



# TESTED. CERTIFIED. LOCKED.

Proven Bolt Locking Solutions



[www.keesafety.cn](http://www.keesafety.cn)



Kee  
Safety

## Global Safety Expertise

Kee Safety Group, maker of the Wedge Washer, is a worldwide organisation with manufacturing and distribution locations to ensure reliable supply wherever it's needed. We provide safety-critical solutions for bolted joints, engineered for reliability, performance, and long-term security. Backed by decades of fastener industry experience, our team delivers expert support so you can specify with confidence.

## Proven Quality

Quality is non-negotiable. By controlling our supply chain directly, we ensure consistent standards and full traceability. Wedge Washers are built for critical bolted joints across many industries and comply with multiple international standards, with certifications continually updated.



## Rigorous Testing

Every Wedge Washer undergoes rigorous testing during and after manufacture, including; functional checks, Junker Testing, material, corrosion resistance, and dimensional checks. This ensures proven locking performance and reliable operation, for the most demanding conditions.

## We Are Here To Help

For technical queries, pricing and availability contact us at:

[www.keesafety.cn](http://www.keesafety.cn)  
[chnsales@keesafety.com](mailto:chnsales@keesafety.com)  
400 820 9261

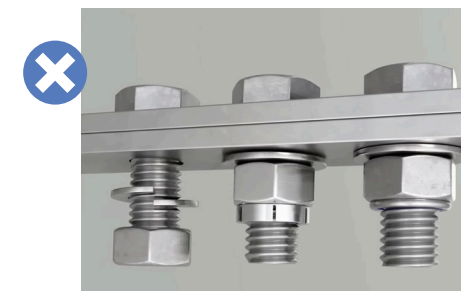
# Critical Safety and Function *Without* Compromise.

Wedge Washer provides a physical locking mechanism that maintains clamp load and joint tension, even under vibration and dynamic loading.



### Friction-Based Solutions Fall Short

- + **Single "lock" washers** rely on friction and serrations. They vary between joints and cannot guarantee a locked connection.
- + **Prevailing torque nuts** grip the thread but loosen under vibration or dynamic loads, losing clamping force quickly from as little as a 1/4 turn.



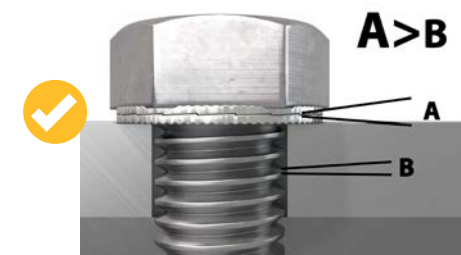
### How Wedge Washer Gets It Right

Wedge Washers are supplied as a pre-glued pair, installing as a single washer. The adhesive ensures correct orientation and ease of installation, with no technical function once fitted.

Each washer has a hardened, serrated outer face that bites into the bolt head, nut, and mating surfaces. The inner faces feature angled cams that interlock, with cam angles steeper than the thread pitch.

Once tightened, any loosening force must act through the cam faces. Under vibration or dynamic loading, this creates the wedge effect, increasing clamp load rather than reducing it.

The joint can only be released by deliberate untightening, forcing the cams over one another. No re-tightening is required, reducing maintenance and providing long-term confidence in the joint.



**For more information and instructional videos, go to:**  
[www.keesafety.cn](http://www.keesafety.cn)

# WE PUT OUR WASHERS TO THE TEST.



## “Junker” Test to ISO 16130 and DIN 25201

The Junker Test is the industry standard for assessing fastener self-loosening. It simulates movement between a bolt, nut, and clamped joint under real-world dynamic loads, providing engineers with confidence that a product will maintain its clamp load over time.

Wedge Washers are tested to ISO 16130 and DIN 25201, a stringent standard that ensures joint integrity under repeated motion. During testing, clamp load is measured throughout 2,000 cycles — a pass requires maintaining 80% or more of the original clamping force.

Compared to traditional locking methods, Wedge Washers are the only product consistently to meet this benchmark, delivering proven, reliable locking performance for critical joints.



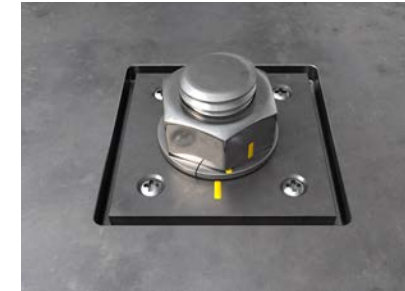
**For more information and a video about the Junker Test, go to:**  
**[www.keesafety.cn](http://www.keesafety.cn)**

## Wedge Washer Versus Traditional Devices – Post Junker Test



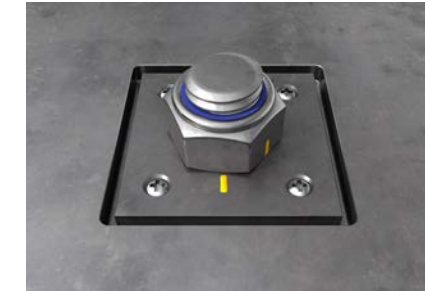
**Wedge Washer**  
**PASS**

You can see from the image above that the markings made before the Junker testing to DIN 25201 are still aligned showing the joint has been locked in position. The yellow line on the Graph below shows that once material settlement has happened the Wedge Washer maintains the majority of the Clamp Load in the joint and passes DIN 25201 with more than 80% maintained.



**Single “Lock” Washer**  
**FAIL**

A single washer with serrations, teeth or spring action can only reduce the effects of the nut or bolt loosening by increasing friction under the bolt or nut head but can not provide a physical locking element. This friction element will change dramatically across each bolted connection even on the same application and therefore does not provide peace of mind the joint is locked. You can see the yellow markings have separated and on the graph below the line named split lock washer shows how it losses the majority of the load and fails DIN 25201 like the others do also.

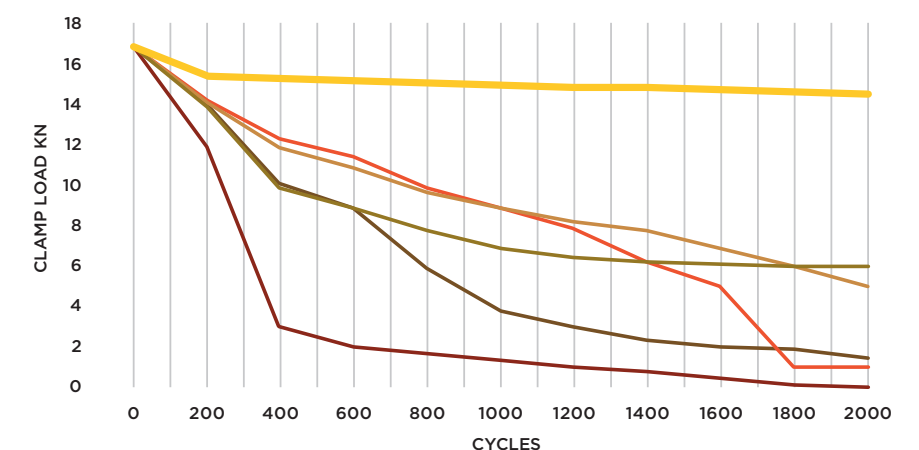


**Prevailing Torque Nut**  
**FAIL**

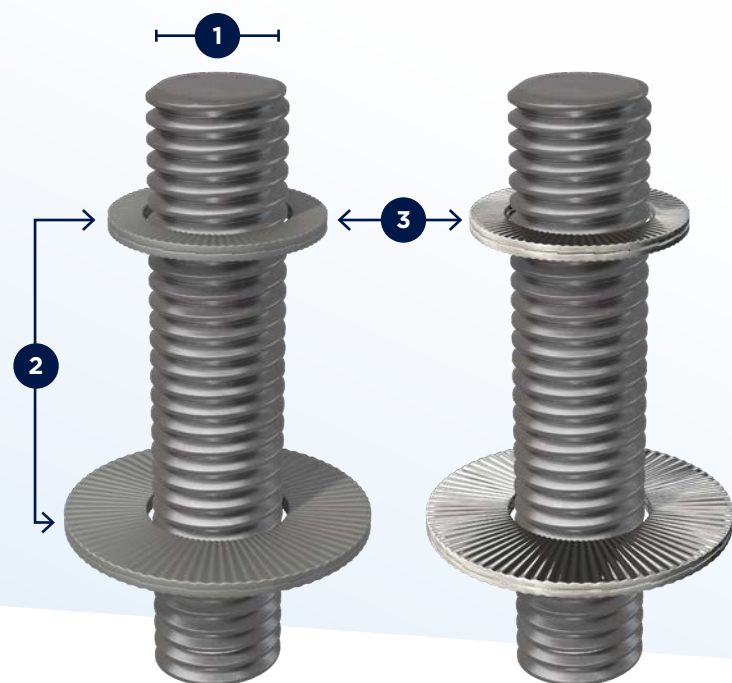
A Prevailing Torque Nut uses Friction to grip onto the thread which prevents the nut from coming off the thread, but it does not stop it from loosening when subject to severe dynamic loading. It only takes a small amount as you can see from the yellow marks (around 1/4 of a turn) to lose a dramatic amount of clamp load and fail the requirement to DIN 25201.

