TORQUE APPLICABLE TO MATERIAL GRADE A2 AND A4

Tightening torque is a very interesting subject for A2 & A4 stainless steel fasteners.

There are theoretical methods in which tightening torque can be calculated but the coefficient of friction is required not only for the mating threads but the head of the bolt and/or nut etc.,

The problem with tightening torque as indicated by GKN some years ago for black self colour bolts in various grades (not stainless steel) is that up to 90% of the applied torque is employed in overcoming friction, 50% at the bearing face of the nut, and 40% between the mating threads. Their final comments on the figures they published were "torque figures are approximate".

It therefore follows seen that only 10% effort is employed in inducing axial load in the bolt. If this is correct then by applying a lubricant to overcome friction (especially for stainless steel when a lubricant is used to help prevent galling / cold welding) the fasteners may be over torqued and may fail in tensile because of the increase in pre-axial load.

There are practical methods in which tightening torque can be measured only under near laboratory conditions to establish the yield point of the thread, this is achieved by applying torque and taking the work shop theory of tighten to 70 - 80 - 85 or even 90% of the yield load.

As indicated all these methods are very in-accurate and at best can only offer a guide to the user. However there are tables available and by kind permission of the Fastener Engineering and Research Association they have been reproduced below.

Tightening Torque and Load Applicable to Material Grade A2 and A4

Bolt or Screw Diameter	Property Class	M3	M4	M5	M6	M8	M10	M12	M14	M16	M20
Tightening Torque (Nm)	100	1.7	4.1	8.1	13.9	33.5	66.0	115.0	182.0	280.0	545.0
	80	1.2	2.7	5.4	9.3	22.0	44.0	76.0	121.0	187.0	364.0
	70	0.9	2.0	4.1	7.0	17.0	33.0	57.0	91.0	140.0	273.0
Applied Preload (N)	100	2.92	5.13	8.32	11.7	21.4	33.9	49.3	67.3	91.8	143.3
	80	2.0	3.4	5.5	7.8	14.3	22.6	32.8	44.8	61.2	95.5
	70	1.5	2.6	4.2	5.9	10.7	17.0	24.7	33.7	46.9	71.7
Failure Load (N)	100	5.0	8.7	14.2	20.1	36.6	58.0	84.3	115.0	157.0	245.0
	80	4.0	7.0	11.3	16.1	29.2	46.6	67.4	92.0	125.6	196.0
	70	3.5	6.1	9.9	14.0	25.6	40.6	59.0	80.5	109.9	171.5
Yield Load (N)	100	4.5	7.9	12.8	18.0	33.0	52.2	75.9	103.5	141.3	220.5
	80	3.0	5.3	8.5	12.0	21.9	34.8	50.5	69.0	94.2	147.0
	70	2.2	3.9	6.4	9.0	16.4	26.1	37.9	51.8	70.6	110.4