



**WEDGE WASHER®**

Bolt Locking Solutions

# Bolt Locking Solutions





WEDGE WASHER®  
Bolt Locking Solutions

# Bolt Locking Solutions

## About Us

Here at Secure Bolting Solutions, we specialise in exactly what our company name says! We focus on providing solutions for critical bolted joints that need to maintain their clamping force for the safety of the joint and its application.

Our well known Wedge Locking Washer Technology is our solution of choice for most critical bolted joints but we will also advise on other solutions if we feel it might be more appropriate for the application.

We use our many years in the Fastener Industry to call upon the best solutions for our clients and like to think we go the extra mile to provide a great service as well as a high-quality product.



## How Do Wedge Washers Work?

Wedge Washers come as a pre-glued pair that act as one washer for the purpose of first installation. The glue is used to hold the two washers together the right way around and has no technical function apart from making the Wedge Washer a one-piece solution that can be easily substituted for a standard washer.

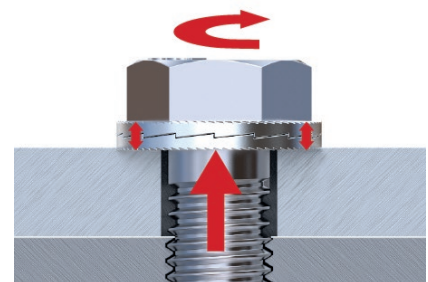
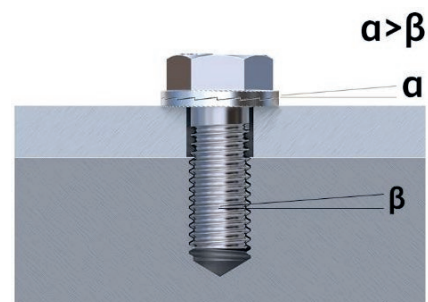
The two pieces both have a Serrated and hardened outer face designed to be harder than most commonly used Bolts or Nuts so that they can bite into their surface as well as into the mating surface to the other side of the washer within the joint.

The clever part is that the inner surfaces have angled cams that fit together with an angle that is steeper than the pitch of the thread (see diagram opposite). The cam surfaces are smooth so after the Joint is tightened, and the pair of washers have seated into the nut/bolt and the mating surfaces have gripped with their serrated edges the only way it can come loose is through the cams.

When a force from a Vibration or a Dynamic load is applied which would naturally cause the bolt / nut to rotate loose this acts through the smooth surface of the cams. When they try to separate this creates the "Wedge" effect because the steeper angles of the cams on the washer lock them in place which means the Pre-load (Clamping Force) in the joint is maintained and not reduced at all.

The only way the joint will come undone is by physically untightening it and manually forcing the Cams over the top of each other. The fact that no re-tightening is required provides peace of mind as well as reduces maintenance costs for every joint.

See the diagrams for a more visual explanation and our videos on our website.





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## Features and Benefits

Feature	Benefit
Resists Vibration and Dynamic Loading to DIN 25201	Peace of mind the load in the joint can be maintained under these conditions.
Maintains Pre-load (Clamping Force)	Reduces risk of failure over the joint lifetime.
No re-tightening required	Reduces Maintenance time and cost.
Can be used with lubrication	Better joint consistency and performance can be achieved compared with friction-based products.
Easy to Install	Can be used just like a normal washer with no special tools or skills required.
Designed for use with most grades of fasteners	Can be used just like a standard washer for most bolted joints
Can be re-used	Reduces costs when compared to friction-based products that can damaged the fastener as well.
Functions at Low and High Pre-loads	Can be used on a variety of applications.
Available in Mild Steel and Stainless	Suitable for many different environments.
Wide range of Diameters	Suitable for small to large applications.
Standard and Wide Versions	Suitable for normal and or slotted/oversize holes.

