Self-Locking Washer

SCHRAUBOOST®

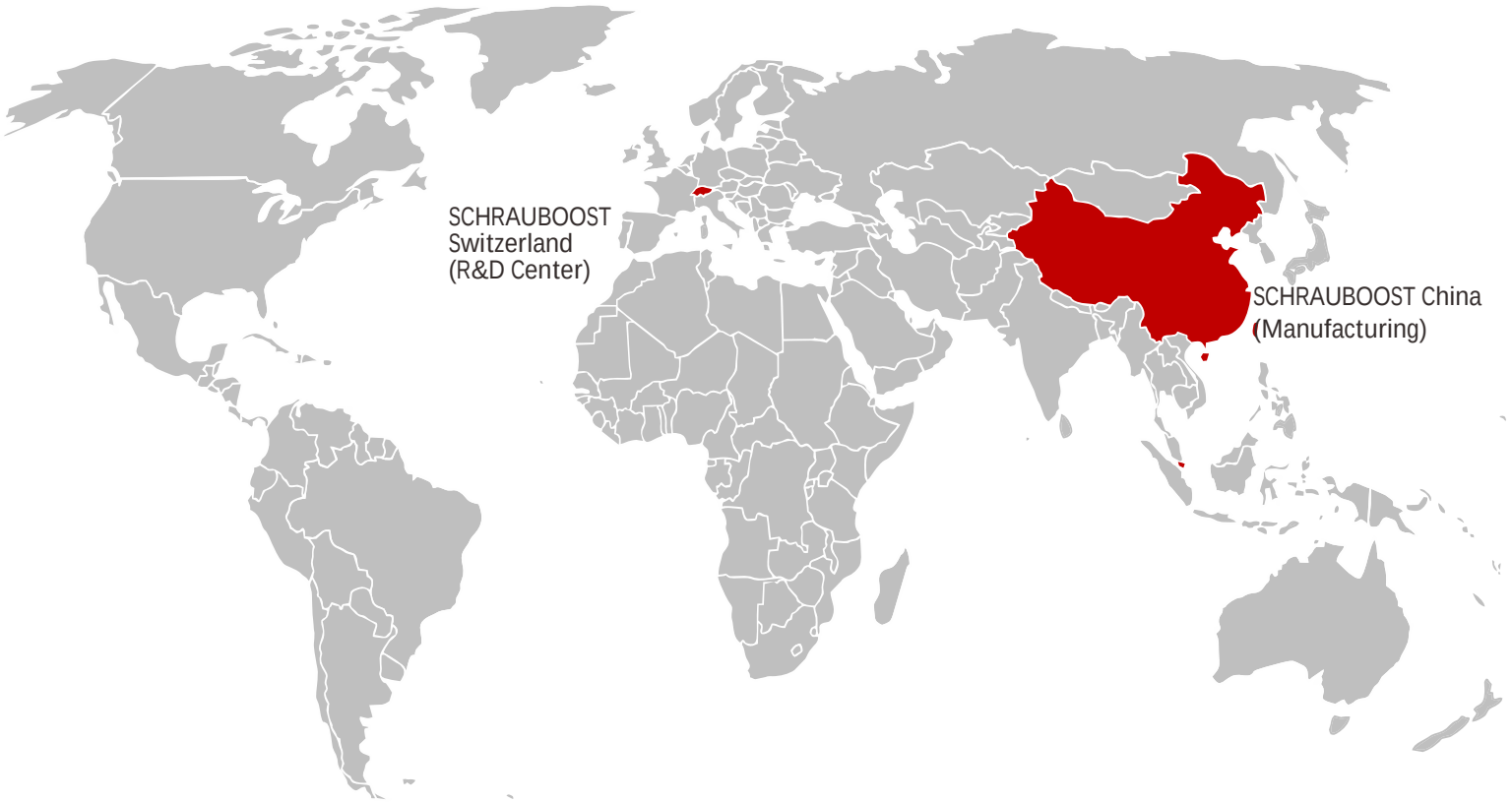
Designed in Europe

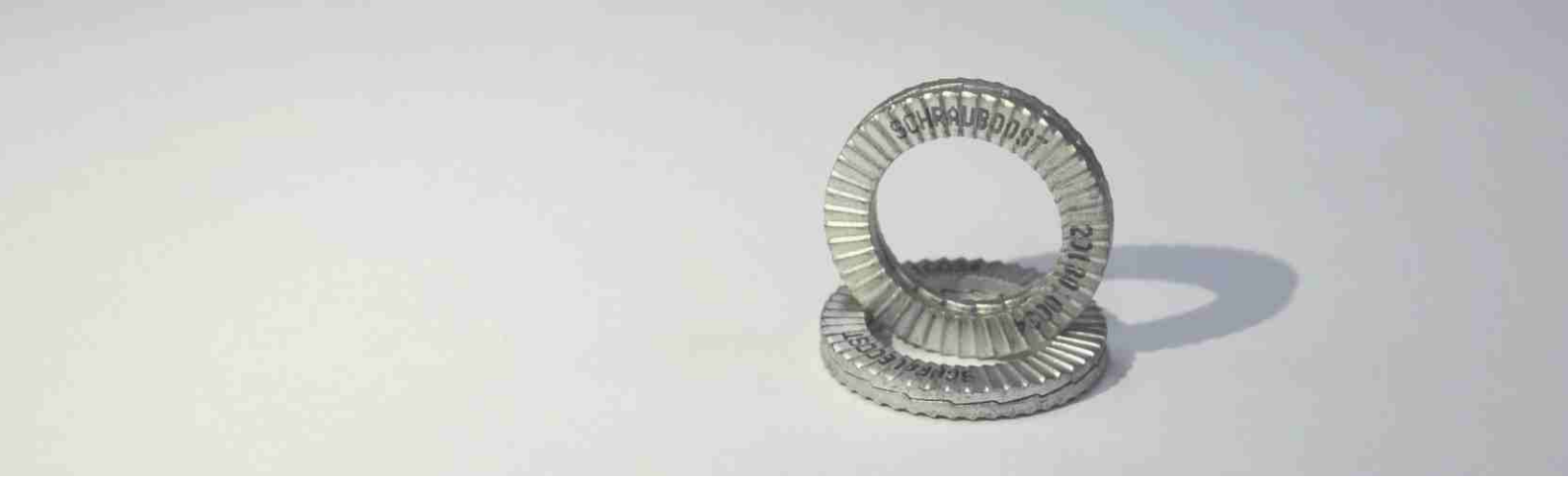
Self-Locking Washer

COMPANY INTRODUCTION

Our team is made up of talents who can make your bolting system reliable and secure, from experienced design and service engineers in bolting analysis and field support, to sales managers who understand the complexity in the bolting market. Our mission is to provide our clients with a reliable and secure bolting system based on Multi Jackbolt Pretensioner technology.

