

USER MANUAL

Nord-Lock X-series washers

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THE EXCEPTIONAL SYSTEM THAT PREVENTS BOLT LOOSENING AND SLACKENING

Nord-Lock X-series washers secure bolted joints with tension instead of friction. The system is comprised of a pair of washers with 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. A unique added spring effect compensates for loss of preload due to slackening.

Pre-glued

Nord-Lock X-series washers are pre-glued in pairs upon delivery to facilitate first time mounting. The glue will no longer be effective after first use.

Reuse

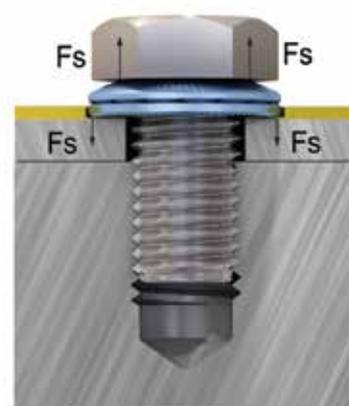
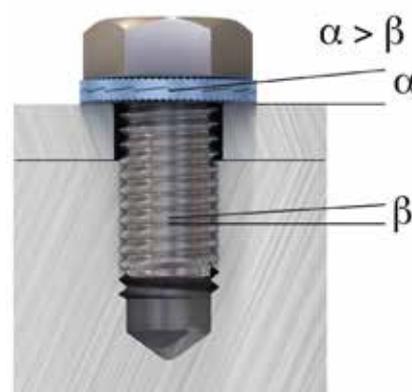
It is possible to reuse Nord-Lock X-series washers. Visually inspect the cams and serrations for obvious defects before re-installation. Make sure the washers are installed in pairs, cam face to cam face. Reusability depends on conditions of use. Please note that the Lifetime Warranty is not applicable during reuse.

Thread

Nord-Lock X-series washers are designed for Metric/UNC coarse pitch threads. They can also be used with fine pitch threads (Metric/UNC), but the increased difference in pitch between the thread and the washer needs to be considered. Higher difference in pitch leads to higher tension load and required torque during untightening. This can lead to exceeding the elastic limit of the bolt.

Traceability

Every box of Nord-Lock X-series washers has a control number. Using the unique control number, every washer batch can be traced from the material certificate of the steel, through the entire production process to the finished washer. Nord-Lock X-series washers are also laser marked with the Nord-Lock brand, control number and a type code. The laser-marking is only for identification and will not last if being re-used.



CORRECT USE OF NORD-LOCK X-SERIES WASHERS

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.



Through holes

Through holes require two pairs of Nord-Lock washers - one pair for securing the bolt and one pair for securing the nut.



Stud bolts

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



Large slotted holes / 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.



NORD-LOCK X-SERIES WASHERS ARE NOT RECOMMENDED

- ✘ When mating surfaces are not locked in place
- ✘ When mating surfaces are harder than the washers
- ✘ With very soft mating surfaces, e.g. wood, plastic
- ✘ For applications with extremely large settlements
- ✘ With non-preloaded joints

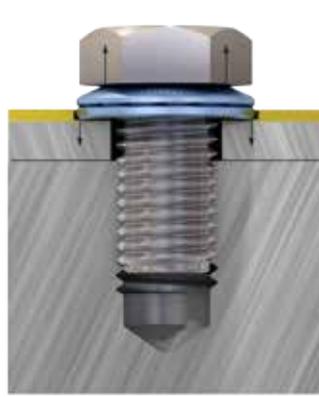


ASSEMBLY INSTRUCTIONS

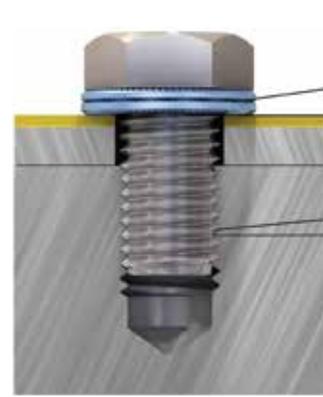
IT'S EASY TO ASSEMBLE NORD-LOCK WASHERS



1. Put on the pre-assembled washer pair on the bolt and install the bolt in the threaded hole. Make sure the washers are oriented according to the picture.



