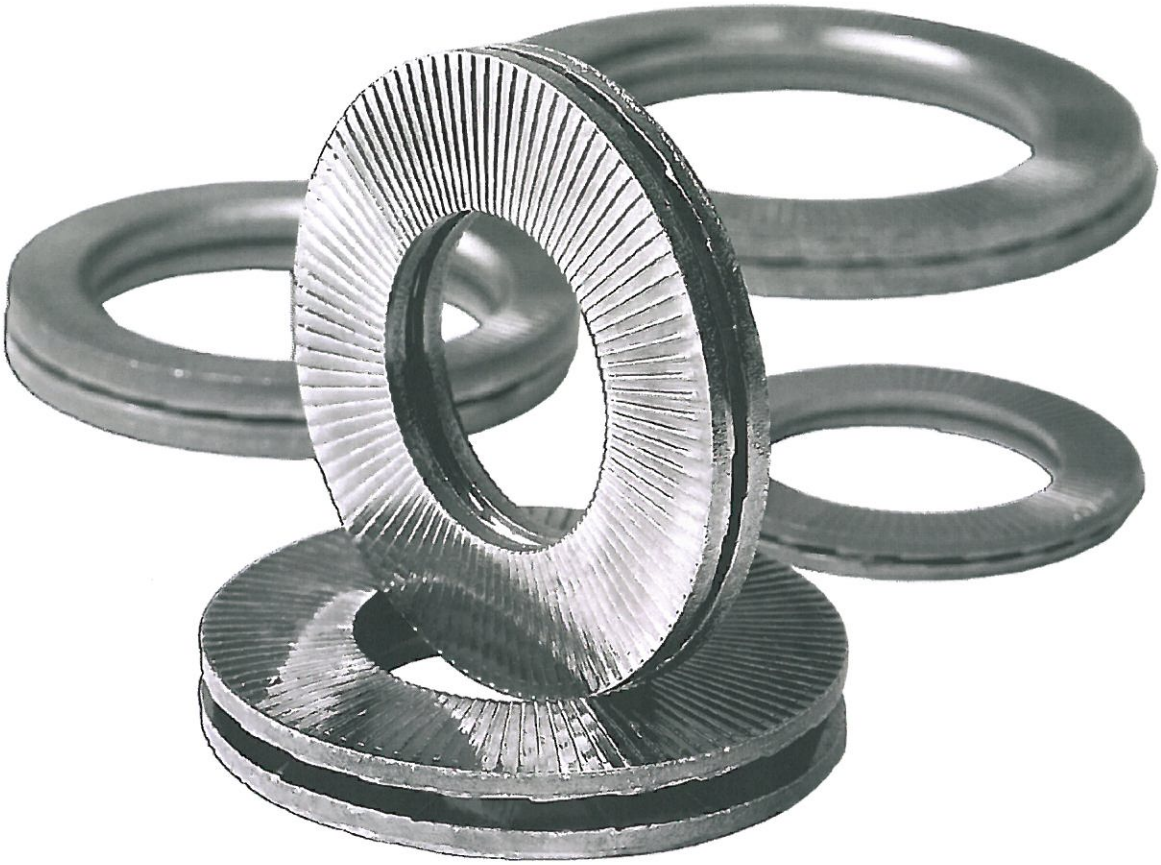
NORD-LOCK



DKC

A/S DANSK KUGLELEJE CENTER

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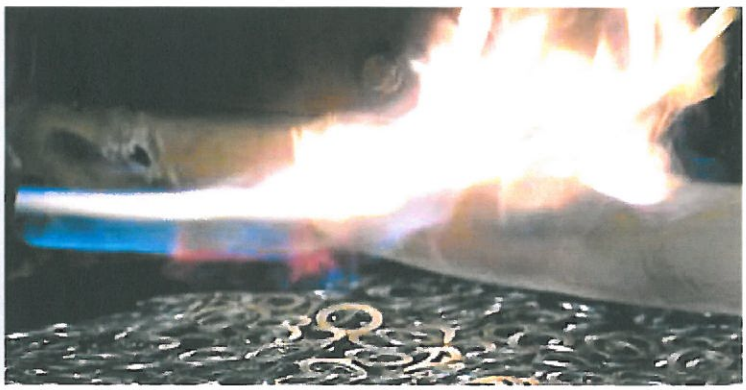
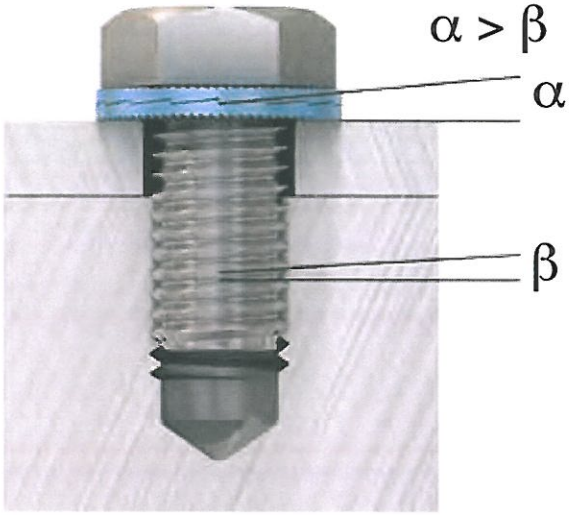
The proven original



Since the Nord-Lock Group began operations in 1982 we have focused on providing the world's most effective bolt securing system. Our products are based on leading wedge-locking technology and are recognized for their ability to safely secure bolted joints exposed to severe vibration and dynamic loads.

When you choose Nord-Lock you do not only choose a supplier or a manufacturer, you also benefit from a partnership with an expert in bolted joint technology. Our global team of sales engineers work with our clients to solve bolt securing problems in the most demanding applications.

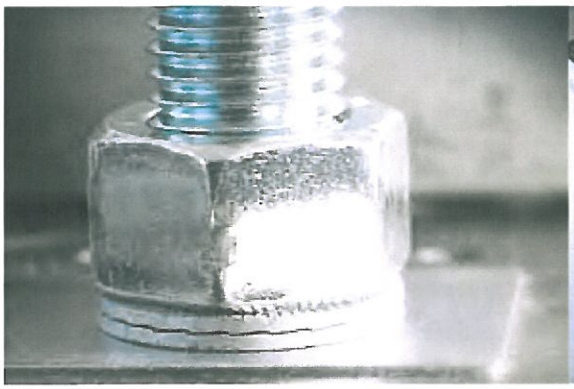


Nord-Lock: The world's most effective bolt securing system.

Nord-Lock is the optimum choice for critical bolted joints.

Nord-Lock secures bolted joints with tension instead of friction. The system is comprised of a pair of washers that has cams on one side and radial teeth on the opposite side.

Since the cam angle 'α' is greater than the thread pitch 'β' a wedge effect is created by the cams, preventing the bolt from rotating loose.



Over the years, Nord-Lock products have been rigorously tested and approved by independent institutes as well as certification authorities.

Proven in Junker vibration test

The Junker test, according to DIN 65151, is considered the most severe vibration test for bolted connections. During the test, the joint is exposed to transverse movements underneath the bolt head / nut, while the clamping force is continuously measured.

Vibration test

Bolt M8 (8.8) with clamp length 25 mm

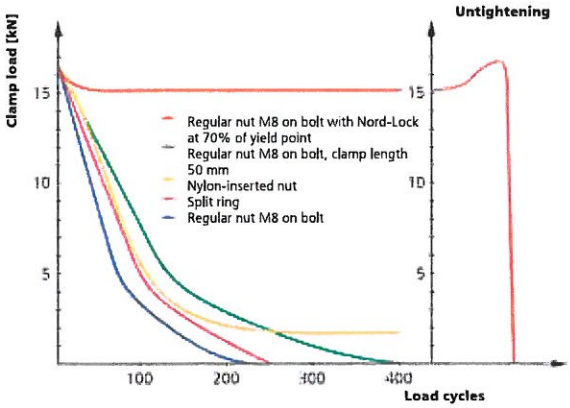


Fig 1: The Junker test shows that Nord-Lock safely secured the bolted connection; only a limited amount of tension is initially lost due to normal settlements. The wedge-locking function is verified through the clear increase in tension during untightening. All other bolt locking methods in the test failed to prevent loosening of the joint.

Nord-Lock washers are proven as a safe bolt securing system according to DIN 65151 tests performed by the independent research organisations IMA and CETIM. In addition, Nord-Lock personnel performs over 10,000 live Junker vibration tests around the globe every year. Would you like to see a live demonstration? Contact Maryland Metrics.

Proven according to NASM impact & vibration test

The National Aerospace test, according to NASM 1312-7, is a test method originally developed by the U.S. military to test bolted connections' resilience against impact and vibration.

