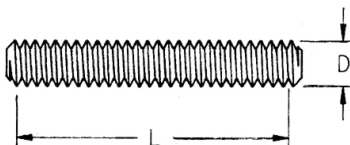


TRUEFAST

PRECISION SOLUTIONS FOR EVERY PROJECT





To avoid any confusion when ordering, we recommend using the Industrial Fasteners Institute (IFI) standard measurements as shown here. If ordering by overall length, please ensure that it is clearly specified as such.

TOLERANCES ON STUD BOLT LENGTHS

STUD BOLT SPECIFICATIONS

STANDARDS: Manufactured in accordance with ANSI Standard B16.5 as specified by the Industrial Fasteners Institute (IFI).

Measurement: Length measured from the first full thread to the last full thread.

Exclusions: Flat chamfer points are not included in the measurement.

Tolerances: Actual length tolerances are as follows:

LENGTH IN INCHES	TOLERANCES IN INCHES
Length up to 12	+ or - 1/16
Over 12 to 18	+ or - 1/8
Over 18	+ or - 1/8

TRUEFAST STOCKS A FULL RANGE OF B7, L7, B8 & B8M HEAVY HEX BOLT BLANKS. WE SPECIALIZE IN CUTTING AND THREADING TO ORDER AS WELL AS THE CUSTOM MANUFACTURING OF STEP STUDS AND COLLAR BOLTS.

**BOLTING DIMENSIONS FOR ANSI FLANGES
ALL SIZES AS PER ANSI B16.5-1988****ANSI 150-LB FLANGES**

Nominal Pipe Size	Diameter of Studs	No. Of Studs	Stud Bolt Length		Ring Joint Gasket No.
			Raised Face	Ring Joint	
Inches	Inches		Inches	Inches	No.
1/2	1/2	4	2-1/4	-	-
3/4	1/2	4	2-1/2	-	-
1	1/2	4	2-1/2	3	R15
1-1/4	1/2	4	2-3/4	3-1/4	R17
1-1/2	1/2	4	2-3/4	3-1/4	R19
2	5/8	4	3-1/4	3-3/4	R22
2-1/2	5/8	4	3-1/2	4	R25
3	5/8	4	3-1/2	4-1/4	R29
3-1/2	5/8	8	3-1/2	4-1/4	R33
4	5/8	8	3-1/2	4-1/4	R36
5	3/4	8	3-3/4	4-1/2	R40
6	3/4	8	4	4-1/2	R43
8	3/4	8	4-1/4	4-3/4	R48
10	7/8	12	4-3/4	5-1/4	R52
12	7/8	12	4-3/4	5-1/2	R56
14	1	12	5-1/4	6	R59
16	1	16	5-1/2	6	R64
18	1-1/8	16	6	6-1/2	R68
20	1-1/8	20	6-1/4	7	R72
22	1-1/4	20	6-1/2	7-1/4	R80
24	1-1/4	20	7	7-3/4	R76□

**BOLTING DIMENSIONS FOR ANSI FLANGES
ALL SIZES AS PER ANSI B16.5-1988
ANSI 300-LB FLANGES**

Nominal Pipe Size	Diameter of Studs	No. Of Studs	Stud Bolt Length		Ring Joint Gasket No.
			Raised Face	Ring Joint	
Inches	Inches		Inches	Inches	
1/2	1/2	4	2-1/2	3	R11
3/4	5/8	4	3 3-1/4	R13	
1	5/8	4	3-1/4	3-1/4	R16
1-1/4	5/8	4	3-1/4	3-3/4	R18
1-1/2	3/4	4	3-1/2	4	R20
2	5/8	8	3-1/2	4-1/4	R23
2-1/2	3/4	8	4 4-1/2	R26	
3	3/4	8	4-1/4	5	R31
3-1/2	3/4	8	4-1/4	5	R34
4	3/4	8	4-1/2	5-1/4	R37
5	3/4	8	4-3/4	5-1/4	R41
6	3/4	12	4-3/4	5-3/4	R45
8	7/8	12	5-1/2	6-1/4	R49
10	1	16	6-1/4	7-1/4	R53
12	1-1/8	16	6-3/4	7-1/2	R57
14	1-1/8	20	7 7-3/4	R61	
16	1-1/4	20	7-1/2	8-1/4	R65
18	1-1/4	24	7-3/4	8-1/2	R69
20	1-1/4	24	8-1/4	9-1/4	R73
22	1-1/2	24	8-3/4	9-3/4	R81
24	1-1/2	24	9-1/4	10-1/4	R77

