

PETROCHEMICAL STUDBOLTS PRODUCT GUIDE

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PETROCHEMICAL STUDBOLTS SPECIALISTS

Connected to our customers like no other fastening company.

At Konnect Fastening Systems®, we focus on supplying the right fastener products at the best value, in the shortest possible time. Our extensive network of branches, specialist knowledge, and vast range of standard and specialized fasteners enable us to provide a streamlined service with prompt delivery to any location across Australasia.

As part of Coventry Group Ltd, a publicly listed Australian company, Konnect Fastening Systems® is a leading name in fasteners. We have a proud history of serving the mining, construction, and manufacturing industries for over 50 years.

The Konnect Fastening Systems® business has grown through the acquisition of strategic regional distributors across Australia and New Zealand. Now operating under a single consolidated trading name, with over 55 branches stocked with the largest range of fasteners in Australasia, we stand as the premier fastener specialist in the region.

Our expertise in manufacturing a customized range of studbolting for the gas, petroleum, and chemical industries further strengthens our position in the market. We remain focused and single-minded in our approach to business.

QUALITY, TOTALLY DOCUMENTED & TRACEABLE

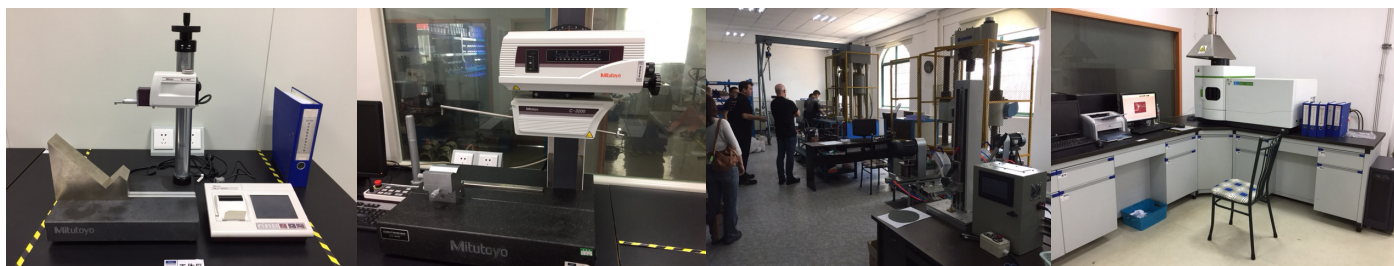
Konnect Fastening Systems® offers specialised facilities in Perth (WA) and Brisbane (QLD) to serve the Australian studbolt market, focusing on high-quality products that meet industry standards.

Quality Assurance

- Konnect Fastening Systems® is certified to ISO9001 ensuring rigorous quality control processes
- Products are sourced from leading local and international suppliers who are vetted for meeting relevant standards
- Many overseas suppliers hold American Petroleum Institute (API) certification, guaranteeing top-tier product quality
- Studs are marked during manufacturing to identify the grade of material and ensure traceability to raw materials throughout the process

Product Certification

- All Konnect Fastening Systems® petrochemical products can be supplied with full certification with mechanical testing and material composition
- Additionally, independent third-party verification testing is included in our certification packages, providing customers with highly engineered, well finished and fully documented products



STUDBOLT PRODUCT GUIDE

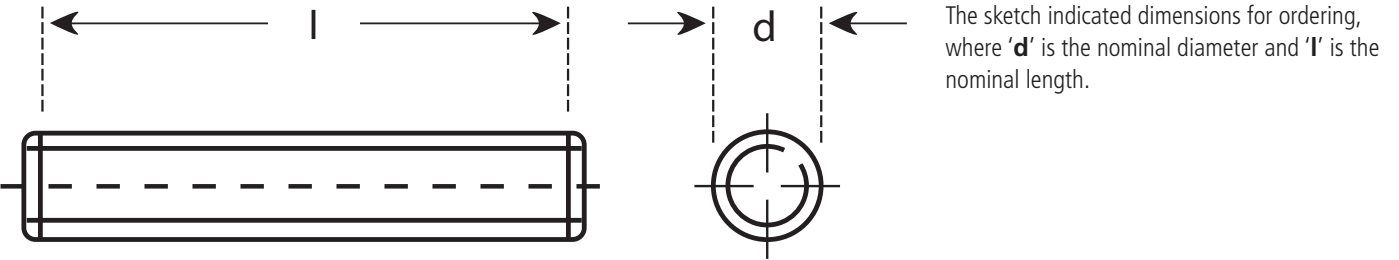
The below table sets out the material grades and diameter ranges available from Konnect Fastening Sytems stock for petrochemical studbolts and nuts in both imperial and metric dimensions.

Studbolts		Compatible Nuts	
ASTM Material	Diameter Range	ASTM Material	Diameter Range
A193 Grade B7	3/8" to 4" M10 to M100	A194 Grade 2H	3/8" to 4" M10 to M100
A193 Grade B7M	3/8" to 4" M10 to M100	A194 Grade 2HM	3/8" to 4" M10 to M100
A320 Grade L7	3/8" to 4" M10 to M100	A194 Grade 7L	3/8" to 4" M10 to M100
A320 Grade L7M	3/8" to 2-1/2" & Metric	A194 Grade 7L	3/8" to 2-1/2" & Metric
A193/A320 Grade B8 Class 2	3/8" to 1-1/2"	A194 Grade 8	3/8" to 1-1/2"
A193/A320 Grade B8M Class 2	3/8" to 1-1/2"	A194 Grade 8M	3/8" to 1-1/2"
A193 Grade B16	1/2" to 3-1/2"	A194 Grade 7L	1/2" to 3-1/2"

NOTES:

- Studbolt threads up to and including 1" diameter are typically supplied in UNC
- Diameters over 1" diameter are typically supplied in an 8UN thread pitch
- Metric diameters can be supplied upon request

DIMENSIONS FOR ORDERING



SPECIAL MATERIALS ARE AVAILABLE ON ORDER

The below table sets out the material grades and diameter ranges available from Konnect Fastening Sytems stock for petrochemical studbolts and nuts in both imperial and metric dimensions.