### Clamp Load during 2000 Cycles of the Junker Test to DIN 25201 – Comparisons

- Wedge Washer
- Nylon Insert Nut
- Hex Nut, No Washer
- Mechanical Lock Nut
- Split Lock Washer
- Hex Nut, Flat Washer



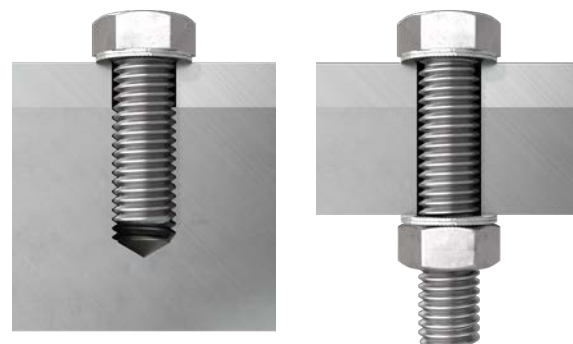
# SELECTING THE RIGHT WASHER FOR YOUR PROJECT IS AS EASY AS 1, 2, 3.



- 1 Select the Bolt Diameter
- 2 Select Standard or Large Diameter
- 3 Select the Material/Finish

### Where do I need a Wedge Washer?

A Wedge Washer should be installed on any side of a bolted joint where rotation could cause the joint to loosen. If the connection is blind and the fastener can only loosen in one direction, a single Wedge Washer is required. For a through-bolted joint, where loosening could occur from either side (clockwise or anti-clockwise), two Wedge Washers are required — one under the bolt head and one under the nut. (See diagrams for illustration.)



### Machine Building

Modern machinery operates at high speeds with multiple moving parts, dynamic loads, and vibration. Downtime is costly and reliability is essential. WW Series Wedge Washers maintain preload in critical bolted joints, preventing loosening and supporting robust mechanical performance.



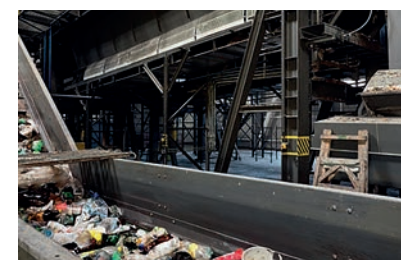
### Oil & Gas

Heavy-duty equipment, often in remote locations, operates in safety-critical environments where joint failure is not an option. WW Series Wedge Washers maintain clamp load under dynamic loading and vibration, providing secure and reliable bolting solutions.



### Manufacturing & Processing

High-speed production lines depend on consistent machine performance with minimal room for error. Loose fasteners lead to downtime and maintenance disruption. WW Series Wedge Washers prevent loosening, reduce re-torque requirements, and improve operational uptime.



### Recycling

Recycling equipment operates under extreme loads from crushing, shredding, and processing materials. Downtime and loose fasteners can damage machinery and contaminate output. WW Series Wedge Washers maintain joint security under vibration and dynamic forces, reducing maintenance and operational risk.



### Medical

Precision medical equipment must operate reliably during movement and high-accuracy procedures. Fastener failure is unacceptable. Wedge Washers maintain preload in bolted joints, reducing maintenance requirements and supporting dependable equipment performance.



### Power Generation

Power generation systems — including wind turbines — are subjected to continuous dynamic loading, often in remote or difficult-to-access locations. WW Series Wedge Washers maintain preload in critical bolted joints, helping reduce maintenance demands and ensuring long-term security under vibration.

# Installation and Re-Use

## Tightening

**Correct tightening is essential to achieving the required clamp load in a bolted joint.** Torque tightening applies controlled rotational force to stretch the fastener and create preload between connected surfaces.

There is no single torque value suitable for every application, as factors such as material strength, friction, clamping length, and embedment all influence the final result. Because friction plays a major role in torque accuracy and clamp load consistency, lubrication is recommended where possible.

**For torque guidance, refer to pages 12, 13, and 17.**

## Application Guidelines

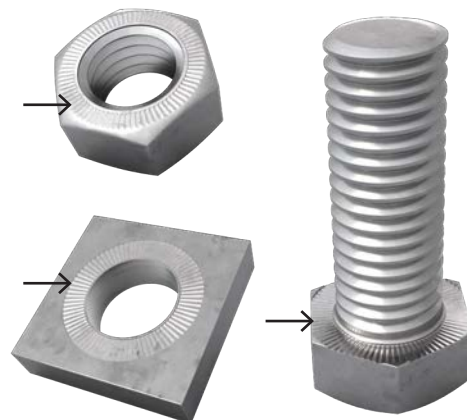
Wedge Washers must grip securely into the bolt head or nut and the mating surface.

The hardened serrated faces are designed to be harder than most commonly used fasteners, allowing them to bite into the joint components. If required, compare washer hardness values (page 10) with the materials being connected.

If surfaces are too soft — such as certain plastics or polymers — correct function may not be achieved and suitability should be verified.

## Surface Interaction

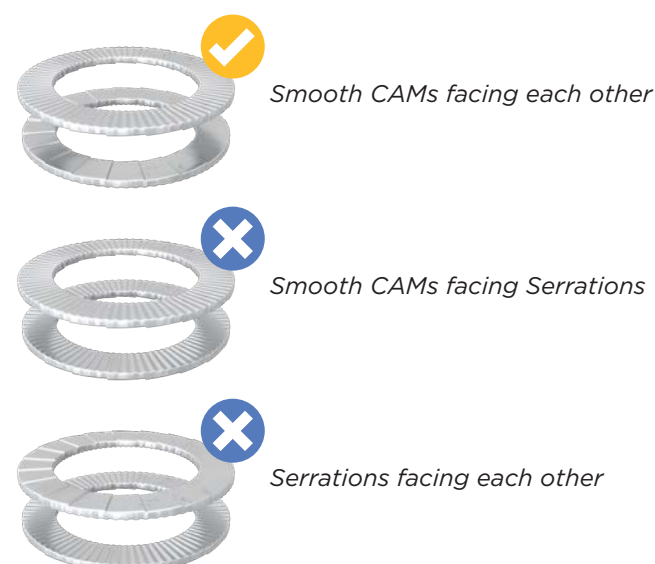
During tightening, the serrated faces create visible indentations in the bolt head, nut, and mating surface. These indentations confirm correct engagement. (See images.)



## Re-Use & Maintenance

Wedge Washers are supplied as a pre-glued pair for correct first installation. The adhesive has no technical function once installed.

If removed, the washers separate into two pieces and must be reinstalled correctly, with cam faces together and serrated faces outward (see diagrams).



## Physical Function Check

**Correct function can be verified quickly:**

1. Tighten the joint using the specified torque.
2. Mark a vertical line across the bolt head or nut, both washer halves, and the mating surface.
3. Untighten the joint.

