
WASCA
DISC SPRINGS
www.wasca.com.au

As WASCA embarks on its 50th year in business, we are proud to announce our representation of International Industrial Springs (IIS) as its sole Australasian Agent.

WASCA 50 YEARS EST 1964

WASCA

Established in 1967, IIS specialise in the manufacture of Disc Springs, Belleville Washers and Coil Springs, Serrated Safety Washers, Flange Washers and Bearing Washers. Their continued steady growth has enabled them to build up a world class manufacturing facility and their commitment to customer satisfaction is second to none.

Standards include DIN 2093, DIN 6796 & also their market leading LockRite™ anti Vibration washers. Custom manufacturing is also available and Materials include High Carbon Spring Steel, Stainless Steel, Incone® and various other precious metals on request.

- 50Crv4
- 51CrMoV4
- Stainless Steel 301, 304, 316 & 17-7PH
- Inconel® 718
- Inconel® X750
- H-13 Tool Steel

Extensive product development and testing laboratories are available and used for in house production and proprietary development. Computer Simulations are available to conduct dimensions and load testing for any application.

Every part manufactured is tracked and traced through the whole manufacturing process, and is delivered with full Mill and Mechancial Certification.

The synergies of WASCA and IIS are seamless and together they can provide full solution capabilities with the same dedication and technical advice you have already been accustomed to the last 50 years.

Contents

> "We are the distributor for a reputable international manufacturer of Disc Springs, Belleville, and Anti-Vibration LockRite® Washers."

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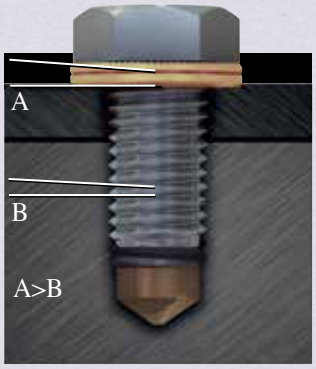
Lockrite® Washers

LockRite® Washers are used in applications where bolts are prone to self-loosening during vibration & fluctuating loads ensuring a long term vibration proof environment for just about any bolt or threaded application.



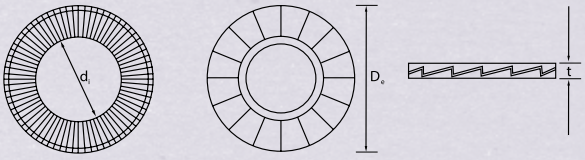
LockRite® Washers are used in applications where bolts are prone to self-loosening during vibration & fluctuating loads ensuring a long term vibration proof environment for just about any bolt or threaded application.

The wedge-shaped lock washers have cam wedge surfaces on the inside and radial ribs on the outside. The shape of the cam wedge is selected so that the angle of the cam wedge surfaces is always greater than the thread angle.

The key is the difference in angles on the cam of the washer and the screw thread pitch. Since the cam angle “A” is larger than the thread pitch “B”, the pair of wedge lock washers expand more than the corresponding pitch of the thread.

LOCKRITE® WASHERS

- Are assembled in pairs; cam face to cam face
- Each washer has radial teeth on outside and mating cams on the inside, creating a wedge under the bolt or nut surface locking under tension preventing unintentional loosening of the assembly
- Eliminate the need to use adhesives
- Are reusable over and over again unlike many lock nut systems
- Are manufactured to 48 HRC and being harder than the fastener assembly; do not distort through preload. In order to assure the unique mechanical locking function of the LockRite® Washers , the hardness of the mating surfaces must be lower than the hardness of the LockRite® Washers
- For a bolt & nut assembly 2 pairs should be used – one under the head of the bolt and one under the nut



- Maintains high clamp load and thereby ensures the function of the joint
- Quick and easy to install and remove with standard tools
- Locking function not affected by lubrication
- Can be used with fasteners up to grade 12.9
- Reliable locking, even for joints with short clamp length
- No retightening needed
- Secures fasteners at both high and low preloads

LockRite® Washers are not recommended where:

- Mating surfaces are not locked in place
- Mating surfaces harder than the washers
- Very soft mating surface, e.g. wood, plastic
- Non-preloaded joints

Applications include:

Automotive, Railways, Marine, Thermal & Wind Power, Construction, Mining, Agriculture, Earthmoving Equipment and Food Process Industries

Manufactured to DIN 25201

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LockRite® Washers - DELTA-PROTEKT® - DIN 25201

LockRite® Washers - DELTA-PROTEKT® - DIN 25201

Bolt Size		De	di	Thickness (t)	Packet Qty	DELTA-PROTEKT®
Metric	UNC					
M3	N/A	7.10	3.30	1.80	200	LR070218
M3.5	N/A	7.40	3.80	1.80	200	LR070318
M3.5	N/A	8.90	3.90	1.80	200	LR080318
M4	N/A	7.40	4.30	1.80	200	LR070418
M4	N/A	8.90	4.30	1.80	200	LR080418
M5	N/A	8.90	5.30	1.80	200	LR080518
M5	N/A	10.90	5.30	1.80	200	LR100518
M6	N/A	10.90	6.60	1.80	200	LR100618
M6	N/A	13.50	6.60	2.50	200	LR130625
N/A	1/4	11.40	7.10	1.80	200	LR110718
N/A	1/4	13.50	7.10	2.50	200	LR130725
M8	5/16	13.50	8.60	2.50	200	LR130825
M8	5/16	16.50	8.60	2.50	200	LR160825
N/A	3/8	16.50	10.40	2.50	200	LR161025
N/A	3/8	21.10	10.40	2.50	200	LR211025
M10	N/A	16.50	10.70	2.50	200	LR161125
M10	N/A	21.10	10.70	2.50	200	LR211125
M11	7/16	18.50	11.40	2.50	200	LR181125
M12	N/A	19.60	13.00	2.50	200	LR191325
M12	N/A	25.40	13.00	3.30	100	LR251333
N/A	1/2	19.60	13.50	2.50	200	LR191425
N/A	1/2	25.40	13.50	3.30	100	LR251433
M14	9/16	23.10	15.20	3.30	100	LR231533
M14	9/16	30.70	15.20	3.30	100	LR301533
M16	5/8	25.40	17.00	3.30	100	LR251733
M16	5/8	30.70	17.00	3.30	100	LR301733
M18	N/A	35.80	19.60	3.30	100	LR351933
M18	N/A	34.50	19.60	3.30	100	LR341933
N/A	3/4	30.70	20.10	3.30	100	LR302033
N/A	3/4	39.10	20.10	3.30	100	LR392033
M20	N/A	30.70	21.30	3.30	100	LR302133
M20	N/A	39.10	21.30	3.30	100	LR392133
M22	7/8	34.50	23.40	3.30	100	LR342333

LockRite® Washers - DELTA-PROTEKT® - DIN 25201

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Bolt Size		De	di	Thickness (t)	Packet Qty	DELTA-PROTEKT®
Metric	UNC					
M22	7/8	41.90	23.40	4.60	50	LR412346
M24	N/A	39.10	25.40	3.30	100	LR392533
M24	N/A	48.50	25.40	4.60	50	LR482546
N/A	1"	39.10	27.90	3.30	100	LR392733
N/A	1"	48.50	27.90	4.60	50	LR482746
M27	N/A	41.90	28.50	6.60	50	LR412866
M27	N/A	48.50	28.50	6.60	25	LR482866
M30	N/A	47.00	31.50	6.60	50	LR473166
M30	N/A	58.50	31.50	6.60	25	LR583166
M33	N/A	48.50	34.30	6.60	25	LR483466
M33	N/A	58.50	34.30	6.60	25	LR583466
M36	N/A	55.10	37.30	6.60	25	LR553766
M36	N/A	63.00	37.30	6.60	25	LR633766
M39	N/A	58.40	40.40	6.60	25	LR584066
M42	N/A	63.00	43.20	6.60	25	LR634366
M45	N/A	70.10	46.20	7.00	25	LR704670
M48	N/A	74.90	49.50	7.00	25	LR744970
M52	N/A	80.00	53.60	7.00	25	LR805370
M56	N/A	85.10	59.20	7.00	10	LR855970
M60	N/A	89.90	63.00	9.40	10	LR896394
M64	N/A	95.00	67.10	9.40	10	LR956794
M68	N/A	100.00	71.10	9.40	10	LR1007194
M72	N/A	105.00	75.20	9.40	5	LR1057594
M76	N/A	110.00	79.00	9.40	5	LR1107994
M80	N/A	115.00	83.10	9.40	5	LR1158394
M85	N/A	120.00	88.10	9.40	5	LR1208894
M90	N/A	130.00	92.50	9.40	5	LR1309294
M95	N/A	135.00	97.30	9.40	5	LR1359794
M100	N/A	145.00	103.40	9.40	1	LR14510394
M105	N/A	150.00	108.50	9.40	1	LR15010894
M110	N/A	155.00	113.30	9.40	1	LR15511394
M115	N/A	165.00	118.40	9.40	1	LR16511894
M120	N/A	170.00	123.40	9.40	1	LR17012394
M125	N/A	173.00	128.50	9.40	1	LR17312894
M130	N/A	178.00	133.30	9.40	1	LR17813394

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Delta-Protekt® KL105

Zinc Flake Coating

DELTA-PROTEKT® KL105 is a zinc flake basecoat. This basecoat provides highly effective anti-corrosion protection with a relatively thin coating.


DELTA MKS

DELTA® protects surfaces.

