KONNECT®

FASTENING SYSTEMS

PETROCHEMICAL STUDBOLTS PRODUCT GUIDE

STUDBOLTS & NUTS FOR GAS, PETROLEUM & CHEMICAL INDUSTRIES ISO 9001:2015 QUALITY ASSURED

THIRD EDITION [SEPTEMBER 2018]

AUSTRALIA: 1300 KONNECT (566 632) | www.konnectfasteningsystems.com.au
NEW ZEALAND: 0508 KONNECT (566 632) | www.konnectfasteningsystems.co.nz

CONTENTS

KONNECT FASTENING SYSTEMS® QUALITY, TOTALLY DOCUMENTED & TRACEABLE

Konnect Fastening Systems® studbolt facility in Redcliffe (WA) operates to a Quality System certified by SGS as meeting the requirements of ISO 9001:2015.

To maintain product quality, raw materials in the form of alloy bar, nuts and coatings are purchased from leading local and overseas suppliers who have been formally assessed as meeting the relevant quality standards. All shipments are received with heat lot and mechanical testing certification.

During manufacture, studs are marked to identify them as Konnect Fastening Systems® product and indicate the grade of material. Traceability to raw materials used is maintained throughout the manufacturing process and all Konnect Fastening Systems® products can be supplied with full certification for material composition and mechanical properties.

High Integrity Fasteners, Complementing the Konnect Fastening Systems® Range

In addition to the standard Konnect Fastening Systems® range, high integrity fasteners in exotic or super alloy materials are available.

If required chemical and mechanical test certification can be supplied, providing customers with highly engineered, well finished and fully documented products.

Konnect Fastening Systems® experience in the supply of a wide range of components to exacting criteria is recognised throughout the industry.

INTRODUCTION

CONNECTED TO OUR CUSTOMERS LIKE NO OTHER FASTENER COMPANY

At Konnect Fastening Systems®, our focus is on supplying the right fastener products at the best value, in the shortest possible time. Our far reaching network of branches, specialist knowledge, and huge range of standard and specialised fasteners, means a streamlined service with prompt delivery to any location around Australasia.

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

The Konnect Fastening Systems® business has been built through acquisition of strategic regional distributors across Australia and New Zealand. Now with one consolidated trading name and over 55 branches throughout Australasia stocked with the largest range of fasteners available, we stand out as the premier fastener specialist in Australasia.

Our experience in manufacturing a customised range of studbolting for the gas, petroleum and chemical industries further supports our position.

We remain single-minded in our business approach because we understand customers want quality industrial fasteners with minimum fuss and maximum efficiency.

PRODUCT RANGE

THE KONNECT FASTENING SYSTEMS® STUDBOLT PRODUCT RANGE

The below table sets out the material grades and diameter ranges available from 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 1-1/2" M10 to M39	A194 Grade 2H	3/8" to 3-1/2" M10 to M39
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 316	1/2" to 3-1/2"	A194	1/2" to 3-1/2"
A320 Grade L7	1/2" to 3-1/2"	A194 Grade 7	1/2" to 3-1/2"

NOTE:

1. Studbolt threads up to and including 1" diameter are UNC. Over 1" diameter studbolts are threaded 8UN. UNC can be supplied on request. Metric diameters can be supplied.
2. The pitch for metric threads is ISO Coarse for all diameters.
3. Grade 4 has been withdrawn from A194/A194M - 17a

Special materials are available on order

- B8T
- Titanium
- Duplexes
- Monel 400
- K500
- Hastelloy
- Incoloy
- Inconel
- Nimonic

STUDBOLT MATERIAL 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, 414	4140, 4142, 414	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**

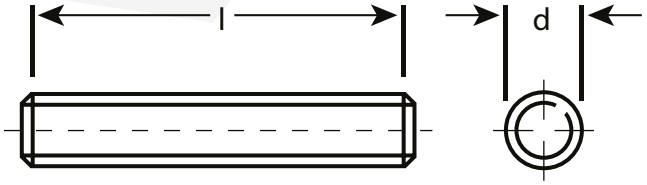
MECHANICAL PROPERTIES FOR ASTM A193/A320 GRADE B8 CLASS 2 STUDBOLTS

DIAMETER	TENSILE STRENGTH ksi min.	YIELD STRENGTH 0.2% OFFSET ksi min.	ELONGATION A193 in 4D min. % A320 in 2" min. %	A193/A320 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	30
Over 1" to 1-1/4" (25mm to 32mm), incl.	105	65	25	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.

DIMENSIONS FOR ORDERING



The sketch indicated dimensions for ordering, where '**d**' is the diameter and '**l**' is the length

STUDBOLT MATERIAL GRADES, COMPOSITION & MECHANICAL PROPERTIES [CONTINUED]

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. un 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	
Impact value @ -101°C for average of each three specimens, 10mm x 10mm.			20 ft. lbf min.
Impact value @ -101°C permitted for one specimen only of a set, 10mm x 10mm.			15 ft. lbf min.
ASTM COMPATIBLE NUT	**A194, GR 8M**	**A194, GR 7**	**A194, GR 7**

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. %	A193/A320 BRINELL HARDNESS max.	A193/A320 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

NOTE:

Service temperature refer to actual metal temperatures.