BOLTING DIMENSIONS FOR ANSI FLANGES
ALL SIZES AS PER ANSI B16.5-1988
ANSI 400-LB FLANGES

Nominal Pipe Size	Diameter of Studs	No. Of Studs	Stud Bolt Length		Ring Joint Gasket No.
			Raised Face	Ring Joint	
Inches	Inches		Inches	Inches	
1/2	1/2	4	3	3	R11
3/4	5/8	4	3-1/2	3-1/2	R13
1	5/8	4	3-1/2	3-1/2	R16
1-1/4	5/8	4	3-3/4	3-3/4	R18
1-1/2	3/4	4	4-1/4	4-1/4	R20
2	5/8	8	4-1/4	4-1/4	R23
2-1/2	3/4	8	4-3/4	4-3/4	R26
3	3/4	8	5	5	R31
3-1/2	7/8	8	5-1/2	5-1/2	R34
4	7/8	8	5-1/2	5-1/2	R37
5	7/8	8	5-3/4	5-3/4	R41
6	7/8	12	6	6	R45
8	1	12	6-3/4	6-3/4	R49
10	1-1/8	16	7-1/2	7-1/2	R53
12	1-1/4	16	8	8	R57
14	1-1/4	20	8-1/4	8-1/4	R61
16	1-3/8	20	8-3/4	8-3/4	R65
18	1-3/8	24	9	9	R69
20	1-1/2	24	9-1/2	9-1/2	R73
22	1-5/8	24	10	10-1/2	R81
24	1-3/4	24	10-1/2	11	R77

**BOLTING DIMENSIONS FOR ANSI FLANGES
ALL SIZES AS PER ANSI B16.5-1988**
ANSI 600-LB FLANGES

Nominal Pipe Size	Diameter of Studs	No. Of Studs	Stud Bolt Length		Ring Joint Gasket No.
			Raised Face	Ring Joint	
Inches	Inches		Inches	Inches	
1/2	1/2	4	3	3	R11
3/4	5/8	4	3-1/4	3-1/4	R13
1	5/8	4	3-1/2	3-1/2	R16
1-1/4	5/8	4	3-3/4	3-3/4	R18
1-1/2	3/4	4	4-1/4	4-1/4	R20
2	5/8	8	4-1/4	4-1/2	R23
2-1/2	3/4	8	5	5-1/4	R26
3	3/4	8	5	5-1/4	R31
3-1/2	7/8	8	5-1/2	5-1/2	R34
4	7/8	8	5-3/4	6	R37
5	1	8	6-1/2	6-1/2	R41
6	1	12	6-3/4	7	R45
8	1-1/8	12	7-3/4	8	R49
10	1-1/4	16	8-1/2	8-3/4	R53
12	1-1/4	20	8-3/4	9	R57
14	1-3/8	20	9-1/4	9-1/2	R61
16	1-1/2	20	10	10-1/4	R65
18	1-5/8	20	10-3/4	11	R69
20	1-5/8	24	11-1/2	11-3/4	R73
22	1-3/4	24	12	12-1/2	R81
24	1-7/8	24	13	13-1/2	R77

**BOLTING DIMENSIONS FOR ANSI FLANGES
ALL SIZES AS PER ANSI B16.5-1988**
ANSI 900-LB FLANGES

Nominal Pipe Size	Diameter of Studs	No. Of Studs	Stud Bolt Length		Ring Joint Gasket No.
			Raised Face	Ring Joint	
Inches	Inches		Inches	Inches	
1/2	3/4	4	4	4-1/4	R12
3/4	3/4	4	4-1/4	4-1/2	R14
1	7/8	4	4-3/4	5	R16
1-1/4	7/8	4	5	5	R18
1-1/2	1	4	5-1/4	5-1/2	R20
2	7/8	8	5-1/2	5-3/4	R24
2-1/2	1	8	6-1/4	6-1/4	R27
3	7/8	8	5-1/2	5-3/4	R31
4	1-1/8	8	6-1/2	6-3/4	R37
5	1-1/4	8	7-1/2	7-1/2	R41
6	1-1/8	12	7-1/2	7-3/4	R45
8	1-3/8	12	8-1/2	8-3/4	R49
10	1-3/8	16	9	9-1/4	R53
12	1-3/8	20	9-3/4	10	R57
14	1-1/2	20	10-1/2	11	R62
16	1-5/8	20	11	11	R66
18	1-7/8	20	12-3/4	12	R70
20	2	20	13-1/2	13-1/2	R74
24	2-1/2	20	17	18	R78