## When Compared to Traditional Methods



Nylon Inserted Nut



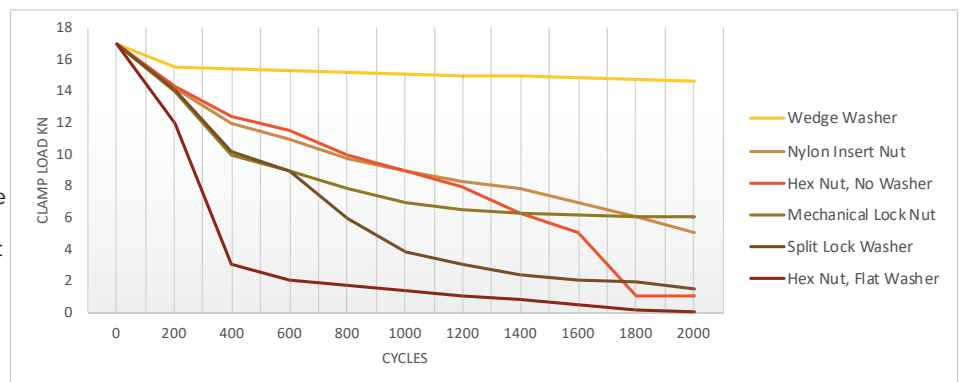
All Metal Locking Nut



Split/Spring Washer

## How do Wedge Washers Perform when tested to DIN 25201 with a Junker Machine?

There are many different systems that have been developed over the years to try and solve the problem of the self-loosening of fasteners. The performance of these systems varies dramatically with many of them not actually performing how you would expect them to do so. The Junker test was developed to demonstrate this and is now combined with the introduction of DIN 25201 in 2010 as a test standard to check this performance.



Our Wedge Washers maintain the pre-load in the joint after a small amount of initial joint settlement and can be classed as a “Bolt Locking” device to DIN 25201 whereas many other systems such as the ones above and to DIN standards DIN 985, DIN 980, DIN 127, DIN 6797, DIN 93 can simply be classed as “Loss Prevention” devices because under severe vibration and dynamic loads they lose the majority of their pre-load as shown in the graph (above).



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## Installation

Simply place the Wedge Washer between the nut face or bolt head and the joint material. You need to use a Wedge Washer on any side of the joint that could work loose so on a through bolted joint you need to use a Wedge Washer on each side.

Tighten the joint as you would normally when using a standard washer but make sure you refer to our torque guidelines on pages 7 & 8 because the values increase slightly due to overcoming the friction on the serrated edges. You will be able to achieve the same pre-load in the joint with the added benefit of a locking mechanism to maintain the pre-load even under vibration or dynamic loading.

The use of a lubricant is always recommended to prevent seizing of the threads and to increase the consistency of the clamping force achieved in the joint. Wedge Washers have the benefit that they use tension to maintain the joint and do not rely on friction of the thread, lubricating the joint is welcomed when using them.

## Removal and Re-use

Wedge Washers are simply removed like any standard washer by untightening the nut/bolt with standard tools. This is the only way the joint will come undone.

Once the Wedge Washers are removed after their first installation the assembly glue will have separated and the pair of washers will now be in two separate pieces.

Wedge Washers can be re-used but it is essential if you do re-use them to inspect the cams to make sure they are still engaging. When re-using the washers, the cams can wear overtime, so it is important to check them for wear and if you are unsure then replace them with a new pair.

When installing used Wedge Washers that are in two pieces you need to make sure the cam faces are together and the serrated edges are facing outwards.

## Quality

The main purpose of the product is to resist vibration and dynamic loading and maintain pre-load in the joint, so it is critical that they comply to DIN 25201 which is the standard for testing Fasteners under vibration and dynamic loading conditions using a Junker Test machine.

Our Wedge Washers certainly meet this standard and are manufactured in facilities with ISO 9001 accreditation to ensure their quality. They come with full traceability through batch numbering and bar-coding systems that are recorded on every delivery.

Our manufacturing facilities also have ISO 14001 so you can be assured we do all we can to reduce our environmental impact with improvements happening on an on-going basis.

Products are regularly assessed using tensile testing, torque testing, salt spray testing, measuring and gauging as well as optical sorting so you can be assured a high-quality product is delivered to you.

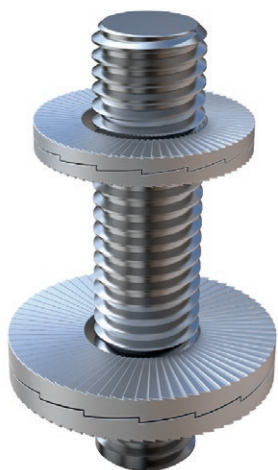






## Washer and Joint Types

**Mild Steel  
Delta Protekt Finish**



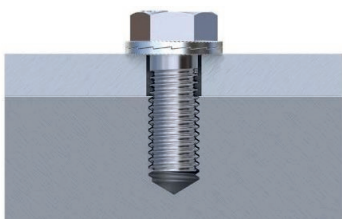
**Stainless Steel  
Grade 316**



Standard Diameter

Large Diameter

### Tapped Holes



When going into a tapped hole and there is only one direction the thread can untighten a pair of Wedge Washers will stop the bolt from untightening.

