

	A	B	C	D	E	F	G	H	I	J	K	L	M	N
1	301429 Torque Testing													
2	Purpose:	The purpose of this test is to measure the torque required to move the trigger pull adjustment screw (301429) in the X-Mark Pro Externally Adjustable Trigger Gun (301463) for normal adjustments. The data will be used to determine the torque limits for the hex bit to knob for the adjustment wrench supplied with the gun to the consumer. Torque will also be measured for informational purposes when the locking element on the adjustment screw is initially engraved to establish the torque level for installation. This engraving will normally be done at assembly.												
3														
4														
5														
6														
7														
8														
9	Procedure:	The trigger assembly used for testing will be mounted in the test fixture using two 1/8" dowel pins through the mounting holes. The adjustment screw is started into the threads in the trigger. A 1/16" hex key will be inserted into the socket in the adjustment screw. A Chatillon digital force gage is to be used such that it contacts the hex key at a right angle 1" from the centerline of the adjustment screw (distance verified with a machinist's scale). With the gage zeroed for force (both instantaneous and peak), the trigger assembly will be rotated slowly through 180 degrees. The peak torque for this rotation will be recorded, the gage re-zeroed, and the wrench reset to measure torque for the next 180 degree arc. This procedure is to be repeated until the adjustment screw bottoms out in the trigger.												
10														
11														
12														
13														
14														
15														
16														
17														
18														
19	Data:													
20	TA #1	Engraving		Normal		TA #5		Engraving		Normal		TA #7		Engraving
21	7SS	Angle	Force	Angle	Force	700SS		Angle	Force	Angle	Force	700SS		Angle
22	1	180	0.475	180	0.145	1		180	0.185	180	0.110	1		180
23		360	0.425	360	0.215			360	0.585	360	0.180			360
24	2	540	1.300	540	0.320	2		540	0.940	540	0.355	2		540
25		720	1.215	720	0.250			720	0.770	720	0.265			720
26	3	900	1.750	900	0.565	3		900	0.830	900	0.275	3		900
27		1080	1.740	1080	0.485			1080	1.135	1080	0.635			1080
28	4	1260	1.990	1260	0.480	4		1260	1.010	1260	0.455	4		1260
29		1440	1.730	1440	0.465			1440	0.995	1440	0.530			1440
30	5	1620	1.130	1620	0.365	5		1620	1.010	1620	0.495	5		1620
31		1800	1.025	1800	0.385			1800	0.660	1800	0.395			1800
32	6	1980	1.455	1980	0.430	6		1980	0.975	1980	0.195	6		1980
33		2160		2160				2160		2160				2160
34	7	2340		2340		7		2340		2340		7		2340
35		2520		2520				2520		2520				2520
36														
37														
38														
39	Conclusion:	Maximum measured torque for the sample tested was 1.295 lbs. If the hex bit to knob interface is capable of supporting 5 in-lbs, there will be sufficient torque with the wrench design to ensure that the hex bit does not turn inside the knob during any foreseeable operating conditions.												
40														
41														
42														
43														
44														

	O	P	Q	R	S	T	U	V	W	X	Y	Z	AA	AB	AC	AD	AE
1																	
2	able trigger																
3	with the																
4	ved to																
5																	
6																	
7																	
8																	
9	rew will be																
10	be set up																
11	he force																
12	ation will																
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20	aving	Normal			TA #2	Engraving		Normal			TA #3	Engraving		Normal			TA #6
21	Force	Angle	Force		7SS	Angle	Force	Angle	Force		7SS	Angle	Force	Angle	Force		700SS
22	0.110	180	0.100		1	180	0.270	180	0.105		1	180	0.565	180	0.145		1
23	0.105	360	0.105			360	0.260	360	0.175			360	0.455	360	0.150		
24	0.170	540	0.090		2	540	0.330	540	0.180		2	540	0.965	540	0.260		2
25	0.115	720	0.090			720	1.110	720	0.165			720	1.115	720	0.350		
26	0.580	900	0.235		3	900	0.865	900	0.260		3	900	1.910	900	0.420		3
27	0.890	1080	0.275			1080	1.445	1080	0.355			1080	2.245	1080	0.460		
28	1.485	1260	0.430		4	1260	1.105	1260	0.445		4	1260	1.850	1260	0.470		4
29	1.620	1440	0.585			1440	1.740	1440	0.555			1440	2.075	1440	0.685		
30	1.545	1620	0.715		5	1620	1.335	1620	0.615		5	1620	1.605	1620	0.810		5
31	1.430	1800	0.915			1800	1.525	1800	0.635			1800	1.260	1800	0.530		
32	1.130	1980	0.775		6	1980	0.860	1980	0.615		6	1980	0.970	1980	0.335		6
33	0.680	2160	0.485			2160	0.465	2160	0.325			2160	1.990	2160	0.580		
34	1.385	2340	1.595		7	2340	0.870	2340	0.720		7	2340		2340			7
35		2520				2520		2520				2520		2520			
36																	
37																	
38																	
39	cient safety margin																
40																	
41																	
42																	
43																	
44																	

	AF	AG	AH	AI	AJ	AK	AL	AM	AN	AO	AP	AQ	AR	AS	AT	AU	AV
1																	
2																	
3																	
4																	
5																	
6																	
7																	
8																	
9																	
10																	
11																	
12																	
13																	
14																	
15																	
16																	
17																	
18																	
19																	
20	Engraving		Normal			TA #4	Engraving		Normal			TA #10	Engraving		Normal		
21	Angle	Force	Angle	Force		7SS	Angle	Force	Angle	Force		700SS	Angle	Force	Angle	Force	
22	180	0.350	180	0.070		1	180	0.845	180	0.270		1	180	0.410	180	0.275	
23	360	0.450	360	0.140			360	0.350	360	0.160			360	0.965	360	0.260	
24	540	0.740	540	0.165		2	540	0.490	540	0.135		2	540	1.160	540	0.265	
25	720	0.975	720	0.200			720	1.075	720	0.115			720	2.290	720	0.370	
26	900	1.115	900	0.445		3	900	0.995	900	0.270		3	900	2.075	900	0.420	
27	1080	1.795	1080	0.280			1080	1.255	1080	0.385			1080	2.590	1080	0.670	
28	1260	1.655	1260	0.420		4	1260	1.475	1260	0.525		4	1260	2.515	1260	0.760	
29	1440	2.115	1440	0.575			1440	1.385	1440	0.505			1440	2.630	1440	0.975	
30	1620	2.490	1620	0.695		5	1620	1.695	1620	0.680		5	1620	2.690	1620	1.250	
31	1800	2.210	1800	0.985			1800	1.255	1800	0.625			1800	1.635	1800	0.920	
32	1980	1.165	1980	0.845		6	1980	1.090	1980	0.615		6	1980	1.140	1980	0.715	
33	2160	0.965	2160	0.630			2160	0.645	2160	0.410			2160	1.770	2160	0.895	
34	2340	2.340	2340	0.405		7	2340	1.160	2340	1.090		7	2340		2340		
35	2520		2520				2520		2520				2520		2520		
36																	
37																	
38																	
39																	
40																	
41																	
42																	
43																	
44																	

