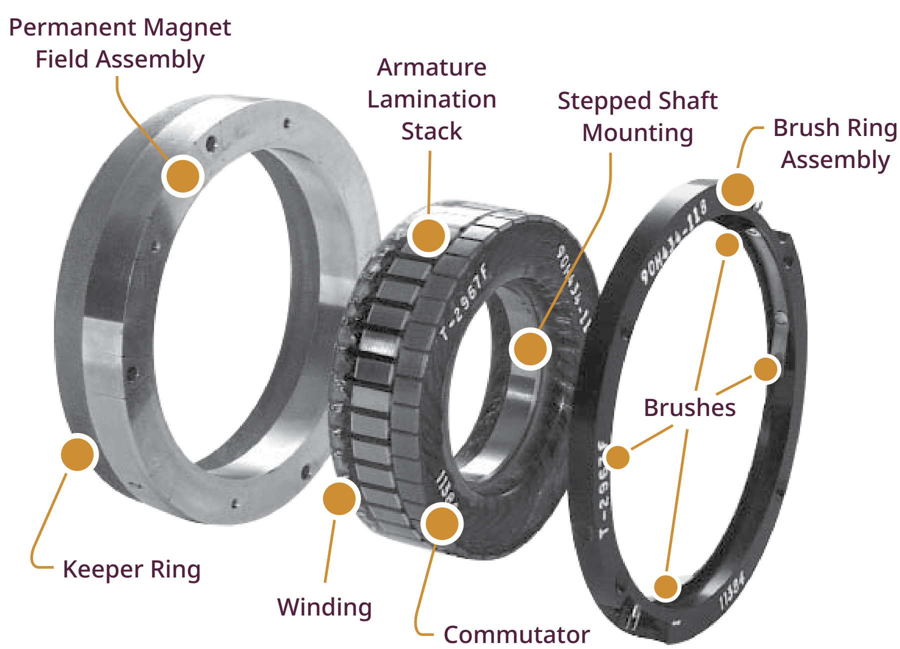
Magnet Material

Kollmorgen frameless torque motors are manufactured with one of two magnet materials: Alnico or rare earth (Samarium Cobalt and Neodymium-Iron-Boron). These magnet materials have different characteristics which determine their suitability for various applications. The QT- series frameless direct drive torque motors highlighted in this brochure utilize rare earth magnets.

Frameless rare earth torque motor



Frameless Alnico magnet torque motor



Performance: A major advantage of rare earth magnet motors is stability of magnetic characteristics in overcurrent conditions. In Alnico magnet motors, exceeding the rated current I_p to develop more torque may demagnetize the permanent magnet field and cause a permanent reduction in torque per unit current. The degree of demagnetization is determined by the magnitude of the overload current.

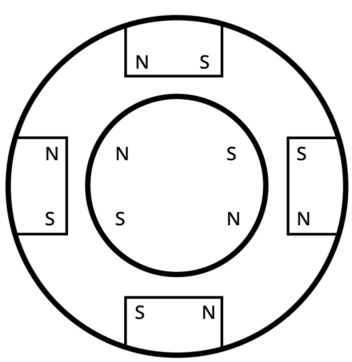
In rare earth magnet units, currents in excess of I_p can be applied for short duration to develop higher torque without demagnetization of the PM field. The limits now become primarily the thermal capacity of the motor and the current density rating of the brushes.

Rare earth magnet motors that are designed to have comparable resistance to similar Alnico designs will generally have a lower inductance value than the Alnico design. Thus, the electrical time constant of rare earth units is normally lower than Alnico units, allowing more rapid system response.

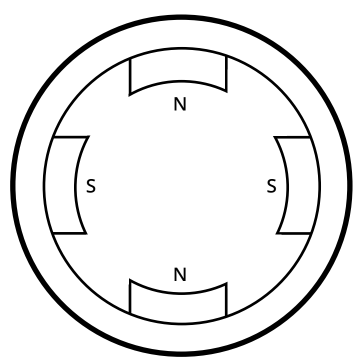
Installation: Alnico magnet motors require a keeper ring or keeper segments to provide a return flux path for the field when the rotor is not in place. Removing or shifting the keeper before inserting the armature into the field will cause significant degradation of performance. In rare earth magnet motors the magnet material has much higher intrinsic coercive force. This feature makes the field assembly immune to the effects of an open magnetic circuit and therefore a keeper is not required. Eliminating the keeper can simplify installation considerably.