### Through Holes



When fastening to both sides of a joint a pair of Wedge washers are required to both sides of the joints to stop the bolt head and nut from rotating loose.

### Counter Bores



The outer diameter of our Wedge Washers are designed for use with counter bore holes according to DIN 974.

### Stud Bolt

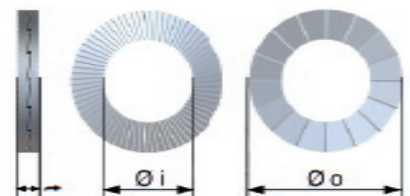


Wedge Washers Safely lock the nut on to stud bolts eliminating the need for adhesives.



## Mild Steel Delta Protekt Washers

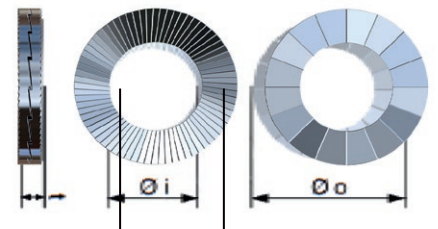
Washer Size	Bolt Size		Ø i [mm]	Ø o [mm]	Thickness t [mm]	Pack Size [pairs]	Approx. Weight [kg /100 pairs]
	Metric	UNC					
WL-3	M3	#5	3.4	7.0	1.8	200	0.03
WL-3.5	M3.5	#6	3.9	7.6	1.8	200	0.04
WL-3.5LD	M3.5	#6	3.9	9.0	1.8	200	0.06
WL-4	M4	#8	4.4	7.6	1.8	200	0.04
WL-4LD	M4	#8	4.4	9.0	1.8	200	0.06
WL-5	M5	#10	5.4	9.0	1.8	200	0.05
WL-5LD	M5	#10	5.4	10.8	1.8	200	0.11
WL-6	M6		6.5	10.8	1.8	200	0.07
WL-6LD	M6		6.5	13.5	2.5	200	0.20
WL-8	M8	5/16"	8.7	13.5	2.5	200	0.15
WL-8LD	M8	5/16"	8.7	16.6	2.5	200	0.28
WL-10	M10		10.7	16.6	2.5	200	0.22
WL-10LD	M10		10.7	21.0	2.5	200	0.47
WL-11	M11	7/16"	11.4	18.5	2.5	200	0.29
WL-12	M12		13.0	19.5	2.5	200	0.29
WL-12LD	M12		13.0	25.4	3.4	100	0.93
WL-14	M14	9/16"	15.2	23.0	3.4	100	0.56
WL-14LD	M14	9/16"	15.2	30.7	3.4	100	1.41
WL-16	M16	5/8"	17.0	25.4	3.4	100	0.67
WL-16LD	M16	5/8"	17.0	30.7	3.4	100	1.28
WL-18	M18		19.5	29.0	3.4	100	0.85
WL-18LD	M18		19.5	34.5	3.4	100	1.58
WL-20	M20		21.4	30.7	3.4	100	0.95
WL-20LD	M20		21.4	39.0	3.4	100	2.03
WL-22	M22	7/8"	23.4	34.5	3.4	100	1.29
WL-22LD	M22	7/8"	23.4	42.0	4.6	50	3.31
WL-24	M24		25.3	39.0	3.4	100	1.68
WL-24LD	M24		25.3	48.5	4.6	50	4.51
WL-27	M27		28.4	42.0	5.8	50	3.29
WL-27LD	M27		28.4	48.5	5.8	25	5.39
WL-30	M30	1 1/8"	31.4	47.0	5.8	50	4.20
WL-30LD	M30	1 1/8"	31.4	58.5	6.6	25	8.96
WL-33	M33	1 1/4"	34.4	48.5	5.8	25	3.97
WL-33LD	M33	1 1/4"	34.4	58.5	6.6	25	8.31
WL-36	M36	1 3/8"	37.4	55.0	5.8	25	5.59
WL-36LD	M36	1 3/8"	37.4	63.0	6.6	25	9.15
WL-39	M39	1 1/2"	40.4	58.5	5.8	25	6.28
WL-42	M42		43.2	63.0	5.8	25	7.47
WL-45	M45	1 3/4"	46.2	70.0	7.0	25	10.20
WL-48	M48		49.6	75.0	7.0	25	12.00
WL-52	M52	2"	53.6	80.0	7.0	25	13.00