SCHRAUBOOST® has a global presence. From the first enquiry, our team of engineers would analyse and optimise your bolting system, and propose the most cost effective solution to meet your needs.





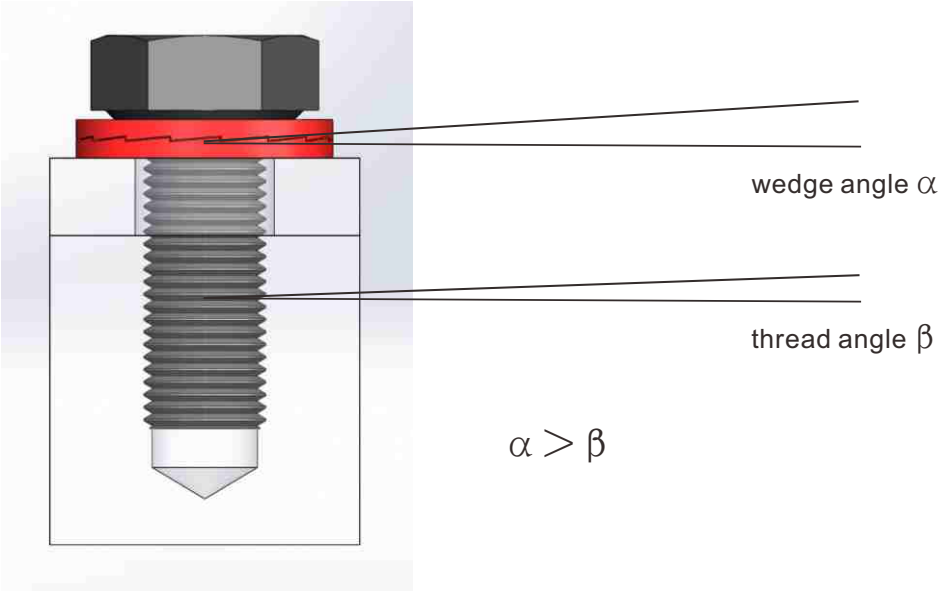
SCHRAUBOOST®

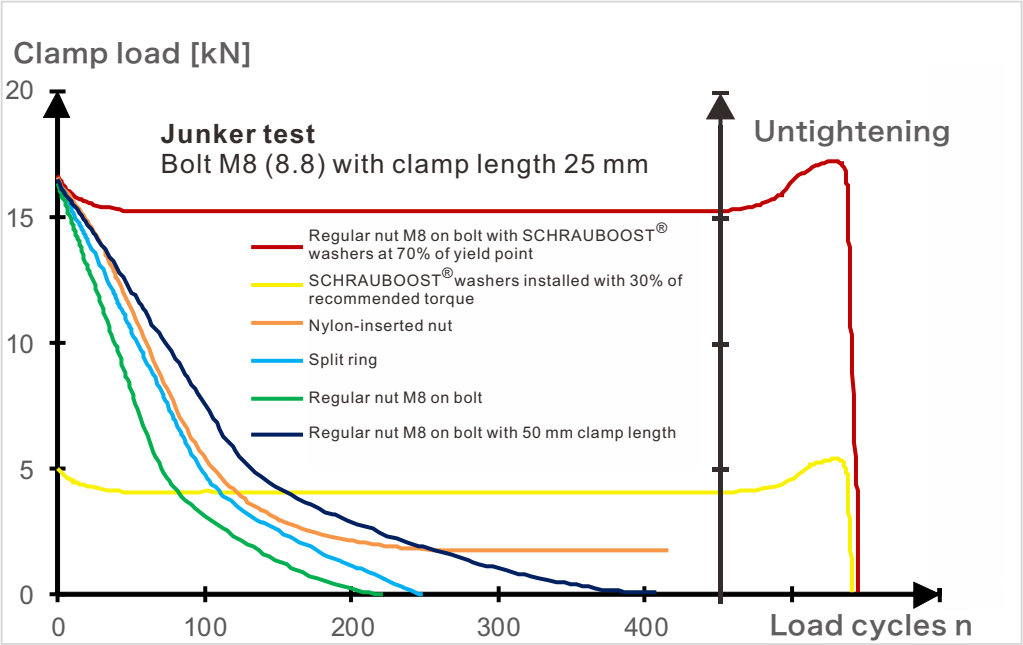
Self-Locking Washer

A revolution in bolting solution

SCHRAUBOOST® Self-Locking Washer satisfies DIN 25201 and can be used in all industrial applications. It consists of two washers with teeth on one side and wedges on the other. When the washers are put together, the wedges interlock and prevent loosening, creating a safe connection for your toughest application.

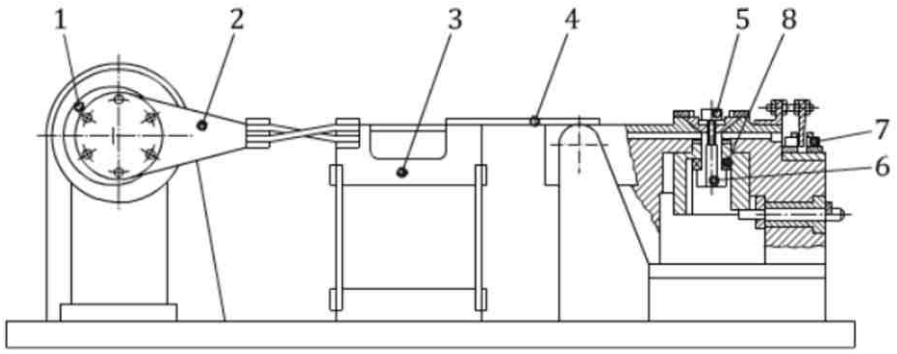
Traditional methods relies on friction to prevent bolted connections from loosening. SCHRAUBOOST® Self-Locking Washer, however, uses tension to achieve its superior anti-loosening performance. As shown in the diagram below, wedge angle, α, is always bigger than thread angle, β. As the bolt tends to turn loose, upper washer moves together while bottom washer remain stationary. This creates an increasing tension, and prevents the connection from loosening. This is useful in preventing bolt loosening, especially under dynamic load or vibration, bringing absolute security to your connections.