DÖRKEN

LICENCE CERTIFICATE

HONEYCOMB TECHNOLOGIES PVT. LTD.
PUNE

licensed to apply
DELTA-MKS® Systems

by
Dörken MKS-Systeme GmbH & Co. KG
58313 Herdecke, Germany

General Manager: Dr. Gerhard Reusmann

General Manager: Martin Welp

nitro PDF professional

CORROSION PROPERTIES

- DELTA-PROTEKT® KL 105 is free of any harmful heavy metals
- RoHS & ELV compliant; conforms to EU guidelines:
  - End-of-Life Vehicle Directive (2000/53/EC)
  - Directive on the Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment (2002/95/EC)

APPLICATION

- Parts are Dip Spinned using a non-electrolytical surface treatment according to DIN EN ISO 10683 und DIN ES ISO 13858. As an additional advantage this removes the risk hydrogen embrittlement which occurs in Electroplating

CORROSION RESISTANCE

- According to DIN EN ISO 9227; enduring minimum of 600 hours salt spray
- Cathodic protection by sacrificial corrosion of zinc

TEMPERATURES

- Curing temperature with max 260°C object temperature
- Temperature stable up to 200 °C (VDA 235-104)

DELTA-PROTEKT® KL 105 IS APPLIED ON LOCKRITE WASHERS AND HEAVY DUTY SAFETY WASHERS – DIN6796

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LockRite® Washers - Stainless Steel 316 - DIN 25201

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Bolt Size		De	di	Thickness (t)	Packet Qty	Stainless Steel 316
Metric	UNC					
M3	N/A	7.00	3.40	2.20	200	LR070322S
M3.5	N/A	7.60	3.90	2.20	200	LR070422S
M3.5	N/A	9.00	3.90	2.20	200	LR090322S
M4	N/A	7.60	4.40	2.20	200	LR080422S
M4	N/A	9.00	4.40	2.20	200	LR090422S
M5	N/A	9.00	5.40	2.20	200	LR090522S
M5	N/A	10.80	5.40	2.20	200	LR100522S
M6	N/A	10.80	6.50	2.20	200	LR100622S
M6	N/A	13.50	6.50	2.00	200	LR130620S
N/A	1/4	11.50	7.20	2.20	200	LR110722S
N/A	1/4	13.50	7.20	2.20	200	LR130722S
M8	5/16	13.50	8.70	2.00	200	LR130820S
M8	5/16	16.60	8.70	2.00	200	LR160820S
N/A	3/8	16.60	10.30	2.00	200	LR161020S
N/A	3/8	21.00	10.30	2.00	200	LR211020S
M10	N/A	16.60	10.70	2.00	200	LR161120S
M10	N/A	21.00	10.70	2.00	200	LR211120S
M11	7/16	18.50	11.40	2.20	200	LR181122S
M12	N/A	19.50	13.00	2.00	200	LR191320S
M12	N/A	25.40	13.00	3.00	100	LR251330S
N/A	1/2	19.50	13.50	2.00	200	LR191420S
N/A	1/2	25.40	13.50	3.20	100	LR251432S
M14	9/16	23.00	15.20	3.00	100	LR231530S
M14	9/16	30.70	15.20	3.20	100	LR301532S
M16	5/8	25.40	17.00	3.00	100	LR251730S
M16	5/8	30.70	17.00	3.20	100	LR301732S
M18	N/A	29.00	19.50	3.20	100	LR291932S
M18	N/A	34.50	19.50	3.20	100	LR341932S

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Bolt Size		De	di	Thickness (t)	Packet Qty	Stainless Steel 316
Metric	UNC					
N/A	3/4	30.70	20.00	3.20	100	LR302032S
N/A	3/4	39.00	20.00	3.20	100	LR392032S
M20	N/A	30.70	21.40	3.00	100	LR302130S
M20	N/A	39.00	21.40	3.20	100	LR392132S
M22	7/8	34.50	23.40	3.20	100	LR342332S
M22	7/8	42.00	23.40	3.20	50	LR422332S
M24	N/A	39.00	25.30	3.20	100	LR392532S
M24	N/A	48.50	25.30	3.20	50	LR482532S
N/A	1"	39.00	27.90	3.20	100	LR392732S
N/A	1"	48.50	27.90	3.20	50	LR482732S
M27	N/A	42.00	28.40	6.80	50	LR422868S
M27	N/A	48.50	28.40	6.80	25	LR482868S
M30	N/A	47.00	31.40	6.80	50	LR473168S
M30	N/A	58.50	31.40	6.80	25	LR583168S
M33	N/A	48.50	34.40	6.80	25	LR483468S
M36	N/A	55.00	37.40	6.80	25	LR553768S
M39	N/A	58.50	40.40	6.80	25	LR584068S
M42	N/A	63.00	43.20	6.80	25	LR634368S
M45	N/A	70.00	46.20	6.80	25	LR704668S
M48	N/A	75.00	49.60	6.80	25	LR754968S
M52	N/A	80.00	53.60	9.00	25	LR805390S
M56	N/A	85.00	59.10	9.00	10	LR855990S
M60	N/A	90.00	63.10	9.00	10	LR906390S
M64	N/A	95.00	67.10	9.00	10	LR956790S
M68	N/A	100.00	71.10	9.00	10	LR1007190S
M72	N/A	105.00	75.10	9.00	5	LR1057590S
M76	N/A	110.00	79.10	9.00	5	LR1107990S
M80	N/A	115.00	83.10	9.00	5	LR1158390S

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Disc Springs

Disc springs are conically formed angular discs which are loaded in the axial direction. They offer a well-developed solution to a vast amount of engineering problems. Through a unique combination of high force in a small space Disc Springs can be used as a single disc or arranged in stacks.

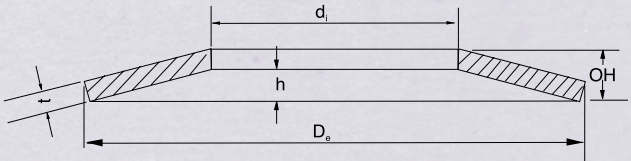
Disc Springs are manufactured to DIN 2093. Materials 50CrV4 and CK1075 and all parts are AUSTEMPERED.

This method of heat treatment is particularly effective for springs as it gives the maximum toughness and therefore considerable durability.

For customers requiring specific needs we can calculate through simulation software the exact force requirement therefore designing the exact dimensions to achieve their goal.

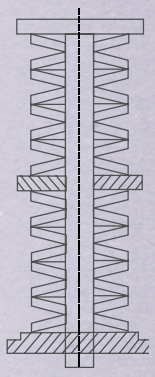
ADVANTAGES OF DISC SPRINGS

1. No Deformation or Fatigue under normal loads
2. High Energy Storage Capacity
3. Long Service Life
4. Stock is minimized as the individual spring sizes can be combined universally
5. Space Saving
6. Largely Self-dampening, giving good shock absorption and energy dissipation
7. Efficient use of space and high spring force with small deflections
8. Adaptable to stacking in numerous configurations
9. Combination use as a modular spring element
10. Low Maintenance cost
11 Greater Security



Load Values for Stainless Steel approx 95% of Spring Steel values shown.

STACK LENGTH



When stacking Disc Springs, effort should be made to keep the stacks as short as possile.

Friction and other influences make a stack more uneven. It influences more on the side of the loading. This effect usually can be neglected for a “normal” spring stack, but not for long stacks. If it is longer the stack can be stabilized by dividing it with guide washers, which as a rule of thumb should have a thickness of at least one and a half times the guide diameter.

DISC SPRINGS IN SERIES & PARALLEL COMBINATIONS.

STACKED IN PARALLEL:

Total Defelction	=	Defelction 1 Disc
Total Load	=	Load on 1 Disc & No. of Discs

STACKED IN SERIES:

Total Defelction	=	Defelction 1 Disc X No. of Discs in Stack
Total Load	=	Load on 1 Disc

STACKED IN PARALLEL SERIES:

Combinations can be designed to accommodate virtually any load or deflection and to obtain progressive or regressive characteristics.

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Disc Springs - DIN 2093

Disc Springs – DIN 2093

Metric Dimensions					Packet Qty	Plain	Stainless Steel 301/304
De	di	Thickness (t)	Dish (h)	Height (OH)			
6	3.2	0.30	0.15	0.45	100	DS060303	DS060303SS
8	3.2	0.20	0.20	0.40	100	DS080302	DS080302SS
8	3.2	0.30	0.25	0.55	100	DS080303	DS080303SS
8	3.2	0.40	0.20	0.60	100	DS080304	DS080304SS
8	3.2	0.50	0.20	0.70	100	DS080305	DS080305SS
8	4.2	0.20	0.25	0.45	100	DS080402	DS080402SS
8	4.2	0.30	0.25	0.55	100	DS080403	DS080403SS
8	4.2	0.40	0.20	0.60	100	DS080404	DS080404SS
10	3.2	0.30	0.35	0.65	100	DS100303	DS100303SS
10	3.2	0.40	0.30	0.70	100	DS100304	DS100304SS
10	3.2	0.50	0.25	0.75	100	DS100305	DS100305SS
10	4.2	0.40	0.30	0.70	100	DS100404	DS100404SS
10	4.2	0.50	0.25	0.75	100	DS100405	DS100405SS
10	4.2	0.60	0.25	0.85	100	DS100406	DS100406SS
10	5.2	0.25	0.30	0.55	100	DS100502	DS100502SS
10	5.2	0.40	0.30	0.70	100	DS100504	DS100504SS
10	5.2	0.50	0.25	0.75	100	DS100505	DS100505SS
12	4.2	0.40	0.40	0.80	100	DS120404	DS120404SS
12	4.2	0.50	0.35	0.85	100	DS120405	DS120405SS
12	4.2	0.60	0.40	1.00	100	DS120406	DS120406SS
12	5.2	0.50	0.40	0.90	100	DS120505	DS120505SS
12	5.2	0.60	0.35	0.95	100	DS120506	DS120506SS
12	6.2	0.50	0.35	0.85	100	DS120605	DS120605SS
12	6.2	0.60	0.35	0.95	100	DS120606	DS120606SS
12.5	5.2	0.50	0.35	0.85	100	DS130505	DS130505SS
12.5	6.2	0.35	0.45	0.80	100	DS130603	DS130603SS
12.5	6.2	0.50	0.35	0.85	100	DS130605	DS130605SS
12.5	6.2	0.70	0.30	1.00	100	DS130607	DS130607SS
14	7.2	0.35	0.45	0.80	100	DS140703	DS140703SS
14	7.2	0.50	0.40	0.90	100	DS140705	DS140705SS
14	7.2	0.80	0.30	1.10	100	DS140708	DS140708SS