The mounting surfaces for frameless Alnico magnet motors must be made of non-magnetic material such as aluminum, brass or non-magnetic stainless steel. The minimum thickness of non-magnetic material required to separate the field structure from magnetic material is one quarter inch. Rare earth motors may be mounted in magnetic or non-magnetic housings.

Rare earth magnet material is more brittle than Alnico, and care must be exercised to avoid chipping or cracking. Because rare earth motors are designed with the magnets on the inner diameter of the stator assembly facing the armature, extra care must be taken when inserting the armature into the field assembly. Most rare earth units have larger radial air gaps than similar size Alnico units. The larger air gap of rare earth units makes rotor-to-stator concentricity less critical.



ALNICO DESIGN



RARE EARTH DESIGN

Please contact Kollmorgen Customer Support, for more information on Alnico magnet motor options.

Performance Data

QT- Direct Drive DC Motor Performance Data (Lower Torque Models < 1 lb-ft)

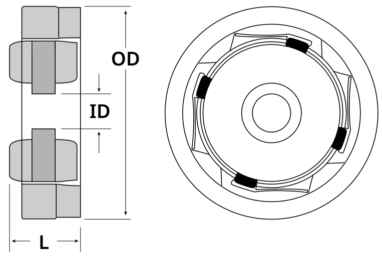
Model Number	Peak Torque @ Stall			Motor Constant		Theoretical No Load Speed	Electrical Time Constant	Friction		Rotor Inertia	
	T_p		P_p	K_m		ω_{NL}	T_e	T_f		J_m	
	oz-in	N-m	W	$\frac{oz\text{-}in}{W^{1/2}}$	$\frac{N\text{-}m}{W^{1/2}}$	rad/sec	msec	oz-in	N-m	oz-in-sec²	Kg-m²
QT-0706	12.3	0.087	63	1.55	1.1×10^{-2}	725	0.32	0.40	0.0028	1.6×10^{-4}	1.1×10^{-6}
QT-0707	7.70	0.054	50	1.09	7.7×10^{-3}	920	0.25	0.30	0.0021	1.1×10^{-4}	7.8×10^{-7}
QT-0717	3.84	0.027	53	0.530	3.7×10^{-3}	1950	0.12	0.25	0.0018	4.5 x 10-5	3.2×10^{-7}
QT-1106	11.0	0.078	49	1.57	1.1×10^{-2}	636	0.14	0.60	0.0042	3.2×10^{-4}	2.3×10^{-6}
QT-1204	11.0	0.078	57	1.46	1.0×10^{-2}	732	0.11	0.60	0.0042	4.2×10^{-4}	3.0×10^{-6}
QT-1207	20.0	0.141	82	2.21	1.6×10^{-2}	580	0.20	0.70	0.0049	6.0×10^{-4}	4.2×10^{-6}
QT-1217	50.0	0.353	165	3.90	2.8×10^{-2}	467	0.38	1.1	0.0078	1.5×10^{-3}	1.1×10^{-5}
QT-1401	55.0	0.388	217	3.74	2.6×10^{-2}	557	0.21	1.8	0.013	1.3×10^{-3}	9.2×10^{-6}
QT-1404	65.0	0.459	98	6.55	4.6×10^{-2}	214	0.24	3.0	0.021	2.6×10^{-3}	1.8×10^{-5}
QT-1406	157	1.11	347	8.42	0.059	313	0.28	3.5	0.0247	3.7×10^{-3}	2.6×10^{-5}
QT-1903	90.0	0.636	107	8.70	6.1×10^{-2}	167	0.22	2.8	0.020	8.8×10^{-3}	6.2×10^{-5}
QT-1906	50.0	0.353	115	4.66	3.3×10^{-2}	326	0.17	1.0	0.0071	3.4×10^{-3}	2.4×10^{-5}
QT-2104	48.0	0.339	39	7.70	5.4×10^{-2}	114	0.50	1.8	0.013	6.0×10^{-3}	4.2×10^{-5}
QT-2105	75.0	0.529	35	12.8	9.0×10^{-2}	65	0.77	3.0	0.021	1.1×10^{-2}	7.8×10^{-5}
QT-2202	81.8	0.578	58	8.28	5.8×10^{-2}	168	0.84	2.5	0.018	8.5×10^{-3}	6.0×10^{-5}
QT-2406	30.0	0.212	54	4.10	2.9×10^{-2}	250	0.13	1.8	0.013	5.4×10^{-3}	3.8×10^{-5}
QT-2502	68.2	0.482	54	9.25	6.5×10^{-2}	113	0.18	2.5	0.018	1.1×10^{-2}	7.8×10^{-5}
QT-2504	60.0	0.424	55	8.10	5.7×10^{-2}	128	0.29	2.5	0.018	1.1×10^{-2}	7.8×10^{-5}
QT-3104	150	1.06	97	15.2	0.11	92	0.38	3.0	0.0212	3.4×10^{-2}	2.4×10^{-4}
QT-4101	100	0.706	76	11.5	0.081	107	0.14	4.0	0.0283	4.7×10^{-2}	3.3×10^{-4}
QT-4602	163	1.15	211	11.3	0.080	183	0.27	5.0	0.0353	8.3×10^{-2}	5.8×10^{-4}