	AW	AX	AY	AZ	BA	BB	BC	BD	BE	BF	BG
1											
2											
3											
4											
5											
6											
7											
8											
9											
10											
11											
12											
13											
14											
15											
16											
17											
18											
19											
20	TA #8	Engraving		Normal			TA #9	Engraving		Normal	
21	700SS	Angle	Force	Angle	Force		700SS	Angle	Force	Angle	Force
22	1	180	0.635	180	0.340		1	180	0.560	180	0.090
23		360	0.490	360	0.250			360	0.435	360	0.120
24	2	540	0.795	540	0.295		2	540	0.550	540	0.170
25		720	1.235	720	0.100			720	1.115	720	0.255
26	3	900	2.255	900	0.560		3	900	1.085	900	0.275
27		1080	1.930	1080	0.495			1080	1.725	1080	0.655
28	4	1260	2.575	1260	0.540		4	1260	1.660	1260	0.585
29		1440	1.900	1440	0.810			1440	2.120	1440	0.890
30	5	1620	3.460	1620	0.885		5	1620	1.740	1620	0.790
31		1800	3.060	1800	1.295			1800	1.730	1800	0.910
32	6	1980	2.250	1980	1.160		6	1980	1.085	1980	0.530
33		2160	1.120	2160	0.455			2160	0.920	2160	0.410
34	7	2340	1.510	2340	0.655		7	2340		2340	
35		2520		2520				2520		2520	
36											
37											
38											
39											
40											
41											
42											
43											
44											

Cell: O21

Comment: ronkainejw:
original screw was only partially engraved, giving lower torque for first part of engraving measurements

Cell: C32

Comment: ronkainejw:
it was hard to tell where the screw bottomed out, so I may have overshoot the point of contact

Cell: AC33

Comment: ronkainejw:
stopped after 90 degrees of rotation.