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Disc Springs - DIN 2093

Disc Springs – DIN 2093

Metric Dimensions					Packet Qty	Plain	Stainless Steel 301/304
De	di	Thickness (t)	Dish (h)	Height (OH)			
15	5.2	0.40	0.55	0.95	100	DS150504	DS150504SS
15	5.2	0.50	0.50	1.00	100	DS150505	DS150505SS
15	5.2	0.60	0.45	1.05	100	DS150506	DS150506SS
15	5.2	0.70	0.40	1.10	100	DS150507	DS150507SS
15	6.2	0.50	0.50	1.00	100	DS150605	DS150605SS
15	6.2	0.60	0.45	1.05	100	DS150606	DS150606SS
15	6.2	0.70	0.40	1.10	100	DS150607	DS150607SS
15	8.2	0.70	0.40	1.10	100	DS150807	DS150807SS
15	8.2	0.80	0.40	1.20	100	DS150808	DS150808SS
16	8.2	0.40	0.50	0.90	100	DS160804	DS160804SS
16	8.2	0.60	0.45	1.05	100	DS160806	DS160806SS
16	8.2	0.70	0.45	1.15	100	DS160807	DS160807SS
16	8.2	0.80	0.40	1.20	100	DS160808	DS160808SS
16	8.2	0.90	0.35	1.25	100	DS160809	DS160809SS
18	6.2	0.40	0.60	1.00	100	DS180604	DS180604SS
18	6.2	0.50	0.60	1.10	100	DS180605	DS180605SS
18	6.2	0.60	0.60	1.20	100	DS180606	DS180606SS
18	6.2	0.70	0.55	1.25	100	DS180607	DS180607SS
18	6.2	0.80	0.50	1.30	100	DS180608	DS180608SS
18	8.2	0.50	0.60	1.10	100	DS180805	DS180805SS
18	8.2	0.70	0.55	1.25	100	DS180807	DS180807SS
18	8.2	0.80	0.50	1.30	100	DS180808	DS180808SS
18	8.2	1.00	0.40	1.40	100	DS180810	DS180810SS
18	9.2	0.45	0.60	1.05	100	DS180904	DS180904SS
18	9.2	0.70	0.50	1.20	100	DS180907	DS180907SS
18	9.2	1.00	0.40	1.40	100	DS180910	DS180910SS
20	8.2	0.50	0.65	1.15	100	DS200805	DS200805SS
20	8.2	0.60	0.70	1.30	100	DS200806	DS200806SS
20	8.2	0.70	0.65	1.35	100	DS200807	DS200807SS
20	8.2	0.80	0.60	1.40	100	DS200808	DS200808SS
20	8.2	0.90	0.55	1.45	100	DS200809	DS200809SS
20	8.2	1.00	0.55	1.55	100	DS200810	DS200810SS
20	10.2	0.40	0.50	0.90	100	DS201004	DS201004SS
20	10.2	0.50	0.65	1.15	100	DS201005	DS201005SS
20	10.2	0.80	0.55	1.35	100	DS201008	DS201008SS
20	10.2	0.90	0.55	1.45	100	DS201009	DS201009SS
20	10.2	1.00	0.55	1.55	100	DS201010	DS201010SS
20	10.2	1.10	0.45	1.55	100	DS201011	DS201011SS
20	10.2	1.20	0.35	1.55	100	DS201012	DS201012SS
20	10.2	1.50	0.30	1.80	100	DS201015	DS201015SS

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Metric Dimensions					Packet Qty	Plain	Stainless Steel 301/304
De	di	Thickness (t)	Dish (h)	Height (OH)			
22.5	11.2	0.60	0.80	1.40	50	DS221106	DS221106SS
22.5	11.2	0.80	0.65	1.45	50	DS221108	DS221108SS
22.5	11.2	1.25	0.50	1.75	50	DS221112	DS221112SS
23	8.2	0.70	0.80	1.50	50	DS230807	DS230807SS
23	8.2	0.80	0.75	1.55	50	DS230808	DS230808SS
23	8.2	0.90	0.70	1.60	50	DS230809	DS230809SS
23	8.2	1.00	0.70	1.70	50	DS230810	DS230810SS
23	10.2	0.90	0.75	1.65	50	DS231009	DS231009SS
23	10.2	1.00	0.70	1.70	50	DS231010	DS231010SS
23	10.2	1.25	0.65	1.90	50	DS231012	DS231012SS
23	12.2	1.00	0.60	1.60	50	DS231210	DS231210SS
23	12.2	1.25	0.60	1.85	50	DS231212	DS231212SS
23	12.2	1.50	0.60	2.10	50	DS231215	DS231215SS
25	10.2	1.00	0.75	1.75	50	DS251010	DS251010SS
25	12.2	0.70	0.90	1.60	50	DS251207	DS251207SS
25	12.2	0.90	0.70	1.60	50	DS251209	DS251209SS
25	12.2	1.00	0.80	1.80	50	DS251210	DS251210SS
25	12.2	1.25	0.70	1.95	50	DS251212	DS251212SS
25	12.2	1.50	0.55	2.05	50	DS251215	DS251215SS
28	10.2	0.80	0.95	1.75	50	DS281008	DS281008SS
28	10.2	1.00	0.90	1.90	50	DS281010	DS281010SS
28	10.2	1.25	0.80	2.05	50	DS281012	DS281012SS
28	10.2	1.50	0.70	2.20	50	DS281015	DS281015SS
28	12.2	1.00	0.95	1.95	50	DS281210	DS281210SS
28	12.2	1.25	0.85	2.10	50	DS281212	DS281212SS
28	12.2	1.50	0.75	2.25	50	DS281215	DS281215SS
28	14.2	0.80	1.00	1.80	50	DS281408	DS281408SS
28	14.2	1.00	0.80	1.80	50	DS281410	DS281410SS
28	14.2	1.25	0.85	2.10	50	DS281412	DS281412SS
28	14.2	1.50	0.65	2.15	50	DS281415	DS281415SS
31.5	12.2	1.00	1.10	2.10	50	DS311210	DS311210SS
31.5	12.2	1.25	0.95	2.20	50	DS311212	DS311212SS
31.5	12.2	1.50	0.85	2.35	50	DS311215	DS311215SS
31.5	16.3	0.80	1.05	1.85	50	DS311608	DS311608SS
31.5	16.3	1.25	0.90	2.15	50	DS311612	DS311612SS
31.5	16.3	1.50	0.90	2.40	50	DS311615	DS311615SS
31.5	16.3	1.75	0.70	2.45	50	DS311617	DS311617SS
31.5	16.3	2.00	0.75	2.75	50	DS311620	DS311620SS

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Metric Dimensions					Packet Qty	Plain	Stainless Steel 301/304
De	di	Thickness (t)	Dish (h)	Height (OH)			
34	12.2	1.00	1.25	2.25	50	DS341210	DS341210SS
34	12.2	1.25	1.10	2.35	50	DS341212	DS341212SS
34	12.2	1.50	1.00	2.50	50	DS341215	DS341215SS
34	14.3	1.25	1.15	2.40	50	DS341412	DS341412SS
34	14.3	1.50	1.05	2.55	50	DS341415	DS341415SS
34	16.3	1.50	1.05	2.55	50	DS341615	DS341615SS
34	16.3	2.00	0.85	2.85	50	DS341620	DS341620SS
35.5	18.3	0.90	1.15	2.05	50	DS351809	DS351809SS
35.5	18.3	1.25	1.00	2.25	50	DS351812	DS351812SS
35.5	18.3	2.00	0.80	2.80	50	DS351820	DS351820SS
40	14.3	1.25	1.40	2.65	20	DS401412	DS401412SS
40	14.3	1.50	1.25	2.75	20	DS401415	DS401415SS
40	14.3	2.00	1.05	3.05	20	DS401420	DS401420SS
40	16.3	1.50	1.30	2.80	20	DS401615	DS401615SS
40	16.3	2.00	1.10	3.10	20	DS401620	DS401620SS
40	18.3	2.00	1.15	3.15	20	DS401820	DS401820SS
40	20.4	1.00	1.30	2.30	20	DS402010	DS402010SS
40	20.4	1.50	1.15	2.65	20	DS402015	DS402015SS
40	20.4	2.00	1.10	3.10	20	DS402020	DS402020SS
40	20.4	2.25	0.90	3.15	20	DS402022	DS402022SS
40	20.4	2.50	0.95	3.45	20	DS402025	DS402025SS
45	22.4	1.25	1.60	2.85	20	DS452212	DS452212SS
45	22.4	1.75	1.30	3.05	20	DS452217	DS452217SS
45	22.4	2.50	1.00	3.50	20	DS452225	DS452225SS
50	18.3	1.25	1.60	2.85	20	DS501812	DS501812SS
50	18.3	1.50	1.80	3.30	20	DS501815	DS501815SS
50	18.3	2.00	1.50	3.50	20	DS501820	DS501820SS
50	18.3	2.50	1.35	3.85	20	DS501825	DS501825SS
50	18.3	3.00	1.00	4.00	20	DS501830	DS501830SS
50	20.4	2.00	1.50	3.50	20	DS502020	DS502020SS
50	20.4	2.50	1.35	3.85	20	DS502025	DS502025SS
50	22.4	2.00	1.60	3.60	20	DS502220	DS502220SS
50	22.4	2.50	1.40	3.90	20	DS502225	DS502225SS
50	25.4	1.25	1.60	2.85	20	DS502512	DS502512SS
50	25.4	1.50	1.60	3.10	20	DS502515	DS502515SS
50	25.4	2.00	1.40	3.40	20	DS502520	DS502520SS
50	25.4	2.25	1.50	3.75	20	DS502522	DS502522SS
50	25.4	2.50	1.40	3.90	20	DS502525	DS502525SS
50	25.4	3.00	1.10	4.10	20	DS502530	DS502530SS

