

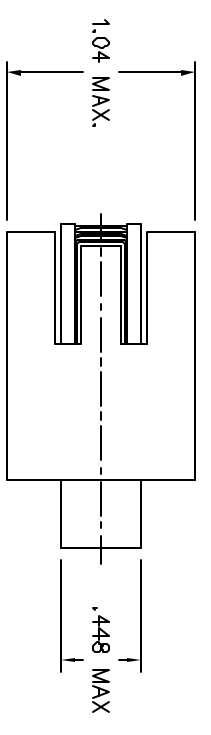
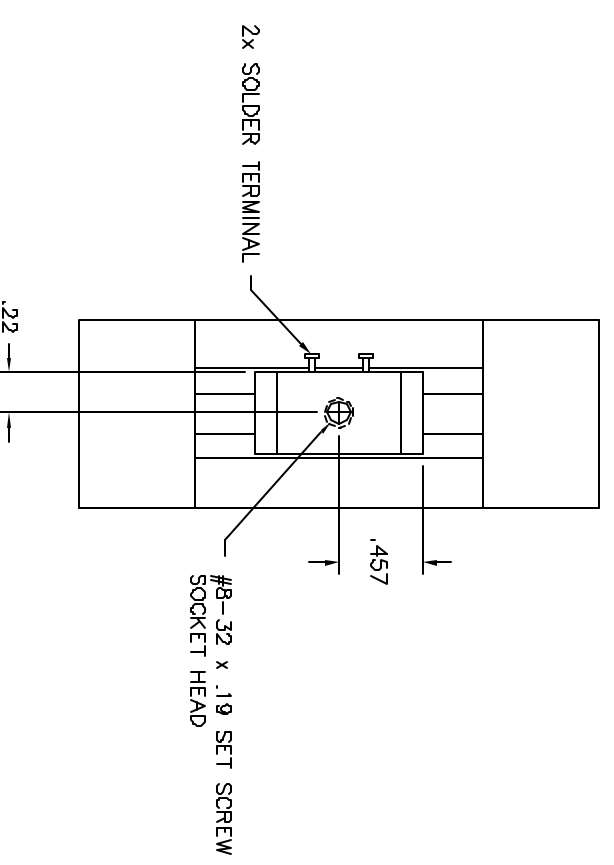
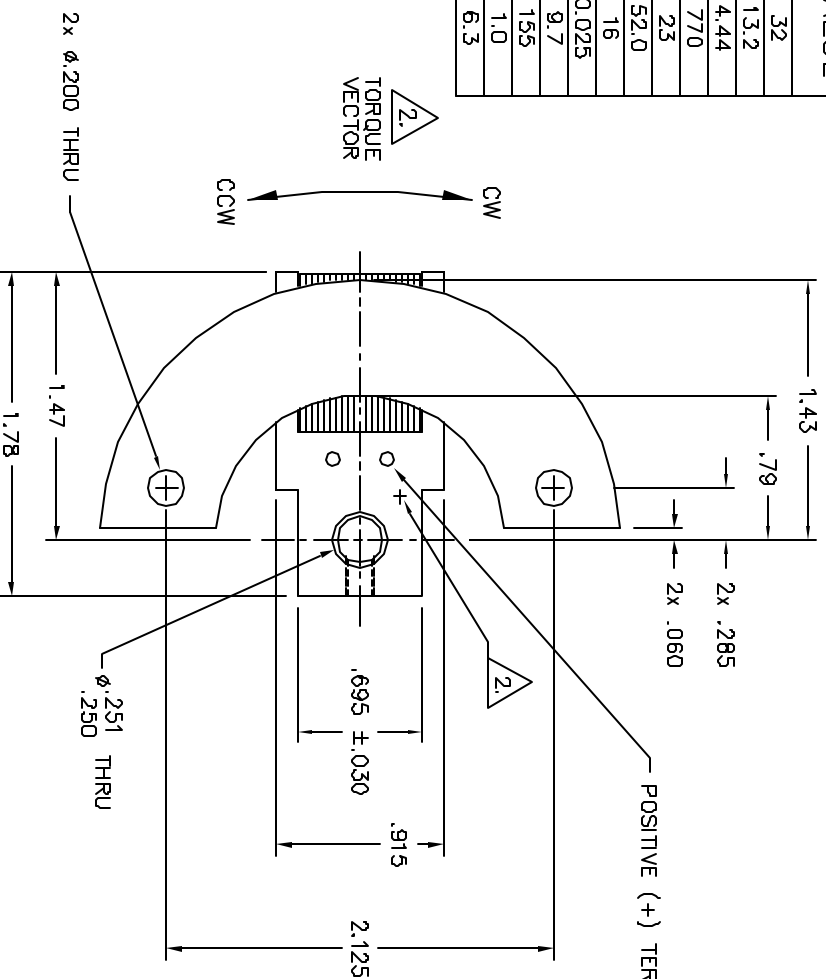
LTR	ECO NO.	DESCRIPTION	DRN	AP'D	DATE
G	045103	MATCH REV. TO AVANTE	JJC	MG	12/16/04
H	060820	ROHS CONVERSION	JWT	SH	10/30/06

4 RA29-11-002A H 1

WINDING CONSTANTS	UNITS	SYM	WDG A	TOL
DC RESISTANCE	OHMS	R	13.0	±12.5%
VOLTAGE @ TORQUE	32 OZ-IN VOLTS	V <sub>e</sub>	26.0	NOMINAL
CURRENT @ TORQUE	32 OZ-IN AMPERES	I <sub>e</sub>	2.00	NOMINAL
TORQUE SENSITIVITY @ MID-STROKE	0Z-IN/AMP	K <sub>t</sub>	16	±10%
BACK EMF CONSTANT @ MID-STROKE	VOLTS/(RAD/SEC)	K <sub>b</sub>	0.11	±10%
INDUCTANCE	MILLI-HENRY	L	10.0	±30%