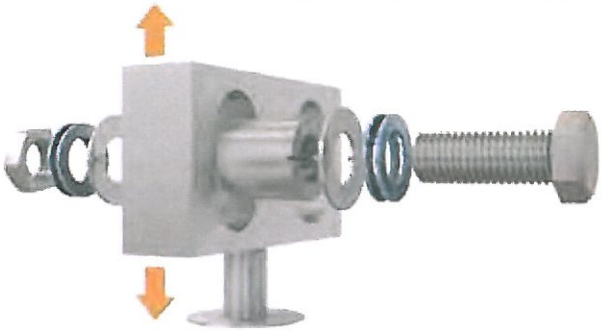


Fig 2: Drawing of the test rig. The assembled parts are vibrated vertically and the joints are subjected to two impacts per cycle. The impacts are parallel to the bolt. The arrow displays the direction of vibration during the test. After testing, the fasteners are inspected for rotation.

Nord-Lock washers are proven as a safe bolt securing system according to NASM 1312-7 tests performed by the independent organisation Det Norske Veritas (DNV). If you wish to perform your own real-life testing and evaluation of Nord-Lock for your application, you can order samples through Maryland Metrics.

Widely used & globally approved

Nord-Lock is a high end product with documented success in many industries. Our products are approved by several industry standards and specified by numerous international companies.

Industries where Nord-Lock washers are used

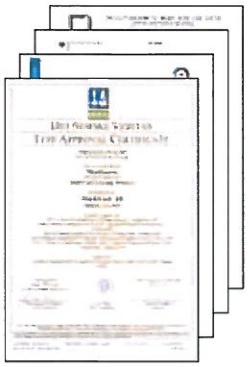
Nord-Lock washers are used in industries such as: energy, transportation, offshore, mining and quarrying, construction and bridge building, manufacturing and processing, ship building, forestry and agriculture, heavy vehicles, and military. The number of industries that use Nord-Lock products is continuously growing.

Often joints do not start to loosen until an application is in regular use, therefore Nord-Lock is commonly retrofitted during maintenance, repair and overhaul procedures.

Certificates & approvals

The most prominent of our certificates are:

- AbP (Allgemein bauaufsichtliches Prüfzeugnis)
- DIBt (Deutsche Institut für Bautechnik)
- DNV (Det Norske Veritas)
- EBA (Eisenbahn-Bundesamt)
- TÜV (Technischer Überwachungs-Verein)



Quality & environmental assurance

- ISO 9001
- ISO 14001
- Licenced by Dörken to perform Delta Protekt® surface coating in-house
- RoHs, ELV and Reach compliant
- Full traceability

For more information or a complete list of certificates and approvals, please visit our website or contact your nearest Nord-Lock representative.

Traceability

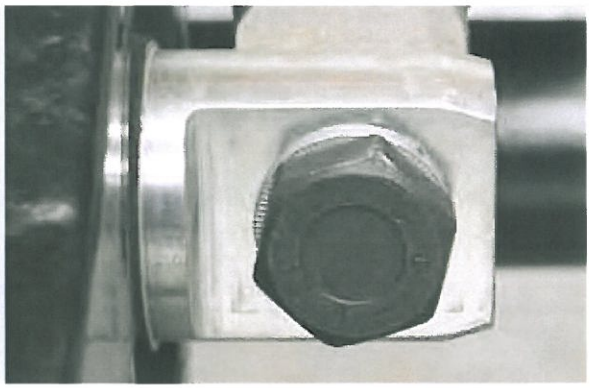
Nord-Lock products are rigorously tested in all steps of production to verify that the quality requirements are met. Each batch is assigned a control number which ensures full traceability and confirms that the product is a genuine Nord-Lock article. The control number is printed on the package as well as on every washer pair, enabling full traceability down to first assembly – even when using bin systems for fastener supply.

With implementation during 2011, every washer pair will be laser marked with the Nord-Lock brand name, the control number and a type code.

Laser marking, type code table

Washer type	Code
Steel washers, Delta Protekt® coating	flZn
Stainless steel washers	SS
254SMO®	254
Inconel® / Hastelloy® C-276	276
Inconel® 718	718

The key to efficient & secure operations



Nord-Lock provides more than just a safe locking function, using our products also improves the general performance of a bolted joint.

Product benefits

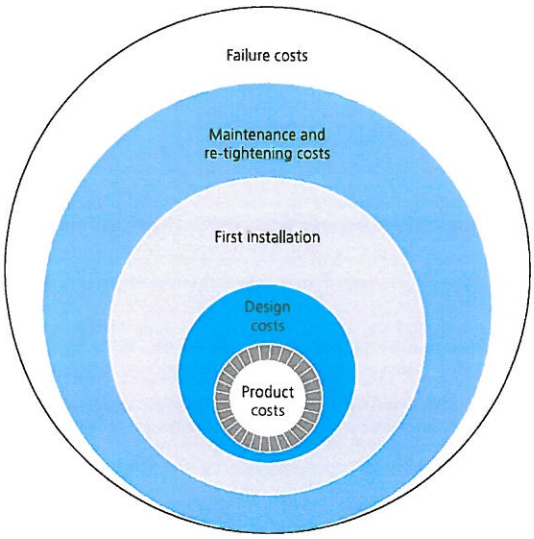
- Maintains high clamp load and thereby ensures the function of the joint
- Quick and easy to install and remove with standard tools
- Locking function not affected by lubrication
- Defined and uniform friction conditions which result in a more accurate preload
- Same temperature characteristics as standard bolt / nut
- Reusable – in addition, Nord-Lock washers do not affect the reusability of fasteners
- The washers are hardened and can support and distribute great loads
- Washers with enlarged outer diameter available for flanged bolts / nuts
- High corrosion resistance
- Can be used with fasteners up to grade 12.9 (ASTM A574)
- Reliable locking, even for joints with short clamp length
- Secures fasteners at both high and low preloads
- No retightening needed
- Verifiable locking function
- Elegant solution and problem solving – modern engineering

More than a physical product

Nord-Lock offers more than just secure bolted joints. When designing an application, it is important to consider the result it will generate throughout the entire lifespan. When using Nord-Lock products you also benefit from our experience and knowledge. We guide you towards the most beneficial and effective bolt design.

Life Cycle Profitability

Over the operational life cycle, Nord-Lock gives increased operational reliability and lower maintenance costs while significantly reducing the risks of production stops, accidents and warranty claims. We help you examine all cost factors related to bolted joints.

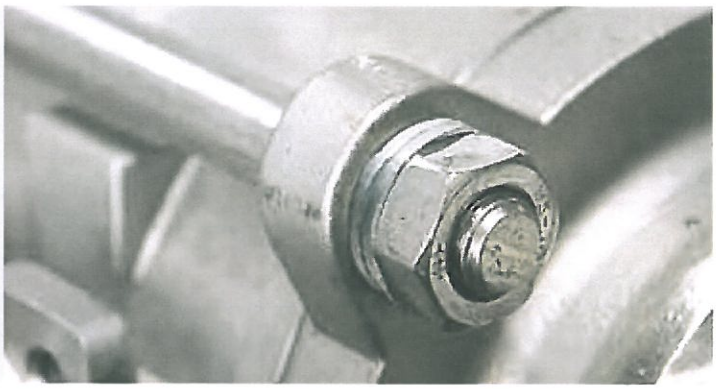


Nord-Lock can help you increase your profitability by considering the complete life cycle cost for bolt securing.

Technical Verification Center

Our skilled and innovative staff is available to help, review and discuss your applications in order to optimize the design of your bolted connections. Many companies take advantage of the customized tests or joint calculations we offer in our in-house laboratories located in Europe, North America and Asia. In addition, we offer on-site and remote product training.

Using Nord-Lock washers



Nord-Lock washers are easy and effective to use while ensuring structural security for applications exposed to vibration and dynamic loads.

Installing the washers

The pre-assembled washers are installed in pairs, cam face to cam face. Nord-Lock recommends lubrication when possible.

Tightening

Tighten Nord-Lock with standard tools according to the guidelines (on page 9-11). Tightening guidelines for other bolt grades are available through your Nord-Lock representative.

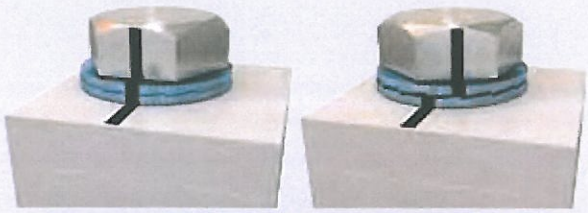
Untightening

Untightening Nord-Lock is as simple as tightening. Note that since the locking function is not based on increased friction, the untightening torque is generally lower than the tightening torque. Therefore it is not possible to measure offtorque as verification of locking function.

Reusing Nord-Lock

Nord-Lock washers can normally be reused. As with all fasteners, they should be inspected for wear before reassembly. Make sure that the washers are reinstalled correctly cam face to cam face. Nord-Lock recommends lubrication of fasteners before reuse in order to minimize changes in friction conditions.

Possible to verify the locking function



When untightening a bolt secured by Nord-Lock, check that sliding occurs between the cam faces.