Performance Data (cont.)

QT- Direct Drive DC Motor Performance Data (Higher Torque Models > 1 lb-ft)

Model Number	Peak Torque @ Stall			Motor Constant		Theoretical No Load Speed	Electrical Time Constant	Friction		Rotor Inertia	
	T_p		P_p	K_m		ω_{NL}	T_e	T_f		J_m	
	lb-ft	N-m	W	$\frac{lb\text{-}ft}{W^{1/2}}$	$\frac{N\text{-}m}{W^{1/2}}$	rad/sec	msec	lb-ft	N-m	lb-ft-sec^2	Kg-m^2
QT-2404	3.0	4.07	260	0.190	0.258	64	1.04	0.06	0.0814	2.0×10^{-4}	2.7×10^{-4}
QT-2603	5.0	6.78	313	0.280	0.380	46	2.10	0.10	0.136	4.0×10^{-4}	5.4×10^{-4}
QT-3102	2.5	3.39	263	0.154	0.209	77	1.20	0.04	0.0542	4.1×10^{-4}	5.6×10^{-4}
QT-3103	3.3	4.47	190	0.240	0.325	39	1.52	0.06	0.0814	5.7×10^{-4}	7.7×10^{-4}
QT-3403	4.0	5.42	126	0.357	0.484	23	2.10	0.10	0.136	9.8×10^{-4}	1.3×10^{-3}
QT-3831	4.8	6.51	252	0.300	0.410	39	0.85	0.10	0.1400	7.2×10^{-4}	9.8×10^{-4}
QT-3832	2.4	3.25	187	0.175	0.238	57	0.58	0.05	0.068	3.6×10^{-4}	4.9×10^{-4}
QT-4402	4.2	5.69	160	0.335	0.454	28	1.10	0.12	0.163	1.5×10^{-3}	2.0×10^{-3}
QT-5404	5.0	6.78	227	0.330	0.447	33	0.60	0.15	0.203	1.9×10^{-3}	2.6×10^{-3}
QT-6202	11	14.9	330	0.610	0.830	22	1.8	0.18	0.244	5.8×10^{-3}	7.9×10^{-3}
QT-6205	25	33.9	627	1.00	1.36	19	2.4	0.35	0.475	1.0×10^{-2}	1.4×10^{-2}
QT-6207	40	54.2	655	1.56	2.12	12	3.0	0.60	0.814	2.0×10^{-2}	2.7×10^{-2}
QT-6301	20	27.1	576	0.830	1.13	21	2.1	0.25	0.339	1.0×10^{-2}	1.4×10^{-2}
QT-6302	4.2	5.69	67	0.510	0.692	12	1.44	0.16	0.217	6.3×10^{-3}	8.5×10^{-3}
QT-6401	26	35.3	657	1.01	1.37	19	3.3	0.40	0.542	1.2×10^{-2}	1.6×10^{-2}
QT-7003	25	33.9	520	1.10	1.49	15	2.4	0.35	0.475	1.3×10^{-2}	1.8×10^{-2}
QT-7004	4.0	5.42	58	0.524	0.710	11	2.00	0.20	0.271	6.3×10^{-3}	8.5×10^{-3}
QT-7201	9.0	12.2	490	0.410	0.560	40	0.79	0.15	0.203	5.6×10^{-3}	7.6×10^{-3}
QT-7602	2.1	2.85	17	0.514	0.697	5.9	0.58	0.30	0.0407	6.0×10^{-3}	8.1×10^{-3}
QT-7801	46	62.4	800	1.63	2.21	13	3.8	0.50	0.678	2.8×10^{-2}	3.8×10^{-2}
QT-7802	23	31.2	620	0.920	1.25	20	2.5	0.37	0.502	1.6×10^{-2}	2.2×10^{-2}
QT-7809	60	81.4	615	2.42	3.28	7.6	4.4	0.83	1.13	4.1×10^{-2}	5.6×10^{-2}
QT-9704	20	27.1	235	1.30	1.76	8.6	1.5	0.72	0.976	2.5×10^{-2}	3.4×10^{-2}
QT-11301	50	67.8	331	2.75	3.73	4.9	1.2	1.6	2.17	6.0×10^{-2}	8.1×10^{-2}
QT-11302	22	29.8	194	1.58	2.14	6.5	1.1	1.0	0.136	3.0×10^{-2}	4.1×10^{-2}
QT-11303	100	136	499	4.50	6.10	3.6	0.76	2.5	3.39	0.11	0.15
QT-12505	200	271	1100	6.04	8.19	4.0	3.8	1.6	2.17	0.27	0.37
QT-12506	123	167	794	4.36	5.91	4.8	3.2	1.2	1.63	0.17	0.23
QT-12901	12	16.3	135	1.05	1.42	8.2	0.37	0.40	0.542	2.4×10^{-2}	3.3×10^{-2}
QT-17301	54	73.2	386	2.75	3.73	5.3	1.6	1.2	0.163	0.13	0.18
QT-23502	700	949	1310	19.0	25.8	1.4	4.8	7.0	9.49	2.9	3.9