ROTORARY ACTUATOR PARAMETERS	UNITS	SYM	VALUE
PEAK TORQUE *	0Z-IN	T <sub>p</sub>	32
CONTINUOUS STALL TORQUE **	0Z-IN	T <sub>cs</sub>	13.2
ACTUATOR CONSTANT	0Z-IN/V/WATT	T <sub>cs</sub>	4.44
ELECTRICAL TIME CONSTANT	MICRO-SEC	T <sub>e</sub>	770
MECHANICAL TIME CONSTANT	MILLI-SEC	T <sub>m</sub>	23
POWER IPR @ TORQUE	32 OZ-IN WATTS	P	52.0
STROKE (ANGULAR)	± DEGREES		16
CLEARANCE ON EACH SIDE OF COIL	IN		0.025
THERMAL RESISTANCE OF COIL	°C/WATT	θ <sub>th</sub>	9.7
MAX ALLOWABLE TEMP OF COIL	°C	TEMP	155
WEIGHT OF COIL ASSEMBLY	OZ	WTC	1.0
TOTAL WEIGHT	OZ	WTI	6.3

\* 10 SEC @ 25°C AMBIENT, 155°C COIL TEMP  
 \*\* 25°C AMBIENT, 155°C COIL TEMP



**BEI** KIMCO MAGNETICS DIVISION  
 VISTA, CA 92081

DRAWN		DATE	TITLE	
JDM		04/10/90	ROTARY ACTUATOR	
MECH CHECK		DATE	TITLE	
THOMPSON		10/0/06	ROTARY ACTUATOR	

APPD	FILE NO.	SCALE	FSCM NO.	DWG NO.	REV
ACM	TOP\RA\RA29-11-002A	1/1	55789	RA29-11-002A	H

THIRD ANGLE PROJECTION  
 UNLESS OTHERWISE SPECIFIED,  
 ALL DIMENSIONS ARE IN INCHES  
 BREAK SHARP EDGES 20% MAX.  
 SURFACE FINISH 320/58  
 DIMENSIONS APPLY AFTER FINISH  
 MAX FILLET R .200

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2. A POSITIVE (+) VOLTAGE APPLIED TO THE POSITIVE (+) TERMINAL WILL PRODUCE A TORQUE ON THE COIL ASSEMBLY IN THE CLOCKWISE (CW) DIRECTION.

1. INTERPRET DIMENSIONS & TOLERANCES PER ASME Y14.5M-1994.

NOTES: UNLESS OTHERWISE SPECIFIED

4 3 2 1

WINDING CONSTANTS	UNITS	TOL	SYM	WDG A
DC RESISTANCE	OHMS	±10%	R	12.5
VOLTAGE @ $K_p$	VOLTS	NOMINAL	$V_c$	31.3
CURRENT @ $T_p$	AMPERES	NOMINAL	$I_c$	2.5
DEMAGNETIZATION CURRENT	AMPERES	MAXIMUM	$I_{max}$	5.0
TORQUE SENSITIVITY	OZ-IN/AMP	±10%	$K_T$	105
BACK EMF CONSTANT	VOLTS/RAD/SEC	±10%	$K_B$	0.74
INDUCTANCE ****	MILLI-HENRY	±15%	L	11.5

ROTARY ACTUATOR PARAMETERS	UNITS	SYM	VALUE
PEAK TORQUE *	OZ-IN	$T_p$	262
CONTINUOUS STALL TORQUE **	OZ-IN	$T_{cs}$	113
ACTUATOR CONSTANT	oz-in/ $\sqrt{WATT}$	$K_A$	29.7
ELECTRICAL TIME CONSTANT	MICRO-SEC	$t_e$	920
MECHANICAL TIME CONSTANT	MILLI-SEC	$t_m$	TBD
POWER $I^2R$ @ $T_p$	WATTS	P	77.8
STROKE (ANGULAR)	± DEGREES		3.75
COIL CLEARANCE	IN		0.015
THERMAL RESISTANCE OF COIL ***	°C/WATT	$\theta_{th}$	6.0
MAX ALLOWABLE TEMP OF COIL	°C	TEMP	155
WEIGHT OF COIL ASSEMBLY	OZ	WTc	0.85-0.95
TOTAL WEIGHT	OZ	WTt	20 MAX.