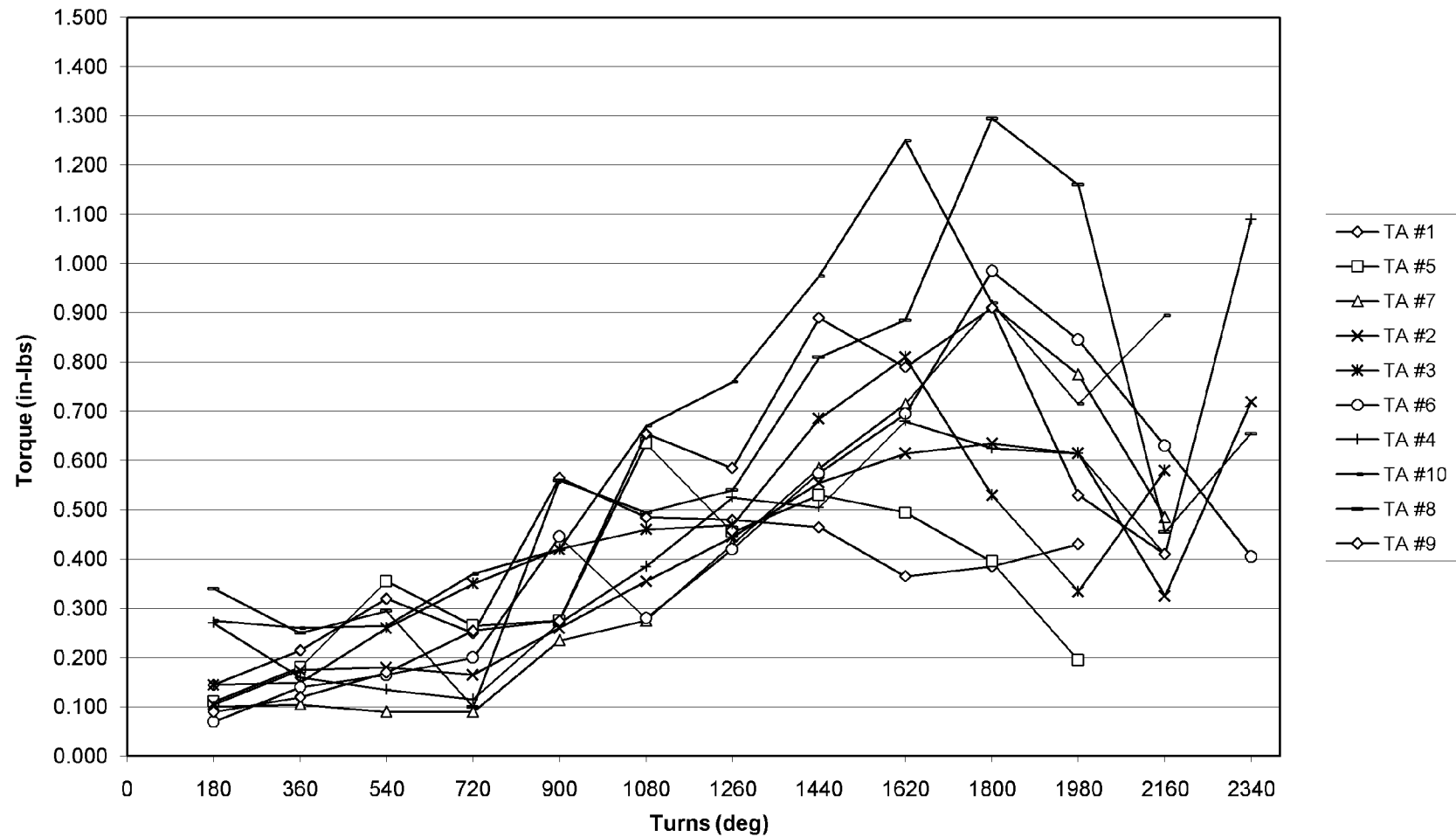
Cell: AM34

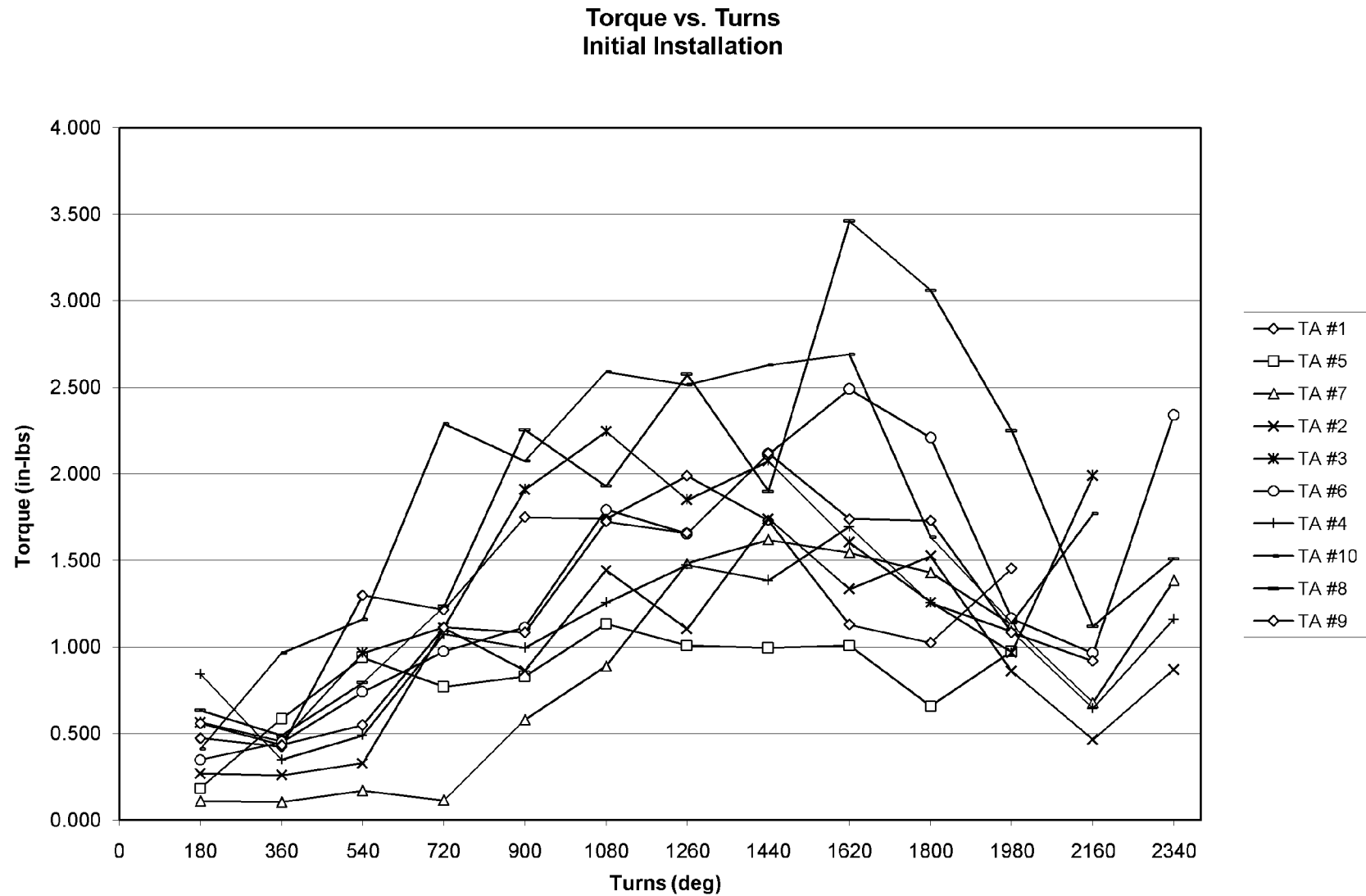
Comment: ronkainejw:
stopped after 90 degrees