NUT MATERIAL GRADES, COMPOSITION & MECHANICAL PROPERTIES

ASTM NUTS grade	A194, 2H	A194, 2HM	A194,8
Service Temperature	-30°C to 400°C	-30°C to 400°C	-150°C to 575°C
AISI Material Specification	Carbon Steel	Carbon Steel	Type 304 Stainless
Chemical Composition %			
Carbon	0.40 min.	0.40 min.	0.08 max.
Silicon	0.40 max.	0.40 max.	1.00 max.
Manganese	1.00 max.	1.00 max.	2.00 max.
Nickel			8.00 to 10.50
Chromium			18.00 to 20.00
Sulphur	0.050 max.	0.050 max.	0.030 max.
Phosphorus	0.040 max.	0.040 max.	0.045 max.
Mechanical Properties			
Brinell Hardness			
Up to 1-1/2" (36mm) dia.	248 to 327 HB	159 to 235 HB	126 to 300 HB
Over 1-1/2" (36mm) dia.	212 to 327 HB	159 to 235 HB	126 to 300 HB

ASTM NUTS GRADE	A194, 8M	A194, 7
Service Temperature	-150°C to 575°C	-100°C to 565°C
AISI Material Specification	Type 316 Stainless	4140, 4142, 4145
Chemical Composition %		
Carbon	0.08 max/	0.37 to 0.49
Silicon	1.00 max.	0.15 to 0.35
Manganese	2.00 max.	0.65 to 1.10
Nickel	10.00 to 14.00	
Chromium	16.00 to 18.00	0.75 to 1.20
Molybdenum	2.00 to 3.00	0.15 to 0.25
Sulphur	0.030 max.	0.040 max.
Phosphorus	0.045 max.	0.040 max.
Mechanical Properties		
Brinell Hardness	126 to 300 HB	248 to 352 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
4	Quenched & tempered carbon-molybdenum heavy hex nuts (withdrawn in 2017)
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

NUT DIMENSIONS

Nuts for imperial studbolts are Unified Heavy Hexagon series to dimensions in the following table. These conform to AS 2528 and are equivalent to ANSI B18.2.2 for Heavy Hexagon Nuts.

Metric nuts in 2H material are manufactured to DIN 934,H = D dimensions. Nominal dimensions are set out in the table below.

IMPERIAL NUTS

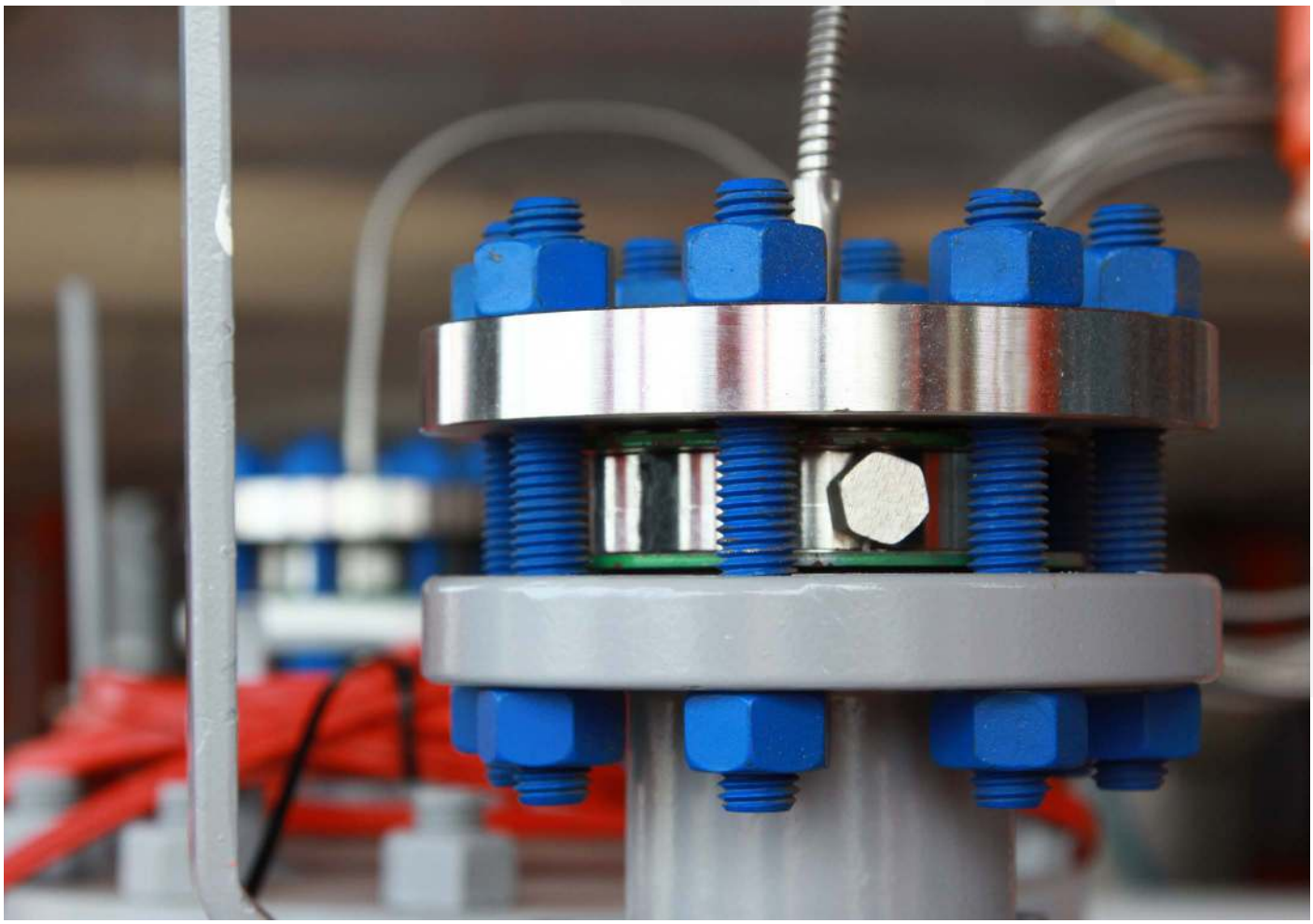
Dia. inch	Pitch TPI	Across Flats		Nut Heigh	
		Max.	Min.	Max.	Min.
3/8	16	0.688	0.669	0.377	0.341
1/2	13	0.875	0.850	0.504	0.464
5/8	11	1.062	1.031	0.631	0.587
3/4	10	1.250	1.212	0.758	0.710
7/8	9	1.438	1.394	0.885	0.833
1	8	1.625	1.575	1.012	0.956
1-1/8	8	1.812	1.756	1.139	1.079
1-1/4	8	2.00	1.938	1.251	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

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

NOTE:

Diameters underlined are non-preferred.