The aviation industry pioneered strict bolting requirement and brought new light to bolt security. Two test standards, DIN 65151 and ISO 16130 from Germany and Europe respectively, are created to address anti-loosening capability in bolting connections. These are the harshest vibration test for bolting connections. As shown in set up below, metal plate under the bolt head vibrates horizontally to simulate vibration. At the same time, tension in the bolt is being measured in real-time. Anti-loosening capability is being shown by the loss of bolt tension, greater the loss, less effective is the anti-loosening capability.

As shown in the graph above, SCHRAUBOOST® Self-Locking Washer stands out in anti-loosening capability. After 400 cycles of vibration, other methods show drastic or complete loss of tension, while SCHRAUBOOST® Washer only lost a small amount of tension. During untightening, tension spiked initially, before it dropped to zero. This spike shows the effective locking can only be overcome with the help of an external force (untightening). Vibration would not be able to overcome this, thus, preventing loose. As shown in the yellow line, tension as low as 30% is enough to create the locking mechanism in SCHRAUBOOST® Self-Locking Washer.

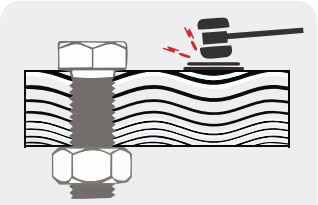


Example of a vibration testing machine

1. infinitely adjustable eccentric
2. connecting rod
3. transverse force sensor
4. connecting plate
5. fastener test assembly
6. clamped part
7. displacement sensor
8. clamp force sensor

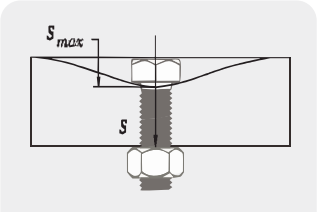
Factors leading to bolt loosening

Friction is an important factor in a bolted connection. Friction acts on all contacting surfaces and ultimately affects tightening torque and bolt tension. Two elements could affect friction: dynamic load and material deformation.



Dynamic load

Dynamic load, especially transverse load, that causes changes in friction that could ultimately lead to bolt loosening, is the most common cause of bolt loosening. During impact, vibration or other dynamic loads, friction reduces and would initiate untightening, ultimately leads to total bolt failure.



Material deformation

Since initial tightening mostly creates stress exceeds material strength, material get squashed permanently. This reduces bolt tension that leads to bolt loosening. The problem is more prevalent in elevated temperatures. Other scenarios like painted surfaces are also susceptible to permanent deformation. Dimensions as little as a few microns could lead to drastic reduction in bolt tension.

SCHRAUBOOST® Advantage

SCHRAUBOOST® Self-Locking Washer advantages:

Convenience in installation and disassembly

No special tools, connection can be secured and disassembled by just using normal torque wrench. Self-Locking Washer and be used with up to 12.9 grade bolts. To reduce cost, they can be reuse and torque check is no longer relevant.

Reliability

With superior anti-loosening capability, bolt connections are able to maintain high tension throughout the equipment life, greatly improving system reliability.

Safety

Higher material strength makes it possible to withstand higher load and prevent pre-mature failure. Even under long term high load, bolt connection remain secured.

High preload accuracy

By encouraging the use of lubricant, you can achieve unprecedented accuracy in all connections, critical in making sure no pre-mature failure.

APPLICATION

Automobile
heavy duty truck, production & assembly line

Metal Works
coupling bolts, anchor bolts, tie rods, housing closures, forging presses

Aviation
cryogenic, extreme gravity and weightless environments

Rail Transportation
braking systems, shaft connections, railway switchs

Energy & Generation
nuclear, wind, hydro, thermal and renewables

Oil & Gas
reciprocating compressors, heat exchangers

Mining Machinery
excavators, dump trucks, cranes, TBM

Marine & Shipbuilding
surface and subsurface propellers, engine shafts, offshore platforms

Parameter	Steel Washer	Stainless Steel Washer	254 SMO® Washer	INCONEL® / HASTELLOY® C-276 Washer	INCONEL® 718 Washer
Material	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
Application	General steel applications	General stainless steel applications. Non chlorine / acid environments	General chloride & salt water applications, for pumps, 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
Thread Size	M3–M130 Dimensions: Page 7	M3–M80 Dimensions: Page 9	M3–M39 Dimensions: Page 10	M3–M39 Dimensions: Bespoke	M3–M39 Dimensions: Bespoke
Types	Standard OD (SD3–SD130) Enlarge OD (SD3.5sp–SD36sp)	Standard OD (SD3ss–SD80ss) Enlarge OD (SD3.5spss–SD30spss)	Standard OD (SD3ss254–SD39ss254) Enlarge OD (SD3.5spss254–SD27spss254)	Standard OD (SD3ss276–SD39ss276) Enlarge OD (SD3.5spss276–SD27spss276)	Standard OD (SD3ss718–SD39ss718) Enlarge OD (SD3.5spss718–SD27spss718)
Heat treatment / Coating	Through Hardened Dacromet	Surface Hardened	Surface Hardened	Surface Hardened	Surface Hardened
Hardness*	⩾465HV1	⩾520HV0.05	⩾600HV0.05	⩾520HV0.05	⩾620HV0.05
Corrosion resistance	Meets ISO 09227, min.600 hours in salt spray test	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***	-50℃ – 200℃	-160℃ – 500℃	-160℃ – 500℃	-160℃ – 500℃	-160℃ – 700℃

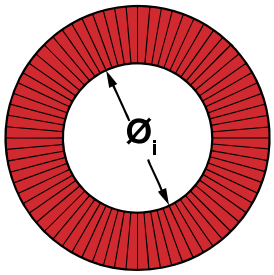
* to ensure the superior mechanical locking of SCHRAUBOOST Self-Locking Washer, clamped surfaces must be softer than the washer (see table above).