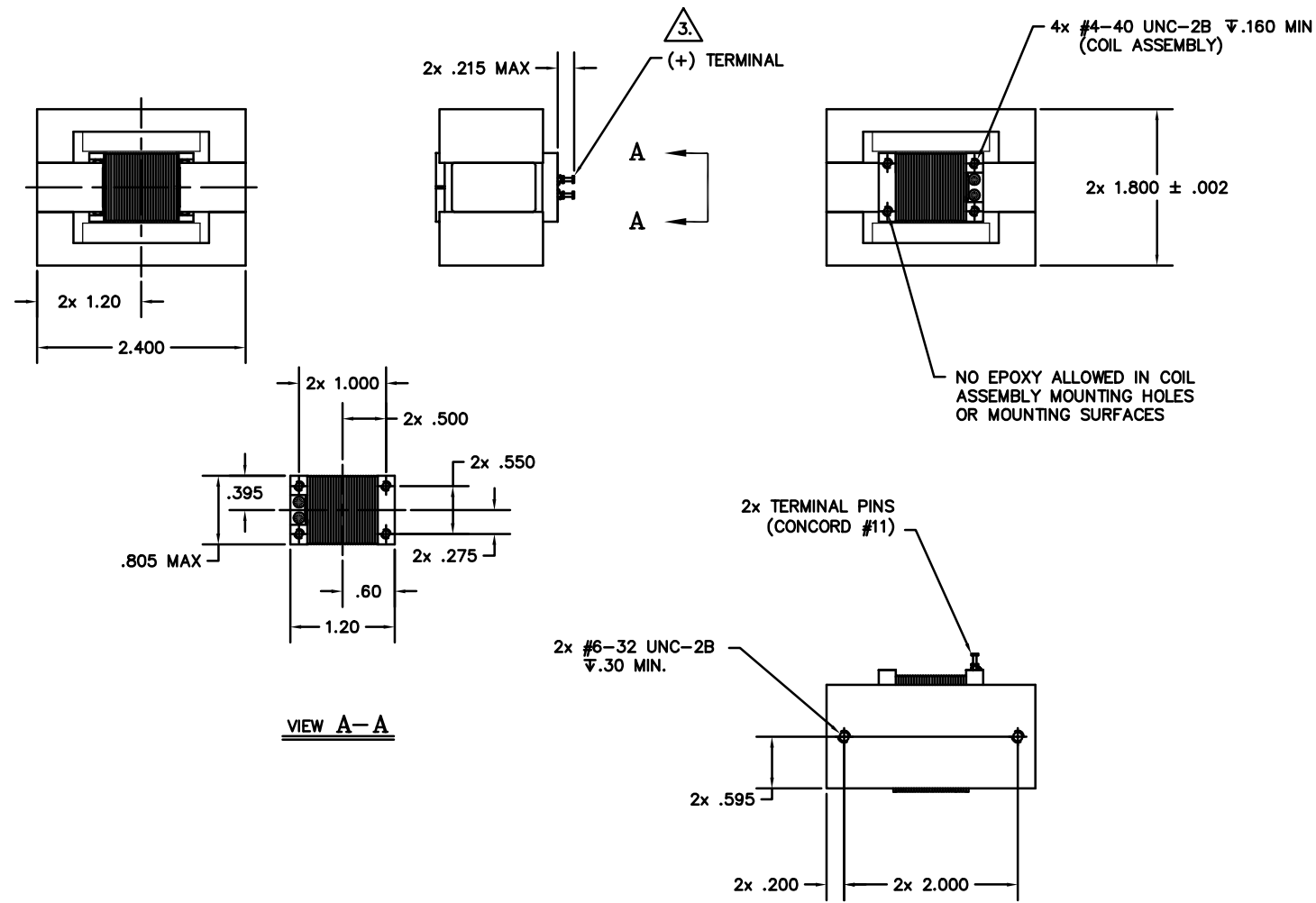
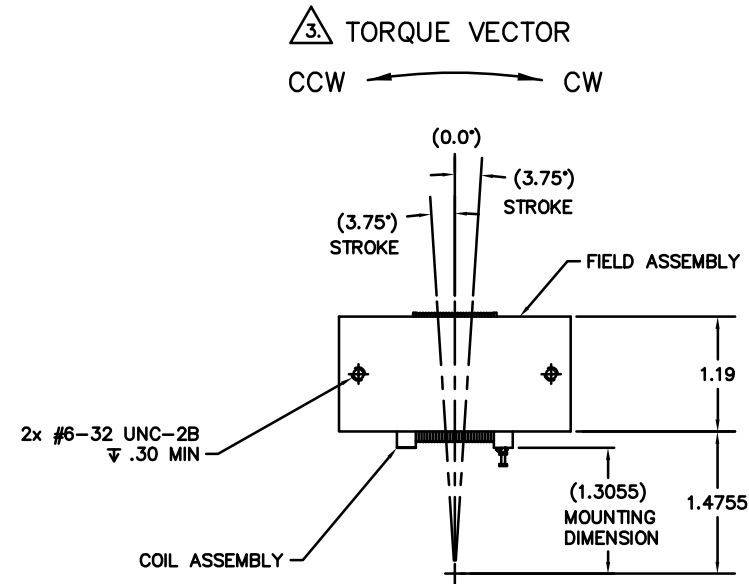
\* 10 SEC @ 25°C AMBIENT, 155°C COIL TEMP

\*\* 25°C AMBIENT, 155°C COIL TEMP

\*\*\* UNIT MOUNTED IN TEST FIXTURE

\*\*\*\* INDUCTANCE MEASURED WITH COIL LOCKED AT MID-STROKE WITH RESPECT TO FIELD ASSEMBLY USING SENCORE MODEL NO. LC53 CAPACITOR-INDUCTOR ANALYZER

REV	DCN NO.	DESCRIPTION	DRN	APP'D	DATE
C	01-0001	CHANGED INDUCTANCE VALUE	RRG	MG	01/04/01
D	010223	UPDATE TO AS BUILT CONDITION	RRG	MG	02/19/01
E	010338	REMOVED MARKING AT THIS LEVEL	RRG	MG	03/09/01



3. A POSITIVE (+) VOLTAGE APPLIED TO THE + TERMINAL WILL PRODUCE A FORCE ON THE COIL ASSEMBLY IN THE CCW DIRECTION WHEN VIEWED AS SHOWN IN TOP VIEW.