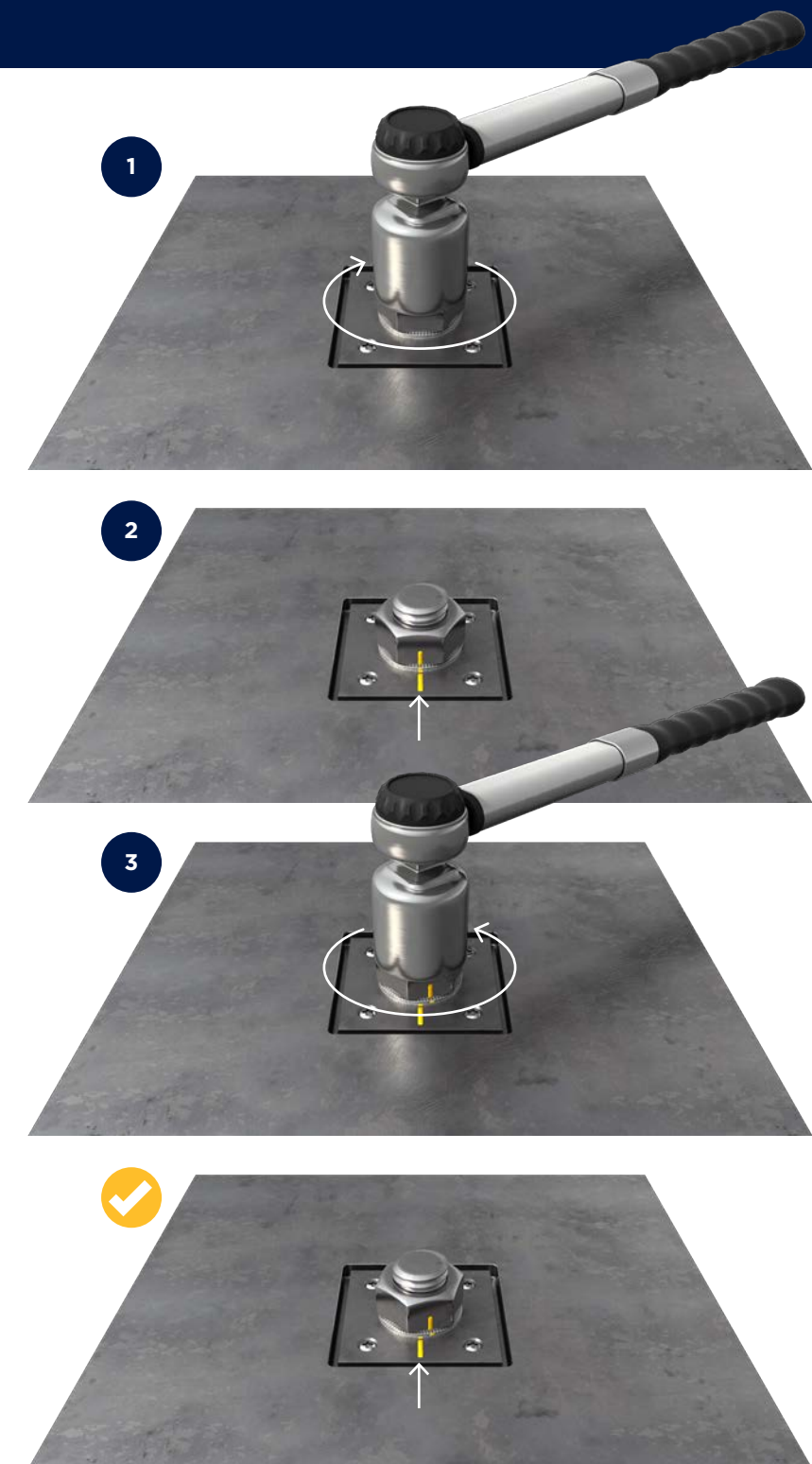
**If functioning correctly:**

- The line on the mating surface remains aligned with the contacting washer half.
- The line on the bolt head or nut separates.

**This confirms serration engagement and cam function.**



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Specifications and Applications

| Specifications                | Applications                             | Dimensions | Heat Treatment / Surface Treatment Process | Product Hardness | Corrosion Resistance                                              | Bolt Grade       | Temperature Range |
|-------------------------------|------------------------------------------|------------|--------------------------------------------|------------------|-------------------------------------------------------------------|------------------|-------------------|
| Alloy steel washers           | Conventional alloy                       | M3-M130    | all-body hardened Zinc Flake coating       | ≥465HV1          | Compliant with ISO9227 for at least 1000 hours of salt spray test | Up to level 12.9 | -50°C to 200°C    |
| Stainless steel washer        | Conventional stainless steel environment | M3-M80     | Surface-hardened                           | ≥700HV0.1        | Pitting resistance equivalent number (PREN) 27                    | Maximum A4-80    | -160°C to 500°C   |
| 254SMO Stainless steel washer | Corrosive environment                    | M3-M80     |                                            |                  | Pitting resistance equivalent number (PREN) 45                    | Maximum A4-80    | -160°C to 500°C   |
| C-276 Stainless steel washer  | Acidic environment                       | M4-M20     |                                            |                  | Pitting resistance equivalent number (PREN) 68                    | Bespoke          | -160°C to 500°C   |
| 718 Stainless steel washer    | High-temperature environment             | M4-M20     |                                            |                  | Pitting resistance equivalent number (PREN) 29                    | Bespoke          | -160°C to 700°C   |

Corrosion Resistance and Applications

Mild Steel Zinc Flake Wedge Washers (Page 11)

Made to EN 1.7182 steel 27MnCrB5 and fully through hardened to the above levels. Salt Spray Compliant to 1000 hours. These are used in many general industrial applications where common grades of bolts such as 4.8, 8.8, 10.9 and 12.9 are being used to make connections. The applications are so wide it is difficult to name them all.

Stainless Steel Grade 316L Wedge Washers (Page 14 )

Made to EN 1.4404 or equivalent alloy stainless steel grade 316L is often referred to as A4 Stainless or marine grade stainless steel. The L indicates it is the low carbon version of 316 Stainless which improves the corrosion resistance. The pitting resistance equivalent number is PREN 27 for this type. These products would most often be used with grade A4-70 or A4-80 Fasteners in industries such as Food & Beverage, Marine & Coastal, Chemical & Petrochemical, Medical, Architectural Facades, Pulp & Paper and many more.

Stainless Steel 254SMO Wedge Washers (Page 15)

Made to (UNS S31254 / 1.4547) and surface hardened to the above hardness levels. It is used where extreme corrosion resistance is needed, especially in chloride-rich environments like seawater, making it ideal for marine equipment, desalination plants, and offshore oil/gas platforms, as well as pulp & paper bleaching plants and chemical processing for flue gas cleaning and handling aggressive acids. Key applications include heat exchangers, piping, pumps, valves, condensers, and scrubbers in these demanding industries.

Super Alloy C276 Wedge Washers (Page 16)

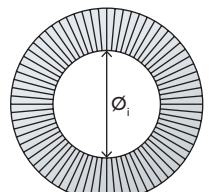
This Super Alloy is often used alongside Stainless Steel and performs best in aggressive acidic environments. It is highly resistant to pitting (PREN 68), crevice corrosion, and stress corrosion cracking, making it suitable for applications in the chemical processing, waste treatment, and oil and gas industries.

Super Alloy 718 Wedge Washers (Page 16)

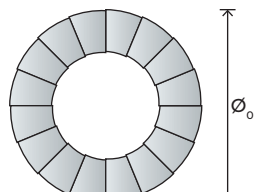
This Super Alloy is also often used alongside Stainless Steel and performs best in high-temperature applications up to 700 Degrees Celsius. Common applications for this material are within Aerospace, Oil & Gas and Nuclear.

