



## ATI FASTENER TORQUE GUIDE

### Scope of Supplement

This supplement is intended to assist those who are involved with the installation, operation and maintenance of ATI Products. This supplement may be used in conjunction with a relevant ATI Installation, Operation & Maintenance Manual (IOM) and with any other applicable manuals and supplements that apply to a Product.

### Applicable Product

This publication is intended as a guide for all ATI Products, and it is referenced in many IOM's. The torque values in this guide are general recommendations. Where provided, other torque values are given in Product manuals supersede values in this supplement. Failure to read and comply with installation, operation and maintenance instructions may result in bodily injury or equipment damage and will void the manufacturer's warranty.

### Company Contact

For any questions or clarification, or for details on your nearest ATI Authorized Representative, contact ATI.

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### Reference Documents

This IOM Supplement is referenced in the following standard IOM's and may be referenced in additional documents.

- IOM 1001 ATI Pneumatic Spring-Return Extend (SRE) Actuator
- IOM 1002 ATI Pneumatic Spring-Return Retract (SRR) Actuator
- IOM 1003 ATI Pneumatic Double-Acting (DA) Actuator
- IOM 1004 ATI Hydraulic Spring-Return Extend (SRE) Actuator
- IOM 1005 ATI Hydraulic Spring-Return Retract (SRR) Actuator
- IOM 1006 ATI Hydraulic Double-Acting (DA) Actuator

### Safety Warnings

**THIS SUPPLEMENT IS NOT A COMPLETE INSTALLATION, OPERATION AND MAINTENANCE MANUAL (IOM). USERS MUST FOLLOW INSTRUCTIONS AND GUIDELINES OF A COMPLETE IOM TO PREVENT PERSONAL INJURY, PROPERTY DAMAGE, AND DAMAGE TO THE PRODUCT.**

**DO NOT INSTALL, OPERATE, OR MAINTAIN AN ATI PRODUCT UNLESS TRAINED AND QUALIFIED IN PRODUCT AND ACCESSORY INSTALLATION, OPERATION AND MAINTENANCE.**

### Revision Record

Rev #	Issue Date	Description	Reviewed	Approved
A	7/01/2015	Initial Release based on ATI chart published in IOM1003 and others.	DGR/DAR	DPL
B	10/06/2017	Reduce Table 1 to values typical for designs in production, revise Table 2 to include values for stainless steel, move thread seals to Appendix.	BJC/DAR/WT	DPL

**Table 1: Tensioning Tie Rods and Head Bolts**

For bolts that thread into the lower head or upper head, use the following torque values for sufficient clamp load to withstand maximum forces created by an actuator built of standard materials at maximum operating pressures up to 120 psig for pneumatic actuators and up to 1500 psig for hydraulic actuators. For operating pressures above these limits or for sizes other than listed, contact ATI engineering with the actuator serial number for tensioning recommendations.

Bolt/Stud Nominal Diameter	Lubricated Tightening Torque <sup>1</sup>	Lubricated Clamp Load <sup>2</sup>
<b>3/8"</b>	<b>96 in-lbf = 8 ft-lbf (11 Nm)</b>	1,550 lbf (6.9 kN)
<b>1/2"</b>	<b>252 in-lbf = 21 ft-lbf (28 Nm)</b>	3,050 lbf (13.6 kN)
<b>5/8"</b>	<b>504 in-lbf = 42 ft-lbf (57 Nm)</b>	4,890 lbf (21.8 kN)
<b>3/4"</b>	<b>95 ft-lbf (129 Nm)</b>	9,210 lbf (41.0 kN)
<b>7/8"</b>	<b>121 ft-lbf (164 Nm)</b>	10,100 lbf (44.9 kN)
<b>1"</b>	<b>182 ft-lbf (247 Nm)</b>	13,200 lbf (58.7 kN)

<sup>1</sup> Tightening Torque value in Table 1 is nominal and assumes tolerance of  $\pm 5\%$ . Recommended lubrication is with an anti-seize extreme pressure lubricant (e.g. Loctite LB-8150 or Never-Seez compounds,  $K \approx .165$ ).

