

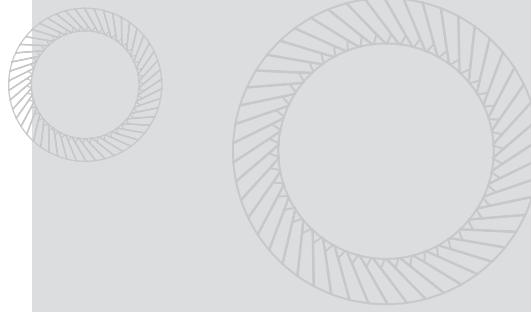
References

Original SCHNORR® safety washers.

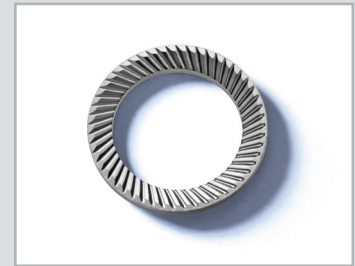
The original SCHNORR® safety washers were developed as a reliable and economic bolt locking device with the basic principle of a disc spring. This ingenious form combines the advantage of security through friction and mechanical locking.

Original SCHNORR® safety washers are now used world wide where secure fastening connections to counter the effect of vibration are required.

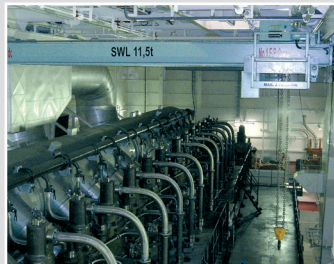
Applications are manifold, from automotive engineering to machine, aggregate and plant engineering. SCHNORR® safety washers are used, for example, in mowing machines, textile machines, machine tools and a lot of other applications..



Mowing machine



Safety washer



Heavy-duty crane



Safety washer



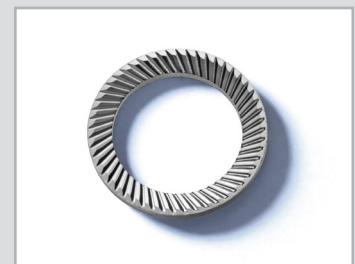
Motorbike



Safety washer



Photovoltaics



Safety washer

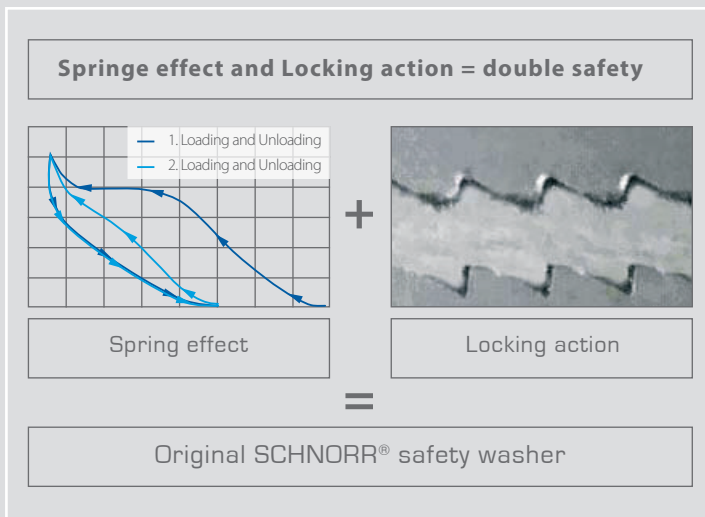
The original SCHNORR® safety washers are in the form of a disc spring but with a trapezoidal cross-section and serrations on both sides. The outer diameter is matched to the head diameter of the pan head and socket head cap screws.