** PREN (Pitting Resistance Equivalent Number) = %Cr + 3.3x%Mo + 16x%N. A higher PREN indicates better corrosion resistance.

*** Temperature recommended by raw material supplier. Locking function not affected if used within specification.

SCHRAUBOOST® DIN 25201 Steel Self-Locking Washer

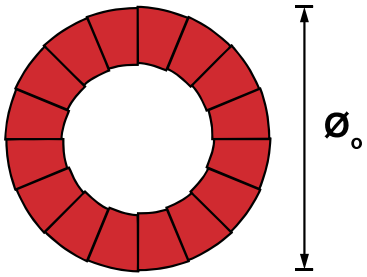
EN 1.7182 or equivalent, DACROMET coated, through hardened



SD3–SD8: $\varnothing_i \pm 0.1$ mm

SD10–SD42: $\varnothing_i \pm 0.2$ mm

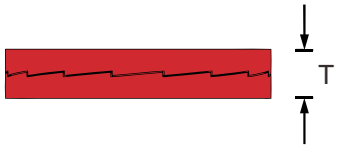
SD45–SD130: $\varnothing_i +0.5/-0.0$ mm



SD3–SD24: $\varnothing_o \pm 0.2$ mm

SD27–SD42: $\varnothing_o \pm 0.3$ mm

SD45–SD130: $\varnothing_o +0.0/-2.0$ mm



SD3–SD42: T ±0.25 mm

SD45–SD130: T ±0.75 mm

Washers Size	Bolt Size		Inside Diameter $\varnothing_i$	Outside Diameter $\varnothing_o$	Thickness T	Quantity/Box	Approx. Weight
	Meric	Imperial	[mm]	[mm]	[mm]	Pair	kg / 100 Pair
SD3	M3	#5	3.4	7.0	1.8	200	0.03
SD3.5	M3.5	#6	3.9	7.6	1.8	200	0.04
SD3.5sp	M3.5	#6	3.9	9.0	1.8	200	0.06
SD4	M4	#8	4.4	7.6	1.8	200	0.04
SD4sp	M4	#8	4.4	9.0	1.8	200	0.06
SD5	M5	#10	5.4	9.0	1.8	200	0.05
SD5sp	M5	#10	5.4	10.8	1.8	200	0.11
SD6	M6		6.5	10.8	1.8	200	0.07
SD6sp	M6		6.5	13.5	2.5	200	0.20
SD1/4"		1/4"	7.2	11.5	1.8	200	0.08
SD1/4"sp		1/4"	7.2	13.5	2.5	200	0.18
SD8	M8	5/16"	8.7	13.5	2.5	200	0.15
SD8sp	M8	5/16"	8.7	16.6	2.5	200	0.28
SD3/8"		3/8"	10.3	16.6	2.5	200	0.23
SD3/8"sp		3/8"	10.3	21.0	2.5	200	0.48
SD10	M10		10.7	16.6	2.5	200	0.22
SD10sp	M10		10.7	21.0	2.5	200	0.47
SD11	M11	7/16"	11.4	18.5	2.5	200	0.29
SD12	M12		13.0	19.5	2.5	200	0.29
SD12sp	M12		13.0	25.4	3.4	100	0.93
SD1/2"		1/2"	13.5	19.5	2.5	200	0.27
SD1/2"sp		1/2"	13.5	25.4	3.4	100	0.90
SD14	M14	9/16"	15.2	23.0	3.4	100	0.56
SD14sp	M14	9/16"	15.2	30.7	3.4	100	1.41
SD16	M16	5/8"	17.0	25.4	3.4	100	0.69
SD16sp	M16	5/8"	17.0	30.7	3.4	100	1.29
SD18	M18		19.5	29.0	3.4	100	0.85
SD18sp	M18		19.5	34.5	3.4	100	1.58
SD3/4"		3/4"	20.0	30.7	3.4	100	1.05
SD3/4"sp		3/4"	20.0	39.0	3.4	100	2.20
SD20	M20		21.4	30.7	3.4	100	0.95
SD20sp	M20		21.4	39.0	3.4	100	2.03
SD22	M22	7/8"	23.4	34.5	3.4	100	1.29
SD22sp	M22	7/8"	23.4	42.0	4.6	50	3.31
SD24	M24		25.3	39.0	3.4	100	1.68
SD24sp	M24		25.3	48.5	4.6	50	4.51
SD1"		1"	27.9	39.0	3.4	100	1.53
SD1"sp		1"	27.9	48.5	4.6	50	4.20
SD27	M27		28.4	42.0	5.8	50	3.29
SD27sp	M27		28.4	48.5	5.8	25	5.39
SD30	M30	1 1/8"	31.4	47.0	5.8	50	4.20
SD30sp	M30	1 1/8"	31.4	58.5	6.6	25	8.96
SD33	M33	1 1/4"	34.4	48.5	5.8	25	3.97
SD33sp	M33	1 1/4"	34.4	58.5	6.6	25	8.31
SD36	M36	1 3/8"	37.4	55.0	5.8	25	5.59
SD36sp	M36	1 3/8"	37.4	63.0	6.6	25	9.15
SD39	M39	1 1/2"	40.4	58.5	5.8	25	6.28
SD42	M42		43.2	63.0	5.8	25	7.47
SD45	M45	1 3/4"	46.2	70.0	7.0	25	10.20
SD48	M48		49.6	75.0	7.0	25	12.00
SD52	M52	2"	53.6	80.0	7.0	25	13.00
SD56	M56	2 1/4"	59.1	85.0	7.0	10	13.50
SD60	M60		63.1	90.0	7.0	10	15.20
SD64	M64	2 1/2"	67.1	95.0	7.0	10	16.70
SD68	M68		71.1	100.0	9.5	1	28.19
SD72	M72		75.1	105.0	9.5	1	30.70
SD76	M76	3"	79.1	110.0	9.5	1	33.31
SD80	M80	3 1/8"	83.1	115.0	9.5	1	36.02
SD85	M85		88.1	120.0	9.5	1	37.84
SD90	M90		92.4	130.0	9.5	1	47.67
SD95	M95		97.4	135.0	9.5	1	49.81
SD100	M100	4"	103.4	145.0	9.5	1	58.91
SD105	M105		108.4	150.0	9.5	1	61.28
SD110	M110		113.4	155.0	9.5	1	63.65
SD115	M115		118.4	165.0	9.5	1	75.28
SD120	M120		123.4	170.0	9.5	1	77.94
SD125	M125		128.4	173.0	9.5	1	76.63
SD130	M130	5"	133.4	178.0	9.5	1	79.17