Dimensional Data



QT- Direct Drive DC Motor Dimensional Data (Lower Torque Models < 1 lb-ft)

Model Number	Physical Dimensions							
	OD		ID		Length		Weight	
	in	mm	in	mm	in	mm	oz	g
QT-0706	1.13	28.7	0.19	4.83	0.76	19.3	2.5	70.9
QT-0707	1.13	28.7	0.19	4.83	0.56	14.2	1.6	45.4
QT-0717	1.13	28.7	0.19	4.83	0.38	9.65	1.4	39.7
QT-1106	1.38	35.1	0.50	12.7	0.39	9.91	1.5	42.5
QT-1204	1.50	38.1	0.63	16.0	0.39	9.91	1.7	48.2
QT-1207	1.50	38.1	0.63	16.0	0.51	13.0	2.3	65.2
QT-1217	1.50	38.1	0.63	16.0	0.96	24.4	5.5	156
QT-1401	1.94	49.3	0.63	16.0	0.54	13.7	4.4	125
QT-1404	1.94	49.3	0.63	16.0	0.84	21.3	8.4	238
QT-1406	1.94	49.3	0.63	16.0	1.11	28.2	12	340
QT-1903	2.38	60.5	1.25	31.8	0.85	21.6	9.5	269
QT-1906	2.38	60.5	1.25	31.8	0.50	12.7	5.0	142
QT-2104	2.81	71.4	1.00	25.4	0.62	15.7	9.2	261
QT-2105	2.81	71.4	1.00	25.4	1.00	25.4	14	398
QT-2202	2.81	71.4	1.00	25.4	0.62	15.7	11	312
QT-2406	2.78	70.6	1.80	45.7	0.45	11.4	3.9	111
QT-2502	3.00	76.2	1.75	44.5	0.61	15.5	9.0	255
QT-2504	3.00	76.2	1.75	44.5	0.53	13.5	8.0	227
QT-3104	3.63	92.2	2.50	63.5	0.80	20.3	14	397
QT-4101	4.59	117	3.33	84.6	0.43	10.9	9.5	269
QT-4602	5.13	130	4.00	102	0.56	14.2	13	369

QT- Direct Drive DC Motor Dimensional Data (Higher Torque Models > 1 lb-ft)