SCHNORR® safety washers are available in two versions:

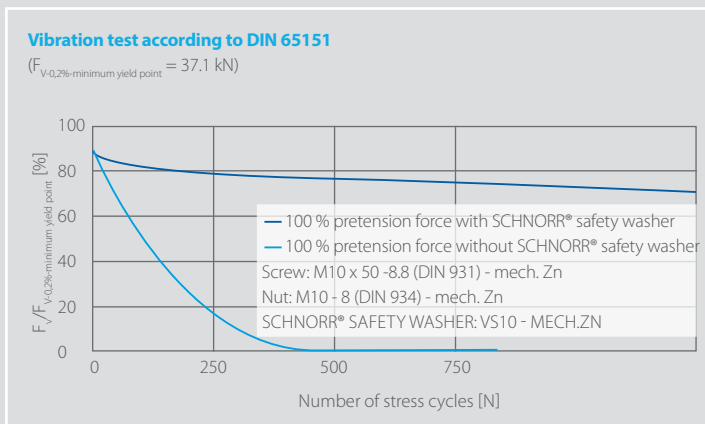
The standard safety washer type “S” is available for screws of sizes M1.6 to M36 and of the property classes up to 8.8.

For screws of property classes 8.8 and 10.9, higher pretension forces might be necessary. These are covered by our reinforced washers type “VS”.

Due to the conical form, optimal traction is achieved at highest positive locking due to the helical gearing.



Vibration test according to DIN 65151



Extensive test series carried out at independent public material research laboratories prove that the original SCHNORR® safety washer brings about a clear improvement of the safety properties

Conclusions

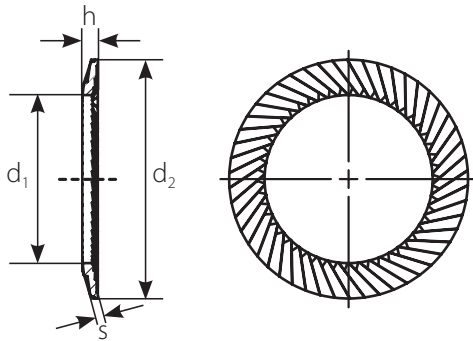
- Connections secured using a SCHNORR® safety washer maintains the pretension force also after 1,500 cycles.
- An unsecured screw connection has lost its pretension already after less than 500 cycles.

Die original SCHNORR® safety washer

Offer the following advantages:

- ① High resistance to vibration due to positive locking of the serrations..
- ② Concentrical force transmission and uniform axial load eliminate bending torques and deformation of the bolt stem..
- ③ The design of the serrations prevents friction and damage to components when tightening.
- ④ Extremely high safety against loss of pretension force and loosening.
- ⑤ Wide variety for materials and different finishes.
- ⑥ The closed ring form results in high degree of pretensioning, while avoiding burst-open effect.
- ⑦ Development and design of the washers take place on the basis of the screw geometrics, tightening torque as well as the constructive circumstances..





Sketch of an original SCHNORR® safety washer type „S“:

Size 8 made of spring steel = safety washer S 8 FSt.

Original SCHNORR® safety washer type „S“

The Original SCHNORR® safety washer „S“ is suitable for normal requirements and available for bolt sizes from M 1.6 to M 36 in grades up to 8.8. Please enquire should you require an item with different dimensions, material or surface treatment.

Explanations on the table:

Article-no.:	applies to the normal version made of spring steel, hardened, blackened; mechanically plate
h max.:	maximum dimension as delivered
h min.:	minimum dimension after load test
Available material gra.:	spring steel acc. to DIN EN 10132-4; corrosion-resistant steel 1.4301; Phosphorus Bronze CuSn8; nickel cobalt alloy; creep-resistant steel 1.4122; Inconel
Surface treatments:	blackened (standard), bronzed, phosphated, zinc-coated, zinc lamellar coatings

Original SCHNORR safety washers type „S“, material 1.1211 (C60S)