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Metric Dimensions					Packet Qty	Plain	Stainless Steel 301/304
De	di	Thickness (t)	Dish (h)	Height (OH)			
60	20.4	2.00	2.10	4.10	10	DS602020	DS602020SS
60	20.4	2.50	1.80	4.30	10	DS602025	DS602025SS
60	20.4	3.00	1.70	4.70	10	DS602030	DS602030SS
60	25.5	2.50	1.90	4.40	10	DS602525	DS602525SS
60	25.5	3.00	1.65	4.65	10	DS602530	DS602530SS
60	30.5	2.50	2.00	4.50	10	DS603025	DS603025SS
60	30.5	2.75	2.00	4.75	10	DS603027	DS603027SS
60	30.5	3.00	1.70	4.70	10	DS603030	DS603030SS
60	30.5	3.50	1.50	5.00	10	DS603035	DS603035SS
63	31	1.80	2.35	4.15	10	DS633118	DS633118SS
63	31	2.50	1.75	4.25	10	DS633125	DS633125SS
63	31	3.00	1.80	4.80	10	DS633130	DS633130SS
63	31	3.50	1.40	4.90	10	DS633135	DS633135SS
70	25.5	2.00	2.50	4.50	5	DS702520	DS702520SS
70	30.5	2.50	2.40	4.90	5	DS703025	DS703025SS
70	30.5	3.00	2.10	5.10	5	DS703030	DS703030SS
70	35.5	3.00	2.10	5.10	5	DS703530	DS703530SS
70	35.5	3.50	1.80	5.30	5	DS703535	DS703535SS
70	35.5	4.00	1.80	5.80	5	DS703540	DS703540SS
70	40.5	4.00	1.60	5.60	5	DS704040	DS704040SS
70	40.5	5.00	1.20	6.20	5	DS704050	N/A
71	36	2.00	2.60	4.60	5	DS713620	DS713620SS
71	36	2.50	2.00	4.50	5	DS713625	DS713625SS
71	36	4.00	1.60	5.60	5	DS713640	DS713640SS
76	46	5.00	1.40	6.40	5	DS764560	N/A
80	31	2.50	2.80	5.30	5	DS803125	DS803125SS
80	31	3.00	2.50	5.50	5	DS803130	DS803130SS
80	31	4.00	2.10	6.10	5	DS803140	DS803140SS
80	36	3.00	2.70	5.70	5	DS803630	DS803630SS
80	36	4.00	2.20	6.20	5	DS806340	DS806340SS
80	41	2.25	2.95	5.20	5	DS804122	DS804122SS
80	41	3.00	2.30	5.30	5	DS804130	DS804130SS
80	41	4.00	2.20	6.20	5	DS804140	DS804140SS
80	41	5.00	1.70	6.70	5	DS804150	N/A
56	28.5	1.50	1.95	3.45	10	DS562815	DS562815SS
56	28.5	2.00	1.60	3.60	10	DS562820	DS562820SS
56	28.5	2.50	1.70	4.20	10	DS562825	DS562825SS
56	28.5	3.00	1.30	4.30	10	DS562830	DS562830SS

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Metric Dimensions					Packet Qty	Plain	Stainless Steel 301/304
De	di	Thickness (t)	Dish (h)	Height (OH)			
90	46	2.50	3.20	5.70	5	DS904625	DS904625SS
90	46	3.50	2.50	6.00	5	DS904635	DS904635SS
90	46	5.00	2.00	7.00	5	DS904650	N/A
100	41	4.00	3.20	7.20	1	DS1004140	DS1004140SS
100	41	5.00	2.75	7.75	1	DS1004150	DS1004150SS
100	51	2.70	3.50	6.20	1	DS1005127	DS1005127SS
100	51	3.50	2.80	6.30	1	DS1005135	DS1005135SS
100	51	4.00	3.00	7.00	1	DS1005140	DS1005140SS
100	51	5.00	2.80	7.80	1	DS1005150	N/A
100	51	6.00	2.20	8.20	1	DS1005160	N/A
112	57	3.00	3.90	6.90	1	DS1125730	DS1125730SS
112	57	4.00	3.20	7.20	1	DS1125740	DS1125740SS
112	57	6.00	2.50	8.50	1	DS1125760	N/A
125	41	4.00	4.20	8.20	1	DS1254140	DS1254140SS
125	51	4.00	4.50	8.50	1	DS1255140	DS1255140SS
125	51	5.00	3.90	8.90	1	DS1255150	DS1255150SS
125	51	6.00	3.40	9.40	1	DS1255160	DS1255160SS
125	61	5.00	4.00	9.00	1	DS1256150	DS1256150SS
125	61	6.00	3.60	9.60	1	DS1256160	DS1256160SS
125	61	8.00	2.90	10.90	1	DS1256180	DS1256180SS
125	64	3.50	4.50	8.00	1	DS1256435	DS1256435SS
125	64	5.00	3.50	8.50	1	DS1256450	N/A
125	64	6.00	3.60	9.60	1	DS1256460	N/A
125	64	7.00	3.00	10.00	1	DS1256470	N/A
125	64	8.00	2.60	10.60	1	DS1256480	N/A
125	71	6.00	3.30	9.30	1	DS1257160	N/A
125	71	8.00	2.40	10.40	1	DS1257180	N/A
125	71	10.00	1.80	11.80	1	DS1257110	N/A
140	72	3.80	4.90	8.70	1	DS1407238	N/A
140	72	3.80	4.90	8.70	1	DS1407238	N/A
140	72	5.00	4.00	9.00	1	DS1407250	N/A
140	72	8.00	3.20	11.20	1	DS1407280	N/A
150	61	5.00	5.30	10.30	1	DS1506150	N/A
150	61	6.00	4.80	10.80	1	DS1506160	N/A
150	71	6.00	4.80	10.80	1	DS1507160	N/A
150	71	8.00	4.00	12.00	1	DS1507180	N/A
150	81	8.00	3.70	11.70	1	DS1508180	N/A
150	81	10.00	3.00	13.00	1	DS1508110	N/A

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Metric Dimensions					Packet Qty	Plain
De	di	Thickness (t)	Dish (h)	Height (OH)		
160	82	4.30	5.60	9.90	1	DS1608243
160	82	4.30	5.60	9.90	1	DS1608243
160	82	6.00	4.50	10.50	1	DS1608260
160	82	10.00	3.50	13.50	1	DS1608210
180	92	4.80	6.20	11.00	1	DS1809248
180	92	4.80	6.20	11.00	1	DS1809248
180	92	6.00	5.10	11.10	1	DS1809260
180	92	10.00	4.00	14.00	1	DS1809210
180	92	13.00	3.50	16.50	1	DS1809213
200	82	8.00	6.20	14.20	1	DS2008280
200	82	10.00	5.50	15.50	1	DS2008210
200	82	12.00	4.60	16.60	1	DS2008212
200	92	10.00	5.60	15.60	1	DS2009210
200	92	12.00	4.80	16.80	1	DS2009212
200	92	14.00	4.10	18.10	1	DS2009214
200	102	5.50	7.00	12.50	1	DS20010255
200	102	5.50	7.00	12.50	1	DS20010255
200	102	8.00	5.60	13.60	1	DS20010280
200	102	10.00	5.60	15.60	1	DS20010210
200	102	12.00	4.20	16.20	1	DS20010212
200	102	14.00	4.20	18.20	1	DS20010214
200	112	10.00	4.22	14.22	1	DS20011210
200	112	12.00	4.20	16.20	1	DS20011212
200	112	14.00	3.50	17.50	1	DS20011214
200	112	16.00	2.80	18.80	1	DS20011216
225	112	6.00	6.00	13.60	1	DS22511260
225	112	6.50	6.20	13.60	1	DS22511265
225	112	8.00	7.50	14.50	1	DS22511280
225	112	12.00	11.25	17.00	1	DS22511212
225	112	16.00	15.00	20.50	1	DS22511216
250	102	10.00	9.60	18.00	1	DS25010210
250	102	12.00	11.50	19.00	1	DS25010212
250	127	6.50	6.50	14.80	1	DS25012765
250	127	7.00	6.70	14.80	1	DS25012770
250	127	10.00	9.40	17.00	1	DS25012710
250	127	12.00	11.25	19.30	1	DS25012712
250	127	14.00	13.10	19.60	1	DS25012714
250	127	16.00	15.00	21.80	1	DS25012716

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Reduced Thickness Disc Springs - DIN 2093

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Metric Dimensions					Packet Qty	Plain	Stainless Steel 301/304
De	di	Thickness (t)	Dish (h)	Height (OH)			
70	35.5	3.75	2.05	5.80	5	DS703540RT	DS703540RTSS
70	40.5	3.75	1.85	5.60	5	DS704040RT	DS704040RTSS
70	40.5	4.60	1.60	6.20	5	DS704050RT	N/A
71	36	3.75	1.85	5.60	5	DS713640RT	DS713640RTSS
80	31	3.75	2.35	6.10	5	DS803140RT	DS803140RTSS
80	36	3.75	2.45	6.20	5	DS803640RT	DS803640RTSS
80	41	3.75	2.45	6.20	5	DS804140RT	DS804140RTSS
80	41	4.70	2.00	6.70	5	DS804150RT	N/A
90	46	4.70	2.30	7.00	5	DS904650RT	N/A
100	41	3.75	3.45	7.20	1	DS1004140RT	DS1004140RTSS
100	41	4.75	3.00	7.75	1	DS1004150RT	DS1004150RTSS
100	51	3.75	3.25	7.00	1	DS1005140RT	DS1005140RTSS
100	51	4.75	3.05	7.80	1	DS1005150RT	N/A
100	51	5.60	2.60	8.20	1	DS1005160RT	N/A
112	57	3.75	3.45	7.20	1	DS1125740RT	DS1125740RTSS
112	57	5.60	2.90	8.50	1	DS1125760RT	N/A
125	41	3.75	4.45	8.20	1	DS1254140RT	DS1254140RTSS
125	51	3.75	4.75	8.50	1	DS1255140RT	DS1255140RTSS
125	51	4.70	4.20	8.90	1	DS1255150RT	DS1255150RTSS
125	51	5.60	3.80	9.40	1	DS1255160RT	DS1255160RTSS
125	61	4.70	4.30	9.00	1	DS1256150RT	DS1256150RTSS
125	61	5.60	4.00	9.60	1	DS1256160RT	DS1256160RTSS
125	61	7.60	3.30	10.90	1	DS1256180RT	DS1256180RTSS
125	64	4.70	3.80	8.50	1	DS1256450RT	N/A
125	64	5.60	4.00	9.60	1	DS1256460RT	N/A
125	64	6.55	3.45	10.00	1	DS1256470RT	N/A
125	64	7.50	3.10	10.60	1	DS1256480RT	N/A
125	71	5.60	3.70	9.30	1	DS1257160RT	N/A
125	71	7.40	3.00	10.40	1	DS1257080RT	N/A
125	71	9.20	2.60	11.80	1	DS1257110RT	N/A
140	72	4.70	4.30	9.00	1	DS1407250RT	N/A
140	72	7.50	3.70	11.20	1	DS1407280RT	N/A