2. INSULATION RESISTANCE TO BE 100MΩ MINIMUM AT 500 VDC.

1. INTERPRET DIMENSIONS & TOLERANCES PER ANSI Y14.5M-1982.

NOTES: UNLESS OTHERWISE SPECIFIED

DO NOT SCALE DRAWING UNLESS OTHERWISE SPECIFIED: DIMENSIONS ARE IN INCHES TOLERANCES ARE ANGULAR = ± 30' .X = ± .03 .XX = ± .01 .XXX = ± .005		SIZE <b>D</b>	FSCM NO. 55789	<b>BEI</b> KIMCO MAGNETICS DIVISION SAN MARCOS, CA 92069
TITLE: ROTARY ACTUATOR		DWG NO: RA54-18-000A		DRN: R. GUERRERO 08/28/00
SCALE: 1/1		SHT. 1 OF 1		APP'D: M. GODKIN 09/05/00

4

3

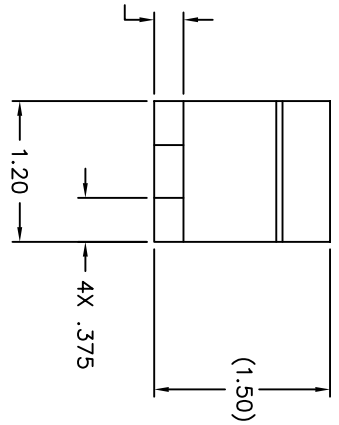
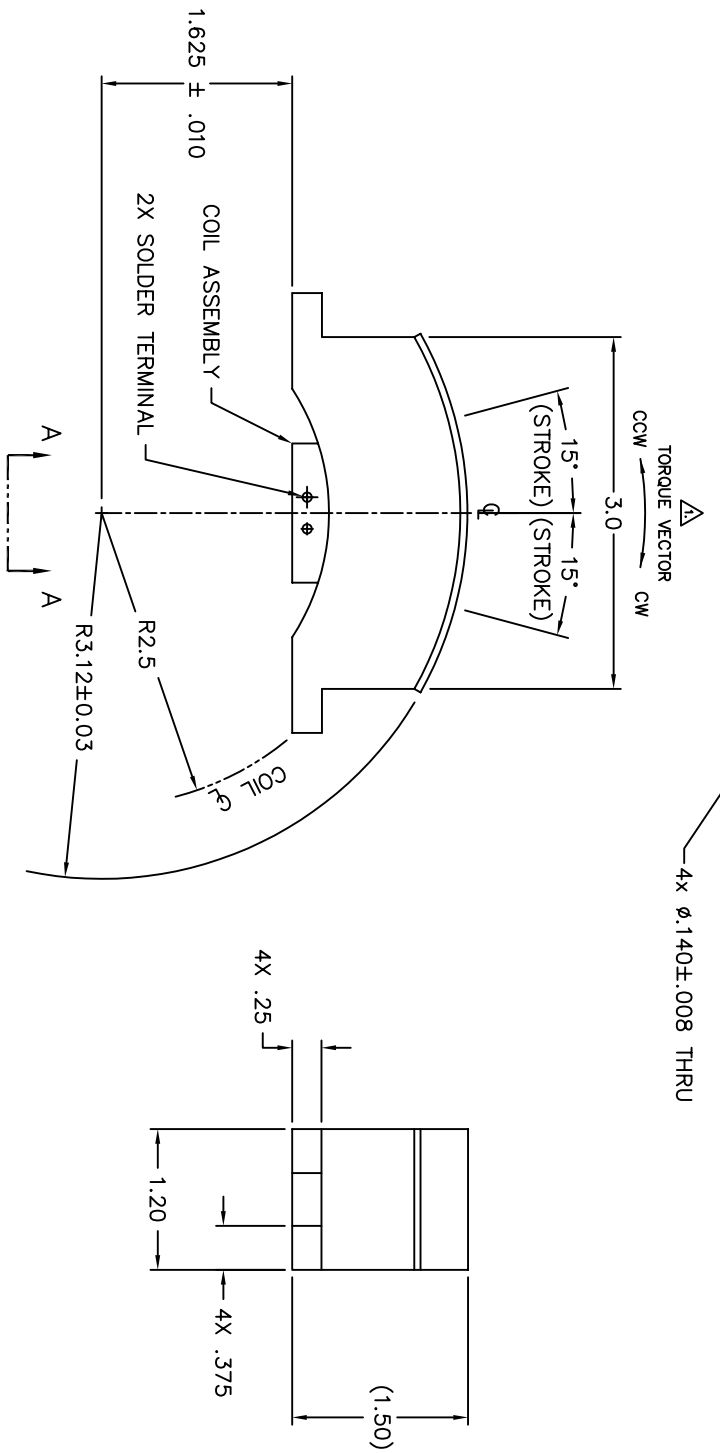
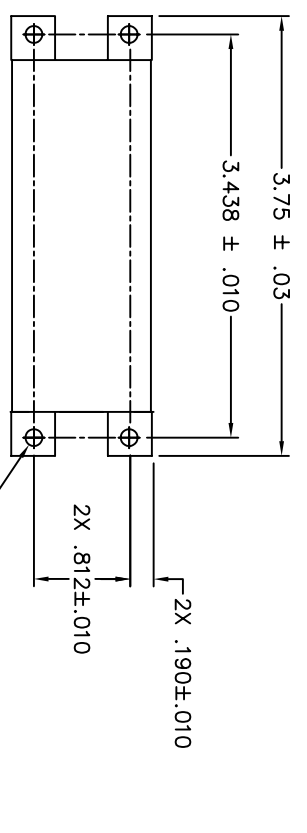
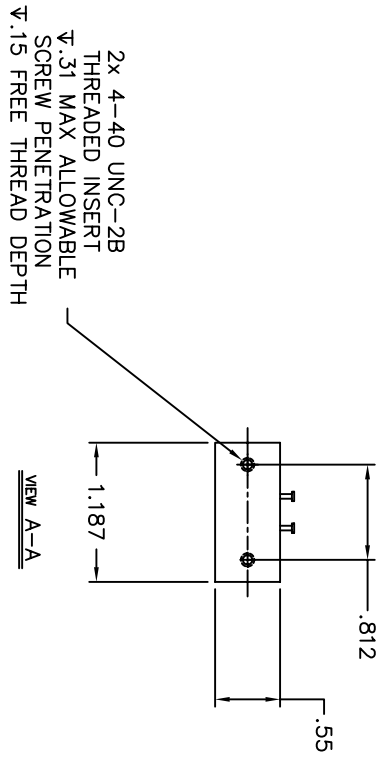
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1