- B8T
 - Duplex
 - Super Duplex
 - Monel 400
 - Monel K500
- Hastelloy
 - Incoloy
 - Inconel
 - Titanium

COATINGS

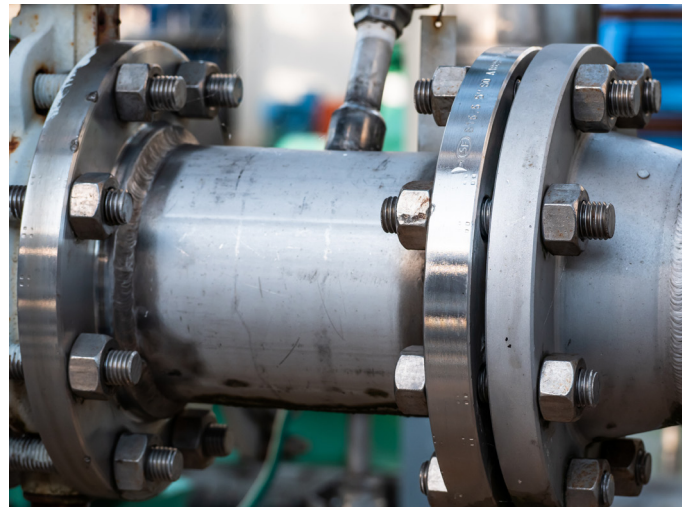
Petrochemical fasteners are used in varying corrosive environments ranging from mild to highly corrosive conditions where product may be subject to immersion in sea water or exposure to chemicals. Konnect Fastening Systems® products are available in a range of finishes designed to meet corrosion protection needs across the spectrum of environments. The finish types available and their relative merits are set out in the following notes.

Plain Finish with Light Oil

No corrosion protection is offered. In external situations, corrosion will commence immediately upon installation, with evidence of "red rust" appearing in a few days. There may be difficulty in disassembly of bolts and nuts due to seizure of threads due to rust build up. For tightening purposes the coefficient of friction for this finish is considered to be 0.20.

Electro Plated Zinc with Clear or Yellow Chromate Conversion

This finish will offer only minimal protection and then in very mild environments. Plating thickness is normally 3 to 5 microns. Although yellow chromate will offer better protection than clear chromate zinc plating, neither are considered to offer more than one year's protection in heavily polluted industrial atmospheres. The coefficient of friction for this finish is considered to be 0.29.



Galvanised

A proven finish where the primary requirement is to protect fasteners from the effects of weather and industrial atmospheres. Coating thickness is in the order of 50 microns. This finish is not suitable for use in situations where products are immersed in seawater or come into direct contact with corrosive chemicals. As an aid to correct tightening, galvanised product should be lightly oiled.

Molybdenum Disulphide Equivalent Coatings

These coatings are grey to black in colour and usually applied over a phosphate base. Depending on the actual variety chosen, corrosion protection at continuous operating temperatures from -70° to 300° C, is achieved. Again, depending upon the actual finish, salt spray resistance testing endurance from 100 to 300 hours is achieved.

Good resistance is offered to acid, alkali and solvent attack. Anti-seize protection is a characteristic. Coating thickness is typically 25 to 35 microns, hence it may be necessary to adjust nut tapping to achieve correct thread fit. Uniform torque characteristics are also a feature. Frictional coefficients ranging from 0.03 to 0.18 are typically available. Due to the variety of these coatings it is recommended that assistance be requested when selecting the actual coating to be supplied.

Superior Coatings for Product in Harsh Corrosive Environments - Xylan® 1014, 1070, 1424

Specialised coatings have been developed that provide for long term protection in harsh corrosive environments. Such environments might be total immersion in sea water, continual exposure to sea spray or exposure to corrosive chemicals in industrial situations. In addition to the need to provide corrosion protection, there is the need to avoid thread seizure when disassembly is required. Depending on the coating system and pretreatment, salt spray endurance testing frequently produces results between 500 and 1000 hours. Typically, standard fastener finishes offer less than 50 hours protection under test conditions.

Predominant amongst these superior finishes are organic fluoro polymer (PTFE) coatings. Depending upon specification PTFE coatings may be applied over a phosphate base. Some coatings are identifiable to the user by colour. On the other hand, some users will specify that a coating be a particular colour to indicate use in a particular application.

Coating thickness is typically 25 to 35 microns, hence it is necessary to adjust nut tapping to achieve correct thread fit. Note that there are other PTFE finishes available offering different features for different applications. Salt spray endurance testing in excess of 1000 hours can be achieved. Frictional coefficients are in the range 0.04 to 0.10.

When selecting these forms of coatings it is recommended that specialist assistance is sought.

Other coatings available on request. Contact your local sales representative for more information.