## Stainless Steel Grade 316 Washers

Washer Size	Bolt Size		Ø i [mm]	Ø o [mm]	Thickness t [mm]	Pack Size [pairs]	Approx. Weight [kg /100 pairs]
	Metric	UNC					
WL-3-SS	M3	#5	3.4	7.0	2.2	200	0.04
WL-3.5-SS	M3.5	#6	3.9	7.6	2.2	200	0.04
WL-3.5LD-SS	M3.5	#6	3.9	9.0	2.2	200	0.07
WL-4-SS	M4	#8	4.4	7.6	2.2	200	0.04
WL-4LD-SS	M4	#8	4.4	9.0	2.2	200	0.07
WL-5-SS	M5	#10	5.4	9.0	2.2	200	0.06
WL-5LD-SS	M5	#10	5.4	10.8	2.2	200	0.11
WL-6-SS	M6		6.5	10.8	2.2	200	0.09
WL-6LD-SS	M6		6.5	13.5	2.0	200	0.16
WL-8-SS	M8	5/16"	8.7	13.5	2.0	200	0.12
WL-8LD-SS	M8	5/16"	8.7	16.6	2.0	200	0.22
WL-10-SS	M10		10.7	16.6	2.0	200	0.18
WL-10LD-SS	M10		10.7	21.0	2.0	200	0.37
WL-11-SS	M11	7/16"	11.4	18.5	2.2	200	0.26
WL-12-SS	M12		13.0	19.5	2.0	200	0.23
WL-12LD-SS	M12		13.0	25.4	3.0	100	0.82
WL-14-SS	M14	9/16"	15.2	23.0	3.0	100	0.49
WL-14LD-SS	M14	9/16"	15.2	30.7	3.2	100	1.31
WL-16-SS	M16	5/8"	17.0	25.4	3.0	100	0.59
WL-16LD-SS	M16	5/8"	17.0	30.7	3.2	100	1.13
WL-18-SS	M18		19.5	29.0	3.2	100	0.80
WL-18LD-SS	M18		19.5	34.5	3.2	100	1.56
WL-20-SS	M20		21.4	30.7	3.0	100	0.82
WL-20LD-SS	M20		21.4	39.0	3.2	100	2.06
WL-22-SS	M22	7/8"	23.4	34.5	3.2	100	1.23
WL-22LD-SS	M22	7/8"	23.4	42.0	3.2	50	2.23
WL-24-SS	M24		25.3	39.0	3.2	100	1.52
WL-24LD-SS	M24		25.3	48.5	3.2	50	3.50
WL-27-SS	M27		28.4	42.0	6.8	50	3.45
WL-27LD-SS	M27		28.4	48.5	6.8	25	5.85
WL-30-SS	M30	1 1/8"	31.4	47.0	6.8	50	4.43
WL-30LD-SS	M30	1 1/8"	31.4	58.5	6.8	25	9.53
WL-33-SS	M33	1 1/4"	34.4	48.5	6.8	25	4.25
WL-36-SS	M36	1 3/8"	37.4	55.0	6.8	25	5.96
WL-39-SS	M39	1 1/2"	40.4	58.5	6.8	25	6.74
WL-42-SS	M42		43.2	63.0	5.8	25	7.96
WL-45-SS	M45	1 3/4"	46.2	70.0	7.0	25	10.20
WL-48-SS	M48		49.6	75.0	7.0	25	12.00
WL-52-SS	M52	2"	53.6	80.0	7.0	1	20.10





## Tightening Torque Guidelines

The below are simply guidelines designed to give you an idea of the level of tightening torque to apply for some common bolt grades and diameters.

These figures are all using a lubricating Oil or Paste because we would always recommend using this where possible. If you are not using a lubricant or are unsure of the torque you should apply, please get in touch.

