Ultimag® Rotary Actuators

The Ultimag® Difference

Ultimag® offers a bidirectional, center return function not found in rotary solenoids. The Ultimag is substantially faster than other solenoids, and can be operated in an on/off mode or proportionally, in both open loop and closed loop systems.

The Ultimag does not offer 360° of rotation which is definitive of motors. With this stroke limitation in mind, Ultimag provides an inexpensive alternative for limited stroke applications, particularly, when total cost of system control is included.

Ultimag actuators offer a 45° stroke. However, the design is capable of a maximum stroke of 160°. Gears, belts, pulley, etc., can be employed to amplify stroke. In all cases, an increase in stroke will cause a reduction in torque.

For shorter strokes, electronic or mechanical stops can be used. By having a unit tooled to perform a specific stroke less than 45°, more torque will be obtained.

When adding the Ultimag to your application, the shaft must be supported to avoid stress fractures to the magnet.

Temperature Limitation

The permanent magnet in the Ultimag is NdFeB. For applications running above 130°C, we do not recommend the Ultimag, since the NdFeB magnets irreversibly degrade after reaching a 150°C temperature.

Typical Examples of Custom Features


Elliptical


Clevis-grooved


Flatted


Clevis-tongue


Drilled hole


Notched


Threaded rod


Tapped hole

Ultimag Selection Overview

Size	Package Dimensions (in) Dia.	Length	Net Starting Torque (lb-in) @ Specified Duty Cycle* 100%	50%	25%	10%	Net Ending Torque (lb-in) @ Specified Duty Cycle* 100%	50%	25%	10%
4EM	1.625	1.04	0.88	1.25	1.80	2.88	0.18	0.50	0.88	1.68
5EM	1.937	1.31	2.00	2.88	3.90	6.30	0.32	0.94	2.00	3.88
6EM	2.312	1.60	5.00	6.10	10.00	14.00	2.50	3.80	5.00	7.30

*Note: Torque outputs degrade with elevated temperatures.

How to Use Ultimag Performance Charts

1. Select one of the four columns which provides the appropriate duty cycle. (For example 50%.)

2. Reading down this column provides a variety of performance and electrical data including maximum on time, watts, and amp turns.

3. Following down the column further into the VDC ratings, select the voltage which most closely matches your supply voltage. (For example, 11.5 for a 12 VDC power supply.)

4. Read across (to the left) to select the awg suffix to complete the part number when ordering. (In this example using our 5EM chart, 25 awg is required, thus to order, specify: 194644-025.)

Performance

Maximum Duty Cycle	100%	50%	25%	10%
K_M (oz-in/√watt)	10.9	9.2	8.2	6.9
Maximum ON Time (sec) when pulsed continuously[1]	∞	100	36	10
Maximum ON Time (sec) for single pulse[2]	∞	160	44	13
Typical Energize Time (msec)[3]	6.0	5.5	4.5	4.0
Watts (@ 20°C)	21	42	84	210
Ampere Turns (@ 20°C)	621	878	1242	1964

Coil Data

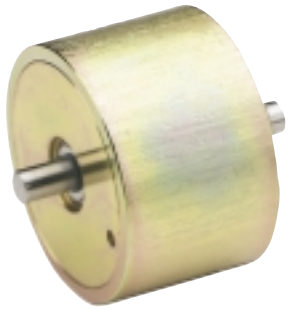
awg (0XX)[4]	Resistance (@20°C)	# Turns[5]	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
23	1.05	128	4.7	6.6	9.4	14.8
24	2.24	213	6.9	9.7	13.7	21.7
25	3.16	240	8.1	11.5	16.3	25.8
26	4.45	270	9.7	13.7	19.3	30.6
27	8.50	404	13.4	18.9	26.7	42.2
28	11.90	452	15.8	22.3	31.6	50.0
29	21.10	630	21.0	29.7	42.1	67.0
30	29.50	705	24.9	35.2	49.8	78.7
31	50.30	948	32.5	46.0	65.0	103.0
32	82.70	1232	41.7	59.0	83.0	132.0
33	134.00	1576	53.0	75.0	106.0	168.0

Ultimag® Size 4EM

Part Number: 197124-0XX

Specifications

Dielectric Strength	1000 VRMS (23 awg); 1200 VRMS (24-33 awg)
Recommended Minimum Heat Sink	Maximum watts dissipated by the Ultimag are based on an unrestricted flow of air at 20°C, with the Ultimag mounted on the equivalent of an aluminum plate measuring 6-1/4" square by 1/8" thick (15.9 cm sq. x 0.32 cm)
Thermal Resistance	7.6°C/watt with heatsink; 15.0°C/watt without heatsink
Rotor Inertia	8.43 x 10^{-7} (kgm^2)
Peak Torque Rating (Tp)	45 oz.in. (0.32 Nm)
Power Input	145 watts (stalled at Tp; 25°C; Pp)
Number of Phases	1
Static Friction (Tf)	1 oz.in. max. (7mNm)
-3dB Closed Loop	78 Hz
Maximum Winding	180°C
Number of Poles	6
Dimensions:	Ø1.625" x 1.04" L (Ø41.66 mm x 26.3 mm L) See page A10.



