

ATL Threaded Fastener Torque Standard for Suppliers

Purpose:

This document outlines Alpha Technologies Ltd. (“ATL”) standard torque values for threaded fasteners used on ATL products.

Scope:

This document applies to all Suppliers who supply to ATL manufactured, fabricated or processed parts as part of meeting the contractual requirements of an ATL-issued and Supplier-accepted Purchase Order. Specific requirements within this document apply as appropriate to the parts or services being supplied to ATL.

Exceptions:

This procedure does not apply to the following:

- Self locking fasteners or fasteners tightened into self-locking inserts
- Self tapping fasteners
- Thread forming or thread rolling fasteners
- Fasteners tightened with lubrication, anti seize compound or equivalent
- Fasteners tightened into thin sheet metal
- Fasteners tightened into tapped holes of plastic, nylon, FR4, or similar materials
- Fasteners tightened into metal thread insert embedded in plastic material or equivalent
- Fasteners used to compress plastic or other compressible non-ferrous materials
- Fasteners used to compress soft gaskets, O-rings, nylon washers, sealing washers, or similar items

Definitions:

Threaded Fastener: A type of fastener that contains a helical structure (thread) used to convert between rotational and linear movement or force. Bolts, screws, and nuts are examples of threaded fasteners and are the most common type of fastener.

Kilogram force (kg_f): the deprecated unit kilogram force is defined as the force exerted by one Kilogram of mass in standard Earth gravity. 1 kg_f = 9.80665 Newtons.

Pound force (lb_f): a non-Si unit of force (or weight). The pound force is equal to a mass of one avoirdupois pound (which is defined as exactly 0.45359237 kg) multiplied by the standard acceleration due to Earth gravity.

Torque: The amount of ‘turning’ or ‘twisting’ force applied to tighten a bolt, screw, or nut. Torque is equivalent to the force applied to a lever multiplied by its distance from the lever’s fulcrum. In the present standard, torque values are provided in metric units as kg_f-cm, and imperial units as in·lb_f.

Torque calibration: A set of operations that establish, under specified conditions, the relationship between the quantities indicated by a torque measuring instrument or torque measuring system, and the corresponding values realized by standards.

Torque tool: A device used to precisely set the torque of a fastener such as a nut and bolt. Common torque tools include the torque wrench and torque screwdriver.

1.0 General Requirements

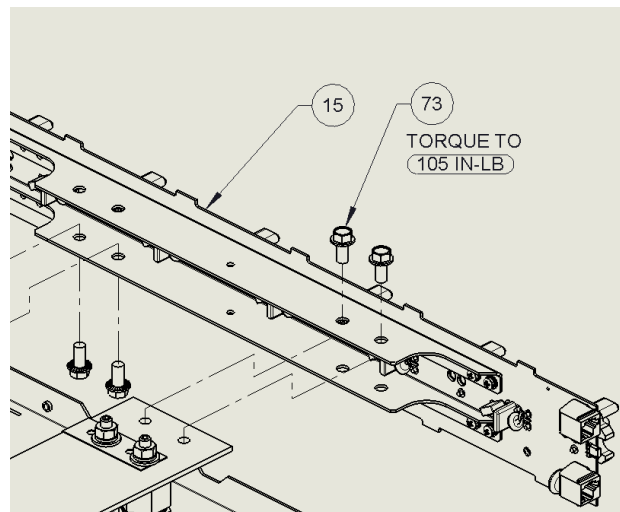
1.1 Torque Values and Equipment

Fasteners shall be tightened to the torque value clearly noted on the specification (drawing) for the assembly; if no torque value is noted for a given fastener on the specification, then that fastener shall be tightened within the applicable range specified in the torque value tables provided in Sec 2.0 below.

Fasteners shall be tightened with a tool and procedure that allows the operator to clearly apply the required torque value in a controlled and repeatable manner. If torque tools are employed, they shall be appropriately calibrated such as to ensure reliable operation.