### Grade 8.8

(Electro Zinc plated Fastener)

Oil: GF = 75%,  $\mu_{th}$  = 0.15,  $\mu_h$  = 0.19 Cu/C Paste:  
Paste: GF = 75%,  $\mu_{th}$  = 0.13,  $\mu_h$  = 0.18

Washer Size	Bolt Size	Pitch [mm]	Oil		Cu/C Paste	
			Torque [Nm]	Clamp Load [kN]	Torque [Nm]	Clamp Load [kN]
WL-3	M3	0.50	1.7	2.4	1.5	2.4
WL-4	M4	0.70	3.8	4.2	3.6	4.2
WL-5	M5	0.80	7.5	6.8	6.9	6.8
WL-6	M6	1.00	13	9.7	12.1	9.7
WL-8	M8	1.25	32	18	29	18
WL-10	M10	1.50	62	28	57	28
WL-12	M12	1.75	107	40	99	40
WL-14	M14	2.00	170	55	157	55
WL-16	M16	2.00	260	75	240	75
WL-18	M18	2.50	364	92	336	92
WL-20	M20	2.50	510	118	470	118
WL-22	M22	2.50	696	146	642	146
WL-24	M24	3.00	878	169	809	169
WL-27	M27	3.00	1284	221	1183	221
WL-30	M30	3.50	1750	269	1613	269

### Grade 10.9

(Self-Colour Bolt)

Oil: GF = 71%,  $\mu_{th}$  = 0.15,  $\mu_h$  = 0.15 Cu/C Paste:  
GF = 75%,  $\mu_{th}$  = 0.13,  $\mu_h$  = 0.15

Washer Size	Bolt Size	Pitch [mm]	Oil		Cu/C Paste	
			Torque [Nm]	Clamp Load [kN]	Torque [Nm]	Clamp Load [kN]
WL-3	M3	0.50	2	3.2	2	3.4
WL-4	M4	0.70	4.5	5.6	4.5	5.9
WL-5	M5	0.80	8.9	9.1	8.9	9.6
WL-6	M6	1.00	15.5	12.9	15.5	13.6
WL-8	M8	1.25	37	23	37	25
WL-10	M10	1.50	73	37	73	39
WL-12	M12	1.75	126	54	126	57
WL-14	M14	2.00	201	74	201	78
WL-16	M16	2.00	307	100	306	106
WL-18	M18	2.50	430	123	429	130
WL-20	M20	2.50	602	156	600	165
WL-22	M22	2.50	821	194	818	205
WL-24	M24	3.00	1036	225	1034	238
WL-27	M27	3.00	1514	294	1509	310
WL-30	M30	3.50	2064	358	2058	378





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## Grade 12.9 (Self-Colour Bolt)

Oil: GF = 71%,  $\mu_{th}$  = 0.15,  $\mu_h$  = 0.13 Cu/C Paste:  
GF = 75%,  $\mu_{th}$  = 0.13,  $\mu_h$  = 0.14

Washer Size	Bolt Size	Pitch [mm]	Oil		Cu/C Paste	
			Torque [Nm]	Clamp Load [kN]	Torque [Nm]	Clamp Load [kN]
WL-3	M3	0.50	2.2	3.9	2.3	4.1
WL-4	M4	0.70	5.1	6.7	5.3	7.1
WL-5	M5	0.80	10	10.9	10.3	11.5
WL-6	M6	1.00	17.4	15.4	18	16.3
WL-8	M8	1.25	42	28	43	30
WL-10	M10	1.50	82	44	85	47
WL-12	M12	1.75	142	65	146	68
WL-14	M14	2.00	226	89	233	94
WL-16	M16	2.00	345	120	355	127
WL-18	M18	2.50	483	148	498	156
WL-20	M20	2.50	676	188	696	198
WL-22	M22	2.50	921	233	948	246
WL-24	M24	3.00	1165	270	1199	286
WL-27	M27	3.00	1700	352	1749	372
WL-30	M30	3.50	2318	430	2385	454

## Grade A4-70 / A4-80 (Stainless Steel Lubricated with Cop- per/graphite paste)

A4-70 Cu/C Paste: GF = 65%,  $\mu_{th}$  = 0,13,  $\mu_h$  = 0,13

A4-80 Cu/C Paste: GF = 65%,  $\mu_{th}$  = 0,13,  $\mu_h$  = 0,13

Washer Size	Bolt Size	Pitch [mm]	A4-70 Cu/C Paste		A4-80 Cu/C Paste	
			Torque [Nm]	Clamp Load [kN]	Torque [Nm]	Clamp Load [kN]
WL-3	M3	0.50	0.8	1.5	1.1	2
WL-4	M4	0.70	1.8	2.6	2.4	3.4
WL-5	M5	0.80	3.6	4.1	4.8	5.5
WL-6	M6	1.00	6.3	5.9	8.4	7.8
WL-8	M8	1.25	15	11	20	14
WL-10	M10	1.50	30	17	39	23
WL-12	M12	1.75	51	25	68	33
WL-14	M14	2.00	81	34	108	45
WL-16	M16	2.00	124	46	165	61
WL-18	M18	2.50	173	56	231	75
WL-20	M20	2.50	243	72	323	95
WL-22	M22	2.50	330	89	440	118
WL-24	M24	3.00	418	103	557	137
WL-27	M27	3.00	609	134	812	179
WL-30	M30	3.50	831	164	1108	219



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## Machine Building

The Machine building Industry covers a very wide range of Industries that the machines are built for but all the machines have a few things in common. The first thing is that they want to be running as efficiently as possible with the least amount of downtime and the second part is that they will all have lots of moving parts that are subjected to dynamic loads and vibrations.