GRADES, COMPOSITION & MECHANICAL PROPERTIES

ASTM Studbolt Grade	A193, B7	A193, B7M	A193/A320 B8 Class 2
Service Temperature	-30°C to 400°C	-30°C to 400°C	-150°C to 575°C
AISI Material Specification	4140, 4142, 4145	4140, 4142, 4145	Type 304 Stainless
Chemical Composition %			
Carbon	0.37 to 0.49	0.37 to 0.49	0.08 max.
Silicon	0.15 to 0.35	0.15 to 0.35	1.00 max.
Manganese	0.65 to 1.10	0.65 to 1.10	2.00 max.
Nickel			8.00 to 10.50
Chromium	0.75 to 1.20	0.75 to 1.20	18.00 to 20.00
Molybdenum	0.15 to 0.25	0.15 to 0.25	
Sulphur	0.040 max.	0.040 max.	0.030 max.
Phosphorus	0.035 max.	0.035 max.	0.045 max.
Mechanical Properties			
Diameter	2-1/2" (65mm) and under	4" (100mm) and under	Refer to table below
Minimum Tensile Strength	125 ksi min.	100 ksi min.	Refer to table below
Yield Strength, 0.2% Offset	105 ksi min.	80 ksi min.	Refer to table below
Brinell Hardness	HB 321 max.	HB 235 max.	Refer to table below
Diameter	Over 2-1/2" to 4" (65mm to 100mm)	Over 4" to 7" (100mm to 180mm)	Refer to table below
Minimum Tensile Strength	115 ksi min.	100 ksi min.	Refer to table below
Yield Strength, 0.2% Offset	95 ksi min.	75 ksi min.	Refer to table below
Brinell Hardness	HB 321 max.	HB 235 max.	Refer to table below
Diameter	4" (100mm) and under	4" (100mm) and under	Refer to table below
Elongation in 4D	16% min.	18% min.	Refer to table below
Reduction of Area	50% min.	50% min.	Refer to table below
Brinell Hardness	HB 321 max.	HB 235 max.	HB 321 max.
ASTM Compatible Nut	A194, GR 2H	A194, GR 2HM	A194, GR 8

MECHANICAL PROPERTIES
FOR ASTM A193/A320 GRADE B8 CLASS 2 STUDBOLTS

Diameter	Tensile strength ksi min.	Yield strength 0.2% Offset ksi min.	Elongation A193 in 4D min. % A320 in 2" min. %	Brinell Hardness max.	Reduction of Area min. %	
					A193	A320
3/4" (20mm) and under	125	100	12	321	35	35
Over 3/4" to 1" (20mm to 25mm), incl.	115	80	15	321	35	35
Over 1" to 1-1/4" (25mm to 32mm), incl.	105	65	20	321	35	35
Over 1-1/4" to 1-1/2" (32mm to 40mm), incl.	100	50	28	321	45	45

NOTE: Service temperature refer to actual metal temperatures.

GRADES, COMPOSITION & MECHANICAL PROPERTIES

ASTM Studbolt Grade	A193/A320 B8M Class 2	A193, B16	A320, L7
Service Temperature	-150°C to 575°C	0°C to 525°C	-101°C to 538°C
AISI Material Specification	Type 316 Stainless	Chromium, Molybdenum, Vanadium	4140, 4142, 4145
Chemical Composition %			
Carbon	0.08 max.	0.36 to 0.47 max.	0.38 to 0.48 max.
Silicon	1.00 max.	0.15 to 0.35	0.15 to 0.35
Manganese	2.00 max.	0.45 to 0.70	0.75 to 1.00
Nickel	10.00 to 14.00		
Chromium	16.00 to 18.00	0.80 to 1.15	0.80 to 1.10
Molybdenum	2.00 to 3.00	0.50 to 0.65	0.15 to 0.25
Vanadium		0.25 to 0.35	
Sulphur	0.030 max.	0.040 max.	0.040 max.
Phosphorus	0.045 max.	0.035 max.	0.035 max.
Mechanical Properties			
Diameter	Refer to table below	2-1/2" (65mm) and under	2-1/2" (65mm) and under
Minimum Tensile Strength	Refer to table below	125 ksi min.	125 ksi min.
Yield Strength, 0.2% Offset	Refer to table below	105 ksi min.	105 ksi min.
Elongation	Refer to table below	18% min. in 4D	16% min. in 2"
Reduction of Area	Refer to table below	50% min.	50% min.
Diameter	Refer to table below	Over 2-1/2" to 4"(65mm to 100mm)	
Minimum Tensile Strength	Refer to table below	110 ksi min.	
Yield Strength, 0.2% Offset	Refer to table below	95 ksi min.	
Elongation	Refer to table below	17% min in 4D	
Reduction of Area	Refer to table below	45% min	
Min Average Impact @ -101°C	N/A	N/A	27 J (10mm x 10mm section size)
Min Impact value @ -101°C	N/A	N/A	20 J (10mm x 10mm section size)
ASTM Compatible Nut	A194, GR 8M	A194, GR 7L	A194, GR 7L

MECHANICAL PROPERTIES
FOR ASTM A193/A320 GRADE B8M CLASS 2 STUDBOLTS

Diameter	Tensile strength ksi min.	Yield strength 0.2% Offset ksi min.	Elongation A193 in 4D min. % A320 in 2" min. %	Brinell Hardness max.	Reduction of Area
					min. %
3/4" (20mm) and under	110	95	15	321	45
Over 3/4" to 1" (20mm to 25mm), incl.	100	80	20	321	45
Over 1" to 1-1/4" (25mm to 32mm), incl.	95	65	25	321	45
Over 1-1/4" to 1-1/2" (32mm to 40mm), incl.	90	50	30	321	45

