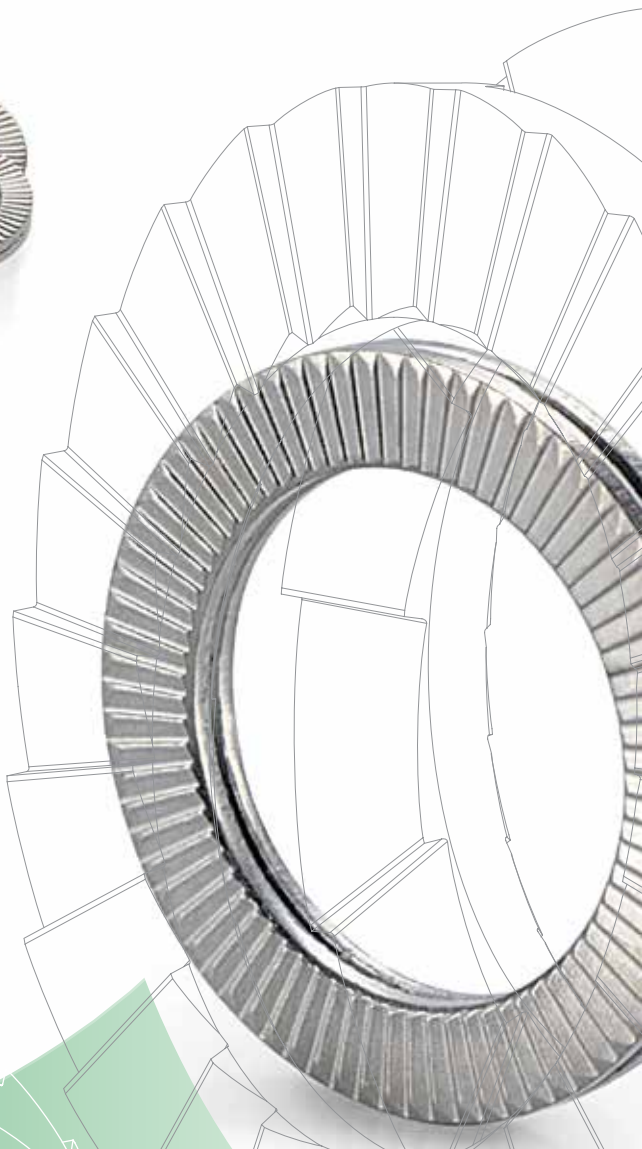




TWIN LOCK[®]
G R O W E R
DOUBLE SECURITY



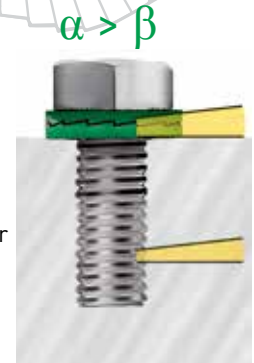
GROWER TWIN-LOCK® SECURITY SYSTEM DOUBLE SECURITY

To ensure the integrity of fastener thread systems, Twin-Lock security system works by using tension rather than friction, which has been the basis for most traditional fastening methods. This ensures the securing of threaded systems.

Twin-Lock security system consists of two identical flat washers which have a set of cams on one side and a radial knurling on the other side.

► Product working principle

The angle of inclination α of the washer cam is bigger than the pitch β of the screw thread. When the fastener is tightened, the knurled surfaces grip both the bearing surface of the fastener and the material into which the screw is being fastened. The larger angle of the cam α , compared to the smaller angle of the screw thread β , will not allow the screw to loosen because of the tension caused by the cam lifting.



PERFORMANCES and ADVANTAGES

► Performances

The Twin-Lock washers ensure proper fastening performance for joints under extreme vibrations or dynamic loads.

The exceptional securing performances of Twin-Lock washers are guaranteed by the following technical features:

- The unique cam angle α of the washer is larger than the pitch angle β of the screw thread.
- The coefficient of friction of the outside knurled surface of the washer is much higher than the coefficient of friction of the cam surface.
- The hardness of Twin-Lock washers is higher than the strength of all classes of bolt/nut (8.8, 10.9 and 12.9).
- This unique cam system uses tension to create high force in a fastened joint that is subjected to vibrations.