Performance

Maximum Duty Cycle	100%	50%	25%	10%
K_M (oz-in/√watt)	5.8	5.1	4.6	4.3
Maximum ON Time (sec) when pulsed continuously[1]	∞	40	15	4
Maximum ON Time (sec) for single pulse[2]	∞	108	34	9
Typical Energize Time (msec)[3]	6	5	4.5	3.5
Watts (@ 20°C)	14.5	29	58	145
Ampere Turns (@ 20°C)	510	721	1020	1613

Coil Data

awg (0XX)[4]	Resistance (@20°C)	# Turns[5]	VDC (Nom)	VDC (Nom)	VDC (Nom)	VDC (Nom)
23	0.71	104	3.2	4.5	6.4	10.1
24	1.54	174	4.7	6.7	9.4	14.9
25	2.15	195	5.6	7.9	11.2	17.6
26	3.01	219	6.6	9.3	13.2	20.9
27	5.78	328	9.2	12.9	18.3	28.9
28	8.09	368	10.8	15.3	21.7	34.3
29	14.40	515	14.5	20.4	28.9	45.7
30	20.11	575	18.9	24.2	37.7	59.6
31	34.40	774	22.3	31.6	44.6	71.0
32	56.60	1008	28.7	40.5	57.0	91.0
33	91.40	1288	36.0	51.5	73.0	115.0

How to Order

Add the coil awg number (0XX) to the part number (for example: to order a 25% duty cycle rated at 18.3 VDC, specify 197124-027).

Please see www.ledex.com (click on Stock Products tab) for our list of stock products available through our North American distributors.

1 Continuously pulsed at stated watts and duty cycle

2 Single pulse at stated watts (with coil at ambient room temperature 20°C)

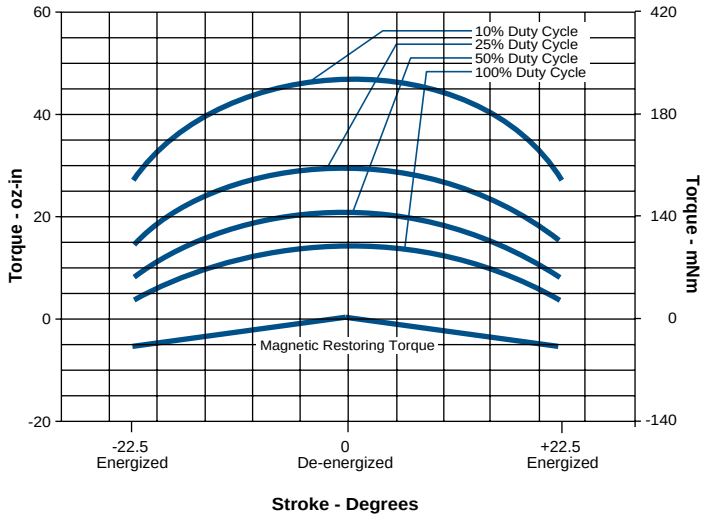
3 Typical energize time based on no load condition. Times shown are for half of full rotary stroke starting at center-off position.

4 Other coil awg sizes available — please consult factory

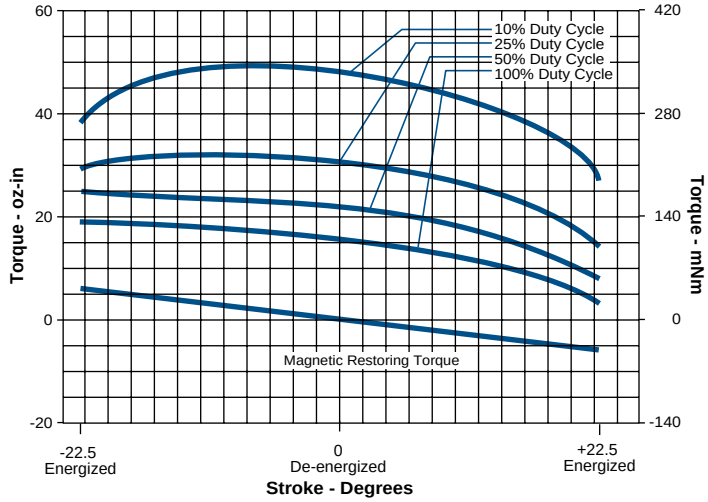
5 Reference number of turns

All specifications subject to change without notice.