WINDING CONSTANTS *	UNITS	TOL	SYMBOL	WDG A
DC RESISTANCE	OHMS	±12.5%	R	1.9
VOLTAGE @ $T_p$	VOLTS	NOMINAL	$V_p$	12.0
CURRENT @ $T_p$	AMPERES	NOMINAL	$I_p$	6.31
TORQUE SENSITIVITY	OZ-IN/AMP	±10%	$K_t$	19
BACK EMF CONSTANT	V/(RAD/SEC)	±10%	$K_b$	0.134
INDUCTANCE ****	MICRO-HENRY	±15%	L	1.38

ACTUATOR PARAMETERS *	UNITS	SYMBOL	VALUE
PEAK TORQUE **	OZ-IN	$T_p$	120
CONTINUOUS STALL TORQUE ***	OZ-IN	$T_{GS}$	56.1
ACTUATOR CONSTANT	OZ-IN/√W	$K_A$	13.8
ELECTRICAL TIME CONSTANT	MICRO-SEC	$T_E$	730
MECHANICAL TIME CONSTANT	MILLI-SEC	$T_M$	9.0
POWER $1/2 R @ T_p$	WATTS	$P_p$	75.8
COIL ASSEMBLY INERTIA	OZ-IN-SEC <sup>2</sup>	$J_M$	0.008
STROKE (ANGULAR)	± DEGREE		15
COIL CLEARANCE	IN		0.015
THERMAL RESISTANCE OF COIL	°C/WATT	$\theta_{TH}$	5.2
MAX. ALLOWABLE WINDING TEMP.	°C	TEMP	155
WEIGHT OF COIL ASSEMBLY	OZ	$WT_{CA}$	0.75
TOTAL WEIGHT	OZ	$WT_T$	14.7

\* AT MID-STROKE & 25° AMBIENT TEMPERATURE  
 \*\* 10 SECONDS AT 25°C AMBIENT & 155°C COIL TEMPERATURE  
 \*\*\* 25°C AMBIENT & 155°C WINDING TEMPERATURE  
 \*\*\*\* MEASURED AT 1000 HZ.



A

B

C

D

RA60-10-001A M

A

C

D

LTR	ECO NO.	DESCRIPTION	DWN	APP'D	DATE
L	99-0886	WINDING LITER A WAS: Z	SMH	MG	11/12/98
M	070044	UPDATE DRAWING, ADDED ROHS LOGO	RG	MG	02/02/07

RA60-10-001A M



**BEI** KIMCO MAGNETICS DIVISION  
 VISTA, CA 92081

ROTARY ACTUATOR

**THIRD ANGLE PROJECTION**  
 UNLESS OTHERWISE SPECIFIED:  
 -ALL DIMENSIONS ARE IN INCHES  
 -BREAK SHARP EDGES .015 MAX.  
 -SURFACE ROUGHNESS: √63  
 -DIMENSIONS APPLY AFTER FINISH  
 -MAX FILET R: .010  
 TOLERANCES:  
 DECIMALS ± .010  
 ANGULAR ± 30'  
 .XXX ± .005  
 DO NOT SCALE DRAWING

DRAWN	DATE	TITLE
WIEDENHAMMER	12/15/82	ROTARY ACTUATOR
MECH CHECK	DATE	
GUERRERO	01/18/07	
APP'D	DATE	
J.K	12/17/82	

FILE NO.	SCALE	SIZE	FORM NO.	DWG NO.	REV
L:\TOP LEVEL\RA\...	2/1	C	55789	RA60-10-001A	M
USED ON:					

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1. A POSITIVE (+) VOLTAGE APPLIED TO THE (+) TERMINAL WILL PRODUCE A TORQUE ON THE COIL ASSEMBLY IN THE CW DIRECTION WHEN VIEWED FROM THE TERMINAL SIDE.  
 NOTES: UNLESS OTHERWISE SPECIFIED