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Metric Dimensions					Packet Qty	Plain
De	di	Thickness (t)	Dish (h)	Height (OH)		
150	61	4.80	5.50	10.30	1	DS1506150RT
150	61	5.80	5.00	10.80	1	DS1506160RT
150	71	5.65	5.15	10.80	1	DS1507160RT
150	71	7.50	4.50	12.00	1	DS1507180RT
150	81	7.50	4.20	11.70	1	DS1508180RT
150	81	9.30	3.70	13.00	1	DS1508110RT
160	82	5.60	4.90	10.50	1	DS1608260RT
160	82	9.40	4.10	13.50	1	DS1608210RT
180	92	5.60	5.50	11.10	1	DS1809260RT
180	92	9.40	4.60	14.00	1	DS1809210RT
180	92	12.10	4.40	16.50	1	DS1809213RT
200	82	7.60	6.60	14.20	1	DS2008280RT
200	82	9.45	6.05	15.50	1	DS2008210RT
200	82	11.35	5.25	16.60	1	DS2008212RT
200	92	9.50	6.10	15.60	1	DS2009210RT
200	92	11.40	5.40	16.80	1	DS2009212RT
200	92	13.20	4.90	18.10	1	DS2009214RT
200	102	7.50	6.10	13.60	1	DS20010280RT
200	102	9.40	6.20	15.60	1	DS20010210RT
200	102	11.25	4.95	16.20	1	DS20010212RT
200	102	13.10	5.10	18.20	1	DS20010214RT
200	112	9.40	4.82	14.22	1	DS20011210RT
200	112	11.10	5.10	16.20	1	DS20011212RT
200	112	12.90	4.60	17.50	1	DS20011214RT
200	112	14.70	4.10	18.80	1	DS20011216RT

Reduce Thickness Disc Springs- DIN 2093 are specific thickness for specialised applications where very accurate torque loads are required.

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Heavy Duty Safety Washers (HDS) - DIN 6796

Heavy Duty Safety or Load Washers; are manufactured as per DIN 6796 and are designed specifically for Heavy Duty Bolted sections.

STANDARD APPLICATIONS INCLUDE:

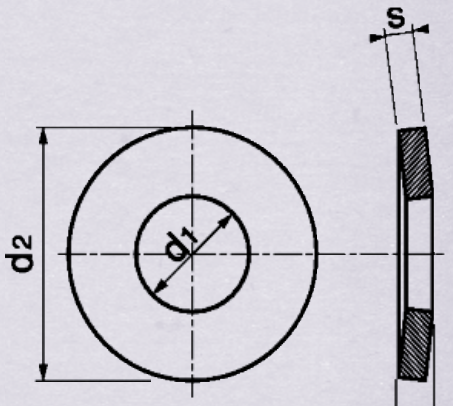
- **Bus Bars in Transformers**
- **Automobile & Heavy construction**
- **Agriculture & Heavy Machinery**
- **Mining & Turbine construction**

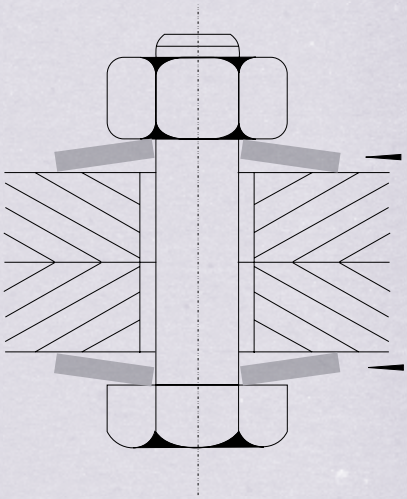
These washers are intended to counteract the effect of setting which results in bolt/nut assemblies working loose. They do not effectively prevent loosening of the assembly under varying radial load and are designed for use with short bolts predominantly subject to thrust.

All HDS Washers are tested as per DIN 6796 and DIN 267: Part 26. They are recommended and designed for high strength bolts with Property Class 8.8 & 10.9. Imperial sizes can be quoted on request.

Our stocked sizes are available in Plain, DELTA-PROTEKT® & Mechanical Zinc Yellow. Thicker sizes are supplied in phosphated & oiled condition and other materials are also available on request including various Carbon steel grades, Chrome Vanadium and Stainless Steels.

Need a higher load? We can also produce HDS washers with a reduced outside diameter to create more Torque in tighter spaces. Just let us know and we'd be happy to act on your requests.





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Heavy Duty Safety Washers (HDS) - DIN 6796

Heavy Duty Safety Washers (HDS) - DIN 6796

Bolt Size	d2	d1	Thickness (s)	Height (h)	Packet Qty	Plain	Zinc	Zinc Yellow
M2	5.00	2.20	0.40	0.6	200	BW052204	BWZ052204	BWZY052204
M2.5	6.00	2.70	0.50	0.72	200	BW062705	BWZ062705	BWZY062705
M3	7.00	3.20	0.60	0.85	200	BW073206	BWZ073206	BWZY073206
M3.5	8.00	3.70	0.80	1.06	200	BW083708	BWZ083708	BWZY083708
M4	9.00	4.30	1.00	1.3	200	BW094310	BWZ094310	BWZY094310
M5	11.00	5.30	1.20	1.55	200	BW115312	BWZ115312	BWZY115312
M6	14.00	6.40	1.50	2	200	BW146415	BWZ146415	BWZY146415
M7	17.00	7.40	1.75	2.3	200	BW177417	BWZ177417	BWZY177417
M8	18.00	8.40	2.00	2.6	200	BW188420	BWZ188420	BWZY188420
M10	23.00	10.50	2.50	3.2	200	BW231025	BWZ231025	BWZY231025
M12	29.00	13.00	3.00	3.95	100	BW291330	BWZ291330	BWZY291330
M14	35.00	15.00	3.50	4.65	100	BW351535	BWZ351535	BWZY351535
M16	39.00	17.00	4.00	5.25	50	BW391740	BWZ391740	BWZY391740
M18	42.00	19.00	4.50	5.8	50	BW421945	BWZ421945	BWZY421945
M20	45.00	21.00	5.00	6.4	40	BW452150	BWZ452150	BWZY452150
M22	49.00	23.00	5.50	7.05	30	BW492355	BWZ492355	BWZY492355
M24	56.00	25.00	6.00	7.75	25	BW562560	BWZ562560	BWZY562560
M27	60.00	28.00	6.50	8.35	10	BW602865	BWZ602865	BWZY602865
M30	70.00	31.00	7.00	9.2	5	BW703170	BWZ703170	BWZY703170

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JW Belleville & Crinkle Washers

JW Belleville & Crinkle Washers

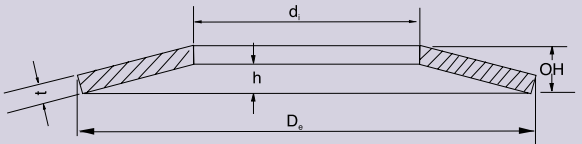
Reference	Bolt Size	De	di	Thickness (t)	Packet Qty	Carton Qty	Plain	WASCOAT®
JW 409	3/16	9.50	4.83	0.40	200	10000	1008200	1008218
JW 410	3/16	9.50	4.83	0.45	200	10000	1008201	1090134
JW 413	1/4	12.70	6.48	0.45	200	10000	1008202	1090135
JW 414	1/4	12.70	6.48	0.70	200	10000	1008203	1008215
JW 417	5/16	15.80	8.05	0.55	200	10000	1008204	1090136
JW 418	5/16	15.80	8.05	0.90	200	10000	1008205	1008216
JW 421	3/8	19.10	9.65	0.70	200	10000	1008206	1008219
JW 422	3/8	19.10	9.65	1.00	200	5000	1008207	1008217
JW 425	1/2	25.40	12.83	0.90	200	5000	1008208	1008220
JW 426	1/2	25.40	12.83	1.20	200	2000	1008209	1090137
JW 427	9/16	28.00	14.20	1.60	200	2000	1008210	1090138
JW 429	5/8	31.80	16.00	1.00	200	2000	1008211	1090139
JW 430	5/8	31.80	16.06	1.60	200	2000	1008212	1090140
JW 433	3/4	38.10	19.18	1.20	200	1000	1008213	1090141
JW 434	3/4	38.10	19.18	2.00	200	1000	1008214	1090144

WW607	1/4	12.70	6.73	0.36	1000	25000	1090208	enquire
WW608	5/16	15.24	8.43	0.36	1000	10000	1090192	enquire
WW609	3/8	17.78	10.31	0.56	1000	10000	1090171	enquire
WW610	1/2	24.13	13.46	0.56	1000	5000	1090209	enquire
WW611	5/8	29.72	16.66	0.70	1000	5000	1090204	enquire

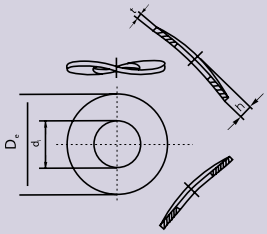
JW Range

JW range of Disc Springs and Crinkle Washers are specific dimensions for small to medium applications. They are made from CK1055 and are available in Plain and WASCOAT®.

Note this range is generally for imperial fasteners but chart has been converted to metric.



Load Values for Stainless Steel approx 95% of Spring Steel values shown.



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Ball Bearing Disc Springs

Ball bearing Disc Springs are available in plain and slotted. They are used with radial Ball bearings to minimize vibration and shaft deflection. Proper preloading will increase bearing rigidity and eliminate excessive wear & tear and running noise.

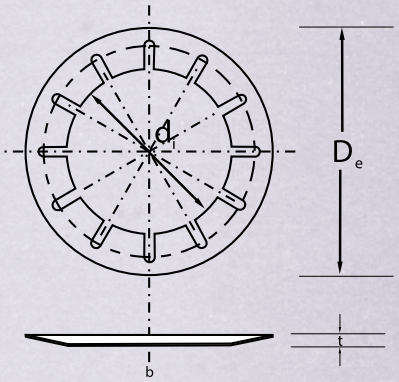
ADVANTAGES OF BALL BEARING DISC SPRINGS PRELOADING WASHERS:

1. Significant increase or decrease in applied force even with small variation in deflection.
2. Backlash compensation & regressive curves help reduce preload variations changes.
3. Very low force characteristics with very large deflection range.
4. Multiplication of force by stacking of two or more in parallel.
5. Available in all size to accommodate all Ball bearing sizes.
6. Elimination of noise and play in Ball Bearings.
7. Round shape ensures equal distribution of load around the bearing ring.

