

Torque guidelines

for steel washers [UNC]



NORD-LOCK zinc flake coated (Delta Protekt®) washers
with electro zinc plated **bolt (grade 5)**



Washer size	Bolt size	Pitch [TPI]	Oil, $G_f=0,75$ $\mu_g=0,10, \mu_w=0,16$		GTP600, $G_f=0,75$ $\mu_g=0,08, \mu_w=0,15$		Dry, $G_f=0,62$ $\mu_g=0,15, \mu_w=0,18$	
			Torque [ftlb]	Clamp load [lb]	Torque [ftlb]	Clamp load [lb]	Torque [ftlb]	Clamp load [lb]
NL3	#5	40	1.1	550	1.0	550	1.1	450
NL3.5	#6	32	1.4	630	1.3	630	1.5	520
NL4	#8	32	2.7	970	2.4	970	2.6	800
NL5	#10	24	3.9	1,200	3.5	1,200	4.0	1,000
NL1/4"	1/4	20	9.1	2,200	8.3	2,200	9.0	1,800
NL8	5/16	18	18	3,600	16	3,600	18	3,000
NL3/8"	3/8	16	30	5,400	28	5,400	31	4,400
NL11	7/16	14	47	7,300	42	7,300	47	6,100
NL1/2"	1/2	13	73	9,800	66	9,800	74	8,100
NL14	9/16	12	104	12,600	94	12,600	104	10,400
NL16	5/8	11	145	15,600	131	15,600	146	12,900
NL3/4"	3/4	10	254	23,100	230	23,100	257	19,100
NL22	7/8	9	408	31,900	369	31,900	413	26,400
NL1"	1	8	617	41,800	557	41,800	624	34,600
NL30	1 1/8	7	771	46,400	697	46,400	780	38,400
NL33	1 1/4	7	1075	58,900	969	58,900	1090	48,700
NL36	1 3/8	6	1410	70,200	1270	70,200	1430	58,100
NL39	1 1/2	6	1860	85,500	1670	85,500	1880	70,600

Torque guidelines for other bolt grades are available on request through your local NORD-LOCK representative.

GTP600 = graphite lubricant

G_f = ratio of yield point

μ_g = thread friction

μ_w = washer friction

NORD-LOCK Delta Protekt® with non-plated **bolt (grade 8)**

Washer size	Bolt size	Pitch [TPI]	Oil, $G_f=0,71$ $\mu_g=0,13, \mu_w=0,14$		GTP600, $G_f=0,75$ $\mu_g=0,08, \mu_w=0,13$	
			Torque [ftlb]	Clamp load [lb]	Torque [ftlb]	Clamp load [lb]
NL3	#5	40	1.5	740	1.3	780
NL3.5	#6	32	1.9	840	1.7	890
NL4	#8	32	3.5	1,300	3.1	1,400
NL5	#10	24	5.1	1,600	4.6	1,700
NL1/4"	1/4	20	12	2,900	11	3,100
NL8	5/16	18	24	4,900	21	5,100
NL3/8"	3/8	16	41	7,200	36	7,600
NL11	7/16	14	64	9,800	56	10,400
NL1/2"	1/2	13	99	13,100	86	13,900
NL14	9/16	12	138	16,800	122	17,800
NL16	5/8	11	197	20,900	171	22,100
NL3/4"	3/4	10	346	30,900	299	32,700
NL22	7/8	9	556	42,700	479	45,100
NL1"	1	8	840	56,000	724	59,200
NL30	1 1/8	7	1190	70,600	1030	74,500
NL33	1 1/4	7	1660	89,600	1430	94,600
NL36	1 3/8	6	2180	107,000	1880	113,000
NL39	1 1/2	6	2870	130,000	2470	137,000