Mild Steel Zinc Flake  
Carbon steel washer S60C, 27MnCrB5

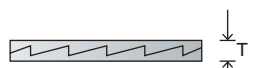
| Washer Code | Bolt Size (Metric) | Bolt Size (US) | Ø <sub>i</sub> [mm] | Ø <sub>o</sub> [mm] | Thickness T [mm] | Approximate Weight kg/100 pairs |
|-------------|--------------------|----------------|---------------------|---------------------|------------------|---------------------------------|
| WW-M3       | M3                 | #5             | 3.4                 | 7.0                 | 1.8              | 0.03                            |
| WW-M3.5     | M3.5               | #6             | 3.9                 | 7.6                 | 1.8              | 0.04                            |
| WW-3.5LD    | M3.5               | #6             | 3.9                 | 9.0                 | 1.8              | 0.06                            |
| WW-M4       | M4                 | #8             | 4.4                 | 7.6                 | 1.8              | 0.04                            |
| WW-M4LD     | M4                 | #8             | 4.4                 | 9.0                 | 1.8              | 0.06                            |
| WW-M5       | M5                 | #10            | 5.4                 | 9.0                 | 1.8              | 0.05                            |
| WW-M5LD     | M5                 | #10            | 5.4                 | 10.8                | 1.8              | 0.11                            |
| WW-M6       | M6                 |                | 6.5                 | 10.8                | 1.8              | 0.07                            |
| WW-M6LD     | M6                 |                | 6.5                 | 13.5                | 2.5              | 0.20                            |
| WW-1/4"     |                    | 1/4"           | 7.2                 | 11.5                | 1.8              | 0.08                            |
| WW-1/4"LD   |                    | 1/4"           | 7.2                 | 13.5                | 2.5              | 0.18                            |
| WW-M8       | M8                 | 5/16"          | 8.7                 | 13.5                | 2.5              | 0.15                            |
| WW-M8LD     | M8                 | 5/16"          | 8.7                 | 16.6                | 2.5              | 0.28                            |
| WW-3/8"     |                    | 3/8"           | 10.3                | 16.6                | 2.5              | 0.23                            |
| WW-3/8"LD   |                    | 3/8"           | 10.3                | 21.0                | 2.5              | 0.48                            |
| WW-M10      | M10                |                | 10.7                | 16.6                | 2.5              | 0.22                            |
| WW-M10LD    | M10                |                | 10.7                | 21.0                | 2.5              | 0.47                            |
| WW-M11      | M11                | 7/16"          | 11.4                | 18.5                | 2.5              | 0.29                            |
| WW-M12      | M12                |                | 13.0                | 19.5                | 2.5              | 0.29                            |
| WW-M12LD    | M12                |                | 13.0                | 25.4                | 3.4              | 0.93                            |
| WW-1/2"     |                    | 1/2"           | 13.5                | 19.5                | 2.5              | 0.27                            |
| WW-1/2"LD   |                    | 1/2"           | 13.5                | 25.4                | 3.4              | 0.90                            |
| WW-M14      | M14                | 9/16"          | 15.2                | 23.0                | 3.4              | 0.56                            |
| WW-M14LD    | M14                | 9/16"          | 15.2                | 30.7                | 3.4              | 1.41                            |
| WW-M16      | M16                | 5/8"           | 17.0                | 25.4                | 3.4              | 0.69                            |
| WW-M16LD    | M16                | 5/8"           | 17.0                | 30.7                | 3.4              | 1.29                            |
| WW-M18      | M18                |                | 19.5                | 29.0                | 3.4              | 0.85                            |
| WW-M18LD    | M18                |                | 19.5                | 34.5                | 3.4              | 1.58                            |
| WW-3/4"     |                    | 3/4"           | 20.0                | 30.7                | 3.4              | 1.05                            |
| WW-3/4"LD   |                    | 3/4"           | 20.0                | 39.0                | 3.4              | 2.20                            |
| WW-M20      | M20                |                | 21.4                | 30.7                | 3.4              | 0.93                            |
| WW-M20LD    | M20                |                | 21.4                | 39.0                | 3.4              | 2.03                            |
| WW-M22      | M22                | 7/8"           | 23.4                | 34.5                | 3.4              | 1.29                            |
| WW-M22LD    | M22                | 7/8"           | 23.4                | 42.0                | 4.6              | 3.31                            |
| WW-M24      | M24                |                | 25.3                | 39.0                | 3.4              | 1.68                            |
| WW-M24LD    | M24                |                | 25.3                | 48.5                | 4.6              | 4.51                            |
| WW-1"       |                    | 1"             | 27.9                | 39.0                | 3.4              | 1.53                            |
| WW-1"LD     |                    | 1"             | 27.9                | 48.5                | 4.6              | 4.20                            |
| WW-M27      | M27                |                | 28.4                | 42.0                | 5.8              | 3.29                            |
| WW-M27LD    | M27                |                | 28.4                | 48.5                | 5.8              | 5.85                            |
| WW-M30      | M30                | 1-1/8"         | 31.4                | 47.0                | 5.8              | 4.20                            |
| WW-M30LD    | M30                | 1-1/8"         | 31.4                | 58.5                | 6.6              | 8.96                            |
| WW-M33      | M33                | 1-1/4"         | 34.4                | 48.5                | 5.8              | 3.97                            |
| WW-M33LD    | M33                | 1-1/4"         | 34.4                | 58.5                | 6.6              | 8.31                            |
| WW-M36      | M36                | 1-3/8"         | 37.4                | 55.0                | 5.8              | 5.59                            |
| WW-M36LD    | M36                | 1-3/8"         | 37.4                | 63.0                | 6.6              | 9.15                            |
| WW-M39      | M39                | 1-1/2"         | 40.4                | 58.5                | 5.8              | 6.28                            |
| WW-M42      | M42                |                | 43.2                | 63.0                | 5.8              | 7.47                            |
| WW-M45      | M45                | 1-3/4"         | 46.2                | 70.0                | 7.0              | 10.20                           |
| WW-M48      | M48                |                | 49.6                | 75.0                | 7.0              | 12.00                           |
| WW-M52      | M52                | 2"             | 53.6                | 80.0                | 7.0              | 13.00                           |
| WW-M56      | M56                | 2-1/4"         | 59.1                | 85.0                | 7.0              | 13.50                           |
| WW-M60      | M60                |                | 63.1                | 90.0                | 7.0              | 15.20                           |
| WW-M64      | M64                | 2-1/2"         | 67.1                | 95.0                | 7.0              | 16.70                           |
| WW-M68      | M68                |                | 71.1                | 100.0               | 9.5              | 28.19                           |
| WW-M72      | M72                |                | 75.1                | 105.0               | 9.5              | 30.70                           |
| WW-M76      | M76                | 3"             | 79.1                | 110.0               | 9.5              | 33.31                           |
| WW-M80      | M80                | 3-1/8"         | 83.1                | 115.0               | 9.5              | 36.02                           |
| WW-M85      | M85                |                | 88.1                | 120.0               | 9.5              | 37.84                           |
| WW-M90      | M90                |                | 92.4                | 130.0               | 9.5              | 47.67                           |
| WW-M95      | M95                |                | 97.4                | 135.0               | 9.5              | 49.81                           |
| WW-M100     | M100               | 4"             | 103.4               | 145.0               | 9.5              | 59.91                           |
| WW-M105     | M105               |                | 108.4               | 150.0               | 9.5              | 61.28                           |
| WW-M110     | M110               |                | 113.4               | 155.0               | 9.5              | 63.65                           |
| WW-M115     | M115               |                | 118.4               | 165.0               | 9.5              | 75.28                           |
| WW-M120     | M120               |                | 123.4               | 170.0               | 9.5              | 77.94                           |
| WW-M125     | M125               |                | 128.4               | 173.0               | 9.5              | 76.63                           |
| WW-M130     | M130               | 5"             | 133.4               | 178.0               | 9.5              | 79.17                           |



M3-M8 Ø<sub>i</sub>±0.1mm  
M10-M42 Ø<sub>i</sub>±0.2mm  
M45-M130 Ø<sub>i</sub>±0.5/-0mm



M3-M24 Ø<sub>o</sub>±0.2mm  
M27-M42 Ø<sub>o</sub>±0.3mm  
M45-M130 Ø<sub>o</sub>+0/-2.0mm



M3-M42 T±0.25mm  
M45-M130 T±0.75mm

# Mild Steel Zinc Flake

## Tightening Torque and Clamp Load Guidelines

The below tables are for guideline purposes only and each critical bolted joint should be analysed individually by a Design Engineer, refer to page 9 for further details.