of rotation - felt screw bottom out

Cell: AY34

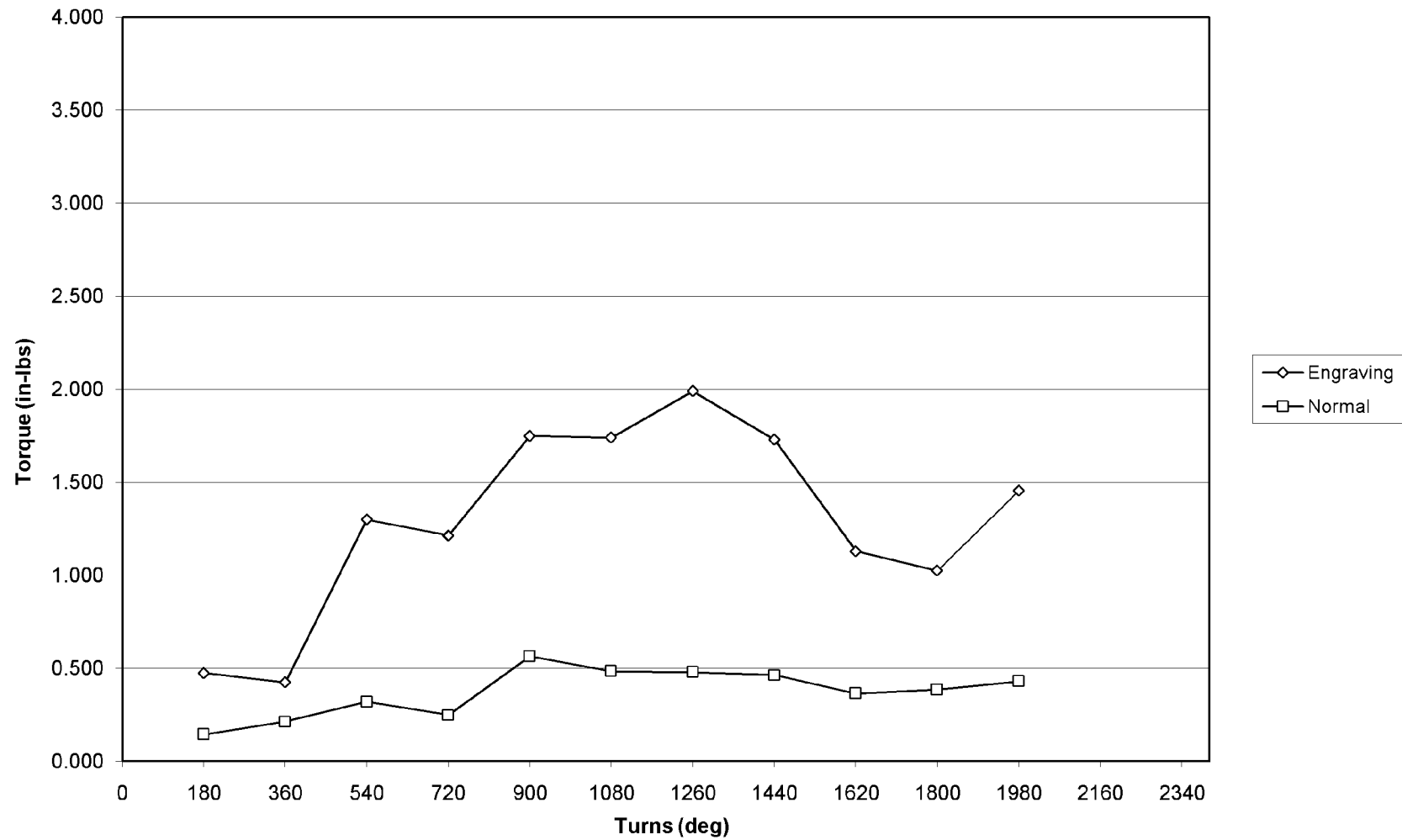
Comment: ronkainejw:
stopped after 90 degrees