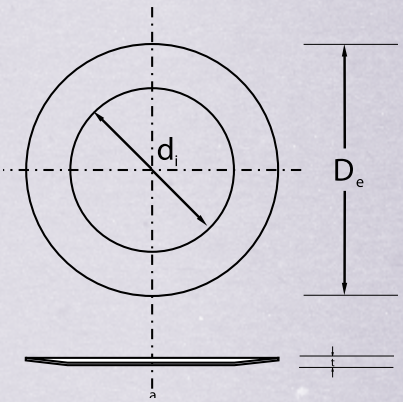
Application of Preloaded Bearing Washers in Electric motors helps to reduce operating noise. The preload force remains practically constant even when there is axial displacement of the bearing as a result of thermal expansion.

If preload is primarily to protect the bearing from vibration damage when stationary, then greater preload is required.

Other types of Ball Bearing Disc Springs available are Slotted Preloading Bearing Washers. These are available on request and are manufactured to order.



- Load tolerances : +_ 20% at 75h



- Load tolerances : +_ 20% at 75h

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Ball Bearing Disc Springs

Ball Bearing Disc Springs

De	di	Thickness (t)	Packet Qty	Plain
9.8	6.2	0.2	100	BP090620
12.8	7.2	0.2	100	BP120725
15.8	8.2	0.2	100	BP150825
18.8	9.2	0.3	100	BP180930
18.8	10.2	0.3	100	BP181035
21.8	12.3	0.3	100	BP211235
23.7	14.3	0.4	100	BP231440
25.7	14.3	0.4	100	BP251440
27.7	17.3	0.4	50	BP271740
29.7	17.3	0.4	50	BP291740
31.7	20.4	0.4	50	BP312040
34.6	20.4	0.4	50	BP342040
34.6	22.4	0.5	50	BP342250
36.6	20.4	0.5	50	BP362050
39.6	25.5	0.5	50	BP392550
41.6	25.5	0.5	50	BP412550
46.5	30.5	0.6	20	BP463060
51.5	35.5	0.6	20	BP513560
54.5	40.5	0.6	20	BP544060
61.5	40.5	0.7	20	BP614070
67.5	50.5	0.7	10	BP675070
71.5	45.5	0.7	10	BP714570
71.5	50.5	0.7	10	BP715070
74.5	55.5	0.8	10	BP745580
79.5	50.5	0.8	10	BP795080
79.5	55.5	0.8	10	BP795580
84.5	60.5	0.9	10	BP846090
89.5	60.5	0.9	10	BP896090
89.5	65.5	0.9	10	BP896590
94.5	75.5	1.0	10	BP947510
99.0	65.5	1.0	10	BP996510
99.0	70.5	1.0	10	BP997010
109.0	70.5	1.2	10	BP1097012
109.0	75.5	1.2	10	BP1097512

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Ball Bearing Disc Springs

Ball Bearing Disc Springs

De	di	Thickness (t)	Packet Qty	Plain
114.0	90.5	1.2	10	BP1149012
119.0	75.5	1.2	5	BP1197512
119.0	85.5	1.2	5	BP1198512
124.0	90.5	1.2	5	BP1249012
129.0	85.5	1.2	5	BP1298512
129.0	95.5	1.2	5	BP1299512
139.0	90.5	1.2	5	BP1399012
139.0	101.0	1.2	5	BP13910112
149.0	95.5	1.5	5	BP1499515
149.0	106.0	1.5	5	BP14910615
159.0	101.0	1.5	5	BP15910115
159.0	111.0	1.5	2	BP15911115
169.0	111.0	1.5	2	BP16911115
169.0	121.0	1.5	2	BP16912115
179.0	121.0	2.0	2	BP17912120
179.0	126.0	2.0	2	BP17912620
189.0	121.0	2.0	2	BP18912120
189.0	131.0	2.0	2	BP18913120
198.0	131.0	2.0	2	BP19813120
198.0	141.0	2.0	2	BP19814120
213.0	151.0	2.2	1	BP21315122
223.0	161.0	2.2	1	BP22316122
228.0	161.0	2.2	1	BP22816122
238.0	161.0	2.2	1	BP23816122
248.0	171.0	2.5	1	BP24817125
258.0	171.0	2.5	1	BP25817125
268.0	181.0	2.5	1	BP26818125
278.0	181.0	2.5	1	BP27818125
288.0	191.0	2.7	1	BP28819127
298.0	191.0	2.7	1	BP29819127
308.0	202.0	3.0	1	BP30820230
318.0	212.0	3.0	1	BP31821230
338.0	232.0	3.0	1	BP33823230
358.0	242.0	3.0	1	BP35824230

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"S" Serrated Safety Washers

"S" Serrated Safety Washers

Bolt Size		d2	d1	Thickness (s)	Zinc	Stainless Steel 301/304
Metric	Imperial					
M1.6	N/A	3.2	1.7	0.3	SWZM16	SWSSM1
M2	N/A	4.0	2.2	0.3	SWZM2	SWSSM2
M2.5	N/A	4.8	2.7	0.4	SWZM25	SWSSM25
M3	1/8"	5.5	3.2	0.4	SWZM3	SWSSM3
M3.5	N/A	6.0	3.7	0.4	SWZM35	SWSSM35
M4	5/32	7.0	4.3	0.5	SWZM4	SWSSM4
M5	N/A	9.0	5.3	0.6	SWZM5	SWSSM5
M6	N/A	10.0	6.4	0.7	SWZM6	SWSSM6
N/A	1/4	9.5	6.7	0.7	SWZ14	SWSS14
M7	N/A	12.0	7.4	0.7	SWZM7	SWSSM7
M8	5/16	13.0	8.4	0.8	SWZM8	SWSSM8
M10	3/8	16.0	10.5	1.0	SWZM10	SWSSM10
N/A	7/16	15.9	11.6	1.0	SWZ716	SWSS716
M12	N/A	18.0	13.0	1.1	SWZM12	SWSSM12
N/A	1/2	19.0	13.7	1.1	SWZ12	SWSS12
M14	9/16	22.0	15.0	1.2	SWZM14	SWSSM14
M16	5/8	24.0	17.0	1.3	SWZM16	SWSSM16
M18	N/A	27.0	19.0	1.5	SWZM18	SWSSM18
N/A	3/4	30.0	20.0	1.5	SWZ34	SWSS34
M20	N/A	30.0	21.0	1.5	SWZM20	SWSSM20
M22	7/8	33.0	23.0	1.5	SWZM22	SWSSM22
M24	N/A	36.0	25.6	1.8	SWZM24	SWSSM24
N/A	1"	38.0	27.0	2.0	SWZ1	SWSS1
M27	1"	39.0	28.6	2.0	SWZM27	SWSSM27
M30	11/8	45.0	31.6	2.0	SWZM30	SWSSM30
M36	13/8	54.0	38.0	2.5	SWZM36	SWSSM36

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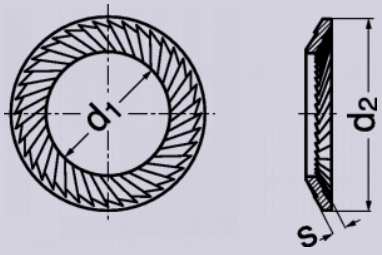
"VS" Serrated Safety Washers

"VS" Serrated Safety Washers

Bolt Size		d2	d1	Thickness (s)	Height	Plain	Zinc	Stainless Steel 301/304
Meric	Imperial							
M5	3/16	9.0	5.3	1.0	1.3	VSWM5	VSWZM5	VSWSSM5
M6	N/A	10.0	6.4	1.0	1.4	VSWM6	VSWZM6	VSWSSM6
M8	5/16	13.0	8.4	1.2	1.7	VSWM8	VSWZM8	VSWSSM8
M10	3/8	16.0	10.5	1.5	2.0	VSWM10	VSWZM10	VSWSSM10
M12	N/A	18.0	13.0	1.5	2.1	VSWM12	VSWZM12	VSWSSM12
M14	9/16	22.0	15.0	1.5	2.2	VSWM14	VSWZM14	VSWSSM14
M16	5/8	24.0	17.0	2.0	2.6	VSWM16	VSWZM16	VSWSSM16
M18	N/A	27.0	19.0	2.0	2.7	VSWM18	VSWZM18	VSWSSM18
M20	N/A	30.0	21.0	2.0	2.8	VSWM20	VSWZM20	VSWSSM20
M22	7/8	33.0	23.0	2.0	3.0	VSWM22	VSWZM22	VSWSSM22
M24	N/A	36.0	25.6	2.5	3.4	VSWM24	VSWZM24	VSWSSM24
N/A	1"	38.0	27.0	2.5	3.4	VSW1	VSWZ1	VSWSS1
M27	N/A	39.0	28.6	2.5	3.5	VSWM27	VSWZM27	VSWSSM27
M30	11/8	45.0	31.6	2.5	3.8	VSWM30	VSWZM30	VSWSSM30
M33	11/4	50.0	34.6	3.0	4.5	VSWM33	VSWZM33	VSWSSM33
M36	13/8	54.0	38.0	3.0	4.5	VSWM36	VSWZM36	VSWSSM36

Serrated Safety Washers are Disc Springs with Trapezoidal Cross Section on both sides for gripping and to sustain preload and avoid loosening. As the bolt or screw is tightened the serrations crunch into the mating faces and prevents the screw from loosening up due to vibration. They are available in various sizes to fit bolts or screws. The outer diameter of the washer is matched to the head diameter of a screw or bolt to also be used in recessed situations; with the exception of countersunk heads. The "S" Serrated Safety Washers are used for normal applications and the "VS" Serrated Safety Washers range are identical except the thickness across the range is increased for higher pre-tensioning loads.