### Grade 4.8 Fastener - Zinc Plated

| Bolt Size | Pitch [mm] | (Oil). GF=75%,<br>μ <sub>th</sub> =0.10 μ <sub>b</sub> =0.16 |                          | Cu/C (Paste). GF=75%,<br>μ <sub>th</sub> =0.11 μ <sub>b</sub> =0.16 |                          | (Dry). GF=62%,<br>μ <sub>th</sub> =0.15 μ <sub>b</sub> =0.18 |                          |
|-----------|------------|--------------------------------------------------------------|--------------------------|---------------------------------------------------------------------|--------------------------|--------------------------------------------------------------|--------------------------|
|           |            | Torque [N.m]                                                 | Clamping Force Load [KN} | Torque [N.m]                                                        | Clamping Force Load [KN} | Torque [N.m]                                                 | Clamping Force Load [KN} |
| M3        | 0.5        | 0.7                                                          | 1.2                      | 0.8                                                                 | 1.2                      | 0.7                                                          | 1.0                      |
| M4        | 0.7        | 1.5                                                          | 2.1                      | 1.8                                                                 | 2.1                      | 1.5                                                          | 1.7                      |
| M5        | 0.8        | 3.0                                                          | 3.4                      | 3.6                                                                 | 3.4                      | 3.0                                                          | 2.8                      |
| M6        | 1.0        | 5.2                                                          | 4.8                      | 6.2                                                                 | 4.8                      | 5.3                                                          | 4.0                      |
| M8        | 1.25       | 12.5                                                         | 8.8                      | 15                                                                  | 8.8                      | 12.6                                                         | 7.3                      |
| M10       | 1.5        | 25                                                           | 14                       | 29                                                                  | 14                       | 25                                                           | 12                       |
| M12       | 1.75       | 42                                                           | 20                       | 48                                                                  | 20                       | 43                                                           | 17                       |
| M14       | 2.0        | 68                                                           | 28                       | 71                                                                  | 28                       | 68                                                           | 23                       |
| M16       | 2.0        | 103                                                          | 38                       | 120                                                                 | 38                       | 104                                                          | 31                       |
| M18       | 2.5        | 144                                                          | 46                       | 167                                                                 | 46                       | 146                                                          | 38                       |
| M20       | 2.5        | 201                                                          | 59                       | 213                                                                 | 59                       | 204                                                          | 49                       |
| M22       | 2.5        | 266                                                          | 69                       | 280                                                                 | 69                       | 268                                                          | 57                       |
| M24       | 3.0        | 346                                                          | 85                       | 366                                                                 | 85                       | 351                                                          | 70                       |
| M27       | 3.0        | 505                                                          | 110                      | 534                                                                 | 110                      | 514                                                          | 91                       |
| M30       | 3.5        | 690                                                          | 135                      | 729                                                                 | 135                      | 700                                                          | 111                      |
| M33       | 3.5        | 927                                                          | 167                      | 982                                                                 | 167                      | 944                                                          | 138                      |
| M36       | 4.0        | 1197                                                         | 196                      | 1267                                                                | 196                      | 1218                                                         | 162                      |
| M39       | 4.0        | 1543                                                         | 234                      | 1635                                                                | 234                      | 1573                                                         | 194                      |
| M42       | 4.5        | 1941                                                         | 276                      | 2058                                                                | 276                      | 1982                                                         | 228                      |

### Grade 8.8 Fastener - Zinc Plated

| Bolt Size | Pitch [mm] | (Oil). GF=75%,<br>μ <sub>th</sub> =0.10 μ <sub>b</sub> =0.16 |                          | Cu/C (Paste). GF=75%,<br>μ <sub>th</sub> =0.11 μ <sub>b</sub> =0.16 |                          | (Dry). GF=62%,<br>μ <sub>th</sub> =0.15 μ <sub>b</sub> =0.18 |                          |
|-----------|------------|--------------------------------------------------------------|--------------------------|---------------------------------------------------------------------|--------------------------|--------------------------------------------------------------|--------------------------|
|           |            | Torque [N.m]                                                 | Clamping Force Load [KN} | Torque [N.m]                                                        | Clamping Force Load [KN} | Torque [N.m]                                                 | Clamping Force Load [KN} |
| M3        | 0.5        | 1.3                                                          | 2.4                      | 2.1                                                                 | 2.4                      | 1.3                                                          | 2.0                      |
| M4        | 0.7        | 3.1                                                          | 4.2                      | 4.4                                                                 | 4.2                      | 3.1                                                          | 3.5                      |
| M5        | 0.8        | 6.0                                                          | 6.8                      | 8.0                                                                 | 6.8                      | 6.0                                                          | 5.6                      |
| M6        | 1.0        | 10.5                                                         | 9.7                      | 13.2                                                                | 9.7                      | 10.5                                                         | 8.0                      |
| M8        | 1.25       | 25                                                           | 18                       | 30                                                                  | 18                       | 25                                                           | 15                       |
| M10       | 1.5        | 49                                                           | 28                       | 49                                                                  | 28                       | 50                                                           | 23                       |
| M12       | 1.75       | 85                                                           | 40                       | 83                                                                  | 40                       | 85                                                           | 33                       |
| M14       | 2.0        | 135                                                          | 55                       | 131                                                                 | 55                       | 136                                                          | 46                       |
| M16       | 2.0        | 205                                                          | 75                       | 197                                                                 | 75                       | 208                                                          | 62                       |
| M18       | 2.5        | 288                                                          | 92                       | 275                                                                 | 92                       | 291                                                          | 76                       |
| M20       | 2.5        | 402                                                          | 118                      | 382                                                                 | 118                      | 408                                                          | 97                       |
| M22       | 2.5        | 548                                                          | 146                      | 517                                                                 | 146                      | 557                                                          | 120                      |
| M24       | 3.0        | 693                                                          | 169                      | 652                                                                 | 169                      | 703                                                          | 140                      |
| M27       | 3.0        | 1010                                                         | 221                      | 945                                                                 | 221                      | 1028                                                         | 182                      |
| M30       | 3.5        | 1379                                                         | 269                      | 1286                                                                | 269                      | 1401                                                         | 222                      |
| M33       | 3.5        | 1855                                                         | 333                      | 1722                                                                | 333                      | 1889                                                         | 275                      |
| M36       | 4.0        | 2394                                                         | 392                      | 2219                                                                | 392                      | 2436                                                         | 324                      |
| M39       | 4.0        | 3087                                                         | 468                      | 2852                                                                | 468                      | 3145                                                         | 387                      |
| M42       | 4.5        | 3820                                                         | 538                      | 3525                                                                | 538                      | 3890                                                         | 445                      |

Cu/C paste = copper/graphite paste \* (Molykote ® 1000)  
Oil = WD40 used  
GF=Yield rate  
μ<sub>th</sub>=Washer friction coefficient  
μ<sub>b</sub>=Thread friction coefficient

# Mild Steel Zinc Flake

## Tightening Torque and Clamp Load Guidelines

The below tables are for guideline purposes only and each critical bolted joint should be analysed individually by a Design Engineer, refer to page 9 for further details.

### Grade 10.9 Fastener - Self Colour

| Bolt Size | Pitch [mm] | (Oil). GF=71%,<br>μ <sub>th</sub> =0.13 μ <sub>b</sub> =0.14 |                          | Cu/C (Paste). GF=75%,<br>μ <sub>th</sub> =0.11 μ <sub>b</sub> =0.15 |                          |
|-----------|------------|--------------------------------------------------------------|--------------------------|---------------------------------------------------------------------|--------------------------|
|           |            | Torque [N.m]                                                 | Clamping Force Load [KN} | Torque [N.m]                                                        | Clamping Force Load [KN} |
| M3        | 0.5        | 1.8                                                          | 3.2                      | 3.5                                                                 | 3.4                      |
| M4        | 0.7        | 4.1                                                          | 5.6                      | 7.0                                                                 | 5.9                      |
| M5        | 0.8        | 8.1                                                          | 9.1                      | 12.5                                                                | 9.6                      |
| M6        | 1.0        | 14.1                                                         | 12.9                     | 20.1                                                                | 13.6                     |
| M8        | 1.25       | 34                                                           | 23                       | 44                                                                  | 25                       |
| M10       | 1.5        | 67                                                           | 37                       | 73                                                                  | 39                       |
| M12       | 1.75       | 115                                                          | 57                       | 121                                                                 | 57                       |
| M14       | 2.0        | 183                                                          | 74                       | 188                                                                 | 78                       |
| M16       | 2.0        | 279                                                          | 100                      | 281                                                                 | 106                      |
| M18       | 2.5        | 391                                                          | 123                      | 388                                                                 | 130                      |
| M20       | 2.5        | 547                                                          | 156                      | 534                                                                 | 165                      |
| M22       | 2.5        | 745                                                          | 194                      | 719                                                                 | 205                      |
| M24       | 3.0        | 942                                                          | 225                      | 902                                                                 | 238                      |
| M27       | 3.0        | 1375                                                         | 294                      | 1297                                                                | 310                      |
| M30       | 3.5        | 1875                                                         | 358                      | 1755                                                                | 378                      |
| M33       | 3.5        | 2526                                                         | 443                      | 2340                                                                | 468                      |
| M36       | 4.0        | 3259                                                         | 522                      | 3003                                                                | 551                      |
| M39       | 4.0        | 4203                                                         | 624                      | 3845                                                                | 659                      |
| M42       | 4.5        | 5202                                                         | 716                      | 4740                                                                | 757                      |