GRADES, COMPOSITION & MECHANICAL PROPERTIES

ASTM Nuts Grade	A194, GR 2H	A194, GR 2HM	A194, GR 7L
Service Temperature	-30°C to 400°C	-30°C to 400°C	-100°C to 565°C
AISI Material Specification	Carbon Steel	Carbon Steel	4140, 4142, 4145
Chemical Composition %			
Carbon	0.40 min.	0.40 min.	0.38 to 0.48 max.
Silicon	0.40 max.	0.40 max.	0.15 to 0.35
Manganese	1.00 max.	1.00 max.	0.75 to 1.0
Chromium			0.80 to 1.10
Sulphur	0.050 max.	0.050 max.	0.040 max.
Phosphorus	0.040 max.	0.040 max.	0.035 max.
Molybdenum			0.15 to 0.25
Mechanical Properties			
Brinell Hardness			
Up to 1-1/2" (36mm) dia.	248 to 327 HB	159 to 235 HB	248 to 327 HB
Over 1-1/2" (36mm) dia.	212 to 327 HB	159 to 235 HB	248 to 327 HB

ASTM Nuts Grade	A194, Gr 2H	A194, Gr 2HM
Service Temperature	-150°C to 575°C	-150°C to 575°C
AISI Material Specification	Type 304 Stainless	Type 316 Stainless
Chemical Composition %		
Carbon (max)	0.08 max.	0.08 max.
Silicon	1.00 max.	1.00 max.
Manganese	2.00 max.	2.00 max.
Nickel	8.00 to 10.50	10.00 to 14.00
Chromium	18.00 to 20.00	16.00 to 18.00
Sulphur	0.030 max.	0.030 max.
Phosphorus	0.045 max.	0.045 max.
Molybdenum		2.00 - 3.00
Mechanical Properties		
Brinell Hardness	126 to 300 HB	126 to 300 HB

NOTE: Service temperature refer to actual metal temperatures.

A194 GRADE TYPES

Grade	Material Type
2	Carbon steel heavy hex nuts
2H	Quenched & tempered carbon steel heavy hex nuts
2HM	Quenched & tempered carbon steel heavy hex nuts, 100% hardness tested
7	Quenched & tempered alloy steel heavy hex nuts
7M	Quenched & tempered alloy steel heavy hex nuts, 100% hardness tested
7L	Quenched & tempered alloy steel heavy hex nuts, Charpy impact tested
8	Stainless AISI 304 heavy hex nuts
8M	Stainless AISI 316 heavy hex nuts

SPECIFICATIONS

Imperial Nuts

Nuts for imperial studbolts are Unified Heavy Hexagon series to dimensions in the following table. These conform to ASTM A194 and are equivalent to ANSI B18.2.2 for Heavy Hexagon Nuts.

Dia. inch	Pitch TPI	Across Flats		Nut Height	
		Max.	Min.	Max.	Min.
3/8"	16	0.688	0.669	0.377	0.341
1/2"	13	0.875	0.850	0.504	0.464
5/8"	11	1.062	1.031	0.631	0.587
3/4"	10	1.250	1.212	0.758	0.710
7/8"	9	1.438	1.394	0.885	0.833
1"	8	1.625	1.575	1.012	0.956
1-1/8"	8	1.812	1.756	1.139	1.079
1-1/4"	8	2.00	1.938	1.251	1.187
1-3/8"	8	2.188	2.119	1.378	1.310
1-1/2"	8	2.375	2.300	1.505	1.433
1-5/8"	8	2.562	2.481	1.632	1.556
1-3/4"	8	2.750	2.662	1.759	1.679
1-7/8"	8	2.938	2.844	1.886	1.802
2"	8	3.125	3.025	2.013	1.925
2-1/4"	8	3.500	3.388	2.251	2.155
2-1/2"	8	3.875	3.750	2.505	2.401
2-3/4"	8	4.250	4.112	2.759	2.647
3"	8	4.625	4.475	3.013	2.893
3-1/4"	8	5.000	4.838	3.252	3.124
3-1/2"	8	5.375	5.200	3.506	3.370

Metric Nuts

Nominal dimensions are set out in the table below.

Dia. inch	Pitch TPI	Across Flats	Nut Height
		Max.	Nominal
M10	1.50	17.0	10.0
M12	1.75	19.0	12.0
<u>M14</u>	<u>2.00</u>	<u>22.0</u>	<u>14.0</u>
M16	2.00	24.0	16.0
<u>M18</u>	<u>2.50</u>	<u>27.0</u>	<u>18.0</u>
M20	2.50	30.0	20.0
<u>M22</u>	<u>2.50</u>	<u>32.0</u>	<u>22.0</u>
M24	3.00	36.0	24.0
<u>M27</u>	<u>3.00</u>	<u>41.0</u>	<u>27.0</u>
M30	3.50	46.0	30.0
<u>M33</u>	<u>3.50</u>	<u>50.0</u>	<u>33.0</u>
M36	4.00	55.0	36.0
M39	4.00	60.0	39.0

NOTE: Diameters underlined are non-preferred.



PREPERATION & INSTALLATION

In almost all cases some form of gasketing material will be placed between the flanges being bolted. Reliable performance of the joint in service will largely be determined by the care taken in preparation, installation and bolting technique.