COATINGS

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 in lightly oiled condition is considered to be 0.18.

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. In this condition the coefficient of friction is in the region of 0.22.

Electro Plated Cadmium and Yellow Chromate

Except in highly corrosive environments, cadmium plating offers moderate protection due to the fact that cadmium is less sacrificial than zinc. This finish is specified by major petroleum producers at a thickness of 12 microns, plated in accordance with AS 1897, for moderate service conditions. Cadmium has been found to be most suitable in marine atmospheres where there may be salt spray. The yellow or iridescent chromate conversion further contributes to the performance of this finish. The coefficient of friction for this finish in a lightly oiled condition would be expected to be 0.14/0.15.

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

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. 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 or cadmium plated 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.

One of the most frequently specified PTFE finishes is blue in colour and widely used for corrosion protection in the gas, petroleum and chemical industries. Corrosion protection in excess of 500 hours salt spray is a feature. Anti-seize properties are very good. Excellent resistance is offered to corrosion from acids, alkalis and solvents. 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.

ASSEMBLY AND TIGHTENING

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

- Inspect the gasket for damage and ensure that the gasket is suitable for the flange operating conditions of temperature, pressure and material being sealed.
- Never reuse a gasket. Small cost savings may be quickly consumed by the costs of unplanned down time.
- 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.
- 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.
- 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.
- Installation
- 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.
- Insert the gasket between the flange faces taking care not to damage the sealing elements.
- 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.
- Finally align gasket and insert all other bolts. Tighten to a "finger tight" condition.

ASSEMBLY AND TIGHTENING [CONTINUED]

Tightening

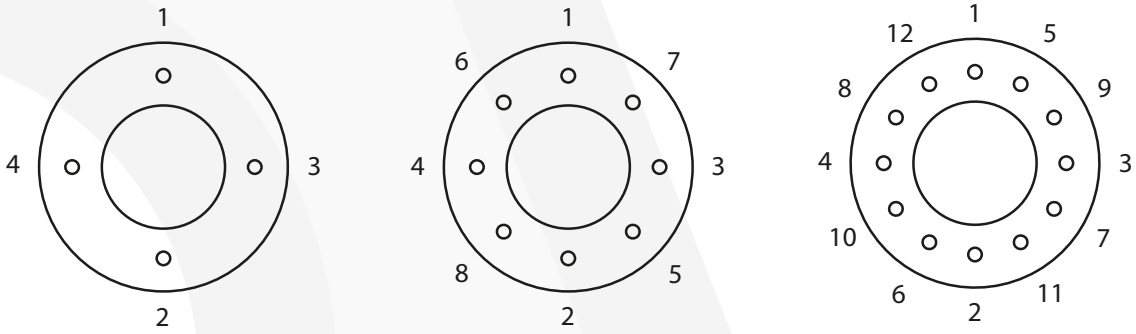
Studbolts should be finally tightened to induce desired clamping loads. Tightening torque values necessary to induce these loads should be specified by the authority responsible for safe operation of the connection. Fastener mechanical properties specify "yield loads" for fastener materials. In simple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

A four step tightening process should be employed.

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

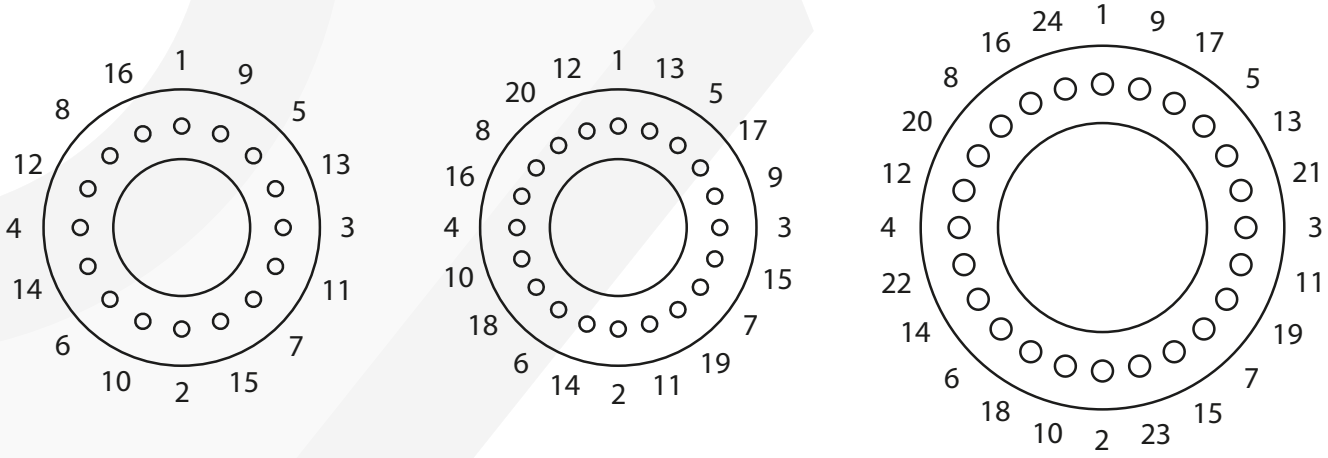
Depending upon circumstances and the experience of the trades person carrying out the tightening process, tightening by "feel" may be adequate. If torque wrenches are used ensure that they are properly calibrated.

During this tightening process the correct sequence must be used.



The sketch above shows the sequence for 4, 8 and 12 bolt flanges.

Sequences for 16, 20 and 24 bolt flanges are shown below.



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.

TIGHTENING TORQUES

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.