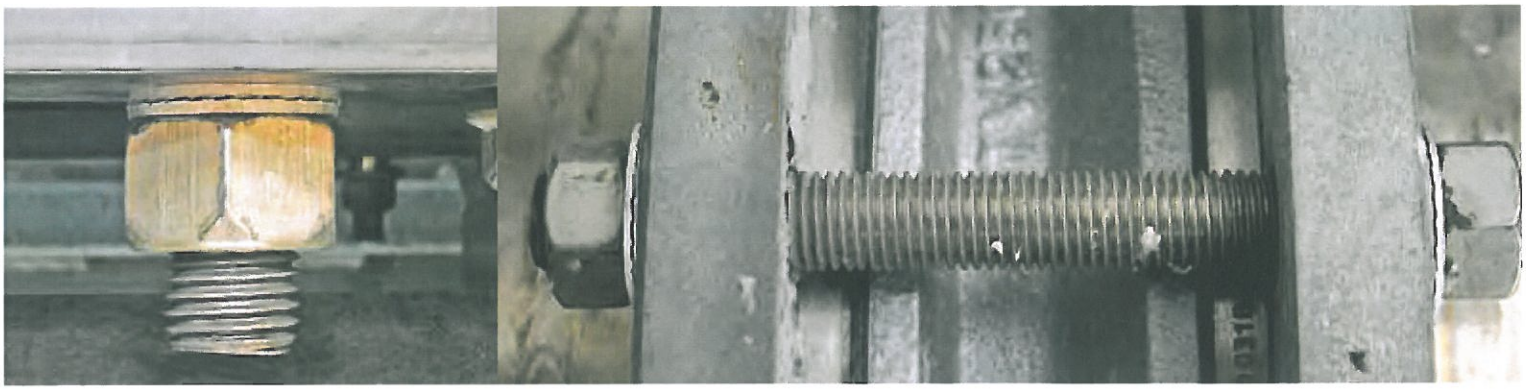
After disassembly, impression marks must be visible on both the fastener and the contact surface.

When the two criteria above are met, you have verified the locking function of the Nord-Lock washers.

Utilize the advantages of lubrication

Nord-Lock recommends the use of a high quality, anti-seize lubricant as it improves the tightening results. It is especially beneficial for large sized bolts and stainless steel applications. The Nord-Lock bolt securing system provides safe locking in both dry and lubricated conditions. Benefits of lubricated fasteners include:

- Improved reusability
- Reduced friction and deviation
- Facilitated assembly and disassembly
- Reduced torsion stress due to minimized thread friction
- Avoided galling and thread seizure
- Additional protection against corrosion



Nord-Lock washer material / type guide

Application parameter	Steel washers	Stainless steel (ss) washers	SMO254 washers	INCONEL®/ HASTELLOY® C-276 washers	INCONEL® 718 washers
Steel type	EN 1.7182 or equivalent	EN 1.4404 or equivalent	EN 1.4547 or equivalent	EN 2.4819 or equivalent	EN 2.4667 or equivalent
Examples of applications	General steel applications	General stainless steel applications. Non chlorine / acid environments	General salt water applications, pumps, chloride applications, heat exchangers, nuclear, desalination, food processing & medical equipment	General acidic environments, process and chemical industry, evaporators, offshore downhole tooling	Applications with high temperatures, gas turbines, turbo charges, incinerators
Available for bolt sizes	M3-M130 (see page 8 for dimensions)	M3-M80 (see page 10 for dimensions)	M3-M39 (see page 11 for dimensions)	M3-M39 available upon request	M3-M39 available upon request
Washer types	Regular outer diameter (NL3–NL130) Enlarged outer diameter (NL3,5sp–NL36sp)	Regular outer diameter (NL3ss–NL80ss) Enlarged outer diameter (NL3,5spss–NL30spss)	Regular outer diameter (NL3ss-254–NL39ss-254) Enlarged outer diameter (NL3,5spss-254–NL27spss-254)	Regular outer diameter (NL3ss-276–NL39ss-276) Enlarged outer diameter (NL3,5spss-276–NL27spss-276)	Regular outer diameter (NL3ss-718–NL39ss-718) Enlarged outer diameter (NL3,5spss-718–NL27spss-718)
Treatment	Through hardened	Surface hardened	Surface hardened	Surface hardened	Surface hardened
Surface coating	Delta Protekt® base coat (KL100) and top coat (VH302GZ)				
Washer hardness*	≥ 465 HV1	≥ 520HV0,05	≥ 600HV0,05	≥ 520HV0,05	≥ 620HV0,05
Corrosion resistance	Minimum 600 hours in salt spray test (according to ISO9227)	PREN 27**	PREN 45**	PREN 68**	PREN 29**
Bolt grades	Up to 12.9	Up to A4-80	Up to A4-80	Up to A4-80	Up to A4-80
Temperature range***	-20°C to 200°C	-160°C to 500°C	-160°C to 500°C	-160°C to 500°C	-160°C to 700°C

* *In order to assure the unique mechanical locking function of the Nord-Lock washers, the hardness of the mating surfaces must be lower than the hardness of the Nord-Lock washers (see table above).*

** *PREN (Pitting Resistance Equivalent Number) = %Cr + 3,3x%Mo + 16x%N. Figures in table valid for base material.*

*** *Temperature recommendations based on information from the raw material supplier. Locking function not affected within the specification.*

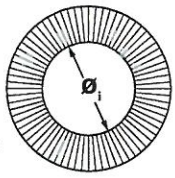
Nord-Lock steel washers

EN 1.7182 or equivalent, zinc flake coating (Delta Protekt®), through hardened

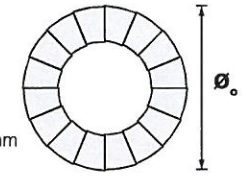
Dimension chart

Washer size	Bolt size		$Ø_i$ [mm]	$Ø_o$ [mm]	Thickness T [mm]	Min. package [pairs]	Approx. weight kg / 100 pairs
	Metric	UNC					
NL3	M3	#5	3,4	7,0	1,8	200	0,03
NL3,5	M3,5	#6	3,9	7,6	1,8	200	0,04
NL3,5sp	M3,5	#6	3,9	9,0	1,8	200	0,06
NL4	M4	#8	4,4	7,6	1,8	200	0,04
NL4sp	M4	#8	4,4	9,0	1,8	200	0,06
NL5	M5	#10	5,4	9,0	1,8	200	0,05
NL5sp	M5	#10	5,4	10,8	1,8	200	0,11
NL6	M6		6,5	10,8	1,8	200	0,07
NL6sp	M6		6,5	13,5	2,5	200	0,20
NL1/4"		1/4"	7,2	11,5	1,8	200	0,08
NL1/4"sp		1/4"	7,2	13,5	2,5	200	0,18
NL8	M8	5/16"	8,7	13,5	2,5	200	0,15
NL8sp	M8	5/16"	8,7	16,6	2,5	200	0,28
NL3/8"		3/8"	10,3	16,6	2,5	200	0,23
NL3/8"sp		3/8"	10,3	21,0	2,5	200	0,48
NL10	M10		10,7	16,6	2,5	200	0,22
NL10sp	M10		10,7	21,0	2,5	200	0,47
NL11	M11	7/16"	11,4	18,5	2,5	200	0,29
NL12	M12		13,0	19,5	2,5	200	0,29
NL12sp	M12		13,0	25,4	3,4	100	0,93
NL1/2"		1/2"	13,5	19,5	2,5	200	0,27
NL1/2"sp		1/2"	13,5	25,4	3,4	100	0,90
NL14	M14	9/16"	15,2	23,0	3,4	100	0,56
NL14sp	M14	9/16"	15,2	30,7	3,4	100	1,41
NL16	M16	5/8"	17,0	25,4	3,4	100	0,67
NL16sp	M16	5/8"	17,0	30,7	3,4	100	1,28
NL18	M18		19,5	29,0	3,4	100	0,85
NL18sp	M18		19,5	34,5	3,4	100	1,58
NL3/4"		3/4"	20,0	30,7	3,4	100	1,05
NL3/4"sp		3/4"	20,0	39,0	3,4	100	2,20
NL20	M20		21,4	30,7	3,4	100	0,93
NL20sp	M20		21,4	39,0	3,4	100	2,03
NL22	M22	7/8"	23,4	34,5	3,4	100	1,29
NL22sp	M22	7/8"	23,4	42,0	4,6	50	3,31
NL24	M24		25,3	39,0	3,4	100	1,68
NL24sp	M24		25,3	48,5	4,6	50	4,51
NL1"		1"	27,9	39,0	3,4	100	1,53
NL1"sp		1"	27,9	48,5	4,6	50	4,20
NL27	M27		28,4	42,0	5,8	50	3,29
NL27sp	M27		28,4	48,5	5,8	25	5,39
NL30	M30	1 1/8"	31,4	47,0	5,8	50	4,20
NL30sp	M30	1 1/8"	31,4	58,5	6,6	25	8,96
NL33	M33	1 1/4"	34,4	48,5	5,8	25	3,97
NL33sp	M33	1 1/4"	34,4	58,5	6,6	25	8,31
NL36	M36	1 3/8"	37,4	55,0	6,6	25	5,59
NL36sp	M36	1 3/8"	37,4	63,0	6,6	25	9,15
NL39	M39	1 1/2"	40,4	58,5	6,6	25	6,28
NL42	M42		43,2	63,0	6,6	25	7,47
NL45	M45	1 3/4"	46,2	70,0	7,0	25	10,20
NL48	M48		49,6	75,0	7,0	25	12,00
NL52	M52	2"	53,6	80,0	7,0	25	13,00
NL56	M56	2 1/4"	59,1	85,0	7,0	10	13,50
NL60	M60		63,1	90,0	7,0	10	15,20
NL64	M64	2 1/2"	67,1	95,0	7,0	10	16,70
NL68	M68		71,1	100,0	9,5	1	28,19
NL72	M72		75,1	105,0	9,5	1	30,70
NL76	M76	3"	79,1	110,0	9,5	1	33,31
NL80	M80		83,1	115,0	9,5	1	36,02
NL85	M85		88,1	120,0	9,5	1	37,84
NL90	M90		92,4	130,0	9,5	1	47,67
NL95	M95		97,4	135,0	9,5	1	49,81
NL100	M100		103,4	145,0	9,5	1	58,91
NL105	M105		108,4	150,0	9,5	1	61,28
NL110	M110		113,4	155,0	9,5	1	63,65
NL115	M115		118,4	165,0	9,5	1	75,28
NL120	M120		123,4	170,0	9,5	1	77,94
NL125	M125		128,4	173,0	9,5	1	76,63
NL130	M130		133,4	178,0	9,5	1	79,17