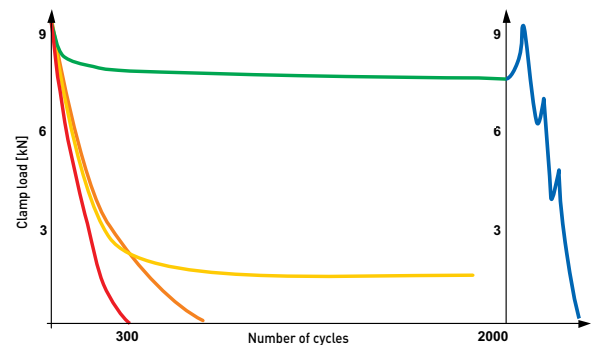
The independent German Institute *Materialprüfungsamt Nordrhein-Westfalen* (MPA NRW) carried out a vibration test with the Twin-Lock washers according to the Standard DIN 65151 (Junker Test) and certified that it is in conformity with the requirements of the Standard DIN 25201:2010 Part 4, Enclosure B (certificate n. 11 0042 11 11-01).

The test showed that the Twin-Lock washers safely lock screws/bolt connections: the clamp force stays almost constant after 2000 cycles and just a minimal amount of tension dissipates at the beginning of the test due to the normal settlement of the fastened joint.

To develop the optimal results of the Twin-Lock washers, the Junker Test Machine was used, in accordance with DIN 65151 Standard, to verify the performance of our washers in the presence of vibrations. After exhaustive testing with the Junker Test Machine, Twin-Lock succeeded in engineering a top performing product in the presence of vibration and dynamic load.

The following diagram shows the optimal security performances of Twin-Lock washers in the presence of vibrations. The blue diagram clarifies that it is necessary to increase the clamping force in order to tighten the bolt after 2000 vibration cycles (click effect).

Vibration test with Twin-Lock washers (Junker Test)



Key

- Bolt M8 with Twin-Lock washers at 70% of yield point
- Bolt M8 without washer
- Bolt M8 with split lock washer
- Bolt M8 nylon-inserted nut
- Behavior of clamping force during the untightening of the bolt (click effect)

► Advantages

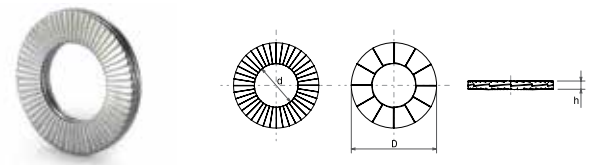
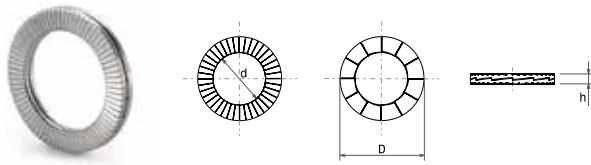
Thanks to its own know-how and the lab tests carried out, Twin-Lock washers can ensure the following main advantages:

- Best locking performance in the presence of vibrations and dynamic loads
- The system works independently from the type of lubrication used and guarantees a secure locking in dry as well as in lubricated conditions. The use of a high quality lubricant in order to maximize the performance of this fastening system is recommended
- Reusable - depending on application and environment
- Locking of fixing elements with high as well as low pre-load
- Can be used with any kind of bolt/nut of any class of resistance (up to 12.9)
- No retightening required
- Assembly-friendly system as the pieces are delivered pre-glued (cams face against cams face)

DIMENSIONS and PACKAGING

The Twin-Lock securing system is available in two versions:

- Standard external diameter (normal series) suitable also for counter-sunk bolts
- Enlarged external diameter (large series) suitable for varnished surfaces and soft materials. These washers are preferably to be applied with flanged bolts/screws.