SCHRAUBOOST® DIN 25201 Steel Self-Locking Washer

EN 1.7182 or equivalent, DACROMET coated, through hardened

Reference Torque

Steel Washers & 4.8 Grade Bolts

			Oil, G_F =75% μ_{th}=0.15, μ_h =0.17		Cu/C Paste*, G_F=75% μ_{th}=0.13, μ_h =0.17		No Lube, G_F =75% μ_{th}=0.15, μ_h =0.18	
Washers Size	Bolt Size	Thread Pitch	Torque	Preload	Torque	Preload	Torque	Preload
		[mm]	[Nm]	[kN]	[Nm]	[kN]	[Nm]	[kN]
SD3	M3	0.5	0.7	1.2	0.8	1.2	0.7	1.0
SD4	M4	0.7	1.5	2.1	1.8	2.1	1.5	1.7
SD5	M5	0.8	3.0	3.4	3.6	3.4	3.0	2.8
SD6	M6	1.0	5.2	4.8	6.2	4.8	5.3	4.0
SD8	M8	1.25	12.5	8.8	15	8.8	12.6	7.3
SD10	M10	1.5	25	14	29	14	25	12
SD12	M12	1.75	42	20	48	20	43	17
SD14	M14	2.0	68	28	71	28	68	23
SD16	M16	2.0	103	38	120	38	104	31
SD18	M18	2.5	144	46	167	46	146	38
SD20	M20	2.5	201	59	213	59	204	49
SD22	M22	2.5	266	69	280	69	268	57
SD24	M24	3.0	346	85	366	85	351	70
SD27	M27	3.0	505	110	534	110	514	91
SD30	M30	3.5	690	135	729	135	700	111
SD33	M33	3.5	927	167	982	167	944	138
SD36	M36	4.0	1197	196	1267	196	1218	162
SD39	M39	4.0	1543	234	1635	234	1573	194
SD42	M42	4.5	1941	276	2058	276	1982	228

Steel Washers & 8.8 Grade Bolts

			Oil, G_F =75% μ_{th}=0.13, μ_h =0.16		Cu/C Paste*, G_F=75% μ_{th}=0.11, μ_h =0.16		No Lube, G_F =75% μ_{th}=0.15, μ_h =0.18	
Washers Size	Bolt Size	Thread Pitch	Torque	Preload	Torque	Preload	Torque	Preload
		[mm]	[Nm]	[kN]	[Nm]	[kN]	[Nm]	[kN]
SD3	M3	0.5	1.3	2.4	2.1	2.4	1.3	2.0
SD4	M4	0.7	3.1	4.2	4.4	4.2	3.1	3.5
SD5	M5	0.8	6.0	6.8	8.0	6.8	6.0	5.6
SD6	M6	1.0	10.5	9.7	13.2	9.7	10.5	8.0
SD8	M8	1.25	25	18	30	18	25	15
SD10	M10	1.5	49	28	49	28	50	23
SD12	M12	1.75	85	40	83	40	85	33
SD14	M14	2.0	135	55	131	55	136	46
SD16	M16	2.0	205	75	197	75	208	62
SD18	M18	2.5	288	92	275	92	291	76
SD20	M20	2.5	402	118	382	118	408	97
SD22	M22	2.5	548	146	517	146	557	120
SD24	M24	3.0	693	169	652	169	703	140
SD27	M27	3.0	1010	221	945	221	1028	182
SD30	M30	3.5	1379	269	1286	269	1401	222
SD33	M33	3.5	1855	333	1722	333	1889	275
SD36	M36	4.0	2394	392	2219	392	2436	324
SD39	M39	4.0	3087	468	2852	468	3145	387
SD42	M42	4.5	3820	538	3525	538	3890	445

Steel Washers & 10.9 Grade Bolts

			Oil, G_F =71% μ_{th}=0.13, μ_h =0.16		Cu/C Paste*, G_F=75% μ_{th}=0.11, μ_h =0.15	
Washers Size	Bolt Size	Thread Pitch	Torque	Preload	Torque	Preload
		[mm]	[Nm]	[kN]	[Nm]	[kN]
SD3	M3	0.5	1.8	3.2	3.5	3.4
SD4	M4	0.7	4.1	5.6	7.0	5.9
SD5	M5	0.8	8.1	9.1	12.5	9.6
SD6	M6	1.0	14.1	12.9	20.1	13.6
SD8	M8	1.25	34	23	44	25
SD10	M10	1.5	67	37	73	39
SD12	M12	1.75	115	57	121	57
SD14	M14	2.0	183	74	188	78
SD16	M16	2.0	279	100	281	106
SD18	M18	2.5	391	123	388	130
SD20	M20	2.5	547	156	534	165
SD22	M22	2.5	745	194	719	205
SD24	M24	3.0	942	225	902	238
SD27	M27	3.0	1375	294	1297	310
SD30	M30	3.5	1875	358	1755	378
SD33	M33	3.5	2526	443	2340	468
SD36	M36	4.0	3259	522	3003	551
SD39	M39	4.0	4203	624	3845	659
SD42	M42	4.5	5202	716	4740	757