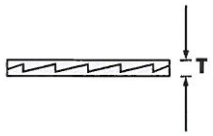
NL3–NL8
$Ø_i$±0,1 mm
NL10–NL42
$Ø_i$±0,2 mm
NL45–NL130
$Ø_i$+0,5 / -0,0 mm



NL3–NL24
$Ø_o$±0,2 mm
NL27–NL42
$Ø_o$±0,3 mm
NL45–NL130
$Ø_o$+0,0 / -2,0 mm



NL3–NL42
T±0,25 mm
NL45–NL130
T±0,75 mm



Note that washers with thickness 6,6 mm has a thickness tolerance +0,0 / -0,5 mm

- Please consult our website for current dimensions and 2D / 3D CAD models: **www.nord-lock.com/cad**
- Information regarding changes in materials and dimensions are available through **www.nord-lock.com/pcn**

Nord-Lock washers made of steel with zinc flake coating are standard stock items, yet subject to prior sale.

Torque guidelines

Nord-Lock steel washers with zinc flake coating (Delta Protekt®)

Nord-Lock steel washers with electro zinc plated **bolt grade 8.8**

Washer size	Bolt size	Pitch [mm]	Oil, G_f=75% μ_{th}=0,10, μ_b=0,16		GTP600, G_f=75% μ_{th}=0,08, μ_b=0,15		Dry, G_f=62% μ_{th}=0,15, μ_b=0,18	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NL3	M3	0,5	1,3	2,4	1,2	2,4	1,3	2,0
NL4	M4	0,7	3,1	4,2	2,8	4,2	3,1	3,5
NL5	M5	0,8	6,0	6,8	5,4	6,8	6,0	5,6
NL6	M6	1,0	10,5	9,7	9,5	9,7	10,5	8,0
NL8	M8	1,25	25	18	23	18	25	15
NL10	M10	1,5	49	28	45	28	50	23
NL12	M12	1,75	85	40	77	40	85	33
NL14	M14	2,0	135	55	122	55	136	46
NL16	M16	2,0	205	75	185	75	208	62
NL18	M18	2,5	288	92	260	92	291	76
NL20	M20	2,5	402	118	363	118	408	97
NL22	M22	2,5	548	146	494	146	557	120
NL24	M24	3,0	693	169	625	169	703	140
NL27	M27	3,0	1010	221	910	221	1028	182
NL30	M30	3,5	1379	269	1243	269	1401	222
NL33	M33	3,5	1855	333	1669	333	1889	275
NL36	M36	4,0	2394	392	2156	392	2436	324
NL39	M39	4,0	3087	468	2777	468	3145	387
NL42	M42	4,5	3820	538	3439	538	3890	445

GTP600 = graphite lubricant
G_f = ratio of yield point
μ_{th} = thread friction
μ_b = washer friction

1 N = 0,225 lb
1 Nm = 0,738 ft-lb

Nord-Lock steel washers with non-plated **bolt grade 10.9**

Washer size	Bolt size	Pitch [mm]	Oil, G_f=71% μ_{th}=0,13, μ_b=0,14		GTP600, G_f=75% μ_{th}=0,08, μ_b=0,13	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NL3	M3	0,5	1,8	3,2	1,6	3,4
NL4	M4	0,7	4,1	5,6	3,6	5,9
NL5	M5	0,8	8,1	9,1	7,0	9,6
NL6	M6	1,0	14,1	12,9	12,3	13,6
NL8	M8	1,25	34	23	30	25
NL10	M10	1,5	67	37	58	39
NL12	M12	1,75	115	54	99	57
NL14	M14	2,0	183	74	158	78
NL16	M16	2,0	279	100	240	106
NL18	M18	2,5	391	123	337	130
NL20	M20	2,5	547	156	470	165
NL22	M22	2,5	745	194	639	205
NL24	M24	3,0	942	225	809	238
NL27	M27	3,0	1375	294	1176	310
NL30	M30	3,5	1875	358	1608	378
NL33	M33	3,5	2526	443	2157	468
NL36	M36	4,0	3259	522	2788	551
NL39	M39	4,0	4203	624	3588	659
NL42	M42	4,5	5202	716	4445	757

Nord-Lock steel washers with non-plated **bolt grade 12.9**

Washer size	Bolt size	Pitch [mm]	Oil, G_f=71% μ_{th}=0,13, μ_b=0,12		GTP600, G_f=75% μ_{th}=0,08, μ_b=0,11	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NL3	M3	0,5	2,0	3,9	1,7	4,1
NL4	M4	0,7	4,6	6,7	4,0	7,1
NL5	M5	0,8	9,1	10,9	7,7	11,5
NL6	M6	1,0	15,8	15,4	13,5	16,3
NL8	M8	1,25	38	28	32	30
NL10	M10	1,5	75	44	64	47
NL12	M12	1,75	128	65	109	68
NL14	M14	2,0	204	89	174	94
NL16	M16	2,0	311	120	263	127
NL18	M18	2,5	437	148	370	156
NL20	M20	2,5	610	188	515	198
NL22	M22	2,5	831	233	699	246
NL24	M24	3,0	1052	270	887	286
NL27	M27	3,0	1533	352	1288	372
NL30	M30	3,5	2091	430	1761	454
NL33	M33	3,5	2815	532	2362	562
NL36	M36	4,0	3633	626	3053	662
NL39	M39	4,0	4683	748	3925	790
NL42	M42	4,5	5799	860	4866	908

Torque guidelines for other bolt grades are available through your local Nord-Lock representative.

Nord-Lock stainless steel washers

EN 1.4404 (AISI 316L) or equivalent, surface hardened

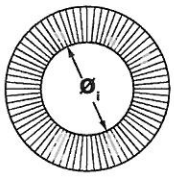
EN 1.4404 is an austenitic chromium-nickel stainless steel containing molybdenum. This stainless steel also has extra low carbon content in order to reduce the risk of chromium-carbide precipitation. EN 1.4404 is one of the most commonly used stainless steel grades and Nord-Lock washers made of EN 1.4404 are suitable for most applications where no chlorides or acids are present.