Preparation

- The gasket seating surfaces should be inspected for tool marks, pitting, cracks or scratches. Radial scratches across the gasket sealing surface are almost impossible to seal regardless of the type of gasket being used. It may be necessary to rework the flange.
- Clean and inspect each studbolt and nut. Nuts should run freely on the studbolt.
- Verify from markings that studbolt and nut materials are compatible or comply with specific assembly instructions.
- It is good practice to renew all studs and nuts. Should this not be possible, ensure that studs being reused are in a serviceable condition. Look for damaged threads, heavy corrosion or signs that the product has otherwise been damaged in use or disassembly.
- Lubricate all studbolts and nuts with anti-seize compounds or parting lubricants. Some companies specify types to use in their installation procedures. All thread contact areas and nut faces must be included in this process. Differing lubricants produce changes to the coefficient of friction between the bolt and nut threads. Approximate values are shown in the table below. These coefficient values are also dependant on the surface finish of flanges. The values shown are typical for machined surfaces but can vary, a further reason to consider the values shown as approximate.

Lubricant	Approx. Coefficient of friction
No lubricant, clean stainless steel studbolts & nuts	0.30
No lubricant, clean steel studbolts & nuts	0.25
Zinc plated, dry	0.29
Machine oil	0.20
Molybdenum disulphide based grease	0.15
Copper based anti-seize	0.15
Solid PTFE film	0.04 to 0.10

* These figures are a guide only. Pre-assembly tests should be undertaken to confirm the exact coefficient of friction of the chosen product.

In simple terms, for a given torque, clamping load applied by the studbolts and nuts increases as the coefficient of friction decreases. Therefore the lower the coefficient of friction, the better the chance of producing reliable joints.

Installation

1. Inspect the gasket for damage and ensure that the gasket is suitable for the flange operating conditions of temperature, pressure and material being sealed
2. Never reuse a gasket. Small cost savings may be quickly consumed by the costs of unplanned down time
3. When using "cut from sheet" gaskets make sure that bolt holes are flat with no burrs or ridges. These imperfections can lead to uneven tightening stresses and premature failure
4. Specify a jointing material manufactured with a suitable release coating or finish if the joint is to be broken regularly. The use of some form of anti-seize is common practice. Gasket manufacturers recommend the use of talcum powder. Industry experience shows this form of release coating is not reliable
5. The use of jointing compounds or grease is not recommended when assembling pipe flange gaskets due to the potential of reduction in friction between gaskets and flanges. This can lead to gasket blow out
6. Insert two or three bolts at the bottom of the flange. Do not tighten. The purpose of these bolts initially is to support the gasket whilst all bolts are installed in the flange
7. Insert the gasket between the flange faces taking care not to damage the sealing elements
8. Insert one bolt at the top of the flange. Do not tighten. The purpose of this bolt is to roughly align the gasket in the joint
9. Finally align gasket and insert all other bolts. Tighten to a "finger tight" condition.

TIGHTENING

Tightening

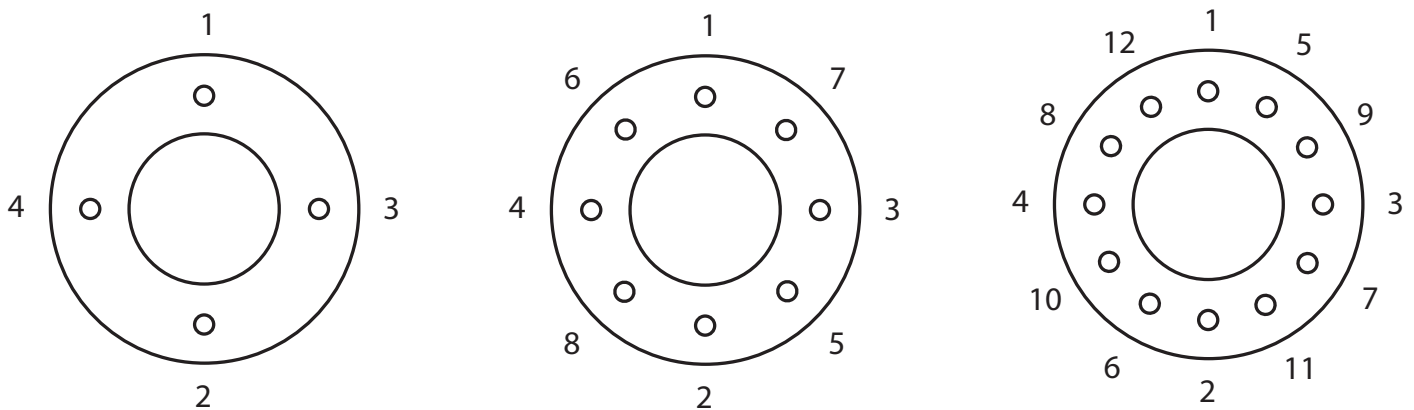
Studbolts should be finally tightened to induce desired clamping loads. Tightening torque values necessary to induce these loads should be specified by the authority responsible for safe operation of the connection. Fastener mechanical properties specify "yield loads" for fastener materials. In simple terms, fastener material has ceased to be elastic when a yield load is applied.

A four step tightening process should be employed.