Note that 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

Dia. inch	Thread	Yield Load kN	Tightening Torques For 30% of Yield Load ft. lb.	Nm	For 60% of Yield Load 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	UN8	82950	467	633	933	1265
1-1/4	UN8	105000	656	889	1313	1780
1-3/8	UN8	129465	860	1207	1780	2413
1-1/2	UN8	156660	1175	1593	2350	3186
1-5/8	UN8	186900	1519	2059	3037	4118
1-3/4	UN8	218400	1911	2591	3822	5182
1-7/8	UN8	253050	2372	3216	4745	6433
2	UN8	290850	2909	3944	5817	7887
2-1/4	UN8	373800	4205	5701	8411	11404
2-1/2	UN8	466200	5828	7902	11655	15802
2-3/4	UN8	515850	7093	9617	14186	19234
3	UN8	618450	9277	12578	18554	25156
3-1/4	UN8	730550	11871	16095	23743	32191
3-1/2	UN8	851200	14896	20196	29792	40393

See note.

ASTM A193 GRADE B7 STUDBOLTS METRIC DIMENSIONS

Dia. mm	Tensile Strength MPa min.	Yield Strength MPa min.
≤ M64	860	720

Dia. mm	Thread	Yield Load kN	Tightening Torques For 30% of Yield Load ft. lb.	Nm	For 60% of Yield Load 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 note.

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 kN	Tightening Torques For 30% of Yield Load ft. lb.	Nm	For 60% of Yield Load 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	UN8	63200	356	483	711	964
1-1/4	UN8	80000	500	678	1000	1356

See note.

NOTE:

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

Refer to comments above and on page 10.

TIGHTENING TORQUES [CONTINUED]

ASTM A193/A320 GRADE B8 CLASS 2 STUDBOLTS IMPERIAL DIMENSIONS

Dia. inch	Tensile Strength TPI	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	UN8	51350	289	392	578	784
1-1/4	UN8	65000	406	550	813	1102
1-3/8	UN8	61650	424	575	848	1150
1-1/2	UN8	74600	560	759	1119	1517

See note.

ASTM A193/A320 GRADE B8M CLASS 2 STUDBOLTS IMPERIAL DIMENSIONS

Dia. inch	Tensile Strength TPI	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	UN8	51350	289	392	578	784
1-1/4	UN8	65000	406	550	813	1102
1-3/8	UN8	61650	424	575	848	1150
1-1/2	UN8	74600	560	759	1119	1517

See note.

NOTE:

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

Refer to comments pages 10 and 12.

ASTM A193 GRADE B16 STUDBOLTS IMPERIAL DIMENSIONS

Dia. inch	Tensile Strength TPI	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	UN8	82950	467	633	933	1265
1-1/4	UN8	105000	656	889	1313	1780
1-3/8	UN8	129465	890	1207	1780	2413
1-1/2	UN8	156660	1175	1593	2350	3186
1-5/8	UN8	186900	1519	2059	3037	4118
1-3/4	UN8	218400	1911	2591	3822	5182
1-7/8	UN8	253050	2372	3216	4745	6433
2	UN8	290850	2909	3944	5817	7887
2-1/4	UN8	373800	4205	5701	8411	11404
2-1/2	UN8	466200	5828	7902	11655	15802
2-3/4	UN8	515850	7093	9617	14186	19234
3	UN8	618450	9277	12578	18554	25156
3-1/4	UN8	730550	11871	16095	23743	32191
3-1/2	UN8	851200	14896	20196	29792	40393

See note.

ASTM A193 GRADE L7 STUDBOLTS IMPERIAL DIMENSIONS

Dia. inch	Tensile Strength TPI	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	UN8	82950	467	633	933	1265
1-1/4	UN8	105000	656	889	1313	1780
1-3/8	UN8	129465	890	1207	1780	2413
1-1/2	UN8	156660	1175	1593	2350	3186
1-5/8	UN8	186900	1519	2059	3037	4118
1-3/4	UN8	218400	1911	2591	3822	5182
1-7/8	UN8	253050	2372	3216	4745	6433
2	UN8	290850	2909	3944	5817	7887
2-1/4	UN8	373800	4205	5701	8411	11404
2-1/2	UN8	466200	5828	7902	11655	15802

See note.

TEMPERATURE AND PRESSURE RATINGS

CARBON STEEL PIPE FLANGES TO ANSI B16.5 (BS 1560)

Operating Temperature	Maximum Working Pressure kPa by PN (Pressure Numbers) (For approximate PSI divide by 7)					
°C	PN20	PN50	PN100	PN150	PN250	PN420
-29 to 38	1960	5110	10210	15320	25530	42550
50	1920	5010	10020	15020	25040	41730
100	1770	4640	9280	13910	23190	38650
150	1580	4520	9050	13570	22610	37690
200	1400	4380	8760	13150	21910	36520
250	1210	4170	8340	12520	20860	34770
300	1020	3870	7750	11620	19370	32280
350	840	3700	7390	11090	18480	30800
375	470	3650	7290	10940	18230	30390
400	650	3450	6900	10350	17250	28750
425	560	2880	5750	8630	14380	23960
450	470	2000	4010	6010	10020	16690
475	370	1350	2710	4060	6770	11290
500	280	880	1760	2540	4400	7330
525	190	520	1040	1550	2590	4320
540	130	330	650	980	1630	2720

NOTE:

Forged flanged to ASTM A 105 are not recommended for prolonged use above 427°C

Forged flanges to ASTM A350-LF2 are not to be used above 343°C

Flanges above DN 600 are not included in ANSI B16.5 and the class designations in these large diameters do not imply specific temperature / pressure ratings.