TWIN-LOCK WASHERS IN CARBON STEEL

Washer's dimension	Bolt size	Inside diameter min.-max.	Outside diameter min.-max.	Height of the pair min.-max.	Weight per 1000 pairs [kg]	Packaging unit [N° of pairs per box]
6.5x10.8	M 6	6.40-6.60	10.60-11.00	1.55-2.05	0.70	200
6.5x13.5		6.40-6.60	13.30-13.70	2.25-2.75	2.00	200
7.2x11.5	1/4"	7.10-7.30	11.30-11.70	1.55-2.05	0.80	200
7.2x13.5		7.10-7.30	13.30-13.70	2.25-2.75	1.80	200
8.7x13.5	M 8 5/16"	8.60-8.80	13.30-13.70	2.25-2.75	1.50	200
8.7x16.6		8.60-8.80	16.40-16.80	2.25-2.75	2.90	200
10.3x16.6	3/8"	10.20-10.40	16.40-16.80	2.25-2.75	2.30	200
10.3x21.0		10.20-10.40	20.80-21.20	2.25-2.75	4.70	200
10.7x16.6	M 10	10.50-10.90	16.40-16.80	2.25-2.75	2.30	200
10.7x21.0		10.50-10.90	20.80-21.20	2.25-2.75	4.65	200
11.4x18.5	M 11 7/16"	11.20-11.60	18.30-18.70	2.25-2.75	2.90	200
13.0x19.5	M 12	12.80-13.20	19.30-19.70	2.25-2.75	2.90	200
13.0x25.4		12.80-13.20	25.20-25.60	3.15-3.65	9.10	100
13.5x19.5	1/2"	13.30-13.70	19.30-19.70	2.25-2.75	2.70	200
13.5x25.4		13.30-13.70	25.20-25.60	3.15-3.65	9.00	100
15.2x23.0	M 14 9/16"	15.00-15.40	22.80-23.20	3.15-3.65	6.20	100
15.2x30.7		15.00-15.40	30.50-30.90	3.15-3.65	14.00	100
17.0x25.4	M 16 5/8"	16.80-17.20	25.20-25.60	3.15-3.65	6.60	100
17.0x30.7		16.80-17.20	30.50-30.90	3.15-3.65	12.70	100
19.5x29.0	M 18	19.30-19.70	28.80-29.20	3.15-3.65	8.50	100
19.5x34.5		19.30-19.70	34.30-34.70	3.15-3.65	15.50	100
20.0x30.7	3/4"	19.80-20.20	30.50-30.90	3.15-3.65	10.20	100
20.0x39.0		19.80-20.20	38.80-39.20	3.15-3.65	22.00	100
21.4x30.7	M 20	21.20-21.60	30.50-30.90	3.15-3.65	9.30	100
21.4x39.0		21.20-21.60	38.80-39.20	3.15-3.65	20.40	100

Dimensions in mm

TWIN-LOCK WASHERS IN STAINLESS STEEL AISI 316L

Washer's dimension	Bolt size	Inside diameter min.-max.	Outside diameter min.-max.	Height of the pair min.-max.	Weight per 1000 pairs [kg]	Packaging unit [N° of pairs per box]
6.5x10.8	M 6	6.40-6.60	10.60-11.00	1.75-2.25	0.90	200
6.5x13.5		6.40-6.60	13.30-13.70	1.75-2.25	1.65	200
7.2x11.5	1/4"	7.10-7.30	11.30-11.70	1.75-2.25	0.95	200
7.2x13.5		7.10-7.30	13.30-13.70	1.75-2.25	1.55	200
8.7x13.5	M 8 5/16"	8.60-8.80	13.30-13.70	1.75-2.25	1.25	200
8.7x16.6		8.60-8.80	16.40-16.80	1.75-2.25	2.35	200
10.3x16.6	3/8"	10.20-10.40	16.40-16.80	1.75-2.25	1.95	200
10.3x21.0		10.20-10.40	20.80-21.20	1.75-2.25	3.95	200
10.7x16.6	M 10	10.50-10.90	16.40-16.80	1.75-2.25	1.90	200
10.7x21.0		10.50-10.90	20.80-21.20	1.75-2.25	3.85	200
11.4x18.5	M 11 7/16"	11.20-11.60	18.30-18.70	1.75-2.25	2.60	200
13.0x19.5	M 12	12.80-13.20	19.30-19.70	1.75-2.25	2.50	200
13.0x25.4		12.80-13.20	25.20-25.60	2.75-3.25	8.70	100
13.5x19.5	1/2"	13.30-13.70	19.30-19.70	1.75-2.25	2.35	200
13.5x25.4		13.30-13.70	25.20-25.60	2.75-3.25	8.40	100
15.2x23.0	M 14 9/16"	15.00-15.40	22.80-23.20	2.75-3.25	5.20	100
15.2x30.7		15.00-15.40	30.50-30.90	2.75-3.25	13.30	100
17.0x25.4	M 16 5/8"	16.80-17.20	25.20-25.60	2.75-3.25	6.30	100
17.0x30.7		16.80-17.20	30.50-30.90	2.75-3.25	11.90	100
19.5x29.0	M 18	19.30-19.70	28.80-29.20	2.75-3.25	8.30	100
19.5x34.5		19.30-19.70	34.30-34.70	2.75-3.25	15.30	100
20.0x30.7	3/4"	19.80-20.20	30.50-30.90	2.75-3.25	9.60	100
20.0x39.0		19.80-20.20	38.80-39.20	2.75-3.25	21.00	100
21.4x30.7	M 20	21.20-21.60	30.50-30.90	2.75-3.25	8.55	100
21.4x39.0		21.20-21.60	38.80-39.20	2.75-3.25	20.50	100