4

3

2

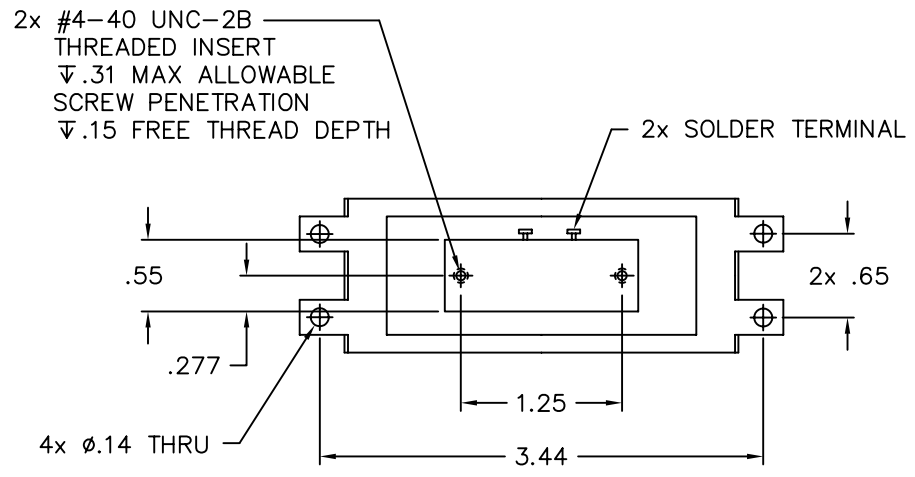
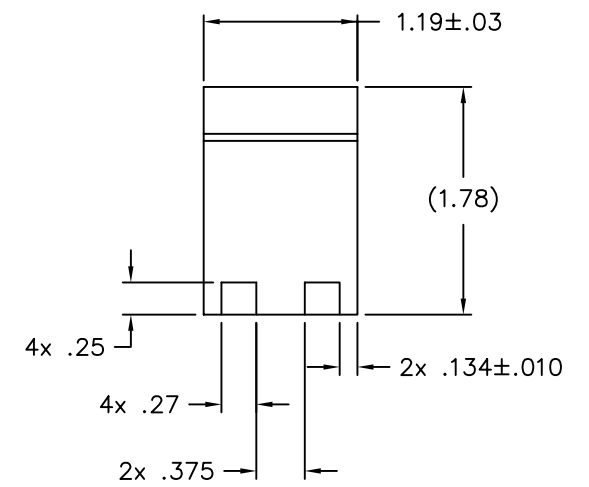
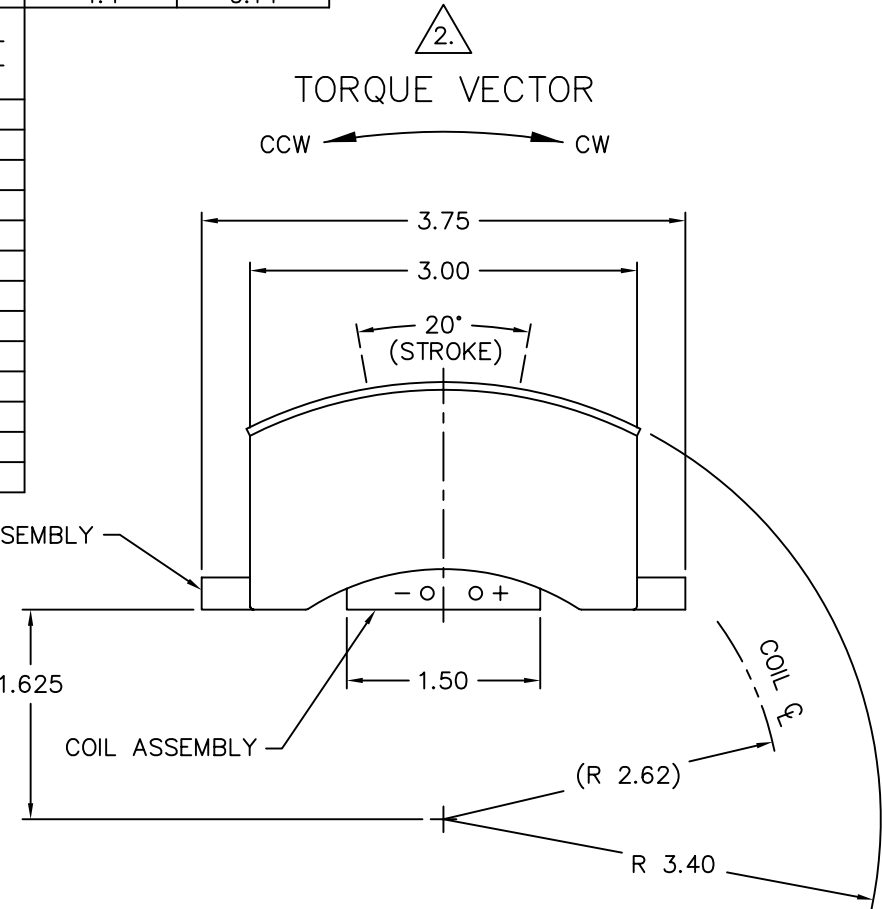
1

WINDING CONSTANTS *	UNITS	TOL	SYM	WDG A	WDG B
DC RESISTANCE	OHMS	±10%	R	5.0	0.15
VOLTAGE @ T <sub>p</sub>	VOLTS	NOMINAL	V <sub>C</sub>	17.0	3.0
CURRENT @ T <sub>p</sub>	AMPERES	NOMINAL	I <sub>C</sub>	3.4	20.0
TORQUE SENSITIVITY (AT MID STROKE)	OZ-IN/AMP	±10%	K <sub>T</sub>	50.0	8.5
BACK EMF CONSTANT	VOLTS/RAD/SEC	±10%	K <sub>B</sub>	0.35	0.06
INDUCTANCE ****	MILLI-HENRY	±30%	L	4.4	0.14

LTR	ECO NO.	DESCRIPTION	DRN	APP'D	DATE
Q	060285	ADD RoHS LOGO	SLM	MG	04/03/06
R	080220	CHANGE INDUCTANCE UNIT TO MILLI	SLM	MG	05/19/08

ROTARY ACTUATOR PARAMETERS *	UNITS	SYM	VALUE
PEAK TORQUE **	OZ-IN	T <sub>P</sub>	170.0
CONTINUOUS STALL TORQUE ***	OZ-IN	T <sub>CS</sub>	92
ACTUATOR CONSTANT	OZ-IN/√WATT	K <sub>A</sub>	22.4
ELECTRICAL TIME CONSTANT	MICRO-SEC	τ <sub>E</sub>	880.0
MECHANICAL TIME CONSTANT	MILLI-SEC	τ <sub>M</sub>	5.5
POWER I <sup>2</sup> R @ T <sub>p</sub>	WATTS	P <sub>P</sub>	57.8
STROKE (ANGULAR)	± DEGREES		10
COIL CLEARANCE	IN		0.02
COIL ASSEMBLY INERTIA	OZ-IN-SEC <sup>2</sup>		-
THERMAL RESISTANCE OF COIL	°C/WATT	⊙th	5.1
MAX ALLOWABLE TEMP OF COIL	°C	TEMP	155
WEIGHT OF COIL ASSEMBLY	OZ	WTc	1.1
TOTAL WEIGHT	OZ	WTt	18.0