CARBON STEEL FLANGES TO AS 2129:2000 (R2016)

Operating Temperature	Maximum Allowable Pressure kPa by Flange Tables (For approximate PSI divide by 7)				
°C	C	D	E	F	H
-18 to 120	1200*				
-50 to 232		700	1400	2100	3500
250		650	130	2000	3300
275		600	1200	1800	3100
300		570	1100	1700	2900
325		550	1000	1600	2600
350		500	950	1400	2400
375		450	900	1300	2200
400		400	800	1200	2000
425		350	700	1000	1700
450					1300
475					900
kPA Maximum Hydrostatic Test Pressure	1800*	1050	2100	3150	5250

***** Applicable to O ring groove flanges only, for water service.

Operating Temperature	Maximum Allowable Pressure kPa by Flange Tables (For approximate PSI divide by 7)				
°C	J	K	R	S	T
-50 to 232	4800	6200	8300	12400	19300
250	4600	5900	7900	11800	18400
275	4300	5500	7400	11100	17200
300	4000	5100	6800	10300	16000
325	3700	4700	6300	9500	14700
350	3400	4300	5800	8700	13500
375	3100	3900	5200	7900	12200
400	2700	3500	4700	7100	11000
425	2400	3100	4200	6300	9800
450	1900	2400	3200	4800	7500
475	1300	1600	2200	3300	5100
kPA Maximum Hydrostatic Test Pressure	7200	9300	12450	18600	28950

BOLTING REQUIREMENTS FOR RAISED FACE FLANGES

SIZES DN 15 TO 600 CONFORMING TO ANSI B16.5 AND DN 750 & 900 TO BS 3293									
Nominal Flange Size		PN20 (Class 150)				PN50 (Class 300)			
DN	NPS	Number of Bolts	Bolt Dia. inch	Length		Number of Bolts	Bolt Dia. inch	Length	
				Stud Bolt mm	Hex Bolt mm			Stud Bolt mm	Hex Bolt mm
15	1/2	4	1/2	60	45	4	1/2	65	55
20	3/4	4	1/2	65	50	4	5/8	75	60
25	1	4	1/2	65	55	4	5/8	80	65
32	1-1/4	4	1/2	70	55	4	5/8	80	65
40	1-1/2	4	1/2	70	60	4	3/4	90	75
50	2	4	5/8	90	75	8	3/4	90	75
65	2-1/2	4	5/8	90	75	8	3/4	100	85
80	3	4	5/8	90	75	8	3/4	110	90
90	3-1/2	8	5/8	90	75	8	3/4	110	95
100	4	8	5/8	90	75	8	3/4	110	95
125	5	8	3/4	90	80	8	3/4	120	100
150	6	8	3/4	100	85	12	3/4	125	105
200	8	8	3/4	110	90	12	7/8	140	110
250	10	12	7/8	115	95	16	1	155	130
300	12	12	7/8	120	100	16	1-1/8	170	145
350	14	12	1	130	110	20	1-1/8	175	150
400	16	16	1	135	115	20	1-1/4	190	160
450	18	16	1-1/8	150	125	24	1-1/4	195	170
500	20	20	1-1/8	160	135	24	1-1/4	205	180
600	24	20	1-1/4	175	145	24	1-1/2	230	195
750	30	28	1-1/4	190	160	28	1-3/4	290	250
900	36	32	1-1/2	215	180	32	2	325	280

See note.

SIZES DN 15 TO 600 CONFORMING TO ANSI B16.5 AND DN 750 & 900 TO BS 3293							
Nominal Flange Size		PN20 (Class 150)			PN50 (Class 300)		
DN	NPS	Number of Bolts	Bolt Dia. inch	Stud Bolt Length mm	Number of Bolts	Bolt Dia. inch	Stud Bolt Length mm
15	1/2	4	1/2	80	4	3/4	105
20	3/4	4	5/8	90	4	3/4	115
25	1	4	5/8	90	4	7/8	125
32	1-1/4	4	5/8	100	4	7/8	125
40	1-1/2	4	3/4	105	4	1	140
50	2	8	5/8	105	8	7/8	145
65	2-1/2	8	3/4	120	8	1	160
80	3	8	3/4	125	8	7/8	145
90	3-1/2	8	7/8	140			
100	4	8	7/8	145	8	1-1/8	170
125	5	8	1	165	8	1-1/4	190
150	6	12	1	170	12	1-1/8	195
200	8	12	1-1/8	195	12	1-3/8	220
250	10	16	1-1/4	216	16	1-3/8	235
300	12	20	1-1/4	220	20	1-3/8	255
350	14	20	1-3/8	235	20	1-1/2	275
400	16	20	1-1/2	255	20	1+5/8	285
450	18	20	1-5/8	275	20	1-7/8	325
500	20	24	1-5/8	290	20	2	345
600	24	24	1-7/8	330	20	2-1/2	435
750	30	28	2	355	Not listed in BS 3293		
900	36	28	2-1/2	400	Not listed in BS 3293		

See note.

NOTE:

1. Raised face height of 2mm for PN20 & 50 and 7mm for PN100 and above is included in bolt length.
2. Studbolt lengths are exclusive of point lengths.
3. Bolt lengths are rounded to the nearest 5mm.

BOLTING REQUIREMENTS FOR RAISED FACE FLANGES [CONTINUED]

SIZES DN 15 TO 600 CONFORMING TO ANSI B16.5 AND DN 750 & 900 TO BS 3293							
Nominal Flange Size		PN20 (Class 150)			PN50 (Class 300)		
DN	NPS	Number of Bolts	Bolt Dia. inch	Stud Bolt Length mm	Number of Bolts	Bolt Dia. inch	Stud Bolt Length mm
15	1/2	4	3/4	105	4	3/4	125
20	3/4	4	3/4	115	4	3/4	125
25	1	4	7/8	125	4	7/8	140
32	1-1/4	4	7/8	125	4	1	150
40	1-1/2	4	1	140	4	1-1/8	170
50	2	8	7/8	145	8	1	175
65	2-1/2	8	1	160	8	1-1/8	195
80	3	8	1-1/8	185	8	1-1/4	220
100	4	8	1-1/4	195	8	1-1/2	255
125	5	8	1-1/2	250	8	1-3/4	300
150	6	12	1-3/8	260	8	2	345
200	8	12	1-5/8	290	12	2	380
250	10	12	1-7/8	335	12	2-1/2	485
300	12	16	2	375	12	2-3/4	540
350	14	16	2-1/4	405			
400	16	16	2-1/2	445			
450	18	16	2-3/4	495			
500	20	16	3	540			
600	24	16	3-1/2	615			
750	30	Not listed in BS 3293			Not listed in BS 3293		
900	36	Not listed in BS 3293			Not listed in BS 3293		

NOTE:

1. Raised face height of 7mm for PN 100 and above is included in bolt length.
2. Studbolt lengths are exclusive of point lengths.
3. Bolt lengths are rounded to the nearest 5mm.