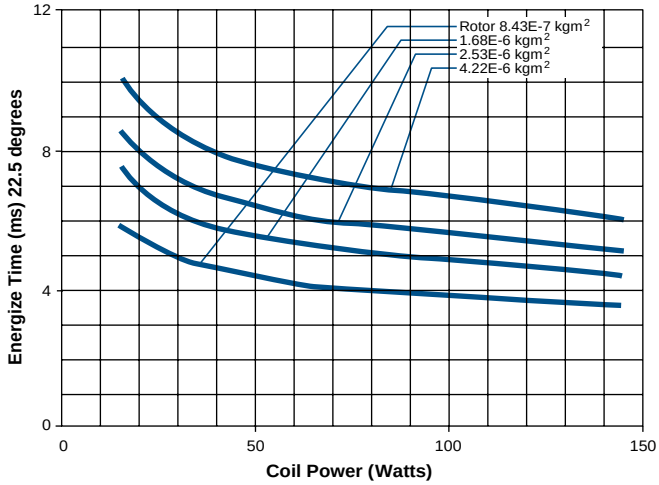
WARNING: Exposed Magnet may affect pacemakers. In the event a product unit's magnet is exposed due to product disassembly, Pacemaker Wearers should distance themselves 10 feet from exposed magnet.



Graph 1 shows three position operation. In any mode, the armature seeks center of stroke at zero power. Applying a positive or negative voltage causes the shaft to rotate clockwise or counter clockwise. When power is removed, the restoring torque is applied to the load, or alternatively, the shaft can be driven to center under power.



Graph 2 shows operation end-to-end. Note the high starting torque for high starting acceleration or for stopping the load by means of reverse voltage at the end of the stroke. If the device is used in a full stroke application, the load can be externally latched, detented, or biased to either end of stroke.



Graph 3 shows how speed varies with load. Each curve represents a different inertial load, which is a multiple of the armature inertia.

Calculate the inertia of your system, then use this chart to determine Ultimag speed in your application. Inertia determination of simple shapes is shown in most engineering handbooks; complex shapes are calculated in solid modeling software or are measured empirically. This graph represents half of the full rotary stroke starting at the center-off position.

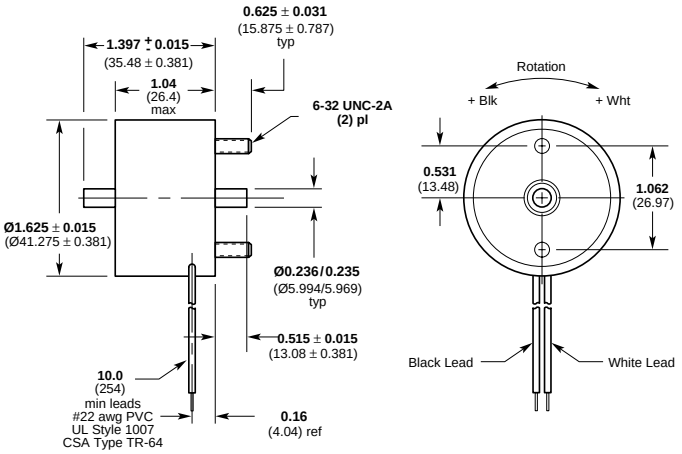
Torque values for reference only.

Ultimag® Dimensions

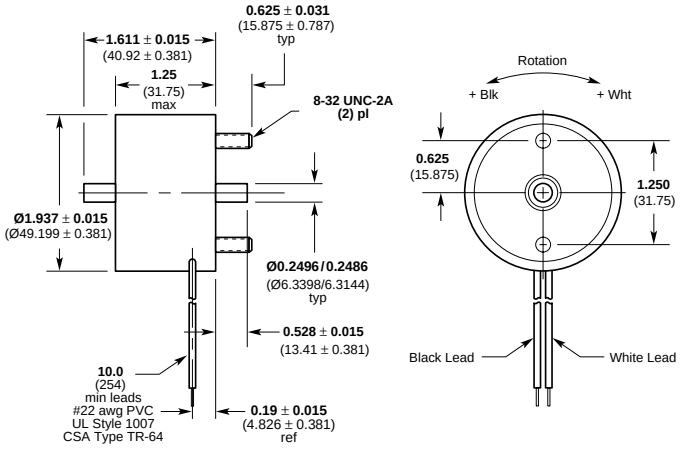
inches (mm)

All specifications subject to change without notice.

4EM



5EM



6EM