Dimension chart

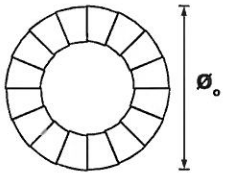
Washer size	Bolt size Metric	Bolt size UNC	øi [mm]	øo [mm]	Thickness T [mm]	Min. package [pairs]	Approx. weight kg / 100 pairs
NL3ss	M3	#5	3,4	7,0	2,2	200	0,04
NL3,5ss	M3,5	#6	3,9	7,6	2,2	200	0,04
NL3,5spss	M3,5	#6	3,9	9,0	2,2	200	0,07
NL4ss	M4	#8	4,4	7,6	2,2	200	0,04
NL4spss	M4	#8	4,4	9,0	2,2	200	0,07
NL5ss	M5	#10	5,4	9,0	2,2	200	0,06
NL5spss	M5	#10	5,4	10,8	2,2	200	0,11
NL6ss	M6		6,5	10,8	2,2	200	0,09
NL6spss	M6		6,5	13,5	2,0	200	0,16
NL1/4"ss		1/4"	7,2	11,5	2,2	200	0,09
NL1/4"spss		1/4"	7,2	13,5	2,2	200	0,15
NL8ss	M8	5/16"	8,7	13,5	2,0	200	0,12
NL8spss	M8	5/16"	8,7	16,6	2,0	200	0,22
NL3/8"ss		3/8"	10,3	16,6	2,0	200	0,19
NL3/8"spss		3/8"	10,3	21,0	2,0	200	0,38
NL10ss	M10		10,7	16,6	2,0	200	0,18
NL10spss	M10		10,7	21,0	2,0	200	0,37
NL11ss	M11	7/16"	11,4	18,5	2,2	200	0,26
NL12ss	M12		13,0	19,5	2,0	200	0,23
NL12spss	M12		13,0	25,4	3,0	100	0,82
NL1/2"ss		1/2"	13,5	19,5	2,0	200	0,24
NL1/2"spss		1/2"	13,5	25,4	3,2	100	0,80
NL14ss	M14	9/16"	15,2	23,0	3,0	100	0,49
NL14spss	M14	9/16"	15,2	30,7	3,2	100	1,31
NL16ss	M16	5/8"	17,0	25,4	3,0	100	0,59
NL16spss	M16	5/8"	17,0	30,7	3,2	100	1,13
NL18ss	M18		19,5	29,0	3,2	100	0,80
NL18spss	M18		19,5	34,5	3,2	100	1,56
NL3/4"ss		3/4"	20,0	30,7	3,2	100	0,96
NL3/4"spss		3/4"	20,0	39,0	3,2	100	2,10
NL20ss	M20		21,4	30,7	3,0	100	0,82
NL20spss	M20		21,4	39,0	3,2	100	2,06
NL22ss	M22	7/8"	23,4	34,5	3,2	100	1,23
NL22spss	M22	7/8"	23,4	42,0	3,2	50	2,23
NL24ss	M24		25,3	39,0	3,2	100	1,52
NL24spss	M24		25,3	48,5	3,2	50	3,50
NL1"ss		1"	27,9	39,0	3,2	100	1,42
NL1"spss		1"	27,9	48,5	3,2	50	3,22
NL27ss	M27		28,4	42,0	6,8	50	3,45
NL27spss	M27		28,4	48,5	6,8	25	5,85
NL30ss	M30	1 1/8"	31,4	47,0	6,8	50	4,43
NL30spss	M30	1 1/8"	31,4	58,5	6,8	25	9,53
NL33ss	M33	1 1/4"	34,4	48,5	6,8	25	4,25
NL36ss	M36	1 3/8"	37,4	55,0	6,8	25	5,96
NL39ss	M39	1 1/2"	40,4	58,5	6,8	25	6,74
NL42ss	M42		43,2	63,0	6,8	25	7,96
NL45ss	M45	1 3/4"	46,2	70,0	6,8	25	10,20
NL48ss	M48		49,6	75,0	6,8	25	12,00
NL52ss	M52	2"	53,6	80,0	9,0	1	20,10
NL56ss	M56	2 1/4"	59,1	85,0	9,0	1	21,30
NL60ss	M60		63,1	90,0	9,0	1	23,50
NL64ss	M64	2 1/2"	67,1	95,0	9,0	1	25,80
NL68ss	M68		71,1	100,0	9,0	1	28,20
NL72ss	M72		75,1	105,0	9,0	1	30,70
NL76ss	M76	3"	79,1	110,0	9,0	1	33,30
NL80ss	M80		83,1	115,0	9,0	1	36,00

Nord-Lock washers made of stainless steel are standard stock items, yet subject to prior sale.

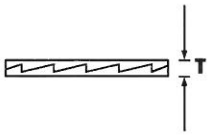
NL3ss – NL8ss
$Ø_i$ ±0,1 mm
NL10ss – NL42ss
$Ø_i$ ±0,2 mm
NL45ss – NL80ss
$Ø_i$ +0,5 / -0,0 mm



NL3ss – NL24ss
$Ø_o$ ±0,2 mm
NL27ss – NL42ss
$Ø_o$ ±0,3 mm
NL45ss – NL80ss
$Ø_o$ +0,0 / -2,0 mm



NL3ss – NL24ss
T±0,25 mm
NL27ss – NL42ss
T+0,0 / -0,5 mm
NL45ss – NL80ss
T±0,75 mm



- Please consult our website for current dimensions and 2D / 3D CAD models: **www.nord-lock.com/cad**
- Information regarding changes in materials and dimensions are available through **www.nord-lock.com/pcn**

Torque guidelines

Nord-Lock stainless steel washers with stainless steel bolt, lubricated with GTP600

Washer size	Bolt size	Pitch [mm]	A4-70, G_f=65% μ_{th}=0,14, μ_b=0,15 Torque [Nm]	A4-70, G_f=65% μ_{th}=0,14, μ_b=0,15 Clamp load [kN]	A4-80, G_f=65% μ_{th}=0,14, μ_b=0,15 Torque [Nm]	A4-80, G_f=65% μ_{th}=0,14, μ_b=0,15 Clamp load [kN]
NL3ss	M3	0,5	0,9	1,5	1,2	2,0
NL4ss	M4	0,7	2,0	2,6	2,7	3,4
NL5ss	M5	0,8	3,9	4,1	5,3	5,5
NL6ss	M6	1,0	6,9	5,9	9,2	7,8
NL8ss	M8	1,25	17	11	22	14
NL10ss	M10	1,5	33	17	43	23
NL12ss	M12	1,75	56	25	75	33
NL14ss	M14	2,0	89	34	119	45
NL16ss	M16	2,0	136	46	181	61
NL18ss	M18	2,5	191	56	254	75
NL20ss	M20	2,5	267	72	356	95
NL22ss	M22	2,5	364	89	485	118
NL24ss	M24	3,0	460	103	613	137
NL27ss	M27	3,0	671	134	895	179
NL30ss	M30	3,5	915	164	1220	219
NL36ss	M36	4,0	1591	239	2121	319

GTP600 = graphite lubricant, G_f= ratio of yield point
μ_{th}= thread friction, μ_b= washer friction

1 N = 0,225 lb
1 Nm = 0,738 ft-lb

Torque guidelines for other bolt grades are available through your local Nord-Lock representative.

Nord-Lock 254 SMO® washers

EN 1.4547 or equivalent, surface hardened

254 SMO® is a high performance austenitic stainless steel (according to EN 1.4547) with greater mechanical strength and resistance against corrosion than most austenitic stainless steel grades. The material is resilient against pitting and crevice corrosion due to high contents of chromium, nickel, molybdenum and nitrogen.

Nord-Lock 254 SMO® washers are specially designed for chloride rich processes and salt water solutions / atmospheres, i.e. environments where stainless steel washers made of EN 1.4404 are not suitable.

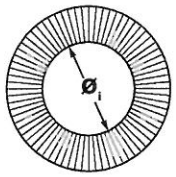
Dimension chart

Washer size	Bolt size Metric	Bolt size UNC	øi [mm]	øo [mm]	Thickness T [mm]	Min. package [pairs]	Approx weight kg / 100 pairs
NL3ss-254	M3	#5	3,4	7,0	2,2	200	0,04
NL3,5ss-254	M3,5	#6	3,9	7,6	2,2	200	0,04
NL3,5spss-254	M3,5	#6	3,9	9,0	2,2	200	0,07
NL4ss-254	M4	#8	4,4	7,6	2,2	200	0,04
NL4spss-254	M4	#8	4,4	9,0	2,2	200	0,07
NL5ss-254	M5	#10	5,4	9,0	2,2	200	0,06
NL5spss-254	M5	#10	5,4	10,8	2,2	200	0,11
NL6ss-254	M6		6,5	10,8	2,2	200	0,09
NL6spss-254	M6		6,5	13,5	2,0	200	0,16
NL1/4"-254		1/4"	7,2	11,5	2,2	200	0,09
NL1/4"spss-254		1/4"	7,2	13,5	2,2	200	0,15
NL8ss-254	M8	5/16"	8,7	13,5	2,0	200	0,12
NL8spss-254	M8	5/16"	8,7	16,6	2,0	200	0,22
NL3/8"ss-254		3/8"	10,3	16,6	2,0	200	0,19
NL3/8"spss-254		3/8"	10,3	21,0	2,0	200	0,38
NL10ss-254	M10		10,7	16,6	2,0	200	0,18
NL10spss-254	M10		10,7	21,0	2,0	200	0,37
NL11ss-254	M11	7/16"	11,4	18,5	2,2	200	0,26
NL12ss-254	M12		13,0	19,5	2,0	200	0,23
NL12spss-254	M12		13,0	25,4	3,0	100	0,82
NL1/2"ss-254		1/2"	13,5	19,5	2,0	200	0,23
NL1/2"spss-254		1/2"	13,5	25,4	3,2	100	0,80
NL14ss-254	M14	9/16"	15,2	23,0	3,0	100	0,49
NL14spss-254	M14	9/16"	15,2	30,7	3,2	100	1,31
NL16ss-254	M16	5/8"	17,0	25,4	3,0	100	0,59
NL16spss-254	M16	5/8"	17,0	30,7	3,2	100	1,13
NL18ss-254	M18		19,5	29,0	3,2	100	0,80
NL18spss-254	M18		19,5	34,5	3,2	100	1,56
NL3/4"ss-254		3/4"	20,0	30,7	3,2	100	0,96
NL3/4"spss-254		3/4"	20,0	39,0	3,2	100	2,14
NL20ss-254	M20		21,4	30,7	3,0	100	0,82
NL20spss-254	M20		21,4	39,0	3,2	100	1,98
NL22ss-254	M22	7/8"	23,4	34,5	3,2	100	1,19
NL22spss-254	M22	7/8"	23,4	42,0	3,2	50	2,44
NL24ss-254	M24		25,3	39,0	3,2	100	1,65
NL24spss-254	M24		25,3	48,5	3,2	50	3,50
NL1"ss-254		1"	27,9	39,0	3,2	100	1,42
NL1"spss-254		1"	27,9	48,5	3,2	50	3,22
NL27ss-254	M27		28,4	42,0	5,8	50	3,10
NL27spss-254	M27		28,4	48,5	5,8	25	5,85
NL30ss-254	M30	1 1/8"	31,4	47,0	5,8	50	4,04
NL33ss-254	M33	1 1/4"	34,4	48,5	5,8	25	4,25
NL36ss-254	M36	1 3/8"	37,4	55,0	5,8	25	5,96
NL39ss-254	M39	1 1/2"	40,4	58,5	5,8	25	6,74

Nord-Lock washers made of 254 SMO® quality are standard stock items, yet subject to prior sale.