Model Number	Physical Dimensions							
	OD		ID		Length		Weight	
	in	mm	in	mm	in	mm	oz	g
QT-2404	3.18	80.8	1.00	25.4	1.53	38.9	2.4	1.1
QT-2603	3.18	80.8	1.14	29.0	2.35	59.7	3.5	1.6
QT-3102	3.73	94.7	1.64	41.7	1.24	31.5	2.0	0.91
QT-3103	3.73	94.7	1.64	41.7	1.70	43.1	3.1	1.4
QT-3403	4.10	104	2.00	50.8	1.80	45.7	4.0	1.8
QT-3831	4.50	114	2.67	67.9	1.07	27.3	2.6	1.20
QT-3832	4.50	114	2.67	67.9	0.69	17.5	1.3	0.6
QT-4402	5.13	130	3.25	93.9	1.25	31.8	3.0	1.4
QT-5404	6.13	156	4.50	114	1.17	29.7	2.9	1.3
QT-6202	7.20	183	3.95	100	1.24	31.5	6.2	2.8
QT-6205	7.20	183	3.95	100	1.99	50.6	12	5.5
QT-6207	7.20	183	3.95	100	3.50	88.9	24	11
QT-6301	7.00	178	4.73	120	1.99	50.6	9.0	4.1
QT-6302	7.00	178	4.73	120	1.29	32.8	6.3	2.9
QT-6401	7.75	197	4.25	108	2.10	53.3	13	5.9
QT-7003	7.73	196	5.25	133	1.94	49.3	10	4.5
QT-7004	7.73	196	5.25	133	0.94	23.9	4.2	1.9
QT-7201	8.20	208	5.94	151	1.09	27.7	4.0	1.8
QT-7602	8.50	216	6.88	175	1.30	33.0	7.3	3.3
QT-7801	9.00	229	5.16	131	2.40	61.0	20	9.1
QT-7802	9.00	229	5.37	136	1.65	41.9	10	4.5
QT-7809	9.00	229	5.16	131	3.40	86.4	31	14
QT-9704	11.0	279	8.00	203	1.56	39.6	11	5.0
QT-11301	11.0	279	8.00	203	1.56	39.6	11	5.0
QT-11302	12.0	305	10.1	257	1.28	32.5	8.7	4.0
QT-11303	12.3	312	10.1	257	4.60	117	39	18
QT-12505	14.0	356	10.5	267	4.48	114	67	30
QT-12506	14.0	356	10.5	267	3.00	76.2	42	19
QT-12901	13.6	345	12.1	307	1.10	27.9	5.0	2.3
QT-17301	18.3	465	15.8	401	1.30	33.0	18	8.2
QT-23502	25.5	648	20.6	523	6.00	152	230	110

Kollmorgen Solutions

Automation and Motion Control

Self-Help Tools

Motioneering® Online

Size and select the right product for your application needs

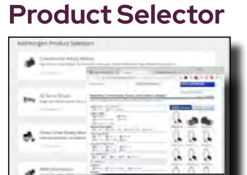
Drawing Generator

Provide TBM/KBM/AKM 2D and 3D drawings in many popular formats

Performance Curve Generator

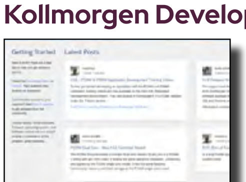
Optimize TBM/KBM/AKM windings using customer supplied environmental and drive information

Product Selector



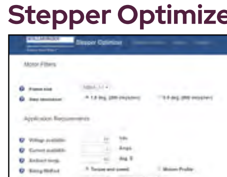
Choose right product for your application needs

Kollmorgen Developer Network



Find answers to many key technical questions or start your own session

Stepper Optimizer



Select the most efficient stepper solution for your application

More Expertise for a More Successful Machine

Our global engineering, service and support network provides deep knowledge of all the major industries that rely on advanced motion control and automation technology. We offer world-class engineering expertise, self-service design tools, personalized field service, and easy access to our design, application and manufacturing centers in strategic locations across the globe.

About Kollmorgen

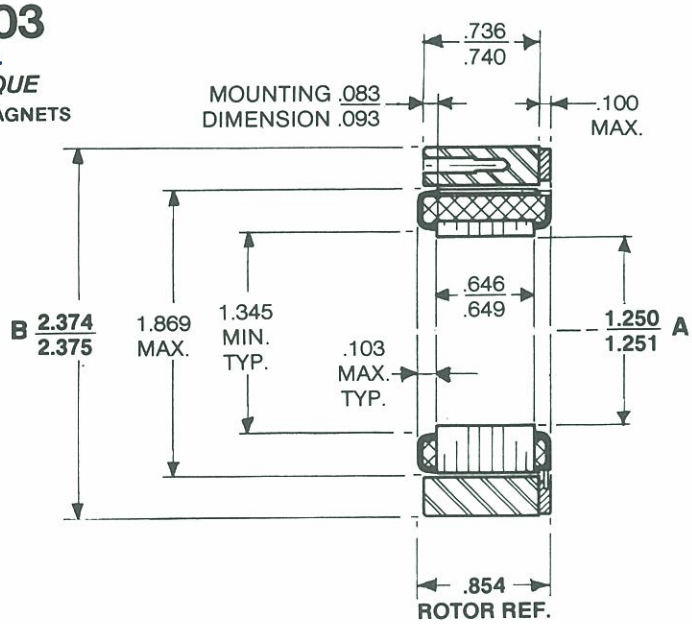
Kollmorgen has more than 70 years of motion experience, proven in the industry's highest-performing, most reliable motors, drives, linear actuators, gearheads, AGV control solutions and automation platforms. We deliver breakthrough solutions that are unmatched in performance, reliability and ease of use, giving machine builders an irrefutable marketplace advantage.