### Grade 12.9 Fastener - Self Colour

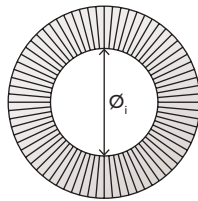
| Bolt Size | Pitch [mm] | (Oil). GF=71%,<br>μ <sub>th</sub> =0.13 μ <sub>b</sub> =0.14 |                          | Cu/C (Paste). GF=75%,<br>μ <sub>th</sub> =0.11 μ <sub>b</sub> =0.15 |                          |
|-----------|------------|--------------------------------------------------------------|--------------------------|---------------------------------------------------------------------|--------------------------|
|           |            | Torque [N.m]                                                 | Clamping Force Load [KN} | Torque [N.m]                                                        | Clamping Force Load [KN} |
| M3        | 0.5        | 2.0                                                          | 3.9                      | 3.8                                                                 | 4.1                      |
| M4        | 0.7        | 4.6                                                          | 6.7                      | 7.6                                                                 | 7.1                      |
| M5        | 0.8        | 9.1                                                          | 10.9                     | 13.6                                                                | 11.5                     |
| M6        | 1.0        | 15.8                                                         | 15.4                     | 21.8                                                                | 16.3                     |
| M8        | 1.25       | 38                                                           | 28                       | 47                                                                  | 30                       |
| M10       | 1.5        | 75                                                           | 44                       | 93                                                                  | 47                       |
| M12       | 1.75       | 128                                                          | 65                       | 151                                                                 | 68                       |
| M14       | 2.0        | 204                                                          | 89                       | 232                                                                 | 94                       |
| M16       | 2.0        | 311                                                          | 120                      | 342                                                                 | 127                      |
| M18       | 2.5        | 437                                                          | 148                      | 467                                                                 | 156                      |
| M20       | 2.5        | 610                                                          | 188                      | 638                                                                 | 198                      |
| M22       | 2.5        | 831                                                          | 233                      | 852                                                                 | 246                      |
| M24       | 3.0        | 1052                                                         | 270                      | 1064                                                                | 286                      |
| M27       | 3.0        | 1533                                                         | 352                      | 1519                                                                | 372                      |
| M30       | 3.5        | 2091                                                         | 430                      | 2042                                                                | 454                      |
| M33       | 3.5        | 2815                                                         | 532                      | 2710                                                                | 562                      |
| M36       | 4.0        | 3633                                                         | 626                      | 3463                                                                | 662                      |
| M39       | 4.0        | 4683                                                         | 748                      | 4415                                                                | 790                      |
| M42       | 4.5        | 5799                                                         | 860                      | 5429                                                                | 908                      |

Cu/C paste = copper/graphite paste \* (Molykote ® 1000)  
Oil = WD40 used  
GF=Yield rate  
μ<sub>th</sub>=Washer friction coefficient  
μ<sub>b</sub>=Thread friction coefficient

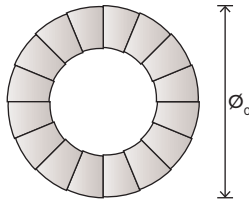
# Stainless Steel

## Grade - 316

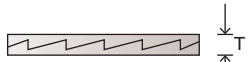
| Washer Code  | Bolt Size (Metric) | Bolt Size (US) | Ø <sub>i</sub> [mm] | Ø <sub>o</sub> [mm] | Thickness T [mm] | Approximate Weight kg/100 pairs |
|--------------|--------------------|----------------|---------------------|---------------------|------------------|---------------------------------|
| WW-M3SS      | M3                 | #5             | 3.4                 | 7.0                 | 2.2              | 0.04                            |
| WW-M3.5SS    | M3.5               | #6             | 3.9                 | 7.6                 | 2.2              | 0.04                            |
| WW-3.5LDSS   | M3.5               | #6             | 3.9                 | 9.0                 | 2.2              | 0.07                            |
| WW-M4SS      | M4                 | #8             | 4.4                 | 7.6                 | 2.2              | 0.04                            |
| WW-M4LDSS    | M4                 | #8             | 4.4                 | 9.0                 | 2.2              | 0.07                            |
| WW-M5SS      | M5                 | #10            | 5.4                 | 9.0                 | 2.2              | 0.06                            |
| WW-M5LDSS    | M5                 | #10            | 5.4                 | 10.8                | 2.2              | 0.11                            |
| WW-M6SS      | M6                 |                | 6.5                 | 10.8                | 2.2              | 0.09                            |
| WW-M6LDSS    | M6                 |                | 6.5                 | 13.5                | 2.0              | 0.16                            |
| WW-1/4"SS    |                    | 1/4"           | 7.2                 | 11.5                | 2.2              | 0.09                            |
| WW-1/4"LDSS  |                    | 1/4"           | 7.2                 | 13.5                | 2.2              | 0.15                            |
| WW-M8SS      | M8                 | 5/16"          | 8.7                 | 13.5                | 2.0              | 0.12                            |
| WW-M8LDSS    | M8                 | 5/16"          | 8.7                 | 16.6                | 2.0              | 0.22                            |
| WW-3/8"SS    |                    | 3/8"           | 10.3                | 16.6                | 2.0              | 0.19                            |
| WW-M3/8"LDSS |                    | 3/8"           | 10.3                | 21.0                | 2.0              | 0.38                            |
| WW-M10SS     | M10                |                | 10.7                | 16.6                | 2.0              | 0.18                            |
| WW-M10LDSS   | M10                |                | 10.7                | 21.0                | 2.0              | 0.37                            |
| WW-M11SS     | M11                | 7/16"          | 11.4                | 18.5                | 2.2              | 0.26                            |
| WW-M12SS     | M12                |                | 13.0                | 19.5                | 2.0              | 0.25                            |
| WW-M12LDSS   | M12                |                | 13.0                | 25.4                | 3.0              | 0.81                            |
| WW-1/2"SS    |                    | 1/2"           | 13.5                | 19.5                | 2.0              | 0.24                            |
| WW-1/2"LDSS  |                    | 1/2"           | 13.5                | 25.4                | 3.2              | 0.80                            |
| WW-M14SS     | M14                | 9/16"          | 15.2                | 23.0                | 3.0              | 0.49                            |
| WW-M14LDSS   | M14                | 9/16"          | 15.2                | 30.7                | 3.2              | 1.31                            |
| WW-M16SS     | M16                | 5/8"           | 17.0                | 25.4                | 3.0              | 0.59                            |
| WW-M16LDSS   | M16                | 5/8"           | 17.0                | 30.7                | 3.2              | 1.18                            |
| WW-M18SS     | M18                |                | 19.5                | 29.0                | 3.2              | 0.80                            |
| WW-M18LDSS   | M18                |                | 19.5                | 34.5                | 3.2              | 1.56                            |
| WW-3/4"SS    |                    | 3/4"           | 20.0                | 30.7                | 3.2              | 0.96                            |
| WW-3/4"LDSS  |                    | 3/4"           | 20.0                | 39.0                | 3.2              | 2.10                            |
| WW-M20SS     | M20                |                | 21.4                | 30.7                | 3.2              | 0.89                            |
| WW-M20LDSS   | M20                |                | 21.4                | 39.0                | 3.2              | 2.06                            |
| WW-M22SS     | M22                | 7/8"           | 23.4                | 34.5                | 3.2              | 1.23                            |
| WW-M22LDSS   | M22                | 7/8"           | 23.4                | 42.0                | 3.2              | 2.23                            |
| WW-M24SS     | M24                |                | 25.3                | 39.0                | 3.2              | 1.52                            |
| WW-M24LDSS   | M24                |                | 25.3                | 48.5                | 3.2              | 3.50                            |
| WW-1"SS      |                    | 1"             | 27.9                | 39.0                | 3.2              | 1.42                            |
| WW-1"LDSS    |                    | 1"             | 27.9                | 48.5                | 3.2              | 3.22                            |
| WW-M27SS     | M27                |                | 28.4                | 42.0                | 6.8              | 3.45                            |
| WW-M27LDSS   | M27                |                | 28.4                | 48.5                | 6.8              | 5.85                            |
| WW-M30SS     | M30                | 1-1/8"         | 31.4                | 47.0                | 6.8              | 4.43                            |
| WW-M30LDSS   | M30                | 1-1/8"         | 31.4                | 58.5                | 6.8              | 9.53                            |
| WW-M33SS     | M33                | 1-1/4"         | 34.4                | 48.5                | 6.8              | 4.25                            |
| WW-M36SS     | M36                | 1-3/8"         | 37.4                | 55.0                | 6.8              | 5.96                            |
| WW-M39SS     | M39                | 1-1/2"         | 40.4                | 58.5                | 6.8              | 6.74                            |
| WW-M42SS     | M42                |                | 43.2                | 63.0                | 6.8              | 7.96                            |
| WW-M45SS     | M45                | 1-3/4"         | 46.2                | 70.0                | 6.8              | 10.20                           |
| WW-M48SS     | M48                |                | 49.6                | 75.0                | 6.8              | 12.00                           |
| WW-M52SS     | M52                | 2"             | 53.6                | 80.0                | 9.0              | 20.10                           |
| WW-M56SS     | M56                | 2-1/4"         | 59.1                | 85.0                | 9.0              | 21.30                           |
| WW-M60SS     | M60                |                | 63.1                | 90.0                | 9.0              | 23.50                           |
| WW-M64SS     | M64                | 2-1/2"         | 67.1                | 95.0                | 9.0              | 25.80                           |
| WW-M68SS     | M68                |                | 71.1                | 100.0               | 9.0              | 28.20                           |
| WW-M72SS     | M72                |                | 75.1                | 105.0               | 9.0              | 30.70                           |
| WW-M76SS     | M76                | 3"             | 79.1                | 110.0               | 9.0              | 33.30                           |
| WW-M80SS     | M80                | 3-1/8"         | 83.1                | 115.0               | 9.0              | 36.00                           |



