

Mondi Štětí a.s.

STANDARD
ST 10.02.07
BOLT CONNECTIONS

Mondi Štětí a.s.	STANDARD ST 10.02.07	Page: 1/8
-------------------------	-----------------------------	------------------

STANDARD

ST 10.02.07

BOLT CONNECTIONS

Worked out by:
Name: Ing. S. Ryšan
Position: Head of servise
of paper machines

Verified by:
Name: Ing. H. Procházková
Position: IMS Coordinator

Approved by:
Name: Ing.Bc.Petr Bubla
Position: Head of
Maintenance Dpt.

Signed by: Ing. S. Ryšan
in her own hand

Signed by: Ing. H. Procházková,
in her own hand

Signed by: Ing.Bc. Petr Bubla,
in his own hand

Version: 06	Valid from: As of the date of issue
--------------------	--

Mondi Štětí a.s.	STANDARD ST 10.02.07	Page: 2/8
------------------	----------------------	-----------

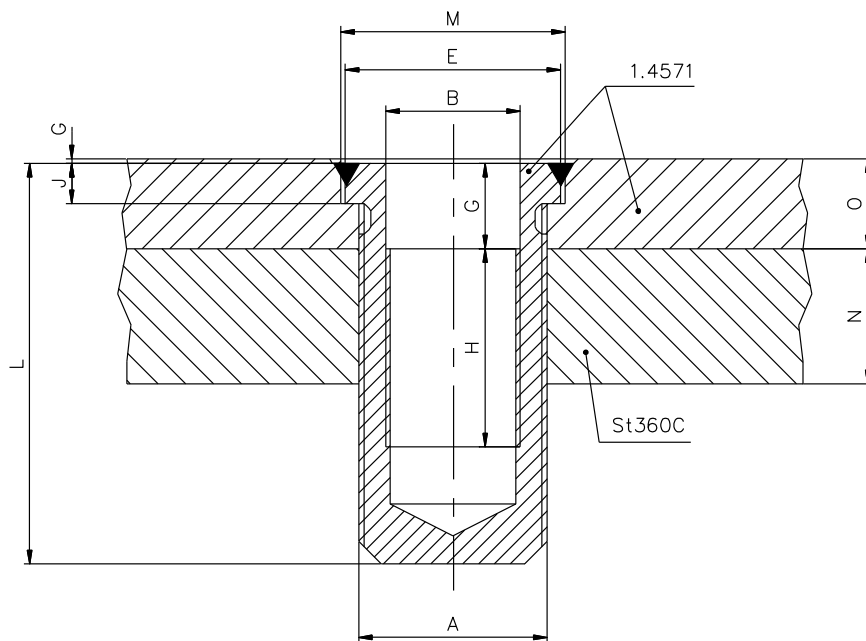
TABLE OF CONTENTS

	Page
1 Bolts	3
1.2 Bolt connecntions	3
1.2 Lock washers.....	4

1 Bolts

1.2 Bolt connections

Cross-section of a tap hole insert seal-welded in machine frame



		A	B	C	D	E	F	G	H	I	J	K
Shoulder 1	EINSATZ 1	M42x2	M30x2	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Shoulder 2	EINSATZ 2	M36x2	M24	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Shoulder 3	EINSATZ 3	M36x2	M20	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Shoulder 4	EINSATZ 4	M30x2	M16	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx
Shoulder 5	EINSATZ 5	M24	M12	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx	xxx

1.2 Lock washers

Lock washers must be used if bolts cannot be positively secured by a locking wire, locking plate or similar.

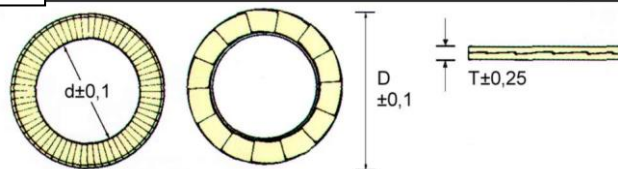
THE USE OF NORD-LOCK SELF-LOCKING RETAINERS, AS AN ALTERNATIVE TO SPRING RINGS AND TOOTH LOCK WASHERS SHOULD BE GIVEN PREFERENCE.