1.2 Marking of Critical Fasteners

Fasteners that provide critical connections are required to be marked once they are tightened to the proper torque value. These critical fasteners are noted by the use of an oval (“donut”) call-out of the torque values on the drawings. An example of a critical torque callout is shown in the figure below.



Once a critical fastener has been tightened to the appropriate torque value, the fastener shall be marked by some manner visible to the human eye. A highly-visible torque seal product, such as F-900 Orange Torque Seal, applied across the bolt head (or nut), washer and fastened part is strongly recommended. An example of acceptably marked critical fasteners is shown in the figure below.



1.3 Tapped Holes

When the material of the tapped hole has less tensile strength than the male-threaded hardware, torque specification for the softer material shall be applied. For example, torque values for copper shall be used for a steel screw tightened into a tapped hole in copper bus bar.

1.4 Fasteners that Conduct Electrical Currents

When a fastener is used to make a connection as part of an electrical circuit, such that the result is that electrical current above 100 milliamps will pass through the fastener, then that fastener is deemed critical and shall be marked according to section 1.2 above. This shall apply regardless of whether the fastener is specifically called out on the drawing as critical or not.

2.0 Default Torque Values

Where there is conflict between the default torque values listed in the following tables and any torque value on a product specification (drawing), the specification shall apply.

IMPERIAL TORQUE VALUES FOR MACHINED FASTENERS (w/o lubrication)											
Imperial	Torque Tool Head Size	Fastener Material									
		Low Carbon Steel (SAE Grade 0-1-2)		Stainless Steel 18-8		Brass		Medium Carbon Heat Treated Steel (SAE Grade 5)		Aluminum and Copper	
		Min. in·lb _f	Max. in·lb _f	Min. in·lb _f	Max. in·lb _f	Min. in·lb _f	Max. in·lb _f	Min. in·lb _f	Max. in·lb _f	Min. in·lb _f	Max. in·lb _f
#2-56		1	2.5	1	2	1	2	n/a	n/a	n/a	n/a
#4-40		3	5	3	5	3	4.5	n/a	n/a	1.7	2.9
#6-32	1/4"	7	9	7	9	6	8	13.5	15	2.9	5.2
#8-32	1/4"	15	18	18	20	14	16	28	30	6	10.5
#10-32	5/16"	27	30	30	32	24	26	45	49	8	13.5
1/4-20	7/16" or 3/8"	62	65	70	75	58	62	99	105	32	45
5/16-18	1/2"	95	130	105	140	78	105	195	225	61	78
3/8-16	9/16"	175	210	190	245	155	190	345	390	105	140
1/2-13	3/4"	380	460	450	530	330	415	840	880	235	300

METRIC TORQUE VALUES FOR MACHINED FASTENERS (w/o lubrication)											
Metric	Torque Tool Head Size	Fastener Material									
		Low Carbon Steel (SAE Grade 0-1-2)		Stainless Steel 18-8		Brass		Medium Carbon Heat Treated Steel (SAE Grade 5)		Aluminum and Copper	
		Min. kg _f ·cm	Max. kg _f ·cm	Min. kg _f ·cm	Max. kg _f ·cm	Min. kg _f ·cm	Max. kg _f ·cm	Min. kg _f ·cm	Max. kg _f ·cm	Min. kg _f ·cm	Max. kg _f ·cm
M2.5	5mm	1.2	2.9	1.2	3	1.2	2.3	n/a	n/a	n/a	n/a
M3	5.5mm	3.5	5.8	3.5	6	3.5	5.2	n/a	n/a	2	3.3
M3.5	6mm	8	10.5	8	11	6.9	9.2	15.5	17	3.3	6
M4	7mm	17.5	20.5	20.5	23	16	18.5	32	34.5	6.9	12.2
M5	8mm	31	34.5	34.5	37	27.5	30	52	57	9.5	15.6
M6	10mm	71	75	81	86	67	71	115	120	36	52
M8	13mm	110	150	120	160	90	120	225	260	70	90
M10	16mm	200	240	220	280	180	220	400	450	120	160
M12	18mm	440	530	520	610	380	480	970	1015	270	350

END OF DOCUMENT