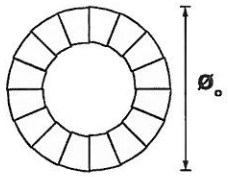
NL3ss-254
–NL8ss-254
$Ø_i$±0,1 mm

NL10ss-254
–NL39ss-254
$Ø_i$±0,2 mm

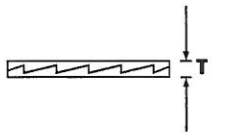


NL3ss254
–NL24ss -254
$Ø_o$±0,2 mm

NL27ss-254
–NL39ss-254
$Ø_o$±0,3 mm



NL3ss-254
–NL39ss-254
T±0,25 mm



- Please consult our website for current dimensions and 2D / 3D CAD models: **www.nord-lock.com/cad**
- Information regarding changes in materials and dimensions are available through **www.nord-lock.com/pcn**

Torque guidelines

Nord-Lock 254 SMO® washers with stainless steel bolt, lubricated with GTP600

Washer size	Bolt size	Pitch [mm]	A4-70, G_t=65% μ_{th}=0,14, μ_b=0,15 Torque [Nm]	A4-70, G_t=65% μ_{th}=0,14, μ_b=0,15 Clamp load [kN]	A4-80, G_t=65% μ_{th}=0,14, μ_b=0,15 Torque [Nm]	A4-80, G_t=65% μ_{th}=0,14, μ_b=0,15 Clamp load [kN]
NL3ss	M3	0,5	0,9	1,5	1,2	2,0
NL4ss	M4	0,7	2,0	2,6	2,7	3,4
NL5ss	M5	0,8	3,9	4,1	5,3	5,5
NL6ss	M6	1,0	6,9	5,9	9,2	7,8
NL8ss	M8	1,25	17	11	22	14
NL10ss	M10	1,5	33	17	43	23
NL12ss	M12	1,75	56	25	75	33
NL14ss	M14	2,0	89	34	119	45
NL16ss	M16	2,0	136	46	181	61
NL18ss	M18	2,5	191	56	254	75
NL20ss	M20	2,5	267	72	356	95
NL22ss	M22	2,5	364	89	485	118
NL24ss	M24	3,0	460	103	613	137
NL27ss	M27	3,0	671	134	895	179
NL30ss	M30	3,5	915	164	1220	219
NL36ss	M36	4,0	1591	239	2121	319

GTP600 = graphite lubricant, G_t= ratio of yield point
μ_{th}= thread friction, μ_b= washer friction

1 N = 0,225 lb
1 Nm = 0,738 ft-lb

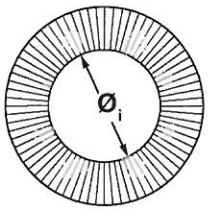
Torque guidelines for other bolt grades are available through your local Nord-Lock representative.

Dimensions and data in US units

NORD-LOCK washer dimensions UNC - preassembled pairs

STEEL, ZINC FLAKE COATED (DELTA PROTEKT®) - ELV & RoHS COMPLIANT

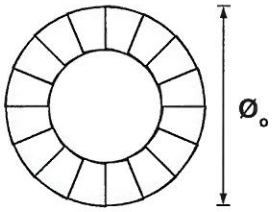
Washer size	Bolt size UNC	Bolt size Metric	$ø_i$ [inch]	$ø_o$ [inch]	Thickness T [inch]	Min. package [pairs]	Approx. weight lbs/100 pairs
NL3	#5	M3	0.13	0.28	0.07	200	0.09
NL3.5	#6	M3.5	0.15	0.30	0.07	200	0.07
NL3.5sp	#6	M3.5	0.15	0.35	0.07	200	0.13
NL4	#8	M4	0.17	0.30	0.07	200	0.09
NL4sp	#8	M4	0.17	0.35	0.07	200	0.13
NL5	#10	M5	0.21	0.35	0.07	200	0.11
NL5sp	#10	M5	0.21	0.43	0.07	200	0.24
NL6		M6	0.26	0.43	0.07	200	0.15
NL6sp		M6	0.26	0.53	0.10	200	0.44
NL1/4"	1/4"		0.28	0.45	0.07	200	0.18
NL1/4"sp	1/4"		0.28	0.53	0.10	200	0.40
NL8	5/16"	M8	0.34	0.53	0.10	200	0.33
NL8sp	5/16"	M8	0.34	0.65	0.10	200	0.62
NL3/8"	3/8"		0.41	0.65	0.10	200	0.51
NL3/8"sp	3/8"		0.41	0.83	0.10	200	1.06
NL10		M10	0.42	0.65	0.10	200	0.49
NL10sp		M10	0.42	0.83	0.10	200	1.04
NL11	7/16"	M11	0.45	0.73	0.10	200	0.64
NL12		M12	0.51	0.77	0.10	200	0.64
NL12sp		M12	0.51	1.00	0.13	100	2.05
NL1/2"	1/2"		0.53	0.77	0.10	200	0.60
NL1/2"sp	1/2"		0.53	1.00	0.13	100	1.98
NL14	9/16"	M14	0.60	0.91	0.13	100	1.23
NL14sp	9/16"	M14	0.60	1.21	0.13	100	3.11
NL16	5/8"	M16	0.67	1.00	0.13	100	1.48
NL16sp	5/8"	M16	0.67	1.21	0.13	100	2.82
NL18		M18	0.77	1.14	0.13	100	1.87
NL18sp		M18	0.77	1.36	0.13	100	3.48
NL3/4"	3/4"		0.79	1.21	0.13	100	2.31
NL3/4"sp	3/4"		0.79	1.54	0.13	100	4.85
NL20		M20	0.84	1.21	0.13	100	2.05
NL20sp		M20	0.84	1.54	0.13	100	4.48
NL22	7/8"	M22	0.92	1.36	0.13	100	2.84
NL22sp	7/8"	M22	0.92	1.65	0.18	50	7.30
NL24		M24	1.00	1.54	0.13	100	3.70
NL24sp		M24	1.00	1.91	0.18	50	9.94
NL1"	1"		1.10	1.54	0.13	100	3.37
NL1"sp	1"		1.10	1.91	0.18	50	9.26
NL27		M27	1.12	1.65	0.26	50	7.25
NL27sp		M27	1.12	1.91	0.26	25	11.88
NL30	1 1/8"	M30	1.24	1.85	0.23	50	9.26
NL30sp	1 1/8"	M30	1.24	2.30	0.26	25	19.75
NL33	1 1/4"	M33	1.35	1.91	0.26	25	8.75
NL33sp	1 1/4"	M33	1.35	2.30	0.26	25	18.32
NL36	1 3/8"	M36	1.47	2.17	0.26	25	12.32
NL36sp	1 3/8"	M36	1.47	2.48	0.26	25	20.17
NL39	1 1/2"	M39	1.59	2.30	0.26	25	13.85
NL42		M42	1.70	2.48	0.26	25	16.47
NL45	1 3/4"	M45	1.82	2.76	0.28	25 *	22.49
NL48		M48	1.95	2.95	0.28	25 *	26.46
NL52	2"	M52	2.11	3.15	0.28	25 *	28.66
NL56	2 1/4"	M56	2.33	3.35	0.28	10 *	29.76
NL60		M60	2.48	3.54	0.28	10 *	33.51
NL64	2 1/2"	M64	2.64	3.74	0.28	10 *	36.82
NL68		M68	2.80	3.94	0.37	1 *	62.15
NL72		M72	2.96	4.13	0.37	1 *	67.68
NL76	3"	M76	3.11	4.33	0.37	1 *	73.43
NL80		M80	3.27	4.53	0.37	1 *	79.41
NL85		M85	3.47	4.72	0.37	1 *	83.42
NL90		M90	3.64	5.12	0.37	1 *	105.09
NL95		M95	3.83	5.31	0.37	1 *	109.81
NL100		M100	4.07	5.71	0.37	1 *	129.87
NL105		M105	4.27	5.91	0.37	1 *	135.10
NL110		M110	4.46	6.10	0.37	1 *	140.32
NL115		M115	4.66	6.50	0.37	1 *	165.96
NL120		M120	4.86	6.69	0.37	1 *	171.83
NL125		M125	5.06	6.81	0.37	1 *	168.94
NL130		M130	5.25	7.01	0.37	1 *	174.54



NL3–NL8
Ø$_i$±0.004 inch

NL10–NL42
Ø$_i$±0.008 inch

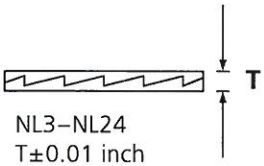
NL45–NL130
Ø$_i$+0.02/-0 inch



NL3–NL24
Ø$_o$±0.008 inch

NL27–NL42
Ø$_o$±0.012 inch

NL45–NL130
Ø$_o$+0/-0.08 inch



NL3–NL24
T±0.01 inch

NL27–NL42
T+0/-0.02 inch

NL45–NL130
T±0.03 inch

** NL45–NL130 upon inquiry*

Materials and dimensions are subject to change without prior notice.