Steel Washers & 12.9 Grade Bolts

			Oil, G_F =71% μ_{th}=0.14, μ_h =0.15		Cu/C Paste*, G_F=75% μ_{th}=0.11, μ_h =0.15	
Washers Size	Bolt Size	Thread Pitch	Torque	Preload	Torque	Preload
		[mm]	[Nm]	[kN]	[Nm]	[kN]
SD3	M3	0.5	2.0	3.9	3.8	4.1
SD4	M4	0.7	4.6	6.7	7.6	7.1
SD5	M5	0.8	9.1	10.9	13.6	11.5
SD6	M6	1.0	15.8	15.4	21.8	16.3
SD8	M8	1.25	38	28	47	30
SD10	M10	1.5	75	44	93	47
SD12	M12	1.75	128	65	151	68
SD14	M14	2.0	204	89	232	94
SD16	M16	2.0	311	120	342	127
SD18	M18	2.5	437	148	467	156
SD20	M20	2.5	610	188	638	198
SD22	M22	2.5	831	233	852	246
SD24	M24	3.0	1052	270	1064	286
SD27	M27	3.0	1533	352	1519	372
SD30	M30	3.5	2091	430	2042	454
SD33	M33	3.5	2815	532	2710	562
SD36	M36	4.0	3633	626	3463	662
SD39	M39	4.0	4683	748	4415	790
SD42	M42	4.5	5799	860	5429	908

Cu/C Paste* = Copper/Graphite (Molykote® 1000)

G_F = Percentage of yield strength

μ_{th} = Thread friction coefficient

μ_h = Under head friction coefficient

1 N = 0.225 lb

1 Nm = 0.738 ft lb

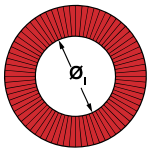
SCHRAUBOOST® DIN 25201 Stainless Steel Self-Locking Washers

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

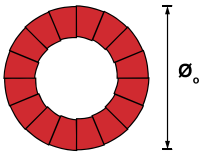
SCHRAUBOOST® Self-Locking Washer made of EN 1.4404 (ASIS 316L) are suitable for applications where no chlorides or acids are present.

Washers Size	Bolt Size		Inside Diameter $\varnothing_i$	Outside Diameter $\varnothing_o$	Thickness T	Quantity /Box	Approx. Weight
	Meric	Imperial	[mm]	[mm]	[mm]	Pair	kg/100 Pair
SD3ss	M3	#5	3.4	7.0	2.2	200	0.04
SD3.5ss	M3.5	#6	3.9	7.6	2.2	200	0.04
SD3.5spss	M3.5	#6	3.9	9.0	2.2	200	0.07
SD4ss	M4	#8	4.4	7.6	2.2	200	0.04
SD4spss	M4	#8	4.4	9.0	2.2	200	0.07
SD5ss	M5	#10	5.4	9.0	2.2	200	0.06
SD5spss	M5	#10	5.4	10.8	2.2	200	0.11
SD6ss	M6		6.5	10.8	2.2	200	0.09
SD6spss	M6		6.5	13.5	2.0	200	0.16
SD1/4"ss		1/4"	7.2	11.5	2.2	200	0.09
SD1/4"spss		1/4"	7.2	13.5	2.2	200	0.15
SD8ss	M8	5/16"	8.7	13.5	2.0	200	0.12
SD8spss	M8	5/16"	8.7	16.6	2.0	200	0.22
SD3/8"ss		3/8"	10.3	16.6	2.0	200	0.19
SD3/8"spss		3/8"	10.3	21.0	2.0	200	0.38
SD10ss	M10		10.7	16.6	2.0	200	0.18
SD10spss	M10		10.7	21.0	2.0	200	0.37
SD11ss	M11	7/16"	11.4	18.5	2.2	200	0.26
SD12ss	M12		13.0	19.5	2.0	200	0.25
SD12spss	M12		13.0	25.4	3.0	100	0.81
SD1/2"ss		1/2"	13.5	19.5	2.0	200	0.24
SD1/2"spss		1/2"	13.5	25.4	3.2	100	0.80
SD14ss	M14	9/16"	15.2	23.0	3.0	100	0.49
SD14spss	M14	9/16"	15.2	30.7	3.2	100	1.31
SD16ss	M16	5/8"	17.0	25.4	3.0	100	0.59
SD16spss	M16	5/8"	17.0	30.7	3.2	100	1.18
SD18ss	M18		19.5	29.0	3.2	100	0.80
SD18spss	M18		19.5	34.5	3.2	100	1.56
SD3/4"ss		3/4"	20.0	30.7	3.2	100	0.96
SD3/4"spss		3/4"	20.0	39.0	3.2	100	2.10
SD20ss	M20		21.4	30.7	3.2	100	0.89
SD20spss	M20		21.4	39.0	3.2	100	2.06
SD22ss	M22	7/8"	23.4	34.5	3.2	100	1.23
SD22spss	M22	7/8"	23.4	42.0	3.2	50	2.23
SD24ss	M24		25.3	39.0	3.2	100	1.52
SD24spss	M24		25.3	48.5	3.2	50	3.50
SD1"ss		1"	27.9	39.0	3.2	100	1.42
SD1"spss		1"	27.9	48.5	3.2	50	3.22
SD27ss	M27		28.4	42.0	6.8	50	3.45
SD27spss	M27		28.4	48.5	6.8	25	5.85
SD30ss	M30	1 1/8"	31.4	47.0	6.8	50	4.43
SD30spss	M30	1 1/8"	31.4	58.5	6.8	25	9.53
SD33ss	M33	1 1/4"	34.4	48.5	6.8	25	4.25
SD36ss	M36	1 3/8"	37.4	55.0	6.8	25	5.96
SD39ss	M39	1 1/2"	40.4	58.5	6.8	25	6.74
SD42ss	M42		43.2	63.0	6.8	25	7.96
SD45ss	M45	1 3/4"	46.2	70.0	6.8	25	10.20
SD48ss	M48		49.6	75.0	6.8	25	12.00
SD52ss	M52	2"	53.6	80.0	9.0	1	20.10
SD56ss	M56	2 1/4"	59.1	85.0	9.0	1	21.30
SD60ss	M60		63.1	90.0	9.0	1	23.50
SD64ss	M64	2 1/2"	67.1	95.0	9.0	1	25.80
SD68ss	M68		71.1	100.0	9.0	1	28.20
SD72ss	M72		75.1	105.0	9.0	1	30.70
SD76ss	M76	3"	79.1	110.0	9.0	1	33.30
SD80ss	M80	3 1/8"	83.1	115.0	9.0	1	36.00