BOLTING FOR CARBON STEEL FLANGES TO AS 2129:2000 (R2016)

See note.

Set out below and on page 18 are details of bolting for carbon steel flanges to AS 2129:2000 (R2016). The following notes apply.

1. Integral valve flanges may differ in thickness to equivalent loose flanges. When integral flanges are involved, adjustments may be necessary to bolt lengths.
2. Bolt lengths listed apply to flat faced or 1.6mm raised face flanges and provide for 1.6mm gasket thickness.
3. Bolts for flanges in Tables D, E and F should conform to AS 1111, Property Class 4.6. For flanges in Tables H, J and R bolts should conform to AS 1110, Property Class 8.8. The operating temperature range for bolting to these Standards is -50°C to +300°C. Studbolts to AS 2528 should be used in applications outside of this range.
4. The listed diameters of M27, M33 and M39 are non preferred diameters and may be difficult to source. Should this be the case, substitute
   1", 1-1/4" and 1-1/2" studbolts to AS 2528 as appropriate to the metric diameter. Where bolt diameters are greater than M24 it is recommended that studbolts to AS 2528 are substituted.

SIZES DN 15 TO 600 CONFORMING TO ANSI B16.5 AND DN 750 & 900 TO BS 3293

Nominal Flange Size	Table D		Table E		Table F	
DN	No. of Bolts	Size	No. of Bolts	Size	No. of Bolts	Size
15	4	M12 x 40	4	M12 x 40	4	M12 x 40
20	4	M12 x 40	4	M12 x 40	4	M12 x 40
25	4	M12 x 40	4	M12 x 40	4	M16 x 45
32	4	M12 x 40	4	M12 x 40	4	M16 x 45
40	4	M12 x 40	4	M12 x 40	4	M16 x 45
50	4	M16 x 45	4	M16 x 45	4	M16 x 50
65	4	M16 x 45	4	M16 x 45	8	M16 x 50
80	4	M16 x 45	4	M16 x 45	8	M16 x 50
100	4	M16 x 45	8	M16 x 45	8	M16 x 60
125	8	M16 x 45	8	M16 x 50	8	M20 x 70
150	8	M16 x 45	8	M20 x 60	12	M20 x 70
200	8	M16 x 45	8	M20 x 60	12	M20 x 75
250	8	M20 x 55	12	M24 x 70	12	M24 x 85
300	12	M20 x 60	12	M24 x 80	16	M24 x 100
350	12	M24 x 75	12	M24 x 85	16	M27 x 100
400	12	M24 x 75	12	M24 x 100	20	M27 x 120
450	12	M24 x 80	16	M24 x 100	20	M30 x 130
500	16	M24 x 85	16	M24 x 110	24	M30 x 140
600	16	M27 x 100	16	M30 x 130	24	M33 x 150
700	20	M27 x 100	20	M30 x 140	24	M33 x 160
750	20	M30 x 120	20	M33 x 150	28	M33 x 170
800	20	M33 x 120	20	M33 x 150	28	M33 x 180
900	24	M33 x 140	24	M33 x 170	32	M36 x 200
1000	24	M33 x 140	24	M36 x 180	36	M36 x 220
1200	32	M33 x 160	32	M36 x 200	40	M39 x 240

BOLTING REQUIREMENTS

BOLTING FOR CARBON STEEL FLANGES TO AS 2129:2000 (R2016) [CONTINUED]

SIZES DN 15 TO 600 CONFORMING TO ANSI B16.5 AND DN 750 & 900 TO BS 3293						
Nominal Flange Size	Table H		Table J		Table R	
DN	No. of Bolts	Size	No. of Bolts	Size	No. of Bolts	Size
15	4	M16 x 45	4	M16 x 50	4	M16 x 50
20	4	M16 x 45	4	M16 x 50	4	M16 x 60
25	4	M16 x 50	4	M16 x 60	4	M16 x 65
32	4	M16 x 55	4	M16 x 60	4	M16 x 65
40	4	M16 x 55	4	M16 x 65	4	M20 x 75
50	4	M16 x 60	4	M20 x 75	8	M16 x 70
65	8	M16 x 60	8	M20 x 75	8	M20 x 80
80	8	M16 x 65	8	M20 x 90	8	M20 x 90
100	8	M16 x 70	8	M20 x 100	8	M24 x 100
125	8	M20 x 80	8	M24 x 110	12	M24 x 110
150	12	M20 x 80	12	M24 x 110	12	M24 x 120
200	12	M20 x 90	12	M24 x 110	12	M27 x 140
250	12	M24 x 100	12	M27 x 130	16	M27 x 150
300	16	M24 x 110	16	M27 x 140	16	M30 x 180
350	16	M27 x 130	16	M30 x 150	16	M33 x 200
400	20	M27 x 140	20	M30 x 170	20	M33 x 220
450	20	M30 x 160	20	M33 x 180	20	M36 x 240
500	24	M30 x 170	24	M33 x 200	20	M39 x 260
600	24	M30 x 190	24	M36 x 240		

NOTE:

Refer to the notes on Page 17

Bolt hole Clearances for Flanges to AS 2129:2000 (R2016)

For bolts up to M24 diameter, flange holes should be 2mm larger than the bolt diameter.

Converting bolt lengths to studbolt lengths

1. Round the bolt diameter up to the next 5mm increment.
2. Add this figure to the bolt length to arrive at the total length for the studbolt expressed in millimetres.

Bolt diameter interchangeability for flanges to AS 2129:2000 (R2016)

1. Round the bolt diameter up to the next 5mm increment.
2. Add this figure to the bolt length to arrive at the total length for the studbolt expressed in millimetres.

METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL
M12	1/2	M24	7/8	M33	1-1/4
M16	5/8	M27	1	M36	1-3/8
M20	3/4	M30	1-1/8	M39	1-1/2

IMPERIAL TO METRIC STUDBOLTS INTERCHANGEABILITY

METRIC	IMPERIAL	METRIC	IMPERIAL	METRIC	IMPERIAL
inch	Use	inch	Use	inch	Use
1/2	M14	1-1/4	M33	1-7/8	M48
5/8	M18	1-3/8	M36	2	M52
3/4	M20	1-1/2	M39	2-1/4	M56
7/8	M24	1-5/8	M42	2-1/2	M64
1	M27	1-3/4	M45	2-3/4	M72
1-1/8	M30				

NOTE:

M14 and M18 diameters may be difficult to obtain.

PRODUCT WEIGHTS

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	73.4	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	27.6	36.1	54.5	78.0	106	141	180
220	8-3/4				29.6	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

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	451	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

BRANCHES

Also available at:
Cooper Fluid Systems Mackay - 8 Michelmore Street, Paget QLD 4740 | Ph: (07) 4952 4844
Cooper Fluid Systems Kalgoorlie - 16 Atbara Street, Kalgoorlie WA 6430 | Ph: (08) 9021 4000
Cooper Fluid Systems Newman - Shed 2, 10 Pardoo Street, Newman WA 6753 | Ph: (08) 9181 5500

KONNECT® FASTENING SYSTEMS

AUSTRALIA — Ph: 1300 KONNECT (566 632) | Web: www.konnectfasteningsystems.com.au

QUEENSLAND	TELEPHONE	OPENING HOURS
BRENDALE 61 Kremzow Road, Brendale QLD 4500	(07) 3265 6111	**Monday to Friday -** 6:30am to 5:00pm
CAIRNS Unit 2/46 Ponzo Street, Woree Business Park QLD 4870	(07) 4035 5600	**Monday to Friday -** 7:30am to 4:30pm
CHINCHILLA Unit 3/4 Dwyer Court, Chinchilla QLD 4413	(07) 4672 7601	**Monday to Friday -** 7:30am to 4:30pm
GLADSTONE 118 Hanson Road, Gladstone QLD 4680	(07) 4972 5511	**Monday to Friday -** 7:00am to 4:00pm
GOLD COAST 34 Taree Street, West Burleigh QLD 4220	(07) 5593 6588	**Monday to Friday -** 7:30am to 4:30pm
MORNINGSIDE Unit 2/525 Lytton Road, Morningside QLD 4170	(07) 3899 6700	**Monday to Friday -** 7:00am to 4:00pm
MOUNT ISA 47 West Street, Mount Isa QLD 4825	(07) 4743 9788	**Monday to Friday -** 7:30am to 4:30pm
PINKENBA Building 2/660 MacArthur Avenue, Pinkenba QLD 4008	(07) 3291 8200	**Monday to Friday -** 7:00am to 4:00pm
SUNSHINE COAST Unit 1/53 Wises Road, Maroochydore QLD 4558	(07) 5451 0388	**Monday to Friday -** 7:00am to 4:00pm
TOOWOOMBA 10 Tradewinds Court, Toowoomba QLD 4350	(07) 4633 1777	**Monday to Friday -** 7:30am to 4:30pm
TOWNSVILLE 92-94 Duckworth Street, Garbutt, Townsville QLD 4810	(07) 4728 6633	**Monday to Friday -** 7:00am to 4:00pm
WACOL Unit 1/1318 Boundary Road, Wacol QLD 4076	(07) 3879 3043	**Monday to Friday -** 7:30am to 4:30pm
YATALA Unit 8/8-10 Christensen Rd, Stapylton QLD 4207	(07) 3291 8255	**Monday to Friday -** 7:00am to 4:00pm
NEW SOUTH WALES	**TELEPHONE**	**OPENING HOURS**
ALEXANDRIA Unit 2/29-33 Bourke Road, Alexandria NSW 2015	(02) 9698 9566	**Monday to Friday -** 7:30am to 4:30pm
ARTARMON Unit 1/1 Waltham Street, Artarmon NSW 2064	(02) 9438 3677	**Monday to Friday -** 7:30am to 4:30pm
LISMORE Unit 1/7 Krauss Avenue, South Lismore NSW 2480	(02) 6621 9677	**Monday to Friday -** 7:00am to 4:30pm
NEWCASTLE Unit 7/21 Babilla Close, Beresfield NSW 2322	(02) 4966 3002	**Monday to Friday -** 7:30am to 4:30pm
ORANGE 203 Byng Street, Orange NSW 2800	(02) 6369 1622	**Monday to Friday -** 7:30am to 4:30pm
TAMWORTH 60 Dampier Street, Tamworth NSW 2340	(02) 6763 8600	**Monday to Friday -** 7:30am to 4:30pm
WAGGA 9 Dobney Avenue, Wagga NSW 2650	(02) 6925 6700	**Monday to Friday -** 7:30am to 4:30pm
WETHERILL PARK Unit 1/429 Victoria Street, Wetherill Park NSW 2164	(02) 9616 6100	**Monday to Friday -** 7:30am to 4:30pm
WOLLONGONG Unit 1/7 Waverley Drive, Unanderra NSW 2526	(02) 4225 3744	**Monday to Friday -** 7:30am to 4:30pm
AUSTRALIAN CAPITAL TERRITORY	**TELEPHONE**	**OPENING HOURS**
CANBERRA Unit 2/10 Maryborough Street, Fyshwick ACT 2609	(02) 6192 6000	**Monday to Friday -** 7:30am to 4:30pm
VICTORIA	**TELEPHONE**	**OPENING HOURS**
CAMPBELLFIELD Unit 2/1730 Hume Highway, Campbellfield VIC 3061	(03) 9357 2755	**Monday to Friday -** 7:30am to 4:30pm
DANDENONG Unit 6/234-238 Frankston Dandenong Road, Dandenong VIC 3175	(03) 9793 3644	**Monday to Friday -** 7:30am to 4:30pm
GEELONG NORTH 18A Tarkin Court, Bell Park, Geelong VIC 3215	(03) 5277 2063	**Monday to Friday -** 7:00am to 4:30pm
LAVERTON Unit 4/151 Dohertys Road, Laverton VIC 3026	(03) 9368 7955	**Monday to Friday -** 7:30am to 4:30pm
MILDURA 53 Seventh Street East, Mildura VIC 3500	(03) 5021 2311	**Monday to Friday -** 7:30am to 4:30pm
SHEPPARTON 84 Benalla Road, Shepparton VIC 3630	(03) 5831 2577	**Monday to Friday -** 7:30am to 4:30pm
SOUTH MELBOURNE 188 Kings Way, South Melbourne VIC 3205	(03) 9368 7930	**Monday to Friday -** 7:30am to 4:30pm
TASMANIA	**TELEPHONE**	**OPENING HOURS**
BURNIE 127 Bass Highway, Cooee TAS 7320	(03) 6431 7077	**Monday to Friday -** 7:30am to 4:30pm
HOBART 71B Charles Street, Moonah TAS 7009	(03) 6272 8794	**Monday to Friday -** 7:30am to 4:30pm
LAUNCESTON 101B Invermay Road, Launceston TAS 7250	(03) 6334 9102	**Monday to Friday -** 7:30am to 4:30pm
SOUTH AUSTRALIA	**TELEPHONE**	**OPENING HOURS**
LONSDALE 6 Aldershot Road, Lonsdale SA 5160	(08) 8326 4122	**Monday to Friday -** 8:00am to 4:30pm
WINGFIELD 13 Rosberg Road, Wingfield SA 5013	(08) 8300 8700	**Monday to Friday -** 7:30am to 4:30pm
WESTERN AUSTRALIA	**TELEPHONE**	**OPENING HOURS**
BIBRA LAKE Unit 2/13 Discovery Drive, Bibra Lake WA 6163	(08) 9331 2455	**Mon to Thurs -** 7:30am to 4:30pm; **Fri -** 7:30am to 4:00pm
BUNBURY Corner Proffit Street & Wilson Road, Bunbury WA 6230	(08) 9724 2500	**Mon to Thurs -** 7:30am to 4:30pm; **Fri -** 7:00am to 4:00pm
KWINANA 36 Mandurah Road, Kwinana WA 6167	(08) 9439 7000	**Mon to Thurs -** 7:30am to 4:30pm; **Fri -** 7:30am to 3:30pm
OSBORNE PARK Unit 1B/15 Hector Street West, Osborne Park WA 6017	(08) 9244 4555	**Mon to Thurs -** 7:00am to 4:00pm; **Fri -** 7:00am to 3:30pm
WANGARA Unit 5/1 Dellamarta Road, Wangara WA 6065	(08) 9276 0100	**Mon to Thurs -** 7:00am to 4:00pm; **Fri -** 7:00am to 3:30pm
WELSHPOOL Unit 5/9-13 Kewdale Road, Welshpool WA 6106	(08) 9350 3600	**Mon to Thurs -** 7:00am to 4:30pm; **Fri -** 7:00am to 4:00pm
NORTHERN TERRITORY	**TELEPHONE**	**OPENING HOURS**
WINNELLIE 20 Mataram Street, Winnellie NT 0820	(08) 8947 1359	**Monday to Friday -** 7:30am to 4:00pm