Article-number/ Order reference	Finish	Size		Ordering dimensions							Packaging		
		NM [mm]	[Inch]	d ₁ [mm]	d ₂ [mm]	s [mm]	d ₁ [inch]	d ₂ [inch]	s [inch]	h _{min.} [mm]	h _{max.} [mm]	Unit [pcs.]	Weight per 1000 pieces [lbs.]
402300 450000	blackened Gal.Zn8 + passivation	1.6		1.7	3.2	0.35	0.067	0.126	0.014	0.016	0.024	2000	0.029
404400 450100	blackened Gal.Zn8 + passivation	2		2.2	4	0.35	0.087	0.157	0.014	0.016	0.024	2000	0.046
406800 450200	blackened Gal.Zn8 + passivation	2.5		2.7	4.8	0.45	0.106	0.189	0.018	0.020	0.035	2000	0.086
409400 450300	blackened Gal.Zn8 + passivation	3	1/8"	3.2	5.5	0.45	0.126	0.217	0.018	0.020	0.035	2000	0.108
411200 450400	blackened Gal.Zn8 + passivation	3.5		3.7	6	0.5	0.146	0.236	0.020	0.022	0.035	2000	0.121
412700 450500	blackened Zn8M + passivation	4	5/32"	4.3	7	0.5	0.169	0.276	0.020	0.022	0.039	1000	0.187
414500 450600	blackened Zn8M + passivation	5	3/16"	5.3	9	0.6	0.209	0.354	0.024	0.024	0.043	1000	0.368
416300 450700	blackened Zn8M + passivation	6		6.4	10	0.6	0.252	0.394	0.024	0.028	0.047	1000	0.441
418100 450800	blackened Zn8M + passivation	6.35	1/4"	6.7	9.5	0.6	0.264	0.374	0.024	0.026	0.047	1000	0.331
419200 450900	blackened Zn8M + passivation	7		7.4	12	0.7	0.291	0.472	0.028	0.031	0.051	1000	0.783
420400 451000	blackened Zn8M + passivation	8	5/16"	8.4	13	0.7	0.331	0.512	0.028	0.035	0.055	1000	0.864
423000 451100	blackened Zn8M + passivation	10	3/8"	10.5	16	0.9	0.413	0.630	0.035	0.043	0.063	1000	1.653
425100 451200	blackened Zn8M + passivation	11.1	7/16"	11.6	15.9	0.9	0.457	0.626	0.035	0.041	0.063	500	1.312
426200 451300	blackened Zn8M + passivation	12		13	18	1	0.512	0.709	0.039	0.045	0.067	500	1.938
427900 451400	blackened Zn8M + passivation	12.7	1/2"	13.7	19	1	0.539	0.748	0.039	0.049	0.071	500	2.152
429100 451500	blackened Zn8M + passivation	14		15	22	1.1	0.591	0.866	0.043	0.053	0.079	500	3.618

Original SCHNORR safety washers type „S“, material 1.1211 (C60S)

Article-number/ Order reference	Finish	Size		Ordering dimensions							Packaging		
		NM [mm]	[Inch]	d ₁ [mm]	d ₂ [mm]	s [mm]	d ₁ [inch]	d ₂ [inch]	s [inch]	h _{min.} [mm]	h _{max.} [mm]	Unit [pcs.]	Weight per 1000 pieces [lbs.]
430700 451600	blackened Gal.Zn8 + passivation	16	5/8"	17	24	1.2	0.669	0.945	0.047	0.061	0.083	500	4.374
432400 451700	blackened Gal.Zn8 + passivation	18		19	27	1.4	0.748	1.063	0.055	0.069	0.091	250	6.548
433800 451800	blackened Gal.Zn8 + passivation	19	3/4"	20	30	1.4	0.787	1.181	0.055	0.075	0.098	250	9.039
435100 451900	blackened Gal.Zn8 + passivation	20		21	30	1.4	0.827	1.181	0.055	0.073	0.098	250	8.250
436600 452000	blackened Gal.Zn8 + passivation	22	7/8"	23	33	1.4	0.906	1.299	0.055	0.077	0.106	100	9.936
437900 452100	blackened Zn8M + passivation	24		25.6	36	1.6	1.008	1.417	0.063	0.085	0.114	100	13.029
439200 452200	blackened Zn8M + passivation	25.4	1"	27	38	1.8	1.063	1.496	0.071	0.093	0.122	100	16.422
440300 452300	blackened Zn8M + passivation	27		28.6	39	1.8	1.126	1.535	0.071	0.093	0.122	100	16.246
441500 452400	blackened Zn8M + passivation	30	1 1/8"	31.6	45	1.8	1.244	1.772	0.071	0.102	0.142	100	23.766
442730 452500	blackened Zn8M + passivation	36	1 3/8"	38	54	2.5	1.496	2.126	0.098	0.126	0.165	50	46.914

We would be glad to offer you safety washers type "S" with different size finish on request.