Torque vs Turns
Normal Use

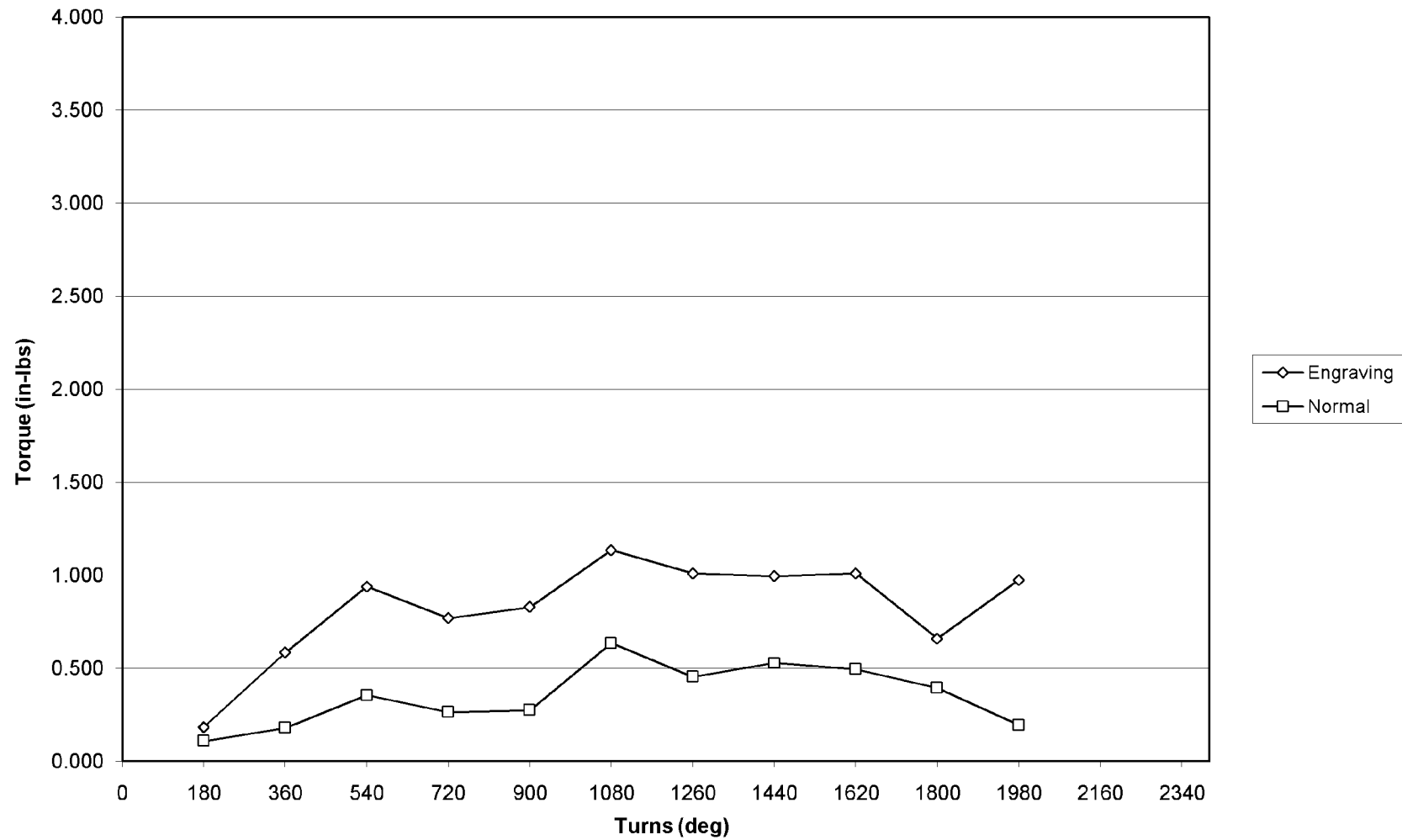




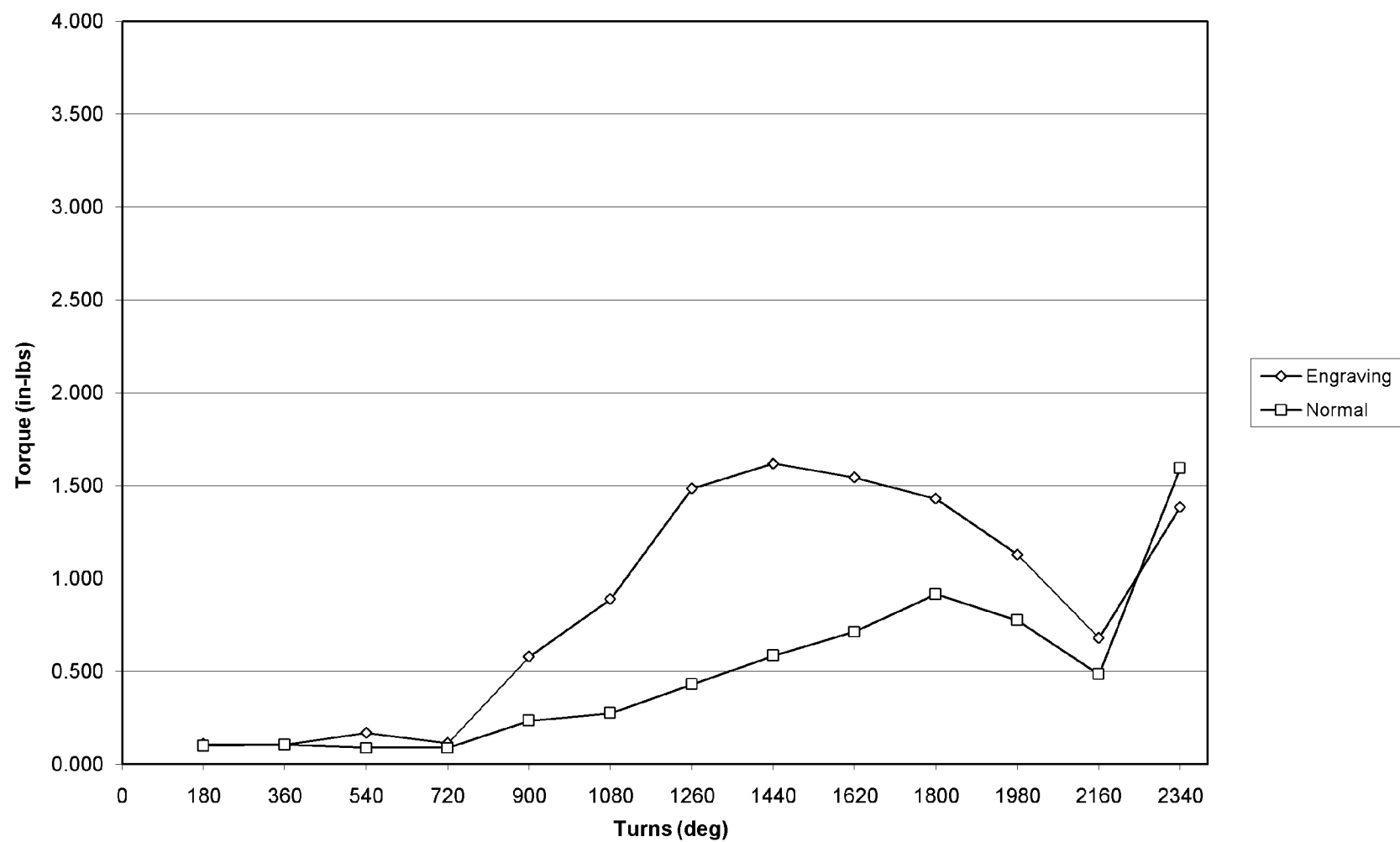