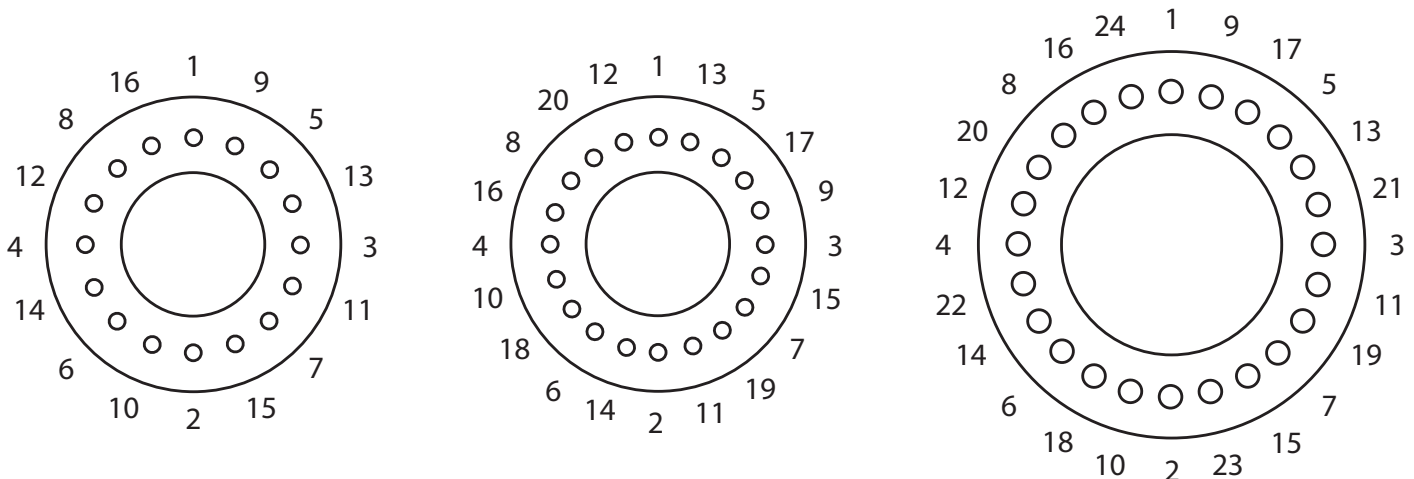
1. All studbolts should be lightly tightened.
2. Further tighten to approximately 30% of final condition or torque.
3. Further tighten to approximately 60% of final condition or torque.
4. Tighten to final condition or 100% of torque.

Depending upon circumstances and the experience of the trades person carrying out the tightening process, tightening by "feel" may be adequate. If torque wrenches are used ensure that they are properly calibrated. During this tightening process the correct sequence must be used.

4, 8 & 12 Bolt Flanges



16, 20 & 24 Bolt Flanges



Having reached the final tightened condition it is likely that some further compression of the gasket material may occur. This would cause loss of studbolt clamping load. Tightening at the final torque figure should be continued in a clockwise manner until no further rotation of the nut is observed.

NOTE: That good bolting practice requires a minimum of two full threads protruding beyond the nut.

SPECIFICATIONS

Set out below and on page 13 are tightening torque figures for the studbolt product range. These are theoretical calculations assuming a coefficient of friction of 0.20. Adjustments are necessary in circumstances where the coefficient is known to differ from this value. Torque figures have been calculated to generate studbolt clamping loads of 30% and 60% of yield loads.

Torque values indicated are intended for initial guidance and should be confirmed as a result of actual usage and experience. Common industry practice for industrial bolting is to specify tightening torques to develop clamping loads of 60% to 65% of yield load. However, for studbolts, there is field experience to suggest that clamping loads of more than 44% of yield load may cause deformation of flanges and difficulty in sealing joints. This fact needs to be taken into account in finally arriving at tightening torques. In truth, some authorities adopt the flange deformation stress as the controlling factor. This allows the selection of a single bolt stress value for a range of pipe classes even if a number of different bolt types are in use.

ASTM A193 Grade B7 Studbolts Imperial Dimensions		
Dia. inch	Tensile Strength ksi min.	Yield Strength ksi min.
≤ 2-1/2"	125	105
> 2-1/2" to 4"	115	95

ASTM A193 Grade B7 Studbolts Metric Dimensions		
Dia. mm	Tensile Strength MPa min.	Yield Strength MPa min.
≤ M64	860	720

Dia. inch	Thread	Yield Load lbf	Tightening Torques			
			For 30% of Yield Load		For 60% of Yield Load	
			ft. lb.	Nm	ft. lbs	Nm
3/8"	UNC	8138	15	20	31	42
7/16"	UNC	11130	24	33	49	66
1/2"	UNC	14910	37	50	75	102
9/16"	UNC	19110	54	73	107	145
5/8"	UNC	23730	74	100	148	201
3/4"	UNC	35070	132	179	263	357
7/8"	UNC	48510	212	287	424	575
1"	UNC	63630	318	431	636	862
1-1/8"	8UN	82950	467	633	933	1265
1-1/4"	8UN	105000	656	889	1313	1780
1-3/8"	8UN	129465	860	1207	1780	2413
1-1/2"	8UN	156660	1175	1593	2350	3186
1-5/8"	8UN	186900	1519	2059	3037	4118
1-3/4"	8UN	218400	1911	2591	3822	5182
1-7/8"	8UN	253050	2372	3216	4745	6433
2"	8UN	290850	2909	3944	5817	7887
2-1/4"	8UN	373800	4205	5701	8411	11404
2-1/2"	8UN	466200	5828	7902	11655	15802
2-3/4"	8UN	515850	7093	9617	14186	19234
3"	8UN	618450	9277	12578	18554	25156
3-1/4"	8UN	730550	11871	16095	23743	32191
3-1/2"	8UN	851200	14896	20196	29792	40393

See notes below.