Self-locking retaining washers

NORD-LOCK®

Technical data

April 1989



Dimensions														
Bolts				Bolts				For screws						
		outside ϕ	inside ϕ			Outside ϕ	Inside ϕ			External. ϕ	Internal. ϕ			
M	Inch	mm	mm	M	Inch	mm	mm	M	Inch	mm	mm			
Pair thickness T: 1.8 mm				11	7/16	18.5	11.4	Pair thickness T: 3.7 mm						
3	1/8	7.0	3.2	12	½	19.5	13.0	18	11/16	30.7	19.5			
4	5/32	9.0	4.3	Pair thickness T: 3.7 mm				20	¾	30.7	21.0			
5	3/16	9.0	5.2					22	7/8	34.5	22.9			
6	¼	10.8	6.5					24	1	40.0	26.0			
Pair thickness T: 2.6 mm				12	½	25.4	13.0	Pair thickness T:: 4.6 mm						
6	¼	13.5	6.5	14	9/16	25.4	14.5	27	1 1/16	48.5	28.5			
8	5/16	13.5	8.25	16	5/8	25.4	17.0	30	1 1/8	47.0	30.5			
8	5/16	16.6	8.2	Pair thickness T: 4.0 mm				33	1 ¼	48.5	33.5			
10	3/8	16.6	10.3					36	1 3/8	58.5	36.6			
10	3/8	21.0	10.3					39	1 ½	58.5	39.5			
Standard types (galvanised steel / hardness HV1 500+50)														
M	Minimum number of pairs in a pack		Weight in kg / 100 pairs		M	Minimum number of pairs in a pack		Weight in kg / 100 pairs		M	Minimum number of pairs in a pack		Weight in kg / 100 pairs	
3	200		0.034		14	100		0.920		27	50		4.106	
4	200		0.058		16	100		0.770		30	50		3.868	
5	200		0.042		18	100		1.122		33	50		3.768	
6	200		0.070		20	100		1.322		36	50		5.878	
8	200		0.155		22	100		1.573		39	50		5.798	
10	200		0.213		24	100		2.080						
11	200		0.338											
12	200		0.300											
Larger support area Standard types (galvanised steel / hardness HV1 500+50)														
M	Minimum number of pairs in a pack		Weight in kg / 100 pairs		M	Minimum number of pairs in a pack		Weight in kg / 100 pairs		M	Minimum number of pairs in a pack		Weight in kg / 100 pairs	
6	200		0.215		10	200		0.540		16	100		1.246	
8	200		0.295		12	200		1.000						
Glued pairs Standard types (galvanised steel / hardness HV1 500+50)														
M	Minimum number of pairs in a pack		Weight in kg / 100 pairs		M	Minimum number of pairs in a pack		Weight in kg / 100 pairs		M	Minimum number of pairs in a pack		Weight in kg / 100 pairs	
8	200		0.295		14	100		0.920		20	100		1.122	
10	200		0.213		16	100		0.770		22	100		1.573	
10	200		0.540		16	100		1.244		24	100		2.080	
12	200		0.300		18	100		1.322						
12	200		1.000											
Stainless steel Standard types (stainless steel A4 / hardness HV1 300+30)														
M	Minimum number of pairs in a pack		Weight in kg / 100 pairs		M	Minimum number of pairs in a pack		Weight in kg / 100 pairs		M	Minimum number of pairs in a pack		Weight in kg / 100 pairs	
3	200		0.040		8	200		0.225		14	100		0.920	
4	200		0.080		10	200		0.236		16	100		0.733	
5	200		0.065		11	200		0.330		20	100		1.030	
6	200		0.095		12	200		0.350						
6	200		0.200		12	200		0.965						
8	200		0.200											

Version: 00

Printouts, if any, are not controlled.

Printed on: 28.09.2022

NORD-LOCK®

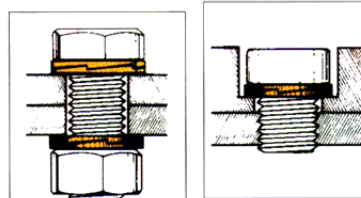
Self-locking retaining washers

- have maximum retaining power,
- are reliable at any bolt temperature,
- can be reused,
- can be used with oiled-up bolts, and
- provide simple loosening of tight bolt connection – despite self-locking power

The **NORD-LOCK** principle features a pair of two equal washers each with minute radial ridges on one side and a multitude of tangentially inclined areas on the other. The angle of these areas is larger than the lead angle of the thread.

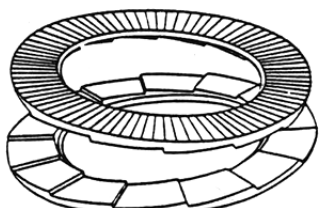
Assembly

NORD-LOCK washers can be used with regular quality screws as well as with extra hard screws. When tightening, a 20 % larger torque is needed to overcome the friction of the radial ridges.



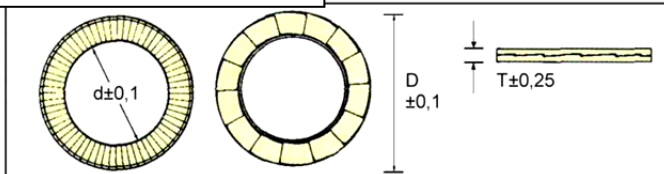
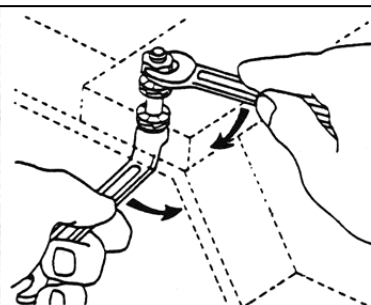
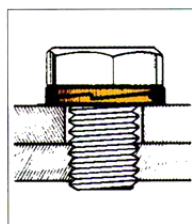
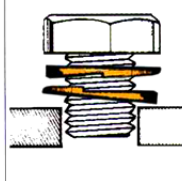
In a bolt connection with a bolt nut, bolt head and nut must be provided with self-locking retaining washers.