TA #1



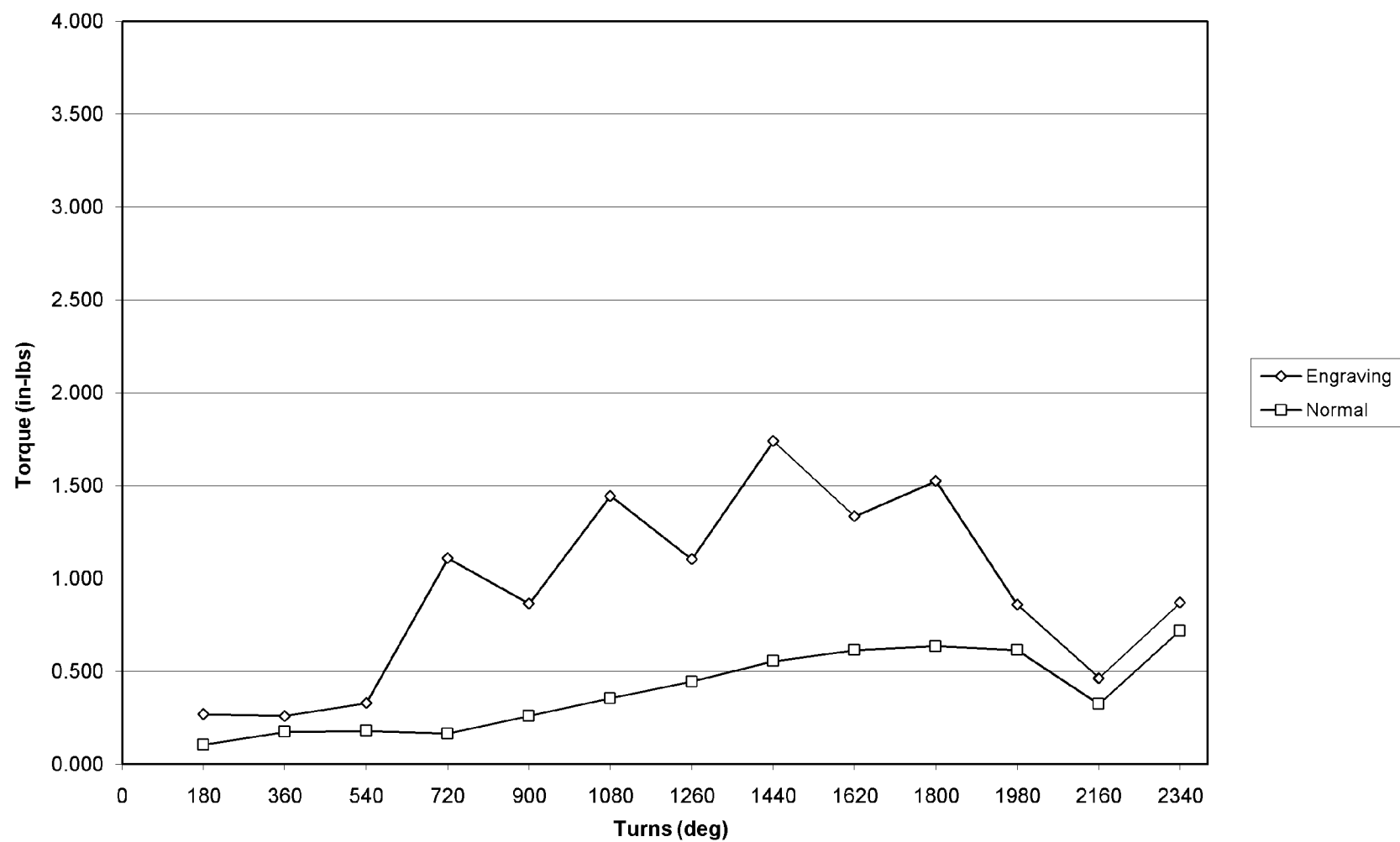
TA #5



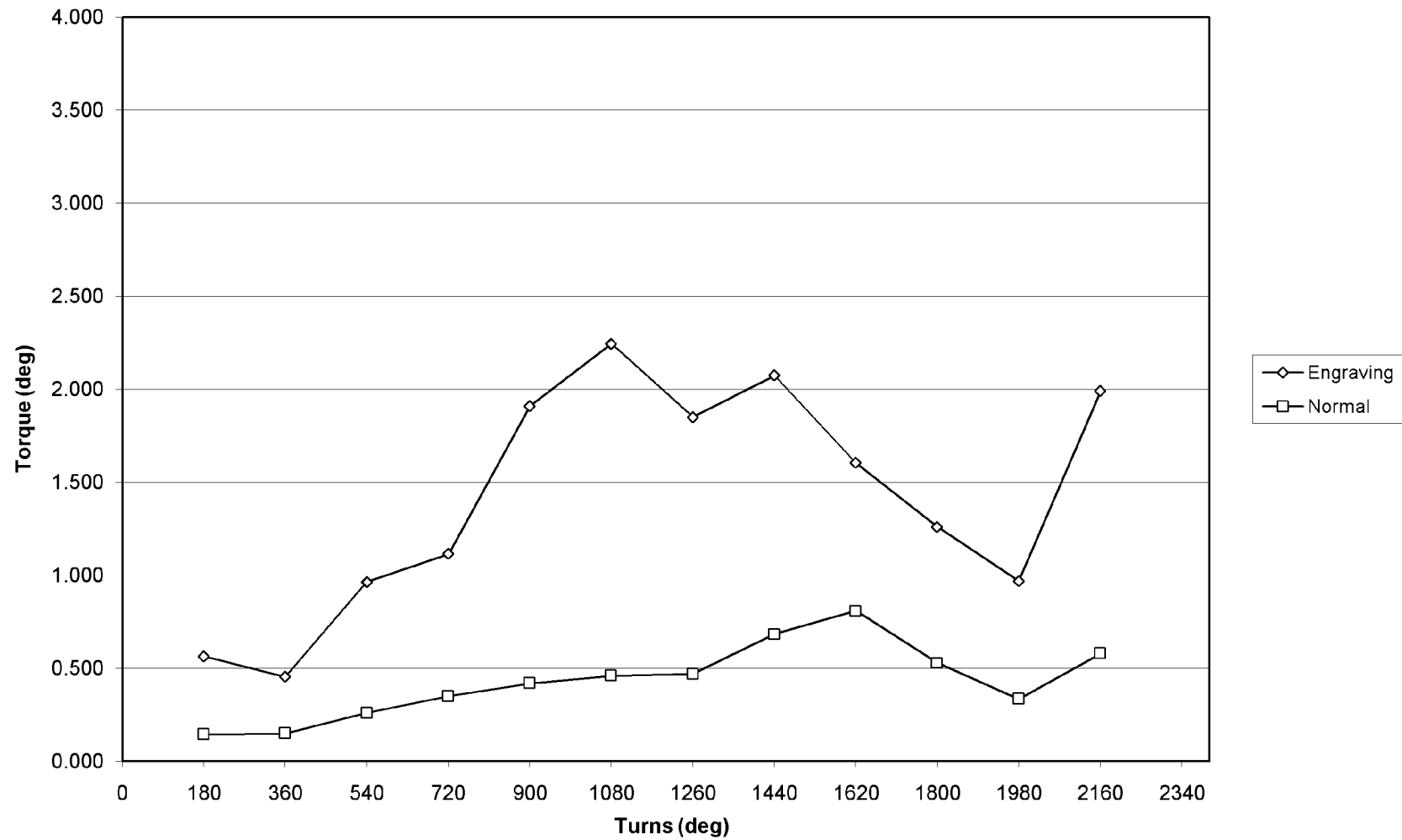
TA #7