Dia. mm	Thread	Yield Load kN	Tightening Torques			
			For 30% of Yield Load		For 60% of Yield Load	
			ft. lb.	Nm	ft. lbs	Nm
M10	1.50	41.8	18	25	37	50
M12	1.75	60.7	32	44	64	87
M14	2.00	82.8	51	69	103	139
M16	2.00	113.0	80	108	160	217
M18	2.50	138.2	110	149	220	298
M20	2.50	176.4	156	212	312	423
M22	2.50	218.2	212	288	425	576
M24	3.00	254.2	270	366	540	732
M27	3.00	330.5	395	536	790	1071
M30	3.50	403.9	536	727	1072	1454
M33	3.50	499.7	729	989	1460	1979
M36	4.00	588.2	937	1271	1874	2541
M39	4.00	702.7	1213	1644	2425	3288

See notes below.

ASTM A193 Grade B7M Studbolts Imperial Dimensions		
Dia. inch	Tensile Strength ksi min.	Yield Strength ksi min.
≤ 2-1/2"	100	80

Dia. inch	Thread	Yield Load lbf	Tightening Torques			
			For 30% of Yield Load		For 60% of Yield Load	
			ft. lb.	Nm	ft. lbs	Nm
1/2"	UNC	11360	28	38	57	77
9/16"	UNC	14560	41	56	82	111
5/8"	UNC	18080	57	77	113	153
3/4"	UNC	26726	100	136	200	271
7/8"	UNC	36960	162	220	323	438
1"	UNC	48480	242	328	485	658
1-1/8"	8UN	63200	356	483	711	964
1-1/4"	8UN	80000	500	678	1000	1356

See notes below.

NOTE: Torque values are calculated on the assumption that studbolts have been lubricated to create a coefficient of friction of 0.20.

ASTM A193/A320 Grade B8 Class 2 Studbolts Imperial Dimensions		
Dia. inch	Tensile Strength ksi min	Yield Strength 0.2% Offset ksi min
≤ 3/4"	125	100
> 3/4" to 1"	115	80
> 1" to 1-1/4"	105	65
> 1-1/4" to 1-1/2"	100	50

Dia. inch	Thread	Yield Load lbf	Tightening Torques			
			For 30% of Yield Load		For 60% of Yield Load	
			ft. lbs	Nm	ft. lbs	Nm
3/8"	UNC	7750	15	20	29	39
7/16"	UNC	10600	23	31	46	62
1/2"	UNC	14200	36	49	71	96
9/16"	UNC	18200	51	69	102	138
5/8"	UNC	22600	71	96	141	191
3/4"	UNC	26720	100	136	200	271
7/8"	UNC	36960	162	220	323	438
1"	UNC	48480	242	328	485	658
1-1/8"	8UN	51350	289	392	578	784
1-1/4"	8UN	65000	406	550	813	1102
1-3/8"	8UN	61650	424	575	848	1150
1-1/2"	8UN	74600	560	759	1119	1517

See notes on page 12.

ASTM A193/A320 Grade B8M Class 2 Studbolts Imperial Dimensions		
Dia. inch	Tensile Strength ksi min	Yield Strength 0.2% Offset ksi min
≤ 3/4"	110	95
> 3/4" to 1"	100	80
> 1" to 1-1/4"	95	65
> 1-1/4" to 1-1/2"	90	50

Dia. inch	Thread	Yield Load lbf	Tightening Torques			
			For 30% of Yield Load		For 60% of Yield Load	
			ft. lbs	Nm	ft. lbs	Nm
3/8"	UNC	7363	14	19	28	38
7/16"	UNC	10070	22	30	44	60
1/2"	UNC	13490	34	46	67	91
9/16"	UNC	17290	49	66	97	132
5/8"	UNC	21470	67	91	134	182
3/4"	UNC	26720	100	136	200	271
7/8"	UNC	36960	162	220	323	438
1"	UNC	48480	242	328	485	658
1-1/8"	8UN	51350	289	392	578	784
1-1/4"	8UN	65000	406	550	813	1102
1-3/8"	8UN	61650	424	575	848	1150
1-1/2"	8UN	74600	560	759	1119	1517

See notes on page 12.

ASTM A193 Grade B16 Studbolts Imperial Dimensions		
Dia. inch	Tensile Strength ksi min	Yield Strength 0.2% Offset ksi min
≤ 2-1/2"	125	105
> 2-1/2" to 4"	105	95

Dia. inch	Thread	Yield Load lbf	Tightening Torques			
			For 30% of Yield Load		For 60% of Yield Load	
			ft. lbs	Nm	ft. lbs	Nm
3/8"	UNC	8138	15	20	31	42
7/16"	UNC	11130	24	33	49	66
1/2"	UNC	14910	37	50	75	102
9/16"	UNC	19110	54	73	107	145
5/8"	UNC	23730	74	100	148	201
3/4"	UNC	35070	132	179	263	357
7/8"	UNC	48510	212	287	424	575
1"	UNC	63630	318	431	636	862
1-1/8"	8UN	82950	467	633	933	1265
1-1/4"	8UN	105000	656	889	1313	1780
1-3/8"	8UN	129465	890	1207	1780	2413
1-1/2"	8UN	156660	1175	1593	2350	3186
1-5/8"	8UN	186900	1519	2059	3037	4118
1-3/4"	8UN	218400	1911	2591	3822	5182
1-7/8"	8UN	253050	2372	3216	4745	6433
2"	8UN	290850	2909	3944	5817	7887
2-1/4"	8UN	373800	4205	5701	8411	11404
2-1/2"	8UN	466200	5828	7902	11655	15802
2-3/4"	8UN	515850	7093	9617	14186	19234
3"	8UN	618450	9277	12578	18554	25156
3-1/4"	8UN	730550	11871	16095	23743	32191
3-1/2"	8UN	851200	14896	20196	29792	40393

See notes on page 12.