SD3ss–SD8ss: $\varnothing_i \pm 0.1$ mm
SD10ss–SD42ss: $\varnothing_i \pm 0.2$ mm
SD45ss–SD80ss: $\varnothing_i +0.5/-0.0$ mm



SD3ss–SD24ss: $\varnothing_o \pm 0.2$ mm
SD27ss–SD42ss: $\varnothing_o \pm 0.3$ mm
SD45ss–SD80ss: $\varnothing_o +0.0/-2.0$ mm



SD3ss–SD24ss: T ±0.25 mm
SD27ss–SD42ss: T +0.0/−0.5 mm
SD45ss–SD80ss: T ±0.75 mm

SCHRAUBOOST® Self-Locking Washer Stainless Steel Washers with Stainless Steel Bolt

Torque and preload values based on connection with Copper/Graphite paste (Molykote® 1000)

			A2-50, A4-50, Cu/C Paste*, G=65% μ_{th}=0.13, μ_h=0.13		A2-70, A4-70, Cu/C Paste*, G=65% μ_{th}=0.13, μ_h=0.13		A2-80, A4-80, Cu/C Paste*, G=65% μ_{th}=0.13, μ_h=0.13	
Washers Size	Bolt Size	Thread Pitch	Torque	Preload	Torque	Preload	Torque	Preload
		[mm]	[Nm]	[kN]	[Nm]	[kN]	[Nm]	[kN]
SD3ss	M3	0.5	0.4	0.7	0.8	1.5	1.1	2.0
SD4ss	M4	0.7	0.9	1.2	1.8	2.6	2.4	3.4
SD5ss	M5	0.8	1.7	1.9	3.6	4.1	4.8	5.5
SD6ss	M6	1.0	2.9	2.7	6.3	5.9	8.4	7.8
SD8ss	M8	1.25	7.0	5.0	15	11	20	14
SD10ss	M10	1.5	14	8.0	30	17	39	23
SD12ss	M12	1.75	24	12	51	25	68	33
SD14ss	M14	2.0	38	16	81	34	108	45
SD16ss	M16	2.0	58	21	124	46	165	61
SD18ss	M18	2.5	81	26	173	56	231	75
SD20ss	M20	2.5	113	33	242	72	323	95
SD22ss	M22	2.5	149	39	330	89	440	118
SD24ss	M24	3.0	195	48	418	103	557	137
SD27ss	M27	3.0	284	63	609	134	812	179
SD30ss	M30	3.5	388	77	831	164	1108	219
SD36ss	M36	4.0	674	111	1444	239	1925	319

Cu/C Paste* = Copper/Graphite (Molykote® 1000)
G_F = Percentage of yield strength
μ_{th} = Thread friction coefficient
μ_h = Under head friction coefficient

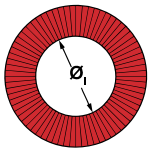
SCHRAUBOOST® DIN 25201 254 SMO® Self-Locking Washers

EN 1.4547 or equivalent, surface hardened

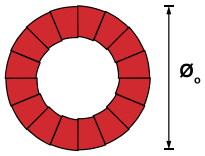
With high Chromium, Molybdenum, Nickle & Nitrogen content, it can combat pitting and crevice corrosion. SCHRAUBOOST® 254 SMO® Self-Locking Washer are specifically created for chloride rich & salt water environments where EN 1.4404 stainless steels are not suitable.

Washers Size	Bolt Size		Inside Diameter $\varnothing_i$	Outside Diameter $\varnothing_o$	Thickness T	Quantity /Box	Approx. Weight
	Meric	Imperial	[mm]	[mm]	[mm]	Pair	kg/100 Pair
SD3ss254	M3	#5	3.4	7.0	2.2	200	0.04
SD3.5ss254	M3.5	#6	3.9	7.6	2.2	200	0.04
SD3.5spss254	M3.5	#6	3.9	9.0	2.2	200	0.07
SD4ss254	M4	#8	4.4	7.6	2.2	200	0.04
SD4spss254	M4	#8	4.4	9.0	2.2	200	0.07
SD5ss254	M5	#10	5.4	9.0	2.2	200	0.06
SD5spss254	M5	#10	5.4	10.8	2.2	200	0.11
SD6ss254	M6		6.5	10.8	2.2	200	0.09
SD6spss254	M6		6.5	13.5	2.0	200	0.16
SD1/4"ss254		1/4"	7.2	11.5	2.2	200	0.09
SD1/4"spss254		1/4"	7.2	13.5	2.2	200	0.15
SD8ss254	M8	5/16"	8.7	13.5	2.0	200	0.12
SD8spss254	M8	5/16"	8.7	16.6	2.2	200	0.22
SD3/8"ss254		3/8"	10.3	16.6	2.0	200	0.19
SD3/8"spss254		3/8"	10.3	21.0	2.2	200	0.38
SD10ss254	M10		10.7	16.6	2.0	200	0.18
SD10spss254	M10		10.7	21.0	2.2	200	0.37
SD11ss254	M11	7/16"	11.4	18.5	2.2	200	0.26
SD12ss254	M12		13.0	19.5	2.0	200	0.23
SD12spss254	M12		13.0	25.4	3.2	100	0.83
SD1/2"ss254		1/2"	13.5	19.5	2.0	200	0.23
SD1/2"spss254		1/2"	13.5	25.4	3.0	100	0.80
SD14ss254	M14	9/16"	15.2	23.0	3.0	100	0.49
SD14spss254	M14	9/16"	15.2	30.7	3.0	100	1.13
SD16ss254	M16	5/8"	17.0	25.4	3.0	100	0.59
SD16spss254	M16	5/8"	17.0	30.7	3.2	100	1.13
SD18ss254	M18		19.5	29.0	3.2	100	0.80
SD18spss254	M18		19.5	34.5	3.2	100	1.56
SD3/4"ss254		3/4"	20.0	30.7	3.2	100	0.96
SD3/4"spss254		3/4"	20.0	39.0	3.2	100	2.14
SD20ss254	M20		21.4	30.7	3.0	100	0.83
SD20spss254	M20		21.4	39.0	3.2	100	1.98
SD22ss254	M22	7/8"	23.4	34.5	3.2	100	1.19
SD22spss254	M22	7/8"	23.4	42.0	3.2	50	2.44
SD24ss254	M24		25.3	39.0	3.2	100	1.65
SD24spss254	M24		25.3	48.5	3.2	50	3.50
SD1"ss254		1"	27.9	39.0	3.2	100	1.42
SD1"spss254		1"	27.9	48.5	5.8	50	5.40
SD27ss254	M27		28.4	42.0	5.8	50	3.10
SD27spss254	M27		28.4	48.5	5.8	25	5.34
SD30ss254	M30	1 1/8"	31.4	47.0	5.8	50	4.04
SD33ss254	M33	1 1/4"	34.4	48.5	5.8	25	3.86
SD36ss254	M36	1 3/8"	37.4	55.0	5.8	25	5.50
SD39ss254	M39	1 1/2"	40.4	58.5	5.8	25	6.74