M3ss-M8ss Ø<sub>i</sub>±0.1mm  
M10ss-M42ss Ø<sub>i</sub>±0.2mm  
M45ss-M80ss Ø<sub>i</sub>±0.5/-0mm



M3ss-M24ss Ø<sub>o</sub>±0.2mm  
M27ss-M42ss Ø<sub>o</sub>±0.3mm  
M45ss-M80ss Ø<sub>o</sub>±0/-2.0mm

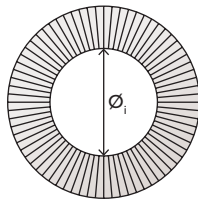


M3ss-M42ss T±0.25mm  
M27ss-M42ss T±0/-0.5mm  
M45ss-M80ss T±0.75mm

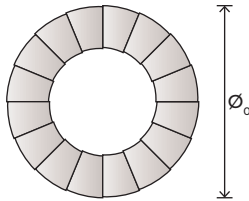
# Stainless Steel

## Grade - SMO 254

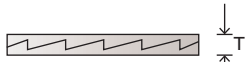
| Washer Code     | Bolt Size (Metric) | Bolt Size (US) | Ø <sub>i</sub> [mm] | Ø <sub>o</sub> [mm] | Thickness T [mm] | Approximate Weight kg/100 pairs |
|-----------------|--------------------|----------------|---------------------|---------------------|------------------|---------------------------------|
| WW-M3SS254      | M3                 | #5             | 3.4                 | 7.0                 | 2.2              | 0.04                            |
| WW-M3.5SS254    | M3.5               | #6             | 3.9                 | 7.6                 | 2.2              | 0.04                            |
| WW-3.5LDSS254   | M3.5               | #6             | 3.9                 | 9.0                 | 2.2              | 0.07                            |
| WW-M4SS254      | M4                 | #8             | 4.4                 | 7.6                 | 2.2              | 0.04                            |
| WW-M4LDSS254    | M4                 | #8             | 4.4                 | 9.0                 | 2.2              | 0.07                            |
| WW-M5SS254      | M5                 | #10            | 5.4                 | 9.0                 | 2.2              | 0.06                            |
| WW-M5LDSS254    | M5                 | #10            | 5.4                 | 10.8                | 2.2              | 0.11                            |
| WW-M6SS254      | M6                 |                | 6.5                 | 10.8                | 2.2              | 0.09                            |
| WW-M6LDSS254    | M6                 |                | 6.5                 | 13.5                | 2.0              | 0.16                            |
| WW-1/4"SS254    |                    | 1/4"           | 7.2                 | 11.5                | 2.2              | 0.09                            |
| WW-1/4"LDSS254  |                    | 1/4"           | 7.2                 | 13.5                | 2.2              | 0.15                            |
| WW-M8SS254      | M8                 | 5/16"          | 8.7                 | 13.5                | 2.0              | 0.12                            |
| WW-M8LDSS254    | M8                 | 5/16"          | 8.7                 | 16.6                | 2.2              | 0.22                            |
| WW-3/8"SS254    |                    | 3/8"           | 10.3                | 16.6                | 2.0              | 0.19                            |
| WW-M3/8"LDSS254 |                    | 3/8"           | 10.3                | 21.0                | 2.2              | 0.38                            |
| WW-M10SS254     | M10                |                | 10.7                | 16.6                | 2.0              | 0.18                            |
| WW-M10LDSS254   | M10                |                | 10.7                | 21.0                | 2.2              | 0.37                            |
| WW-M11SS254     | M11                | 7/16"          | 11.4                | 18.5                | 2.2              | 0.26                            |
| WW-M12SS254     | M12                |                | 13.0                | 19.5                | 2.0              | 0.23                            |
| WW-M12LDSS254   | M12                |                | 13.0                | 25.4                | 3.2              | 0.83                            |
| WW-1/2"SS254    |                    | 1/2"           | 13.5                | 19.5                | 2.0              | 0.23                            |
| WW-1/2"LDSS254  |                    | 1/2"           | 13.5                | 25.4                | 3.2              | 0.80                            |
| WW-M14SS254     | M14                | 9/16"          | 15.2                | 23.0                | 3.0              | 0.49                            |
| WW-M14LDSS254   | M14                | 9/16"          | 15.2                | 30.7                | 3.2              | 1.13                            |
| WW-M16SS254     | M16                | 5/8"           | 17.0                | 25.4                | 3.0              | 0.59                            |
| WW-M16LDSS254   | M16                | 5/8"           | 17.0                | 30.7                | 3.2              | 1.13                            |
| WW-M18SS254     | M18                |                | 19.5                | 29.0                | 3.2              | 0.80                            |
| WW-M18LDSS254   | M18                |                | 19.5                | 34.5                | 3.2              | 1.56                            |
| WW-3/4"SS254    |                    | 3/4"           | 20.0                | 30.7                | 3.2              | 0.96                            |
| WW-3/4"LDSS254  |                    | 3/4"           | 20.0                | 39.0                | 3.2              | 2.14                            |
| WW-M20SS254     | M20                |                | 21.4                | 30.7                | 3.0              | 0.83                            |
| WW-M20LDSS254   | M20                |                | 21.4                | 39.0                | 3.2              | 1.98                            |
| WW-M22SS254     | M22                | 7/8"           | 23.4                | 34.5                | 3.2              | 1.19                            |
| WW-M22LDSS254   | M22                | 7/8"           | 23.4                | 42.0                | 3.2              | 2.44                            |
| WW-M24SS254     | M24                |                | 25.3                | 39.0                | 3.2              | 1.65                            |
| WW-M24LDSS254   | M24                |                | 25.3                | 48.5                | 4.5              | 4.47                            |
| WW-1"SS254      |                    | 1"             | 27.9                | 39.0                | 3.2              | 1.42                            |
| WW-1"LDSS254    |                    | 1"             | 27.9                | 48.5                | 5.6              | 5.30                            |
| WW-M27SS254     | M27                |                | 28.4                | 42.0                | 5.8              | 3.10                            |
| WW-M27LDSS254   | M27                |                | 28.4                | 48.5                | 5.8              | 5.34                            |
| WW-M30SS254     | M30                | 1-1/8"         | 31.4                | 47.0                | 5.8              | 4.04                            |
| WW-M33SS254     | M33                | 1-1/4"         | 34.4                | 48.5                | 5.8              | 3.86                            |
| WW-M36SS254     | M36                | 1-3/8"         | 37.4                | 55.0                | 5.8              | 5.50                            |
| WW-M39SS254     | M39                | 1-1/2"         | 40.4                | 58.5                | 5.8              | 6.74                            |



M3ss-M8ss Ø<sub>i</sub>±0.1mm  
3/8"ss-M39ss Ø<sub>i</sub>±0.2mm



M3ss-1"spss Ø<sub>o</sub>±0.2mm  
M27ss-M39ss Ø<sub>o</sub>±0.3mm



M3ss-M39ss T±0.25mm



For more information  
and instructional  
videos, go to:  
[www.keesafety.cn](http://www.keesafety.cn)