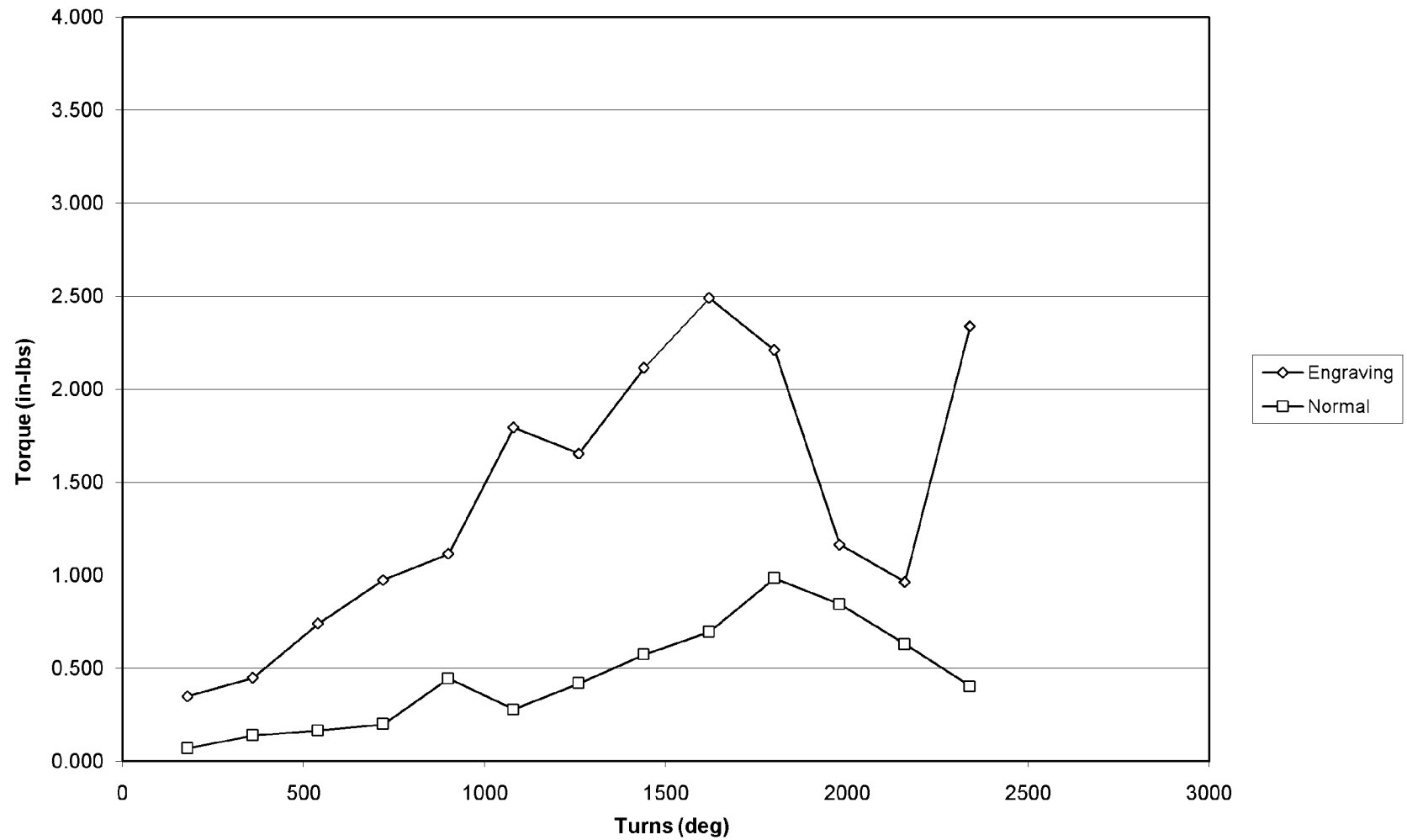
TA #2



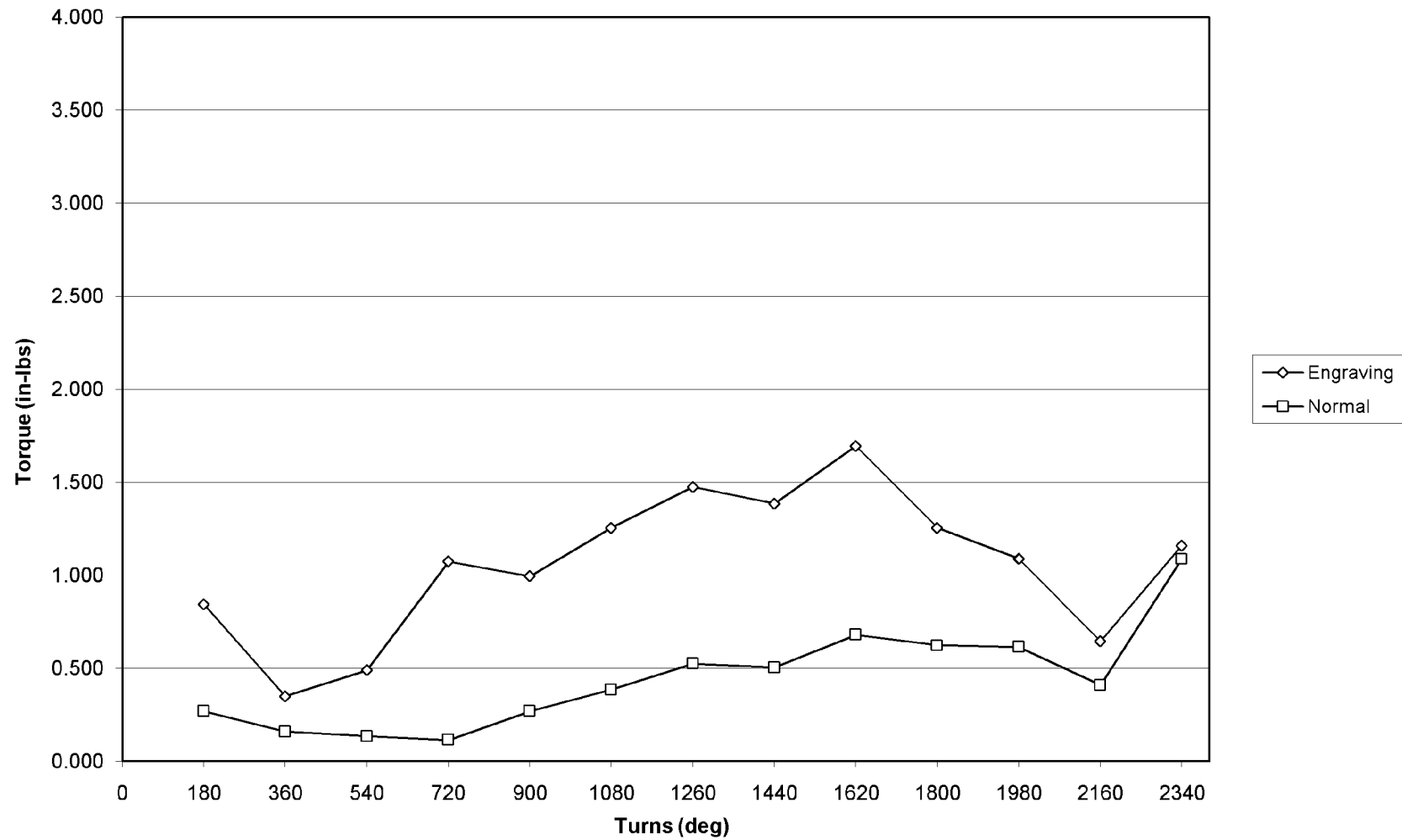
TA #3