<sup>2</sup> Clamp load is a nominal value assuming coarse (UNC) threads.

**Table 2: Tensioning other bolted connections**

For bolts that thread into a nut material of equivalent strength, use the following torque values.

Nominal Diameter	Stainless Steel Bolt/Stud (F593 316SS)			Carbon Steel Bolt/Stud (J429 Grade 5 or Grade 8)			
	Dry [K=.30]	Lubricated [K=.165]	Clamp Load (lbf)	Dry plain [K=.30]	Dry plated [K=.20]	Lubricated [K=.165]	Clamp Load (lbf)
#6	9.4 in-lbf	5.2 in-lbf	230	17 in-lbf	12 in-lbf	9.5 in-lbf	420
#8	17	9.5	350	32	21	17	640
#10	25	14	440	46	31	25	800
1/4"	60	33	800	110	73	60	1,460
5/16"	123	68	1,310	226	151	124	2,410
3/8"	18 ft-lbf	10 ft-lbf	1,940	33 ft-lbf	22 ft-lbf	18 ft-lbf	3,560
7/16"	29	16	2,660	53	36	29	4,890
1/2"	44	24	3,550	82	54	45	6,530
9/16"	64	35	4,550	118	78	65	8,370
5/8"	88	49	5,650	162	108	89	10,400
3/4"	125	69	6,690	288	192	159	15,400
7/8"	202	111	9,240	465	310	256	21,200
1"	303	167	12,100	697	464	383	27,900
1-1/8"	481	265	17,100	975	650	536	34,700
1-1/4"	671	369	21,500	1,358	905	747	43,500
1-3/8"	904	497	26,300	1,830	1,220	1,007	53,200
1-1/2"	1,186	652	31,600	2,401	1,601	1,321	64,000

Tensioning values in Table 2 assume coarse thread (UNC) fasteners up to 1"-8 and fine thread (12 tpi) for fasteners 1 1/8" and larger, with bolts tensioned to 50% of minimum yield strength. Carbon steel values are based on the lesser strength of Grade 5 material; with engineering approval, Grade 8 may be tensioned to higher values for higher clamp loads.



## Appendix

### Torque for thread seals

ATI standard product does not use thread seals. The following torque recommendations are a guide for thread seals used on older designs and special constructions with jackscrew (JS1) overrides, with adjustable stop bolts that penetrated the pressure boundary of the cylinder, and with adjustable speed controls for pneumatic cushions.

STAT-O SEALS OR THREAD SEALS							
COARSE THREADS				FINE THREADS			
Bolt Size	Clamp Load (lbf)	PLAIN (ft-lbf)	PLATED (ft-lbf)	Bolt Size	Clamp Load (lbf)	PLAIN (ft-lbf)	PLATED (ft-lbf)
1/4"-20	2,850	7	5	1/4"-28	3,263	8	6
5/16"-18	4,725	13	10	5/16"-24	5,113	14	11
3/8"-16	6,975	23	18	3/8"-24	7,875	25	20
7/16"-14	9,600	36	27	7/16"-20	10,650	38	29
1/2"-13	12,750	54	42	1/2"-20	14,400	57	46
9/16"-12	16,350	77	60	9/16"-18	18,300	63	67
5/8"-11	20,325	108	82	5/8"-18	23,025	113	92
3/4"-10	30,075	189	145	3/4"-16	33,600	209	160
7/8"-9	41,550	305	231	7/8"-14	45,825	335	251
1"-8	54,525	456	342	1"-12	59,700	498	355
				1"-14	61,125	510	383
1-1/8"-7	68,700	647	487	1-1/8"-12	77,025	724	542
1-1/4"-7	87,225	912	683	1-1/4"-12	96,600	1,008	755
1-3/8"-6	103,950	1,197	896	1-3/8"-12	118,350	1,357	1,025
1-1/2"-6	126,450	1,585	1,187	1-1/2"-12	142,275	1,779	1,335