NEW ZEALAND — Ph: 0508 KONNECT (566 632) | Web: www.konnectfasteningsystems.co.nz

NORTH ISLAND	TELEPHONE	OPENING HOURS
WHANGAREI Unit 2/17 Dyer Street, Whangarei 0110	(09) 438 1080	**Monday to Friday -** 7:30am to 4:30pm
ALBANY Unit K/118 Bush Road, Rosedale, Auckland 0632	(09) 477 0480	**Monday to Friday -** 7:30am to 4:30pm
AUCKLAND CBD Unit 3/114 Nelson Street, Auckland City 1010	(09) 477 0484	**Monday to Friday -** 7:30am to 4:00pm
EAST TAMAKI 11 Bruce Roderick Drive, East Tamaki, Auckland 2013	(09) 276 0760	**Monday to Friday -** 7:00am to 4:30pm
HAMILTON 31 Tawn Place, Te Rapa, Hamilton 3200	(07) 848 1290	**Monday to Friday -** 7:30am to 4:30pm
MT MAUNGANUI Unit 4/23 Tukorako Drive, Mt Maunganui 3116	(07) 929 6849	**Monday to Friday -** 7:30am to 4:30pm
NAPIER 62 Austen Street, Onekawa, Napier 4110	(06) 873 9500	**Monday to Friday -** 7:30am to 4:30pm
NEW PLYMOUTH 53A Hurlstone Drive, New Plymouth 4312	(06) 769 6745	**Monday to Friday -** 7:30am to 4:30pm
WELLINGTON 18 Centennial Highway, Ngauranga Gorge, Wellington 6035	(04) 499 3292	**Monday to Friday -** 7:30am to 4:30pm
SOUTH ISLAND	**TELEPHONE**	**OPENING HOURS**
NELSON Unit 2B/7 Nayland Road, Stoke, Nelson 7011	(03) 547 2681	**Monday to Friday -** 7:30am to 5:00pm
CHRISTCHURCH CBD Shop 1/574 Colombo St, Christchurch Central, Christchurch 8011	(03) 339 1293	**Monday to Friday -** 7:00am to 4:00pm
CHRISTCHURCH 117 Wrights Road, Addington, Christchurch 8024	(03) 338 8825	**Monday to Friday -** 7:30am to 5:00pm
TIMARU Unit 1/26 Washdyke Flat Rd, Timaru 7910 NZ	(03) 927 2514	**Monday to Friday -** 8:00am to 5:00pm
DUNEDIN Corner Crawford and Gordon Streets, Dunedin 9016	(03) 477 7369	**Monday to Friday -** 7:30am to 4:30pm

CURRENT AS OF 30/08/2018. Branch Listings may have changed from time and date of printing.