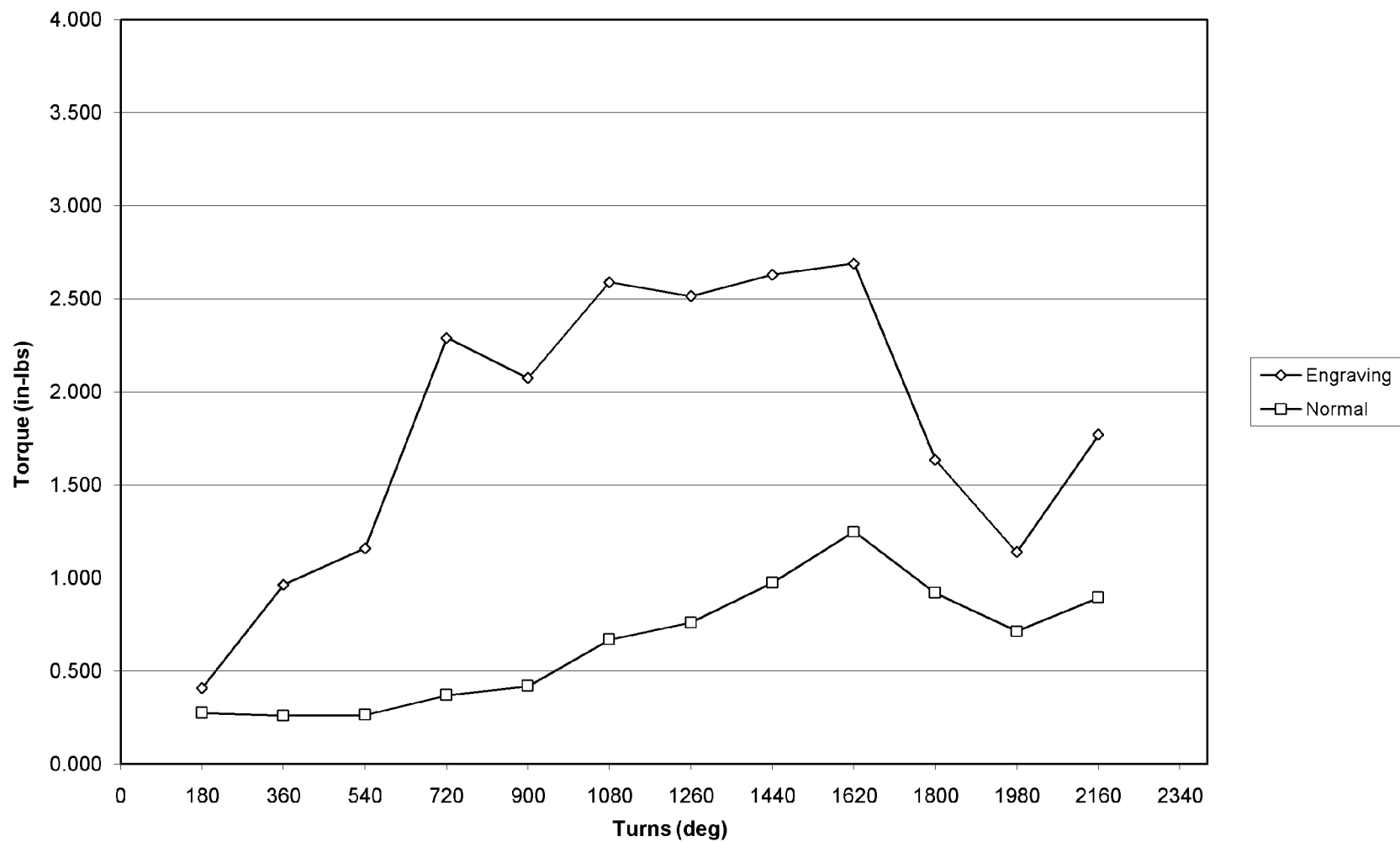
TA #6



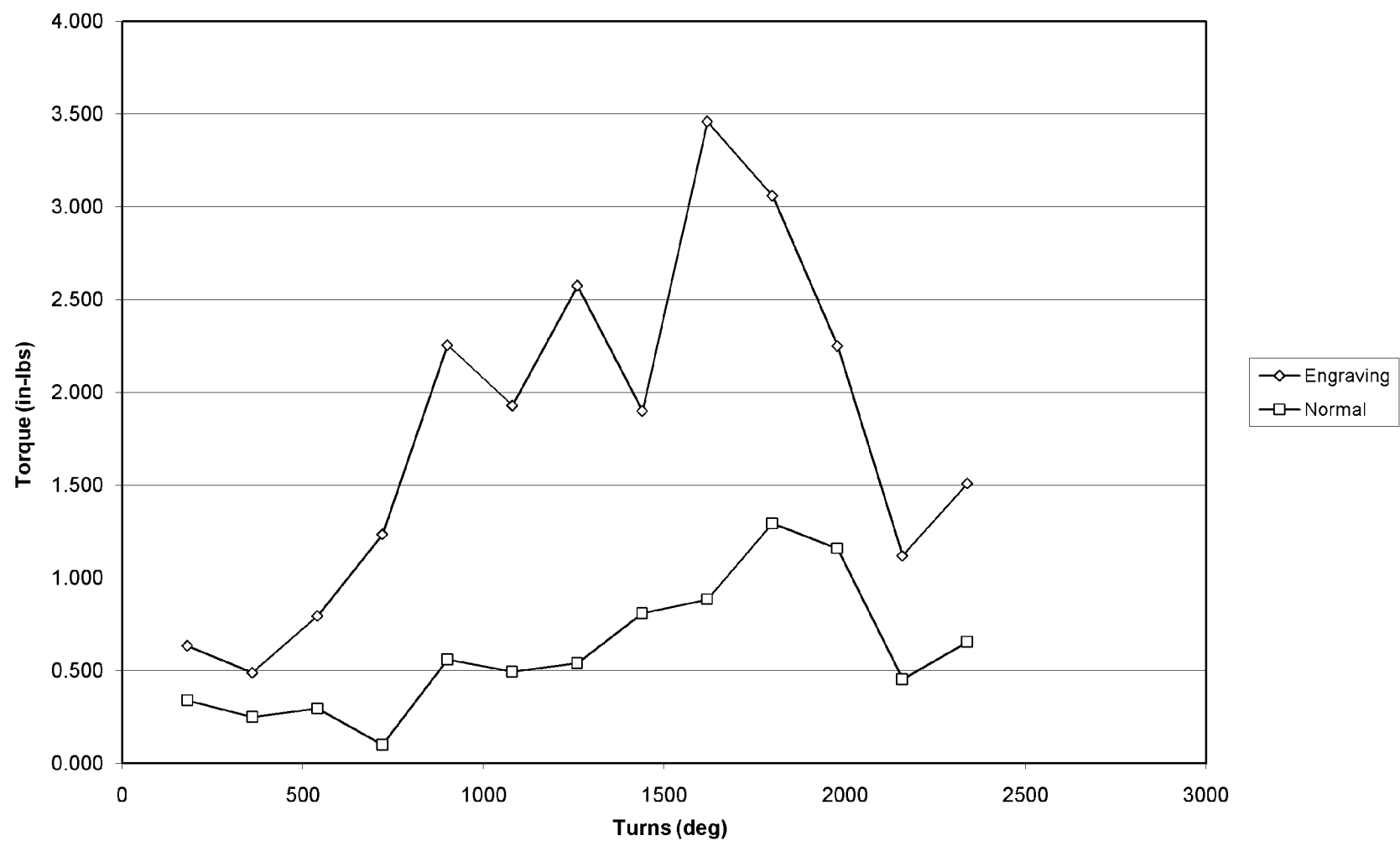
TA #4



TA #10



TA #8



TA #9