Please consult our website for current dimensions:
www.nord-lock.com

1inch = 25.4 mm

1lb = 0.4536 kg

Dimensions and data in US units

Torque guidelines [ftlb]

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 μ_g=0,10, μ_w=0,16 Torque [ftlb]	Clamp load [lb]	GTP600, G_F=0,75 μ_g=0,08, μ_w=0,15 Torque [ftlb]	Clamp load [lb]	Dry, G_F=0,62 μ_g=0,15, μ_w=0,18 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 μ_g=0,13, μ_w=0,14 Torque [ftlb]	Clamp load [lb]	GTP600, G_F=0,75 μ_g=0,08, μ_w=0,13 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)**

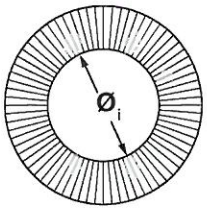
Washer size	Bolt size	Pitch [TPI]	Oil, G_F=0,71 μ_g=0,13, μ_w=0,12 Torque [ftlb]	Clamp load [lb]	GTP600, G_F=0,75 μ_g=0,08, μ_w=0,11 Torque [ftlb]	Clamp load [lb]
NL3	#5	40	1.7	870	1.6	910
NL3.5	#6	32	2.2	990	2.0	1,050
NL4	#8	32	3.8	1,500	3.7	1,600
NL5	#10	24	5.8	1,900	5.5	2,000
NL1/4"	1/4	20	13	3,400	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

Dimensions and data in US units

NORD-LOCK washer dimensions UNC - preassembled pairs

STAINLESS STEEL A4 (according to EN 1.4404, AISI 316L)

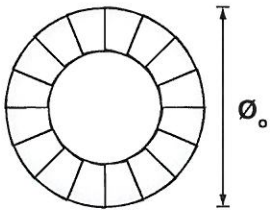
Washer size	Bolt size UNC	Bolt size Metric	$ø_i$ [inch]	$ø_o$ [inch]	Thickness T [inch]	Min. package [pairs]	Approx. weight lbs /100 pairs
NL3ss	#5	M3	0.13	0.28	0.09	200	0.09
NL3.5ss	#6	M3.5	0.15	0.30	0.09	200	0.09
NL3.5spss	#6	M3.5	0.15	0.35	0.09	200	0.15
NL4ss	#8	M4	0.17	0.30	0.09	200	0.09
NL4spss	#8	M4	0.17	0.35	0.09	200	0.15
NL5ss	#10	M5	0.21	0.35	0.09	200	0.13
NL5spss	#10	M5	0.21	0.43	0.09	200	0.24
NL6ss		M6	0.26	0.43	0.09	200	0.20
NL6spss		M6	0.26	0.53	0.08	200	0.35
NL1/4"ss	1/4"		0.28	0.45	0.09	200	0.20
NL1/4"spss	1/4"		0.28	0.53	0.09	200	0.33
NL8ss	5/16"	M8	0.34	0.53	0.08	200	0.26
NL8spss	5/16"	M8	0.34	0.65	0.08	200	0.48
NL3/8"ss	3/8"		0.41	0.65	0.08	200	0.42
NL3/8"spss	3/8"		0.41	0.83	0.09	200	0.84
NL10ss		M10	0.42	0.65	0.08	200	0.40
NL10spss		M10	0.42	0.83	0.08	200	0.82
NL11ss	7/16"	M11	0.45	0.73	0.09	200	0.57
NL12ss		M12	0.51	0.77	0.08	200	0.51
NL12spss		M12	0.51	1.00	0.12	100	1.81
NL1/2"ss	1/2"		0.53	0.77	0.09	200	0.53
NL1/2"spss	1/2"		0.53	1.00	0.13	100	1.76
NL14ss	9/16"	M14	0.60	0.91	0.12	100	1.08
NL14spss	9/16"	M14	0.60	1.21	0.13	100	2.89
NL16ss	5/8"	M16	0.67	1.00	0.12	100	1.30
NL16spss	5/8"	M16	0.67	1.21	0.12	100	2.49
NL18ss		M18	0.77	1.14	0.13	100	1.76
NL18spss		M18	0.77	1.36	0.13	100	3.44
NL3/4"ss	3/4"		0.79	1.21	0.13	100	2.12
NL3/4"spss	3/4"		0.79	1.54	0.13	100	4.63
NL20ss		M20	0.84	1.21	0.12	100	1.81
NL20spss		M20	0.84	1.54	0.13	100	4.54
NL22ss	7/8"	M22	0.92	1.36	0.13	100	2.71
NL22spss	7/8"	M22	0.92	1.65	0.13	50	4.92
NL24ss		M24	1.00	1.54	0.13	100	3.35
NL24spss		M24	1.00	1.91	0.13	50	7.72
NL1"ss	1"		1.10	1.54	0.13	100	3.13
NL1"spss	1"		1.10	1.91	0.13	50	7.10
NL27ss		M27	1.12	1.65	0.27	50	7.61
NL27spss		M27	1.12	1.91	0.27	25	12.90
NL30ss	1 1/8"	M30	1.24	1.85	0.27	50	9.77
NL30spss	1 1/8"	M30	1.24	2.30	0.27	25	21.01
NL33ss	1 1/4"	M33	1.35	1.91	0.27	25	9.37
NL36ss	1 3/8"	M36	1.47	2.17	0.27	25	13.14
NL39ss	1 1/2"	M39	1.59	2.30	0.27	25	14.86
NL42ss		M42	1.70	2.48	0.27	25	17.55
NL45ss	1 3/4"	M45	1.82	2.76	0.27	25 *	22.49
NL48ss		M48	1.95	2.95	0.27	25 *	26.46
NL52ss	2"	M52	2.11	3.15	0.35	1 *	44.31
NL56ss	2 1/4"	M56	2.33	3.35	0.35	1 *	46.96
NL60ss		M60	2.48	3.54	0.35	1 *	51.81
NL64ss	2 1/2"	M64	2.64	3.74	0.35	1 *	56.88
NL68ss		M68	2.80	3.94	0.35	1 *	62.17
NL72ss		M72	2.96	4.13	0.35	1 *	67.68
NL76ss	3"	M76	3.11	4.33	0.35	1 *	73.41
NL80ss		M80	3.27	4.53	0.35	1 *	79.37



NL3ss–NL8ss
$Ø_i$±0.004 inch

NL10ss–NL42ss
$Ø_i$±0.008 inch

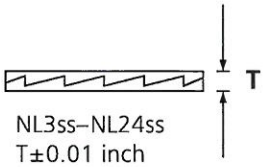
NL45ss–NL80ss
$Ø_i$+0.02/-0 inch



NL3ss–NL24ss
$Ø_o$±0.008 inch

NL27ss–NL42ss
$Ø_o$±0.012 inch

NL45ss–NL80ss
$Ø_o$+0/-0.08 inch



NL3ss–NL24ss
T±0.01 inch

NL27ss–NL42ss
T+0/-0.02 inch

NL45ss–NL80ss
T±0.03 inch

* *NL45ss–NL80ss upon inquiry*

Materials and dimensions are subject to change without prior notice.

Please consult our website for current dimensions:
www.nord-lock.com

NL3 to NL20 available upon request in other steel alloys, e.g. 254SMO, Inconel® 718 and Inconel®/Hastelloy® C-276.