Our surfaces are Cr 6-free and comply with the EU "Old Car" (2000/53/EG) RoHS-(2002/95/CE) Directive as well as the WEEE Directive (2002/96/EC)

Original SCHNORR® safety washers type „S“, material 1.4301 (X5CrNi18.10)

Article-number/ Order reference	Size		Ordering dimensions							Packaging		
	NM [mm]	[Inch]	d ₁ [mm]	d ₂ [mm]	s [mm]	d ₁ [inch]	d ₂ [inch]	s [inch]	h _{min.} [mm]	h _{max.} [mm]	Unit [pcs.]	Weight per 1000 pieces [lbs.]
403221	1.6		1.7	3.2	0.5	0.067	0.126	0.020	0.022	0.030	1000	0.042
405420	2		2.2	4	0.5	0.087	0.157	0.020	0.022	0.030	2000	0.064
407660	2.5		2.7	4.8	0.5	0.106	0.189	0.020	0.022	0.037	2000	0.093
410750	3	1/8"	3.2	5.5	0.5	0.126	0.217	0.020	0.022	0.037	2000	0.093
412500	3.5		3.7	6	0.7	0.146	0.236	0.028	0.030	0.045	2000	0.185
414200	4	5/32"	4.3	7	0.7	0.169	0.276	0.028	0.030	0.047	1000	0.179
416100	5	3/16"	5.3	9	0.7	0.209	0.354	0.028	0.030	0.047	1000	0.461
417900	6		6.4	10	0.7	0.252	0.394	0.028	0.030	0.047	1000	0.425
418104	6.35	1/4"	6.7	9.5	0.7	0.264	0.374	0.028	0.030	0.047	1000	0.379
422700	8	5/16"	8.4	13	1	0.331	0.512	0.039	0.047	0.063	1000	1.228
424900	10	3/8"	10.5	16	1	0.413	0.630	0.039	0.043	0.063	1000	1.612
425110	11.1	7/16"	11.6	15.9	1.3	0.457	0.626	0.051	0.051	0.073	1000	1.819
427600	12		13	18	1.3	0.512	0.709	0.051	0.051	0.073	500	2.423
428950	12.7	1/2"	13.7	19	1.3	0.539	0.748	0.051	0.055	0.077	500	2.694
430500	14		15	22	1.5	0.591	0.866	0.059	0.065	0.091	500	4.947
432200	16	5/8"	17	24	1.5	0.669	0.945	0.059	0.069	0.091	500	5.483
433650	18		19	27	1.8	0.748	1.063	0.071	0.081	0.102	250	8.472
433821	19	3/4"	20	30	1.8	0.787	1.181	0.071	0.087	0.102	250	11.671
436400	20		21	30	1.8	0.827	1.181	0.071	0.085	0.110	250	8.649
437810	22	7/8"	23	33	1.8	0.906	1.299	0.071	0.091	0.118	100	12.992
439091	24		25.6	36	2	1.008	1.417	0.079	0.093	0.122	100	16.552
439170	25.4	1"	27	38	2.5	1.063	1.496	0.098	0.112	0.142	100	23.166
441410	27		28.6	39	2.5	1.126	1.535	0.098	0.112	0.142	100	22.708
442711	30	1 1/8"	31.6	45	2.5	1.244	1.772	0.098	0.122	0.161	100	33.477
442790	36	1 3/8"	38	54	3	1.496	2.126	0.118	0.146	0.185	50	57.801