\* AT MID-STROKE & 25° AMBIENT TEMPERATURE  
 \*\* 10 SECONDS AT 25°C AMBIENT & 155°C COIL TEMPERATURE  
 \*\*\* 25°C AMBIENT & 155°C WINDING TEMPERATURE  
 \*\*\*\* MEASURED AT 1000 Hz



2. A POSITIVE (+) VOLTAGE APPLIED TO THE POSITIVE (+) TERMINAL WILL PRODUCE A TORQUE ON THE COIL ASSEMBLY IN THE CLOCKWISE (CW) DIRECTION, AS VIEWED FROM THE TERMINAL SIDE.

1. INSULATION RESISTANCE IS 100 MEGOHMS MINIMUM AT 500 VDC.  
 NOTES: UNLESS OTHERWISE SPECIFIED

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THIRD ANGLE PROJECTION

UNLESS OTHERWISE SPECIFIED:  
 -ALL DIMENSIONS ARE IN INCHES  
 -BREAK SHARP EDGES .015 MAX.  
 -SURFACE ROUGHNESS √63  
 -DIMENSIONS APPLY AFTER FINISH  
 -MAX FILLET R .010

TOLERANCES:  
 DECIMALS .X ± .03  
 .XX ± .01  
 .XXX ± .005  
 ANGULAR ±0° 30'  
 DO NOT SCALE DRAWING

**BEI KIMCO MAGNETICS DIVISION**  
 VISTA, CA 92081

DRAWN: R. ELLIOTT DATE: 9/9/88  
 MECH CHECK: R. GUERRERO DATE: 12/13/04  
 APPD: HA PHAM DATE: 9/12/88  
 FILE NO.: L:\TOP LEVEL\RA\ ...

**ROTARY ACTUATOR**

SIZE: C FSCM NO.: 55789 DWG NO.: RA68-12-001(LTR) REV: R  
 SCALE: 1/1 SHEET: 1 OF 1



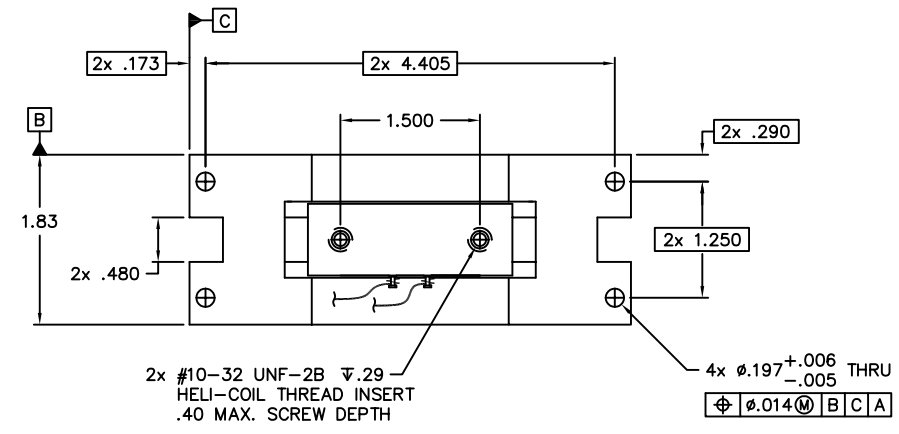
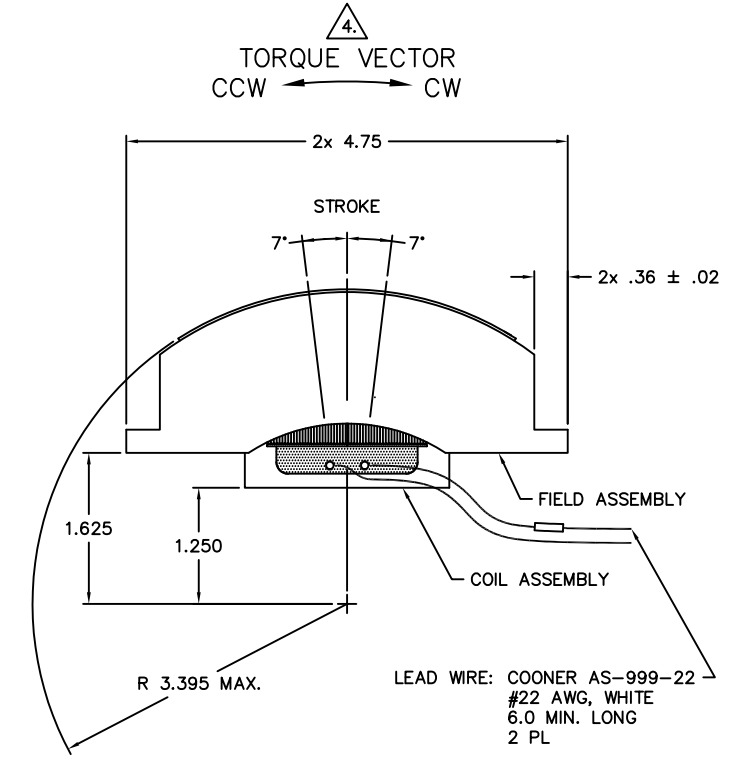
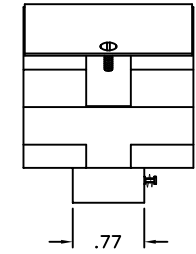
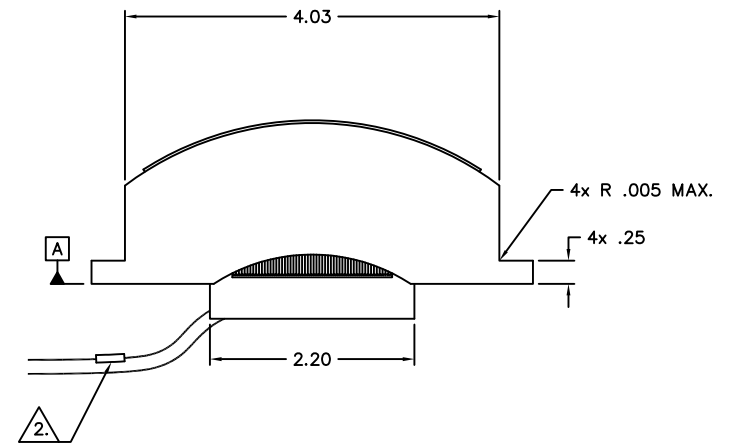
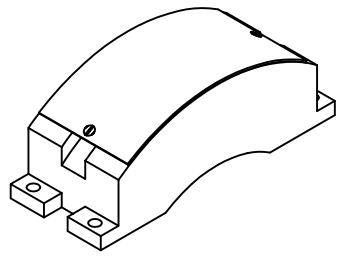
RA68-12-001(LTR)