1inch = 25.4 mm

1lb = 0.4536 kg

Torque guidelines [ftlb]

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 μ_g=0,14, μ_w=0,15 Torque [ftlb]	Clamp load [lb]	303, 304, 305, G_F=0,65 μ_g=0,14, μ_w=0,15 Torque [ftlb]	Clamp load [lb]
NL3ss	#5	40	-	-	-	-
NL3.5ss	#6	32	-	-	-	-
NL4ss	#8	32	-	-	-	-
NL5ss	#10	24	-	-	-	-
NL1/4"ss	1/4	20	5.2	1,300	5.2	1,300
NL8ss	5/16	18	10.3	2,200	10.3	2,200
NL3/8"ss	3/8	16	18	3,300	18	3,300
NL11ss	7/16	14	28	4,500	28	4,500
NL1/2"ss	1/2	13	43	6,000	43	6,000
NL14ss	9/16	12	61	7,700	61	7,700
NL16ss	5/8	11	85	9,500	85	9,500
NL3/4"ss	3/4	10	104	9,800	104	9,800
NL22ss	7/8	9	166	13,500	166	13,500
NL1"ss	1	8	251	17,700	251	17,700
NL30ss	1 1/8	7	356	22,300	356	22,300
NL36ss	1 3/8	6	653	33,800	653	33,800

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**

ZINC FLAKE COATING DELTA PROTEKT®

APPLIED ON NORD-LOCK STEEL WASHERS

ENVIRONMENTAL COMPLIANCE	· ELV compliant (EU directive 2000/53/EC) · RoHS compliant (EU directive 2002/95/EC)
COATING SPECIFICATION	Zinc and aluminium based inorganic surface coating: · Base coat KL100 (according to EN ISO 10683). Silvery / matt grey colour. · Top coat VH 302 GZ. A water based and transparent seal.
APPLICATION TECHNIQUE	Dip spin *The method offers an evenly applied micro layer. Furthermore; the use of a non-electrolytically applied surface treatment eliminates the risk of hydrogen embrittlement. After dip spin, the washers are heated in order to cure the coating.*
CORROSION RESISTANCE	Endures a minimum of 600 hours of salt spray test in accordance with ISO 9227 and DIN 50021. *The coating provides cathodic protection and also a barrier effect.*
TEMPERATURE TOLERANCE	Temperatures above 180°C affect the corrosion resistance according to Dörken.
REGARDING HIGH PURITY APPLICATIONS	Particles from the zinc flake coating may loosen can contaminate sensitive environments such as clean rooms, food processing facilities, hydraulic / engine oil. Therefore NORD-LOCK recommends suitability testing in applications with specific requirements for high purity (no loose particles). Contact NORD-LOCK for product samples and further technical advice.
FURTHER INFORMATION	The surface coating process is performed at the NORD-LOCK factory in Sweden. Our Dörken certificate and salt spray test results are available through our website: www.nord-lock.com *Dörken's website: www.doerken-mks.de*

Nord-Lock joint guide

Tapped holes
Nord-Lock washers safely lock the bolt against the underlying surface.

Counter bores
The outer diameter of regular Nord-Lock washers is designed for counter-bore holes according to DIN 974, i.e. the washers fit under the head of standard bolts.

Through holes
As for all locking washers, through holes require two pairs of Nord-Lock washers – one pair for securing the bolt and a second pair for securing the nut.

Turn both fasteners in order to close the cams on both washer pairs before tightening to minimize settlements. Keep the nut secured while tightening the bolt.

Stud bolts
Nord-Lock washers safely lock the nut on stud bolts and eliminate the need for adhesives.

Large / slotted holes

Soft underlying surfaces

Applications with large / slotted holes or soft underlying surfaces
To optimize the load distribution for applications with large / slotted holes or with soft underlying surface, use a flanged nut / bolt together with Nord-Lock "SP" washers with enlarged outer diameter.

Designs where Nord-Lock washers are not recommended

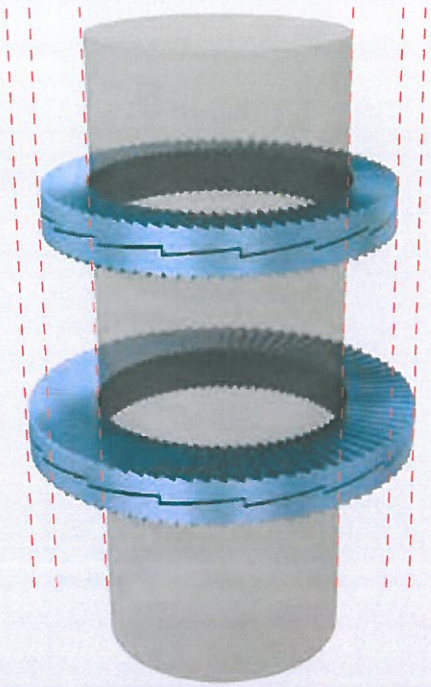
- Mating surfaces that are not locked in place (see left figure)
- Mating surfaces harder than the washers
- Very soft mating surface, e.g. wood, plastic
- Applications with extremely large settlements
- Non-preloaded joints

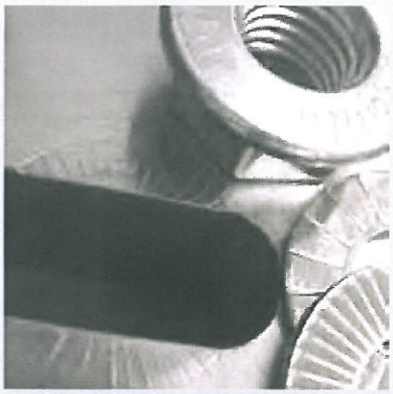
If your application corresponds to one or more of the mentioned design critera, contact your Nord-Lock representative and we will help you find an alternative solution.

Nord-Lock washers with enlarged outer diameter

Nord-Lock washers are available with an enlarged outer diameter, referred to as SP washers. SP washers are designed for use on large / slotted holes, painted / sensitive surfaces or soft materials. Use Nord-Lock SP washers with flanged bolts or nuts for optimum load distribution.

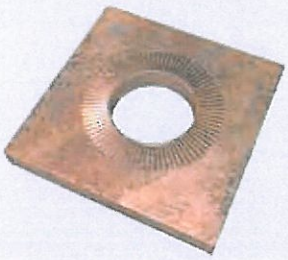
Ø inner regular = Ø inner SP
Ø outer regular < Ø outer SP



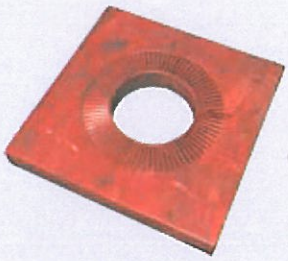


A flanged nut and Nord-Lock SP washers increase the load supporting surface for applications with slotted holes.

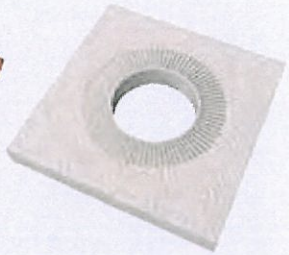
By using SP washers, the load is distributed over a larger surface which can be more gentle for sensitive surfaces. Please consult Nord-Lock to find the optimal solution for your application.



Nord-Lock SP washers on soft metal.



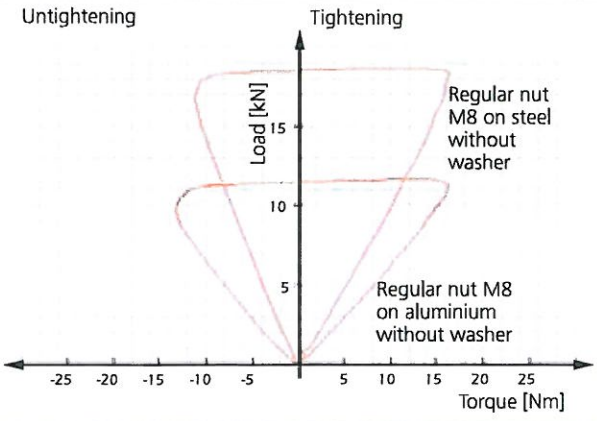
Nord-Lock SP washers on painted surface.



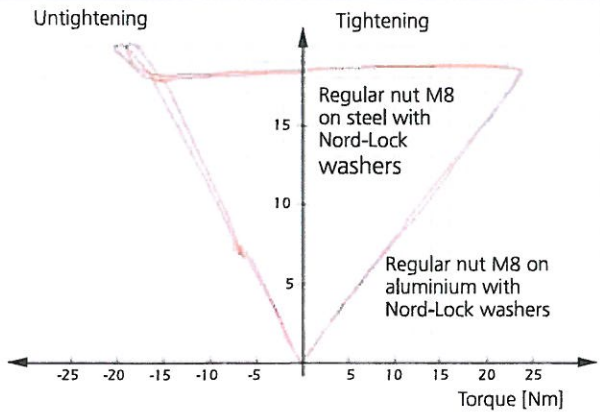
Nord-Lock SP washers on fibre surface.

Uniform friction with Nord-Lock

It is important to have control over the friction conditions in order to obtain the desired preload when tightening a joint.



When no washer is used under the fastener, the friction depends on the contact surface. At a given torque, the obtained preload will vary depending on the contact material.



When using Nord-Lock washers, sliding always occurs between the upper washer and the bolt head / nut. At a given torque, the preload will be the same, regardless of the contact material.

Nord-Lock provides customized torque guidelines for your application, contact your nearest representative.

DKC

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