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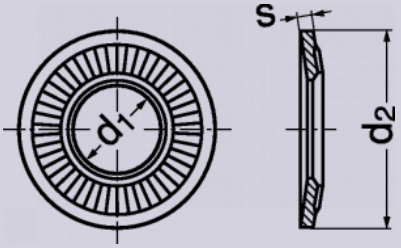
Contact Washers NFE 25-511

Contact Washers NFE 25-511

Screw Size	d1	d2	Thickness (s)	Height max	# of knurls	Packet Qty	Zinc Yellow
M4	4.1	10	0.9	1.4	32	200	CW41009
M5	5.1	12	1.1	1.8	36	200	CW51211
M6	6.1	14	1.3	2.1	45	200	CW61413
M8	8.2	18	1.4	2.3	45	200	CW81814
M10	10.2	22	1.6	2.7	45	200	CW102216
M12	12.4	27	1.8	3.1	45	100	CW122718
M14	14.4	30	2.4	3.7	45	100	CW143024
M16	16.4	32	2.8	4.1	60	100	CW163228
M20	20.5	40	3.2	4.3	60	100	CW204032

Contact Washers are conical shaped lock washers formed with a ribbed top surface. The conical shape exerts locking force 360° around the underside of the screw head or nut. The ribbed top surface further enhances the locking force and resists the torqued fastener connection potential for loosening under pressure and vibration.



With a strict quality system, IIS products are put through rigorous in-house testing before being despatched to WASCA®, so your mind is at ease every time you recieve an IIS product. We can also supply full certifications for all products upon request.

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E-Clips - DIN 6799

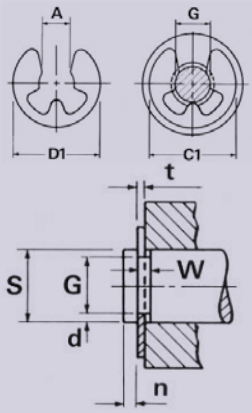
E-Clips - DIN 6799

Groove Diameter	Shaft Diameter Range		Lock Washer				Packet Qty	Plain
G	S		t		A			
Nominal Size	from	to		Tolerance		Tolerance (+/-IT 10)		
0.8	1	1.4	0.2	+/-0.02	0.5	+/-0.04	1000	ECLIP08
1.2	1.4	2	0.3		1.0		1000	ECLIP120
1.5	2	2.5	0.4		1.2		1000	ECLIP150
1.9	2.5	3	0.5		1.6		1000	ECLIP190
2.3	3	4	0.6		1.9		1000	ECLIP23
3.2	4	5	0.6		2.7		1000	ECLIP32
4	5	7	0.7		3.3	+/-0.048	1000	ECLIP4
5	6	8	0.7		4.1		1000	ECLIP5
6	7	9	0.7		5.2		1000	ECLIP6
7	8	11	0.9		5.8		1000	ECLIP7
8	9	12	1	+/-0.03	6.5	+/-0.058	1000	ECLIP8
9	10	14	1.1		7.6		1000	ECLIP9
10	11	15	1.2		8.3		500	ECLIP10
12	13	18	1.3		10.4	+/-0.07	500	ECLIP12
15	16	24	1.5		12.6		500	ECLIP15
19	20	31	1.75		15.9		500	ECLIP19
24	25	38	2		21.8	+/-0.084	250	ECLIP24
30	32	42	2.5		25.8		250	ECLIP30

**For supplementary data, please refer to our website www.wasca.com.au*

E-clip

'E' Clips are used to permit rotation but to prevent lateral movement on machined grove shafts. They are semi-flexible and can be elastically deformed to install or remove them, but are sized to provide an interference on grooves.



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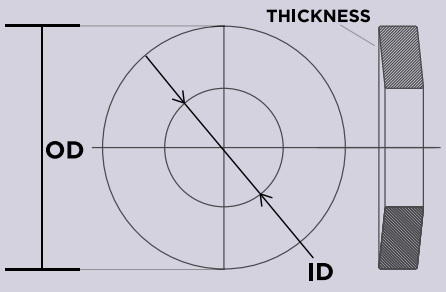
H13 - Flange Bolt Washers

H13 - Flange Bolt Washers

OD	ID	Thickness	Torque Ft. Lbs.	Packet Qty	Plain
25.6	13.4	3.5	60	1	AFB 1-60
29.1	16.2	4.7	120	1	AFB 2-60
34.8	19.3	5.5	200	1	AFB 3-60
40.3	22.6	7.1	320	1	AFB 4-60
45.9	25.9	8.0	490	1	AFB 5-60
51.4	29.0	9.4	710	1	AFB 6-60
58.6	32.2	10.2	1,000	1	AFB 7-60
62.7	35.5	11.3	1,360	1	AFB 8-60
68.0	38.7	12.7	1,600	1	AFB 9-60
74.9	41.8	13.7	2,200	1	AFB 10-60
80.5	45.0	15.0	3,000	1	AFB 11-60
86.0	48.2	14.8	4,000	1	AFB 12-60
91.4	51.4	15.7	4,400	1	AFB 13-60
102.6	57.9	17.7	6,360	1	AFB 14-60
113.8	64.2	19.8	8,800	1	AFB 15-60
124.9	70.6	22.0	11,840	1	AFB 16-60
136.1	76.9	24.1	15,440	1	AFB 17-60

Flange Bolt Washers help to eliminate Flange Leakage. In these situations several different leaks can occur such as Bolt Stretch, Gasket Creep and Cycles of Thermal Change. However, by maintaining load on the Bolted Joints leakage is heavily reduced, if not eliminated. H13 Tool Steel is the main material for this product group, with a working temperature to 1000°F.



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Shims - DIN 988

SHIMS - DIN 988

OD	ID	Thickness	Packet Qty	Plain
6	3	1.0	100	SHIM6310
8	4	1.0	100	SHIM8410
10	5	1.0	100	SHIM10510
12	6	1.2	100	SHIM12612
13	7	1.2	100	SHIM13712
14	8	1.2	100	SHIM14812
15	9	1.2	100	SHIM15912
16	10	1.2	100	SHIM161012
17	11	1.2	100	SHIM171112
18	12	1.2	100	SHIM181212
19	13	1.5	100	SHIM191315
20	14	1.5	100	SHIM201415
21	15	1.5	100	SHIM211515
22	16	1.5	100	SHIM221615
24	17	1.5	100	SHIM241715
25	18	1.5	100	SHIM251815
26	19	1.5	100	SHIM261915
28	20	2.0	100	SHIM282020
30	22	2.0	100	SHIM302220
32	22	2.0	100	SHIM322220
35	25	2.0	100	SHIM352520
36	25	2.0	100	SHIM362520
37	26	2.0	100	SHIM372620
40	28	2.0	50	SHIM402820
42	30	2.5	50	SHIM423025
45	32	2.5	50	SHIM453225
45	35	2.5	50	SHIM453525
45	36	2.5	50	SHIM453625
47	37	2.5	50	SHIM473725
50	40	2.5	50	SHIM504025
52	42	3.0	50	SHIM524230
55	45	3.0	50	SHIM554530
56	45	3.0	50	SHIM564530
60	48	3.0	20	SHIM604830
62	50	3.0	20	SHIM625030
63	50	3.0	20	SHIM635030
65	52	3.0	20	SHIM655230
68	55	3.0	20	SHIM685530
70	56	3.0	5	SHIM705630
72	56	3.0	5	SHIM725630
75	60	3.0	5	SHIM756030
80	63	3.0	5	SHIM806330
85	65	3.5	5	SHIM856535
90	70	3.5	5	SHIM907035
95	75	3.5	5	SHIM957535
100	80	3.5	1	SHIM1008035
105	85	3.5	1	SHIM1058535
110	90	3.5	1	SHIM1109035
115	95	3.5	1	SHIM1159535
120	100	3.5	1	SHIM12010035
125	100	3.5	1	SHIM12510035
130	105	3.5	1	SHIM13010535
140	110	3.5	1	SHIM14011035
150	120	3.5	1	SHIM15012035
160	130	3.5	1	SHIM16013035
170	140	3.5	1	SHIM17014035
180	150	3.5	1	SHIM18015035
190	160	3.5	1	SHIM19016035
200	170	3.5	1	SHIM20017035

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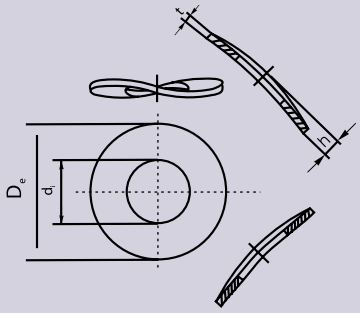
Wave Washers - DIN 137B

Wave Washers - DIN 137B

Bolt Size	De	di	Thickness (t)	Height (h)		Plain
				min.	max.	
M3.5	8.0	3.7	0.5	0.9	1.8	WW083705
M4	9.0	4.3	0.5	1.0	2.0	WW094305
M5	11.0	5.3	0.5	1.1	2.2	WW115305
M6	12.0	6.4	0.5	1.3	2.6	WW126405
M7	14.0	7.4	0.8	1.5	3.0	WW147405
M8	15.0	8.4	0.8	1.5	3.0	WW158408
M10	21.0	10.5	1.0	2.1	4.2	WW211010
M12	24.0	13.0	1.2	2.5	5.0	WW241312
M14	28.0	15.0	1.6	3.0	6.0	WW281516
M16	30.0	17.0	1.6	3.2	6.4	WW301716
M18	34.0	19.0	1.6	3.3	6.6	WW341916
M20	36.0	21.0	1.6	3.7	7.4	WW362116
M22	40.0	23.0	1.8	3.9	7.8	WW402318
M24	44.0	25.0	1.8	4.1	8.2	WW442518
M27	50.0	28.0	2.0	4.7	9.4	WW502820
M30	56.0	31.0	2.2	5.0	10.0	WW563122
M33	60.0	34.0	2.2	5.3	10.6	WW603422
M36	68.0	37.0	2.5	5.8	11.6	WW683725

Wave Washers



Wave Washers as per DIN 137B are made from Spring Steel, Stainless Steel and Copper.

They are designed to offer a compensating spring force and maintain a load and take up shock.

The irregular shape formed deflects and acts like a spring when loaded providing preload between two surfaces.