LTR	ECO NO.	DESCRIPTION	DRN	APP'D	DATE
-		INITIAL RELEASE	RLE	MG	5/26/00
A	050110	MATCH REVISION TO BOM IN AVANTE	JJC	M.G	2/18/05

WINDING CONSTANTS *	UNITS	TOL	SYM	WDG A
DC RESISTANCE	OHMS	±12.5%	R	5.5
VOLTAGE @ T <sub>p</sub>	VOLTS	NOMINAL	V <sub>c</sub>	44.0
CURRENT @ T <sub>p</sub>	AMPERES	NOMINAL	I <sub>c</sub>	8.0
TORQUE SENSITIVITY (AT MID STROKE)	OZ-IN/AMP	±10%	K <sub>T</sub>	125
BACK EMF CONSTANT	VOLTS/RAD/SEC	±10%	K <sub>B</sub>	0.88
INDUCTANCE ****	MILLI-HENRY	±30%	L	15.0

ROTARY ACTUATOR PARAMETERS *	UNITS	SYM	VALUE
PEAK TORQUE **	OZ-IN	T <sub>p</sub>	1000
CONTINUOUS STALL TORQUE ***	OZ-IN	T <sub>cs</sub>	250
ACTUATOR CONSTANT	OZ-IN/√WATT	K <sub>A</sub>	53.3
ELECTRICAL TIME CONSTANT	MICRO-SEC	t <sub>E</sub>	2700
MECHANICAL TIME CONSTANT	MILLI-SEC	t <sub>M</sub>	3.5
POWER I <sup>2</sup> R @ T <sub>p</sub>	WATTS	P <sub>p</sub>	352
STROKE (ANGULAR)	± DEGREES		7.0
COIL CLEARANCE	IN		0.015
THERMAL RESISTANCE OF COIL	°C/WATT	θ <sub>th</sub>	4.0
MAX ALLOWABLE TEMP OF COIL	°C	TEMP	155
WEIGHT OF COIL ASSEMBLY	OZ	WT <sub>c</sub>	4.0
TOTAL WEIGHT	OZ	WT <sub>t</sub>	39.5

\* AT MID-STROKE & 25° AMBIENT TEMPERATURE  
 \*\* 10 SECONDS AT 25°C AMBIENT & 155°C COIL TEMPERATURE  
 \*\*\* 25°C AMBIENT & 155°C WINDING TEMPERATURE  
 \*\*\*\* MEASURED AT 1000 Hz



US PATENT NO.  
5,677,963

4. A POSITIVE (+) VOLTAGE APPLIED TO COIL ASSEMBLY LEAD MARKED WITH SHRINK TUBING WILL PRODUCE A TORQUE ON THE COIL ASSEMBLY IN THE CCW DIRECTION WHEN VIEWED FROM THE LEAD WIRE SIDE.

- ALL ABBREVIATIONS IAW MIL-STD-12.
- INTERPRET DRAWING IAW MIL-STD-100.
- INTERPRET DIMENSIONING AND TOLERANCING IAW ASME Y14.5M-1994.

NOTES: UNLESS OTHERWISE SPECIFIED

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	UNLESS OTHERWISE SPECIFIED: -ALL DIMENSIONS ARE IN UNITS -BREAK SHARP EDGES .015 MAX. -SURFACE ROUGHNESS √63 -DIMENSIONS APPLY AFTER FINISH -MAX FILLET R FILLET		DRAWN R. ELLIOTT	DATE 5/24/00	TITLE ROTARY ACTUATOR	
	TOLERANCES: DECIMALS ANGULAR .X ± .X ANGTDL .XX ± .XX .XXX ± .XXX DO NOT SCALE DRAWING		MECH CHECK PHIL STAHL	DATE 2/17/05	APPD M. GODKIN	DATE 5/26/00
	FILE NO. L:\TOP LEVEL\RA\...	SIZE D	FSCM NO. 55789	DWG NO. RA68-19-000A	REV A	SHEET 1 OF 1

RA68-19-000A A