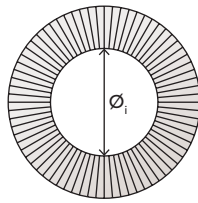
# Stainless Steel

## Grade - C276

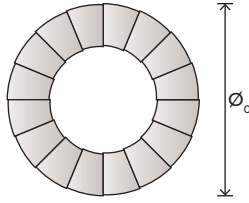
| Washer No.    | Bolt Size (Metric) | Bolt Size (US) | Ø <sub>i</sub> [mm] | Ø <sub>o</sub> [mm] | Thickness T [mm] | Approximate Weight kg/100 pairs |
|---------------|--------------------|----------------|---------------------|---------------------|------------------|---------------------------------|
| WW-M4SS276    | M4                 | #8             | 4.4                 | 7.6                 | 2.3              | 0.043                           |
| WW-M5SS276    | M5                 | #10            | 5.4                 | 9.0                 | 2.3              | 0.059                           |
| WW-M6SS276    | M6                 |                | 6.5                 | 10.8                | 2.3              | 0.085                           |
| WW-M8SS276    | M8                 | 5/16"          | 8.7                 | 13.5                | 2.3              | 0.116                           |
| WW-M8LDSS276  | M8                 | 5/16"          | 8.7                 | 16.6                | 2.3              | 0.220                           |
| WW-M10SS276   | M10                |                | 10.7                | 16.6                | 2.3              | 0.175                           |
| WW-M10LDSS276 | M10                |                | 10.7                | 21.0                | 2.3              | 0.372                           |
| WW-M12SS276   | M12                |                | 13.0                | 19.5                | 2.3              | 0.230                           |
| WW-M12LDSS276 | M12                |                | 13.0                | 25.4                | 3.0              | 0.820                           |
| WW-M16SS276   | M16                | 5/8"           | 17.0                | 25.4                | 3.0              | 0.695                           |
| WW-M20SS276   | M20                |                | 21.4                | 30.0                | 3.0              | 0.820                           |

## Grade - 718

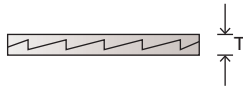
| Washer No.    | Bolt Size (Metric) | Bolt Size (US) | Ø <sub>i</sub> [mm] | Ø <sub>o</sub> [mm] | Thickness T [mm] | Approximate Weight kg/100 pairs |
|---------------|--------------------|----------------|---------------------|---------------------|------------------|---------------------------------|
| WW-M4SS718    | M4                 | #8             | 4.4                 | 7.6                 | 2.3              | 0.043                           |
| WW-M5SS718    | M5                 | #10            | 5.4                 | 9.0                 | 2.3              | 0.059                           |
| WW-M6SS718    | M6                 |                | 6.5                 | 10.8                | 2.3              | 0.085                           |
| WW-1/4"SS718  |                    | 1/4"           | 7.2                 | 11.5                | 2.3              | 0.092                           |
| WW-M8SS718    | M8                 | 5/16"          | 8.7                 | 13.5                | 2.3              | 0.120                           |
| WW-M8LDSS718  | M8                 | 5/16"          | 8.7                 | 16.6                | 2.3              | 0.220                           |
| WW-3/8"SS718  |                    | 3/8"           | 10.3                | 16.6                | 2.3              | 0.190                           |
| WW-M10SS718   | M10                |                | 10.7                | 16.6                | 2.3              | 0.175                           |
| WW-M10LDSS718 | M10                |                | 10.7                | 21.0                | 2.3              | 0.372                           |
| WW-M12SS718   | M12                |                | 13.0                | 19.5                | 2.3              | 0.230                           |
| WW-M12LDSS718 | M12                |                | 13.0                | 25.4                | 3.2              | 0.820                           |
| WW-1/2"SS718  |                    | 1/2"           | 13.5                | 19.5                | 2.3              | 0.238                           |
| WW-M16SS718   | M16                | 5/8"           | 17.0                | 25.4                | 3.2              | 0.679                           |
| WW-3/4"SS718  |                    | 3/4"           | 20.0                | 30.7                | 3.2              | 0.956                           |
| WW-M20SS718   | M20                |                | 21.4                | 30.7                | 3.2              | 0.820                           |



M4ss-M8ss Ø<sub>i</sub>±0.1mm  
M10ss-M20ss Ø<sub>i</sub>±0.2mm



M4ss-M20ss Ø<sub>o</sub>±0.2mm



M4ss-M12ss T±0.4mm  
M12ss-M20ss T±0.5mm

# Stainless Steel

## Tightening Torque and Clamp Load Guidelines for Grades A2 and A4 Fasteners

The below tables are for guideline purposes only and each critical bolted joint should be analysed individually by a Design Engineer, refer to page 9 for further details.

| Bolt Size | Pitch [mm] | A2-50, A4-50<br>Cu/C (Paste). GF=65%,<br>μ <sub>th</sub> =0.12 μ <sub>b</sub> =0.14 |                          | A2-70, A4-70<br>Cu/C (Paste). GF=65%,<br>μ <sub>th</sub> =0.12 μ <sub>b</sub> =0.14 |                          | A2-80, A4-80<br>Cu/C (Paste). GF=65%,<br>μ <sub>th</sub> =0.12 μ <sub>b</sub> =0.14 |                          |
|-----------|------------|-------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|-------------------------------------------------------------------------------------|--------------------------|
|           |            | Torque [N.m]                                                                        | Clamping Force Load [kN] | Torque [N.m]                                                                        | Clamping Force Load [kN] | Torque [N.m]                                                                        | Clamping Force Load [kN] |
| M3 SS     | 0.5        | 0.6                                                                                 | 0.7                      | 1.5                                                                                 | 1.5                      | 1.7                                                                                 | 2.0                      |
| M4 SS     | 0.7        | 1.5                                                                                 | 1.2                      | 3.0                                                                                 | 2.6                      | 3.6                                                                                 | 3.4                      |
| M5 SS     | 0.8        | 2.9                                                                                 | 1.9                      | 5.5                                                                                 | 4.1                      | 6.7                                                                                 | 5.5                      |
| M6 SS     | 1.0        | 4.0                                                                                 | 2.7                      | 8.1                                                                                 | 5.9                      | 11.2                                                                                | 7.8                      |
| M8 SS     | 1.25       | 8.2                                                                                 | 5                        | 18                                                                                  | 11                       | 21                                                                                  | 14                       |
| M10 SS    | 1.5        | 16.1                                                                                | 8                        | 26                                                                                  | 17                       | 34                                                                                  | 23                       |
| M12 SS    | 1.75       | 27.7                                                                                | 12                       | 41                                                                                  | 25                       | 62                                                                                  | 33                       |
| M14 SS    | 2.0        | 43                                                                                  | 16                       | 68                                                                                  | 34                       | 101                                                                                 | 45                       |
| M16 SS    | 2.0        | 64                                                                                  | 21                       | 108                                                                                 | 46                       | 157                                                                                 | 61                       |
| M18 SS    | 2.5        | 95                                                                                  | 26                       | 157                                                                                 | 56                       | 224                                                                                 | 75                       |
| M20 SS    | 2.5        | 111                                                                                 | 33                       | 223                                                                                 | 72                       | 318                                                                                 | 95                       |
| M22 SS    | 2.5        | 146                                                                                 | 39                       | 310                                                                                 | 89                       | 438                                                                                 | 118                      |
| M24 SS    | 3.0        | 192                                                                                 | 48                       | 397                                                                                 | 103                      | 558                                                                                 | 137                      |
| M27 SS    | 3.0        | 281                                                                                 | 63                       | 589                                                                                 | 134                      | 823                                                                                 | 179                      |
| M30 SS    | 3.5        | 383                                                                                 | 77                       | 815                                                                                 | 164                      | 1132                                                                                | 219                      |
| M36 SS    | 4.0        | 665                                                                                 | 111                      | 1445                                                                                | 239                      | 1993                                                                                | 319                      |

When using Stainless Materials we always recommend using a lubricant to avoid thread galling.

Cu/C paste = copper/graphite paste \* (Molykote \* 1000)

GF=Yield rate

μ<sub>th</sub>=Washer friction coefficient

μ<sub>b</sub>=Thread friction coefficient



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