Highly complicated machines are available now with as many as 5 axis and with robotics that are moving at speeds never seen before.

To keep up with the electronics on these machines the mechanical parts need to be more robust than ever. Maintaining the Pre-load in the bolted joint to stop it coming loose is essential and can be achieved by introducing the WL series Wedge Washer to the joint.



## Oil and Gas

The production of Oil & Gas and Petroleum involves the use of a wide range of heavy-duty machinery often installed in remote locations. The need for reliable bolting solutions is essential due to the majority of bolted joints being installed in Safety critical applications.

The use of WL Series Wedge Washers provides these reliable bolting solutions by maintaining the Pre-Load in the bolted joint and stopping the fastener from coming loose under dynamic load and or vibrations.



## Manufacturing and Processing

Any type of manufacturing process from the smallest of products such as electronics to largest of items such as steel stock requires machines to produce the products. These machines are generally working at high speeds to keep the production efficient and have lots of moving parts.

Most production lines are working with a small amount of room for error and do not want to have downtime where it can easily be avoided.

The machines will be held together with lots of small to large, bolted joints and stopping these from coming loose and avoiding down time is very simple. The implementation of the WL Series Wedge Washer can eliminate this issue immediately and reduce the need for down time or the need for maintenance on the fasteners and re-checking the torque.



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## Recycling

The recycling industry is growing massively across the world and with this becomes more efficient ways to recycle products, to keep up the machines to do this are becoming ever more complex and powerful. These machines have lots of moving parts and generate lots of power needed for the crushing, shredding and filtering of materials.

The running of the recycling plants is becoming much more competitive, so it is essential that down time of the machines and processes are kept to an absolute minimum. The thought of a bolted joint coming loose or the need for regular maintenance to re-tighten loosened fasteners is unthinkable. The potential of a loose fastener getting mixed into the recycled material is also unthinkable for the product as well as for the potential to damage the extremely expensive equipment.



## Medical

The medical industry produces a wide range of highly complicated and precise equipment used for many different applications from scanning a patient, transporting them, performing intricate surgeries and many more.

The applications mentioned above all require movement of the equipment to perform the tasks they are designed for and due to the nature of the importance and accuracy of some of these tasks they simply cannot afford to be let down by the nuts and bolts that are holding them together. The use of Wedge Washers removes the concern for the fasteners coming loose and allows the machines to operate at high speeds with reduced maintenance requirements which all contribute to the equipment's efficiency.



## Power Generation

The generation of Power has become an industry that has had to innovate quickly to be able to keep up with the ever-growing demand for energy around the world. This reliance on energy has created challenges to the industry to not only keep up with demand in the immediate future but to look at how this can be sustained in the long term whilst reducing the environmental impact.

The Wind Energy industry has become a huge growing area for the Power Generation sector and the installation of Wind Turbines has become more and more familiar across our landscape. The Turbines can be small ones used for domestic applications to large scale Wind Farms installed all over the world. The blades on wind turbines are subjected to excessively high loading and it is essential that the joints where they are bolted to the main shaft maintain their pre-load. WL Series Wedge Washers would be used for these applications as well as on the ladders inside the Turbine and any other areas where bolted joints are present and subjected to the transfer of dynamic loads or vibrations. The remote locations of some of the Wind Farms require the highest levels of bolt security to reduce the expensive and labour-intensive maintenance schedules involved in re-tightening and checking fasteners.





**WEDGE WASHER®**  
Bolt Locking Solutions

# Bolt Locking Solutions

## We Don't Stop There

Our Bolt Securing Washers can be used almost anywhere. Read about more industries that we work in on our website: [www.wedgewasher.co.uk](http://www.wedgewasher.co.uk)



## Contact Us

We are here to help with Technical queries for the right solutions as well as to support you commercially with good pricing and availability.

Trade prices and accounts are available so please get in touch now and see how we can assist you on your next project.