When tightening the nut, the bolt



When the bolt connection is tightened, the radial ridges are forced into the bolt head or nut or support area.

If a tight bolt connection would go loose, the inclined areas of one washer would have to slide along the areas of the other and thus increase the overall thickness of the pair or the tightening force of the connection.



Standard dimensions

Skrut	M3	M4	M5	M6	M8	M10	M11	M12	M14	M16	M18	M20	M22	M24	M27	M30	M33	M36	M39
dmm	3,2	4,3	5,2	6,5	8,2	10,3	11,4	13,0	14,5	17,0	19,5	21,0	22,9	26,0	28,5	30,5	33,5	36,6	39,5
Dmm	7,0	9,0	9,0	10,8	13,5	16,6	18,5	19,5	23,0	25,4	29,0	30,7	34,5	39,0	42,0	47,0	48,5	56,0	58,5
Tmm	1,8	1,8	1,8	1,8	2,6	2,6	2,6	2,6	3,7	3,7	3,7	3,7	3,7	3,7	4,6	4,6	4,6	4,6	4,6
MvNm	1,5	3,5	7,2	12	30	59	84	103	160	250	350	490	660	850	1220	1600	2200	2900	3800

M_v = tightening torque as for bolts of quality 8.8. Washers are yellow-galvanised. Hardness approx. 50 HRC
M4 to M20 also in stainless steel according to DIN 1.4436. Washers for M10 to M24 are available also as glued pair washers.

Ver:

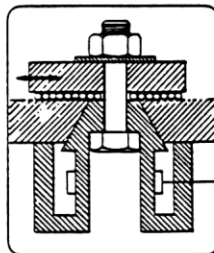
NORD-LOCK[®]

Self-locking retaining washers

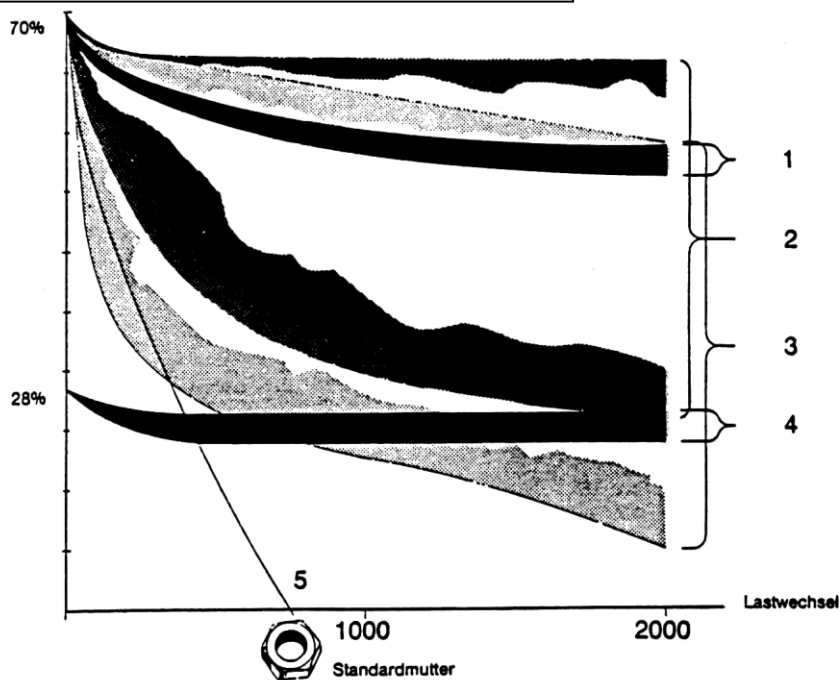


Loosening test demonstration

Junkers test stand, as shown in the illustration
 Bolt M 10
 Hardness 8.8
 Frequency 20.8 Hz
 Shifting ± 0.75 mm
 Clamped length 35 mm
 Materials connected: mild steel
 Pre-stressing in % of permissible bolt load



The NORD-LOCK system eliminates the risk of unequal tightening torque. As shown by tests



Standard NORD-LOCK retaining washer.



Flange nut with nylon insert.



Nut with nylon insert according to DIN 985



Less tightened regular nut with NORD-LOCK retaining washer

Safety with the NORD-LOCK system.

Different methods and materials are used in the prevention of bolt loosening. Retaining plates, castle nuts, wire securing, coiled thread inserts, plastic inserts, plastic coatings, pastes and glues do not provide absolute security against accidental loosening, some of them merely prevent the bolts from getting lost. They need additional work on the fasteners and/or costs for preparation, mounting and checking.

Most preparations have to be made at the producer's mechanical shops and cannot be readily made during regular repair work.

The NORD-LOCK system does away with such nuisance:

- NORD-LOCK washers prevent a decrease in bolt pre-stressing.
- Loosening of bolt connections secured with NORD-LOCK retaining washers is simple and causes no damage to fasteners or connected members.
- NORD-LOCK washers can be reused several times.
- A 100%-reliable NORD-LOCK securing can be achieved by untrained workers without the use of a torque-controlled wrench.