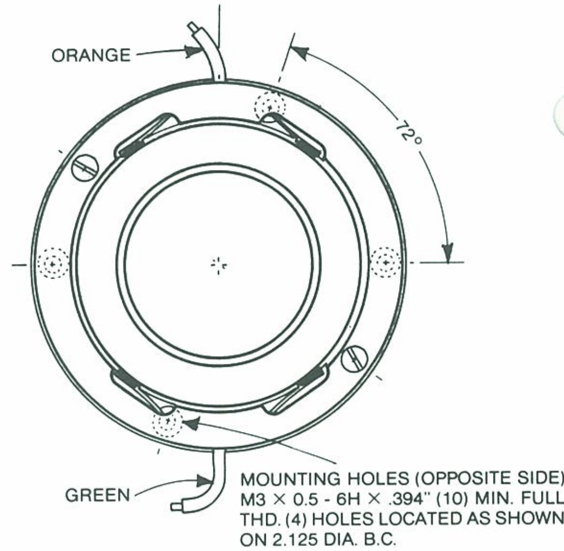
Kollmorgen is a brand of Altra Industrial Motion Corp. (NASDAQ: AIMC), a premier global designer and producer of a wide range of motion control and power transmission solutions. With engineered components and systems that provide the essential control of equipment speed, torque, positioning, and other functions, Altra products can be used in nearly any machine, process or application involving motion.

KM_BR_000385_RevA_EN

QT-1903

90 oz. in.
PEAK TORQUE
RARE EARTH MAGNETS





NOTES:

1. — MOTOR TO BE SHIPPED AS THREE SEPARATE COMPONENTS: BRUSH RING ASSEMBLY, ROTOR ASSEMBLY, AND STATOR ASSEMBLY.
2. — MOUNTING REQUIREMENTS: DIAMETERS "**A**" AND "**B**" TO BE CONCENTRIC WITHIN .002(.004 T.I.R) WHEN MOUNTED.
3. — WITH POSITIVE CURRENT APPLIED TO GREEN LEAD, WITH RESPECT TO ORANGE LEAD, ROTATION SHALL BE C.C.W. FACING BRUSH RING END.
4. — TYPICAL BRUSH LIFE > 10^7 REVS.
5. — GOLD PLATED COMMUTATOR.

LEADS:
#24 AWG TYPE "E" TEFLON COATED
6" MIN. LENGTH.

SIZE CONSTANTS

		Value	*Units*
Peak Torque Rating - T_P		90	OZ. IN.
Power Input, Stalled at T_P(25°C) - P_P		107	WATTS
Motor Constant - K_M		8.7	OZ.IN./$\sqrt{\text{WATT}}$
No Load Speed, Theoretical @ V_P - ω_{NL}		167	RAD/S
Electrical Time Constant - τ_E		0.22	MS
Static Friction (Max.) - T_F		2.8	OZ. IN.
Viscous Damping Coefficients	Zero Impedance - F_0	0.539	OZ. IN. PER RAD/S
	Infinite Impedance - F_I	0.03	OZ. IN. PER RAD/S
Maximum Winding Temperature		155	°C
Temperature Rise per Watt - TPR		10	°C/WATT
Ripple Torque (Average to Peak) - T_R		5	PERCENT
Ripple Frequency (Fundamental)		41	CYCLES/REV.
Number of Poles		10	
Rotor Inertia - J_M		8.8×10^{-3}	$OZ.IN.S^2$
Motor Weight		9.5	OZ.

WINDING CONSTANTS — *Winding Designation*

	UNITS	TOLERANCES	A	B	C	D	E	F	G
Voltage, Stalled at T_P(25°C) - V_P	VOLTS	Nom.	30.3	24.1	12.1	60.5			
Peak Current - I_P	AMPERES	Rated	3.52	4.40	8.82	1.76			
Torque Sensitivity - K_T	OZ.IN./AMP.	±10%	25.6	20.5	10.2	51.2			
Back EMF Constant - K_B	V per RAD/S	±10%	0.181	0.145	0.072	0.362			
DC Resistance (25°C) - R_M	OHMS	±12.5%	8.60	5.5	1.37	34.4			
Inductance - L_M	mH	±30%	1.9	1.2	0.3	7.6			