Wave Washers are very useful for limited radial space and moderate thrust load. The number of waves can be two, three or more.

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WASCA

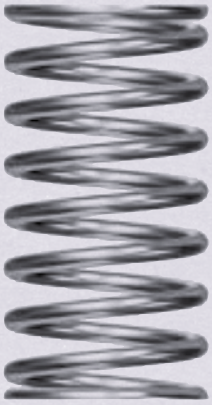
Coil Springs

IIS manufactures to order an entire range of Compression, Extension and Torsion Coil Springs.

These are available in various materials such as: -Spring Steel, 50crV4, 51CrV4, Stainless Steel, Inconel 718 / X750, 17 - 7 PH

COMPRESSION SPRINGS

Compression Springs are Helical Springs with an Open-Coil configuration designed to store energy or to resist a force applied. The most common form of Compression Spring is Straight Cylindrical Coil Spring with the ends Squared (Closed), and a common example for this is a Ball Point Pen Spring.



EXTENSION SPRINGS

Extension Springs are Helical Springs designed to store Energy and resist Pulling Force. The spring used on a Screen Door is good example of the most common Extension Spring.

TORSION SPRINGS

Torsion Springs are Helical Springs used to apply a Torque or store Rotational Energy. The common example of Torsion Spring is that used in a Cloth Peg.

Quality assurance is of prime importance in their field and the company is ISO 9001:2000 accredited and committed to continuous improvement in and further advancement.

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Washers & Stamped Components Australia Pty Ltd Terms and Conditions

1. ACCEPTANCE OF ORDERS
Any quotation given by WASCA lapses if not accepted within 7 days. WASCA will only accept orders which are accompanied by payment of the required deposit (if any). All quoted prices are exclusive of GST.

2. TERMS OF PAYMENT
Terms of payment where WASCA has accepted the Customer's credit application, are unless agreed otherwise by WASCA, 30 days from the end of the month of invoice. If payment is not made within the above terms WASCA is entitled to calculate and charge daily interest at a rate not greater than the maximum interest rate charged by ANZ on its credit card accounts from time to time, and WASCA reserves the right to recover from Customer all costs, expenses and charges incurred by WASCA in undertaking any debt recovery action, including legal fees on a full indemnity basis. WASCA accepts payment by EFT, Cheque, VISA or Mastercard. Please note that a 1.75% merchant fee applies to VISA and Mastercard payments.

3. MINIMUM INVOICE / ORDER VALUE
Due to the administrative cost of each order, we are unable to process orders below $50.00 invoice value.

4. DEFAULT
If Customer defaults in payment, fails to accept delivery of goods, or an application is made to a court to wind up Customer, or a receiver or administrator or trustee-in-bankruptcy is appointed to manage the affairs of Customer, then WASCA may terminate the contract and may recover from Customer reasonable compensation for materials purchased and ordered and labour expended in complying with Customer's orders.

5. DELIVERY AND RISK
While WASCA will use all reasonable endeavours to deliver by the date specified, it does not guarantee delivery on that date and is not liable for any Loss resulting from late delivery. Risk in the goods passes to Customer at the time of delivery. Delivery to Customer is deemed to occur at the time of delivery to Customer, its agent or carrier.

6. PASSING OF PROPERTY
Customer agrees that property in the goods is retained by WASCA until payment by Customer of all sums owing to WASCA, whether under this contract or otherwise. If Customer fails to pay by the due date any amount owing to WASCA, WASCA may (without prejudice to any of its other rights) recover and resell any goods in which property has not passed to Customer, and Customer hereby authorises WASCA to enter onto the premises where the goods are kept to take possession of the goods for that purpose at any time. If Customer sells or purports to sell any goods supplied by WASCA in which property has not passed to Customer, then Customer does so as a fiduciary for WASCA. The proceeds of such sale are the property of WASCA to the extent of any money owed to it by Customer. Customer must account to WASCA for that portion of the proceeds of sale, and WASCA may trace the proceeds of any such sale. Customer consents to registration by WASCA of a financing statement under the Personal Property Securities Act 2009 (Cth) ("the PPSA") to perfect the purchase money security interest created by this clause. Customer also agrees to the contracting out by WASCA of each of the obligations which it is permitted to contract out of by Section 115 of the PPSA.

7. CANCELLATIONS AND RETURNS
Any request by Customer for cancellation of an order must be in writing. Customer is liable to reimburse WASCA for the costs it has incurred for labour and materials in fulfilling the order up to the date the request for cancellation is received by WASCA. WASCA will accept returns of standard goods provided the goods are: (i) unused; (ii) in their original packaging, and (iii) returned within 14 days of delivery; WASCA reserves the right to charge a 15% re-stocking fee for the return of goods which are not faulty. WASCA will not accept the return of goods manufactured to Customer's order, unless the goods are faulty.

8. FORCE MAJEURE
Neither party is liable for any Loss incurred by the other party as a result of any delay or failure to observe any of these Terms and Conditions (other than an obligation to pay money) as a result of any circumstance beyond the party's control, including but not limited to any strike, lockout, labour dispute, act of God, fire, flood, accidental or malicious damage or breakdown in machinery. The party affected must notify the other party as soon as possible of such circumstance. During the continuance of such circumstance the obligations of the party affected, to the extent they are affected by the circumstance, are suspended and resume as soon as possible after the circumstance has ceased to have effect.

9. WASCA'S LIABILITY
a) Nothing in this document is to be interpreted as having the effect of excluding, restricting or modifying any condition or warranty, or right or liability implied by any applicable legislation into the arrangement between WASCA and Customer, if such exclusion, restriction or modification would be void or prohibited by the legislation.
b) To the extent that WASCA breaches any condition or warranty implied into the arrangement between WASCA and Customer and which cannot be excluded or modified, WASCA's liability is limited to, at WASCA's discretion, either: (i) replacement of the goods or supply of equivalent goods; (ii) payment of the cost of replacing the goods or acquiring equivalent goods; (iii) repair of the goods; or (iv) payment of the cost of having the goods repaired; and in the case of services, to: (i) supply of the services again; or (ii) payment of the cost of having the services supplied again.
c) Subject to (a) and (b) above, WASCA is not liable to Customer (or to any third party claiming through Customer) for any Loss caused by any act or omission of WASCA, its employees or agent, and whether based on negligence or other tort, contract or otherwise.

10. JURISDICTION
This agreement is governed by the laws of the State of Victoria, and the parties submit to the jurisdiction of the courts of that State, and the Commonwealth of Australia.

11. MISCELLANEOUS
a) The waiver of any provision or breach of these Terms and Conditions is not to be construed as a waiver of any other provision or breach, or subsequent breach of the same or any other provision of the contract.
b) Unless agreed otherwise by WASCA and the Customer, WASCA reserves the right to deliver goods with a tolerance of up to +/- 10% of the quantity ordered by Customer.
c) The property in any tooling and diagrams used to manufacture the goods remains always the property of WASCA.
d) Customer indemnifies WASCA against any Loss suffered by WASCA arising out of or in connection with the supply of goods where Customer fails to communicate to WASCA the purpose for which it requires the goods, where such purpose is not otherwise obvious to WASCA from the information provided to WASCA.
e) If any provision of these Terms & Conditions is unenforceable or void either in whole or in part for any reason then that provision (or part) is deemed to be deleted without in any way affecting the validity or enforceability of the remainder of this document.
f) The terms and conditions of any purchase order issued by the Customer do not operate to modify or amend these Terms and Conditions
g) The following words have the following meanings in these Terms & Conditions, unless the context requires otherwise:-
"Customer" means the person (including its successors, personal representatives and permitted assigns) who acquires goods from WASCA, and where this consists of more than one person the obligations in these Terms & Conditions are deemed to be joint and several;
"Goods" means all goods and/or services supplied under these Terms & Conditions;
"Loss" means any loss, liability, damage, expense or cost whatsoever and includes (without limitation) indirect or consequential loss or damage, loss of profits or business opportunity, and damage to equipment or property; and
"WASCA" means Washers & Stamped Components Australia Pty Ltd, ABN 48 004 614 966.

12. PRICE VARIATION
The price quoted by WASCA is subject to variation at any time prior to the date of delivery upon written notice to Customer. If Customer is unable or unwilling to accept delivery on or before the nominated delivery date, or if no delivery date is nominated and Customer is unable to accept delivery when WASCA gives notice that the goods are available for delivery, then WASCA will hold the goods in stock for 45 days after which time it may, at its discretion: (i) continue to hold the goods and charge Customer for storage; (ii) invoice Customer and deliver the goods in accordance with prior arrangements, notwithstanding that Customer's representative or agent is not present or is unwilling to accept the goods; or (iii) treat the contract as having been repudiated by Customer and invoice Customer for the full contract price for the goods and any other costs incurred by WASCA less any amounts received by WASCA from a bona fide sale of the goods to a third party.

13. ACCEPTANCE OF TERMS AND CONDITIONS
Please note that purchase of 'goods' as defined in 11(g) above, from WASCA, signifies your acceptance of these terms and conditions.

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WASCA

Located in our modern factory and warehouse in Rowville, Victoria; we remain one of only a handful of Australian suppliers with in-house CAD design, tooling and manufacturing capabilities; which helps us control quality and cost.

To further compete on a global scale we have invested in overseas manufacturing operations and have developed close relationships with many reputable International suppliers.

So the next time you require a fastener or component solution, give WASCA a go.....

With our expanded product divisions and our team of highly experienced technical staff, we are confident we can assist you no matter what...

DISC SPRINGS

WASCA Disc Springs catalogue

We are the distributor for a reputable international manufacturer of Disc Springs, Belleville, and Anti-Vibration LockRite® Washers.

FASTENERS

WASCA Fasteners catalogue

Consisting of high quality, competitively-priced fasteners. Our range ensures you will find the exact product you're looking for.

ENGINEERING

WASCA Engineering catalogue

Our in-house capabilities and Global partners mean we can design, manufacture and/or source a fully customised project solution.

ASSORTMENTS

WASCA Assortments catalogue

We have compiled a total fastener assortment solution for every Industry sector. We have the right combination everytime.

WASCA

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WA Distributor
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21 Pavers Circle
Malaga WA 6090

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