ASTM A193 Grade L7 Studbolts Imperial dimensions		
Dia. inch	Tensile Strength ksi min	Yield Strength 0.2% Offset ksi min
≤ 2-1/2"	125	105

Dia. inch	Thread	Yield Load lbf	Tightening Torques			
			For 30% of Yield Load		For 60% of Yield Load	
			ft. lbs	Nm	ft. lbs	Nm
3/8"	UNC	8138	15	20	31	42
7/16"	UNC	11130	24	33	49	66
1/2"	UNC	14910	37	50	75	102
9/16"	UNC	19110	54	73	107	145
5/8"	UNC	23730	74	100	148	201
3/4"	UNC	35070	132	179	263	357
7/8"	UNC	48510	212	287	424	575
1"	UNC	63630	318	431	636	862
1-1/8"	8UN	82950	467	633	933	1265
1-1/4"	8UN	105000	656	889	1313	1780
1-3/8"	8UN	129465	890	1207	1780	2413
1-1/2"	8UN	156660	1175	1593	2350	3186
1-5/8"	8UN	186900	1519	2059	3037	4118
1-3/4"	8UN	218400	1911	2591	3822	5182
1-7/8"	8UN	253050	2372	3216	4745	6433
2"	8UN	290850	2909	3944	5817	7887
2-1/4"	8UN	373800	4205	5701	8411	11404
2-1/2"	8UN	466200	5828	7902	11655	15802

See notes on page 12.

APPROX. WEIGHT (KG) PER 100

Approx. Product weights KG per 100 for studbolts complete with 2 nuts											
Length		Diameter (inches)									
mm	inch	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"	1-1/8"	1-1/4"
65	2-1/2"	5.5	7.6	10.8	13.5						
70	2-3/4"	5.9	8.2	11.6	14.5	19.8					
80	3-1/4"	6.3	8.8	12.4	15.5	21.0	32.4				
90	3-1/2"	6.7	9.4	13.2	16.5	22.2	34.3	50.0			
100	4"	7.1	10.0	14.0	17.5	23.4	36.2	52.6	71.8		
110	4-1/4"	7.5	10.6	14.8	18.5	24.6	38.1	55.2	75.2	102	
120	4-3/4"	7.9	11.2	15.6	19.5	25.8	40.0	57.8	78.6	106	137
125	5"	8.5	11.8	16.4	20.5	27.0	41.9	60.4	82.0	111	142
140	5-1/2"	8.9	12.2	17.2	21.5	28.2	43.8	63.0	85.4	115	147
150	6"	9.4	12.8	18.0	22.5	29.4	45.7	65.6	88.8	119	153
160	6-1/4"		13.4	18.8	23.5	30.6	47.6	68.2	92.2	123	158
170	6-3/4"		14.0	19.6	24.5	32.3	49.5	70.8	95.6	128	164
180	7"		14.7	20.4	25.5	33.5	50.8	93.4	99.0	132	169
190	7-1/2"			21.2	26.5	34.8	52.7	75.5	103	136	174
205	8"			22.0	27.5	36.1	54.5	78.0	106	141	180
220	8-3/4"				29.5	38.6	58.1	83.1	112	149	191
240	9-1/2"					41.1	61.8	88.2	118	158	201
260	10-1/4"							93.3	125	166	212
300	11-3/4"								138	184	233
Nuts kg / 100		1.3	2.3	3.1	4.9	5.4	8.6	13.2	19.1	26.3	36.7



APPROX. WEIGHT (KG) PER 100

Approx. Product weights KG per 100 for studbolts complete with 2 nuts											
Length		Diameter (inches)									
mm	inch	1-3/8"	1-1/2"	1-5/8"	1-3/4"	1-7/8"	2"	2-1/4"	2-1/2"	2-3/4"	3"
125	5"	179									
140	5-1/2"	186	234								
150	6"	193	242	289							
160	6-1/4"	200	250	298	363						
170	6-3/4"	206	258	308	374	437					
180	7"	213	266	317	385	449					
190	7-1/2"	220	275	326	396	462					
205	8"	226	283	336	407	475					
220	8-3/4"	240	299	354	429	500	593				
240	9-1/2"	253	316	373	251	526	622	830			
260	10-1/4"	267	332	391	474	551	651	868			
300	11-3/4"	292	358	429	518	602	710	944	1208	1516	1879
400	15-3/4"	359	437	524	627	731	856	1126	1440	1798	2214
500	19-3/4"		517	619	738	858	1000	1313	1672	2080	2552
600	23-3/4"					986	1146	1500	1904	2362	2890
700	27-1/2"							1686	2136	2644	3227
Nuts kg / 100		47.6	62	78	97	116	140	190	256	335	432



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