Dimensions in mm

ASSEMBLY GUIDE

► Positioning

tapped holes



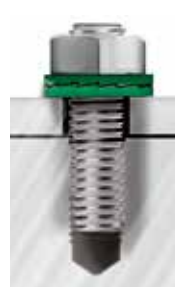
counter bores



through holes



stud bolts



Positioning with large/slotted holes and soft underlying surfaces (rubber, varnished surfaces, etc...)

For these applications it is recommended to assemble washers with an enlarged external diameter combined with screws or nuts with flanged head in order to reduce the unit load on the underlying surface.



TWIN-LOCK WASHERS GUIDELINE

Twin-Lock in CARBON STEEL

Twin-Lock in STAINLESS STEEL

Type of material	Carbon Steel	EN 10088
Material number	—	1.4404 (AISI 316L)X2CrNiMo17-12-2
Environment of application	General applications in non aggressive environments and with low temperature.	For aggressive environment, non acid/chloride environments No acid chlorine, fluoride, sulphuric.
Material standard treatment	Quenched and tempered	Surfaced hardened (Kolsterising®)
Hardness of the washer*	465 - 550 HV 10	≥ 550 HV 0.05
Standard surface treatment	Delta Protekt® Base coat KL100 Top coat VH301	None
Corrosion resistance	Corrosion resistance min. 600 hours red rust (ISO 9227)	PREN 27**
Bolt grades	Up to 12.9	Up to A4-80
Temperature range***	From -20°C to 200°C	From -150°C to 500°C
Available dimensions	From M6 up to M20 From 1/4" up to 3/4"	From M6 up to M20 From 1/4" up to 3/4"
Available washers	Standard external diameter From M6 up to M20 From 1/4" up to 3/4"	Standard external diameter From M6 up to M20 From 1/4" up to 3/4"
	Enlarged external diameter From M6 up to M20 From 1/4" up to 3/4"	Enlarged external diameter From M6 up to M20 From 1/4" up to 3/4"

- * The hardness of the underlying surfaces must be lower than the hardness of the Twin-Lock washers to guarantee their mechanical locking function (see table above).
- ** PREN (Pitting Resistance Equivalent Number) = %Cr + 3,3x%Mo + 16x%N. The figures indicated in the table refer to the base material.
- *** Temperatures shown in the table are just recommendations. The locking function is not affected within the specification stated.

MATERIALS and SURFACE TREATMENTS

The Twin-Lock securing system is available in different materials and surface treatments; all in compliance with the regulations of RoHs/ELV and Reach.

► Materials

- Carbon steel, hardness 465-550 HV 10 after hardening and tempering
- Stainless Steel AISI 316L according to EN 10088-1.4404, surface hardness ≥ 550 HV 0.05 after surface hardening (Kolsterising®)

► Surface Treatments

- Delta Protekt® KL100 + VH301 Cr6 free, red corrosion resistance min. 600 hours (salt spray corrosion test according to ISO 9227)



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