2. We recommend the use of a lubricant. Lubricate the thread and the area under the head prior to installation.



3. Tighten the bolt at a torque corresponding to the desired clamp load, using a calibrated torque wrench.

READY!

Tightening of through holes

1. Turn both fasteners (bolt head/nut) in order to close the cams on both washers before tightening to minimize settlements.

We recommend the use of a lubricant. Lubricate the thread, the nut and the area under the head prior to installation.

2. Keep the bolt/nut secured while tightening the other part (bolt/nut).

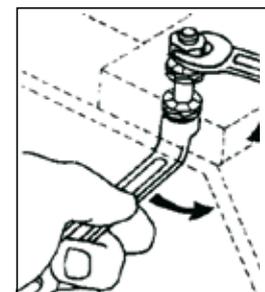
3. Ready!



Closed cams - correct



Open cams – not correct



TECHNICAL DATA

MATERIAL SELECTION GUIDE

Steel type	Examples of application	Washer types	Treatment Surface coating	Washer hardness*	Corrosion resistance	Bolt grades	Temperature range**
EN 1.7225 or equivalent	General steel applications	Regular outer diameter Enlarged outer diameter (sp)	Through hardened Delta Protekt® base coat (KL100) and top coat (VH302GZ)	≥ 485HV1	Minimum 600 hours in salt spray test (according to ISO9227)	Up to 12.9	-40°C to 150°C

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

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

TORQUE GUIDELINES

The below torque values have been verified in test laboratories and represent a configuration example. The values are indicative and should not be seen as recommendations as varying conditions, joint designs and requirements apply. The Nord-Lock Group provides customized torque calculations to any standard, free of charge.

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

Washer size	Bolt size	Pitch [mm]	Oil, $G_f=75\%$ $\mu_{th}=0,15, \mu_h=0,19$		Cu/C paste, $G_f=75\%$ $\mu_{th}=0,13, \mu_h=0,18$		Dry, $G_f=62\%$ $\mu_{th}=0,18, \mu_h=0,2$	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NLX6	M6	1,0	13	9,7	12	9,7	12	8,0
NLX8	M8	1,25	32	18	29	18	29	15
NLX10	M10	1,5	62	28	57	28	56	23
NLX12	M12	1,75	107	40	99	40	97	33
NLX14	M14	2,0	170	55	157	55	155	46
NLX16	M16	2,0	260	75	240	75	237	62
NLX20	M20	2,5	510	118	470	118	464	97

μ_{th} = thread friction coefficient
 μ_h = under head friction coefficient
 Cu/C paste = copper/graphite paste (Molykote® 1000)
 Oil = WD40 has been used
 G_f = Ratio of yield point. When tightening according to guidelines and with no deviation, this is the pre-stress achieved expressed as % of yield point.

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

Thread friction coefficients have theoretical values but are verified through testing. Under head friction coefficients have been established by tests.

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

Washer size	Bolt size	Pitch [mm]	Oil, $G_f=71\%$ $\mu_{th}=0,15, \mu_h=0,15$		Cu/C paste, $G_f=75\%$ $\mu_{th}=0,13, \mu_h=0,15$	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NLX6	M6	1,0	15,5	12,9	15,5	13,6
NLX8	M8	1,25	37	23	37	25
NLX10	M10	1,5	73	37	73	39
NLX12	M12	1,75	126	54	126	57
NLX14	M14	2,0	201	74	201	78
NLX16	M16	2,0	307	100	306	106
NLX20	M20	2,5	602	156	600	165

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

Washer size	Bolt size	Pitch [mm]	Oil, $G_f=71\%$ $\mu_{th}=0,15, \mu_h=0,13$		Cu/C paste, $G_f=75\%$ $\mu_{th}=0,13, \mu_h=0,14$	
			Torque [Nm]	Clamp load [kN]	Torque [Nm]	Clamp load [kN]
NLX6	M6	1,0	17,4	15,4	18	16,3
NLX8	M8	1,25	42	28	43	30
NLX10	M10	1,5	82	44	85	47
NLX12	M12	1,75	142	65	146	68
NLX14	M14	2,0	226	89	233	94
NLX16	M16	2,0	345	120	355	127
NLX20	M20	2,5	676	188	696	198