SD3ss254–SD8ss254: $\varnothing_i \pm 0.1$ mm
SD10ss254–SD39ss254: $\varnothing_i \pm 0.2$ mm



SD3ss254–SD24ss254: $\varnothing_o \pm 0.2$ mm
SD27ss254–SD39ss254: $\varnothing_o \pm 0.3$ mm



SD3ss254–SD39ss254: T ±0.25 mm

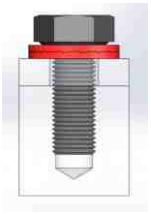
SCHRAUBOOST® 254 SMO® Self-Locking Washer with Stainless Steel Bolt

Torque and preload values based on connection with Copper/Graphite paste (Molykote® 1000)

			A2-50, A4-50, Cu/C Paste*, G=65% μ_{th}=0.13, μ_h=0.13		A2-70, A4-70, Cu/C Paste*, G=65% μ_{th}=0.13, μ_h=0.13		A2-80, A4-80, Cu/C Paste*, G=65% μ_{th}=0.13, μ_h=0.13	
Washers Size	Bolt Size	Thread Pitch	Torque	Preload	Torque	Preload	Torque	Preload
		[mm]	[Nm]	[kN]	[Nm]	[kN]	[Nm]	[kN]
SD3ss254	M3	0.5	0.4	0.7	0.8	1.5	1.1	2.0
SD4ss254	M4	0.7	0.9	1.2	1.8	2.6	2.4	3.4
SD5ss254	M5	0.8	1.7	1.9	3.6	4.1	4.8	5.5
SD6ss254	M6	1.0	2.9	2.7	6.3	5.9	8.4	7.8
SD8ss254	M8	1.25	7.0	5.0	15	11	20	14
SD10ss254	M10	1.5	14	8.0	30	17	39	23
SD12ss254	M12	1.75	24	12	51	25	68	33
SD14ss254	M14	2.0	38	16	81	34	108	45
SD16ss254	M16	2.0	58	21	124	46	165	61
SD18ss254	M18	2.5	81	26	173	56	231	75
SD20ss254	M20	2.5	113	33	242	72	323	95
SD22ss254	M22	2.5	149	39	330	89	440	118
SD24ss254	M24	3.0	195	48	418	103	557	137
SD27ss254	M27	3.0	284	63	609	134	812	179
SD30ss254	M30	3.5	388	77	831	164	1108	219
SD36ss254	M36	4.0	674	111	1444	239	1925	319

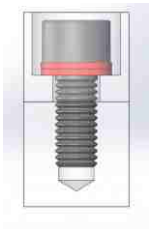
Cu/C Paste* = Copper/Graphite (Molykote® 1000)
G_F = Percentage of yield strength
μ_{th} = Thread friction coefficient
μ_h = Under head friction coefficient

SCHRAUBOOST® Self-Locking Washer Application Guide



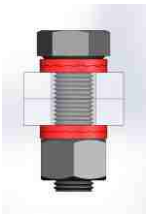
Threaded hole

Install Washer under bolt head and tighten.



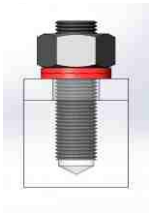
Counterbore

Standard SCHRAUBOOST® Self-Locking Washer can be fitted into counterbore (based on DIN 974), application similar to thread hole.



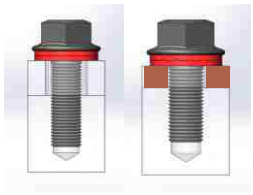
Through hole

Here requires two pairs of SCHRAUBOOST® Self-Locking Washer, one for the bolt, the other for the nut. Tighten both bolt and nut to close the wedges in the washer. Apply final torque to nut.



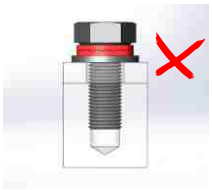
Studs for threaded hole

Put one washer under nut. This can replace welding and adhesives.



Large/Slotted holes, soft surfaces

For better pressure distribution, use a flanged nut with SCHRAUBOOST® “sp” Self-Locking Washer with bigger OD ∅.



SCHRAUBOOST Self-Locking Washer are not designed for

✗ Surface under washer can be rotated

✗ Surface has higher hardness than washer

✗ Surface made of plastic & wood

✗ Soft surfaces

✗ Connections with no preload

Chemical Composition Analysis & Mechanical Properties Examination

All materials used for SCHRAUBOOST® products are selected and tested based on international standards. These all go through strict chemical analysis and mechanical examination.

Quality & Tracability

At SCHRAUBOOST, we monitor every process closely. Products go through dimensional and mechanical checks to ensure they meet stringent quality standards. All items are marked and completely traceable. Quality and technical documents are part of the standard package upon delivery.

Impact Test

Tensile Test

Fatigue Test

Chemcal Composition Test