NORD-LOCK Delta Protekt® with **ASTM A574 bolt, (high-grade)**

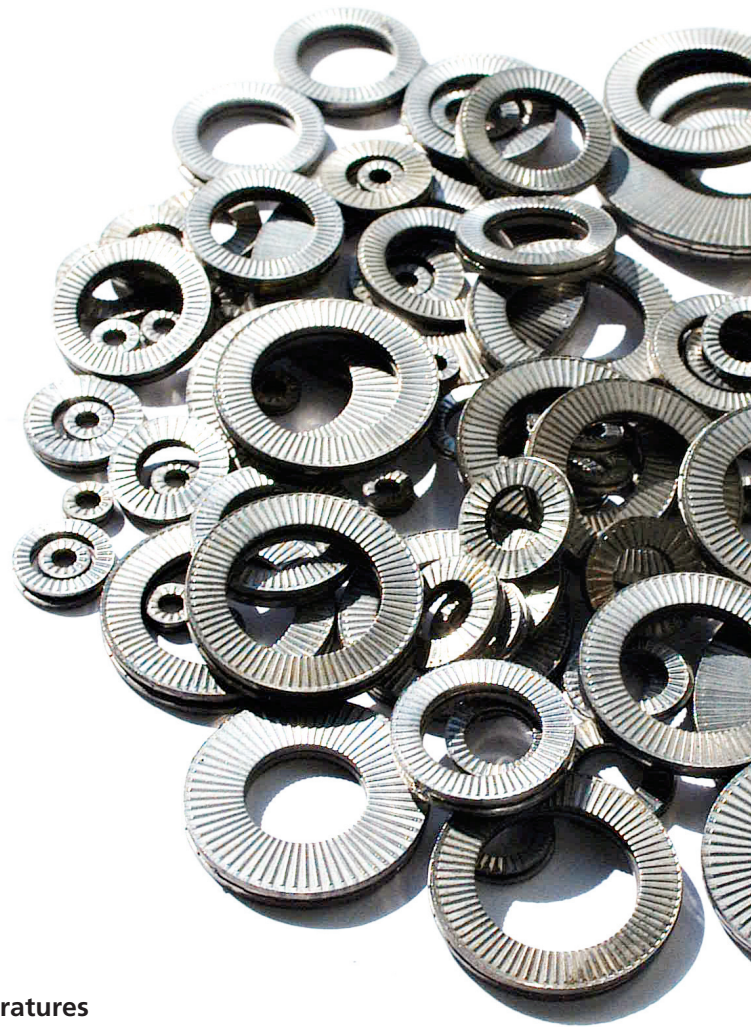
Washer size	Bolt size	Pitch [TPI]	Oil, $G_f=0,71$ $\mu_g=0,13, \mu_w=0,12$		GTP600, $G_f=0,75$ $\mu_g=0,08, \mu_w=0,11$	
			Torque [ftlb]	Clamp load [lb]	Torque [ftlb]	Clamp load [lb]
NL3	#5	40	1.7	870	1.6	910
NL3.5	#6	32	2.2	990	2.0	1,050
NL4	#8	32	3.8	1,500	3.7	1,600
NL5	#10	24	5.8	1,900	5.5	2,000
NL1/4"	1/4	20	13	3,400	12	3,700
NL8	5/16	18	26	5,700	23	6,000
NL3/8"	3/8	16	45	8,400	39	8,900
NL11	7/16	14	70	11,500	60	12,200
NL1/2"	1/2	13	109	15,400	93	16,300
NL14	9/16	12	148	19,800	141	20,900
NL16	5/8	11	216	24,600	184	26,000
NL3/4"	3/4	10	378	36,400	321	38,400
NL22	7/8	9	607	50,200	514	53,000
NL1"	1	8	916	65,900	776	69,600
NL30	1 1/8	7	1300	83,000	1100	87,700
NL33	1 1/4	7	1810	105,000	1530	111,000
NL36	1 3/8	6	2380	126,000	2020	133,000
NL39	1 1/2	6	3140	153,000	2640	161,000

Torque guidelines

for stainless steel washers [UNC]

NORD-LOCK stainless steel (A4) washers with
ASTM F593 bolt (stainless steel) lubricated with GTP600

Washer size	Bolt size	Pitch [TPI]	316, 316L, $G_f=0,65$ $\mu_g=0,14, \mu_w=0,15$		303, 304, 305, $G_f=0,65$ $\mu_g=0,14, \mu_w=0,15$	
			Torque [ftlb]	Clamp load [lb]	Torque [ftlb]	Clamp load [lb]
NL3	#5	40	-	-	-	-
NL3.5	#6	32	-	-	-	-
NL4	#8	32	-	-	-	-
NL5	#10	24	-	-	-	-
NL1/4"	1/4	20	5.2	1,300	5.2	1,300
NL8	5/16	18	10.3	2,200	10.3	2,200
NL3/8"	3/8	16	18	3,300	18	3,300
NL11	7/16	14	28	4,500	28	4,500
NL1/2"	1/2	13	43	6,000	43	6,000
NL14	9/16	12	61	7,700	61	7,700
NL16	5/8	11	85	9,500	85	9,500
NL3/4"	3/4	10	104	9,800	104	9,800
NL22	7/8	9	166	13,500	166	13,500
NL1"	1	8	251	17,700	251	17,700
NL30	1 1/8	7	356	22,300	356	22,300
NL33	1 1/4	7	497	28,300	497	28,300
NL36	1 3/8	6	653	33,800	653	33,800
NL39	1 1/2	6	859	41,100	859	41,100



GTP600 = graphite lubricant

G_f = ratio of yield point

μ_g = thread friction

μ_w = washer friction

1ft = 0,3048 m

1lb = 0,4536kg = 4,450 N

1ftlb = 0,3048 x 0,4536 x 9,81 = 1,356 Nm

Lubrication

NORD-LOCK recommends the use of a good lubricant (e.g. GTP600 or Molykote® 1000) in order to reduce friction, minimize preload deviation and protect against corrosion.

Reuse

NORD-LOCK washers can normally be reused. However, for high temperature applications, reuse is not recommended. Always lubricate fasteners before reusing!

Temperatures

NORD-LOCK washers have similar temperature characteristics as bolts/nuts of corresponding material. The hardness of NORD-LOCK steel washers decreases at temperatures above 200°C. Stainless steel (A4) washers start to degrade at temperatures above 500°C. For applications up to 700°C we recommend our Inconel® 718 washers.

Calculation of load area

The load area [mm²] under the washer must be larger than the clamp load [N] divided by the yield point [N/mm²] of the material.

$$\text{Load area [mm}^2\text{]} > \frac{\text{Clamp load [N]}}{\text{Yield point [N/mm}^2\text{]}}$$

Design

2D & 3D models of all NORD-LOCK products can be found through www.nord-lock.com