**BOLTING DIMENSIONS FOR ANSI FLANGES
ALL SIZES AS PER ANSI B16.5-1988
ANSI 1500-LB FLANGES**

Nominal Pipe Size	Diameter of Studs	No. Of Studs	Stud Bolt Length		Ring Joint Gasket No.
			Raised Face	Ring Joint	
Inches	Inches		Inches	Inches	
1/2	3/4	4	4	4-1/4	R12
3/4	3/4	4	4-1/4	4-1/2	R14
1	7/8	4	4-3/4	5	R16
1-1/4	7/8	4	5 5	R18	
1-1/2	1	4	5-1/4	5-1/2	R20
2	7/8	8	5-1/2	5-3/4	R24
2-1/2	1	8	6-1/4	6-1/4	R27
3	1-1/8	8	6-3/4	7	R35
4	1-1/4	8	7-1/2	7-3/4	R39
5	1-1/2	8	9-3/4	9-3/4	R44
6	1-3/8	12	10 10-1/2	R46	
8	1-5/8	12	11-1/4	11-3/4	R50
10	1-7/8	12	13-1/4	13-1/2	R54
12	2	16	14-3/4	15-1/4	R58
14	2-1/4	16	16 16-3/4	R63	
16	2-1/2	16	17-1/2	18-1/2	R67
18	2-3/4	16	19-1/4	20-1/4	R71
20	3	16	21 22-1/4	R75	
24	3-1/2	16	24 25-1/2	R79	

**BOLTING DIMENSIONS FOR ANSI FLANGES
ALL SIZES AS PER ANSI B16.5-1988
ANSI 2500-LB FLANGES**

Nominal Pipe Size	Diameter of Studs	No. Of Studs	Stud Bolt Length		Ring Joint Gasket No.
			Raised Face	Ring Joint	
Inches	Inches		Inches	Inches	
1/2	3/4	4	4-3/4	4-3/4	R13
3/4	3/4	4	4-3/4	5	R16
1	7/8	4	5-1/4	5-1/2	R18
1-1/4	1	4	6 6	R21	
1-1/2	1-1/8	4	6-1/2	6-3/4	R23
2	1	8	6-3/4	7	R26
2-1/2	1-1/8	8	7-3/4	8	R28
3	1-1/4	8	8-1/2	9	R32
4	1-1/2	8	9-3/4	10-1/4	R38
5	1-3/4	8	11-3/4	12-1/4	R42
6	2	8	13-1/2	14	R47
8	2	1	215	15-1/2	R51
10	2-1/2	1	219	20	R55
12	2-3/4	1	221	22	R60□

**BOLTING DIMENSIONS FOR API FLANGES
2000 LB. W.P.**

Nominal Size Inches	Gasket API Number	Number Of Studs	Stud Bolt Size Inches
2-1/16	R23	8	5/8 X 4-1/2
2-9/16	R26	8	3/4 X 5
3-1/8	R31	8	3/4 X 5-1/4
4-1/16	R37	8	7/8 X 6
5-1/8	R41	8	1 X 6-3/4
7-1/16	R45	12	1 X 7
9	R49	12	1-1/8 X 8
11	R53	16	1-1/4 X 8-3/4
13-5/8	R57	20	1-1/4 X 9
16-3/4	R65	20	1-1/2 X 10-1/4
21-1/4	R73	24	1-5/8 X 11-3/4
26-3/4	BX167	20	1-3/4 X 13-3/4

**BOLTING DIMENSIONS FOR API FLANGES
3000 LB. W.P.**

Nominal Size Inches	Gasket API Number	Number Of Studs	Stud Bolt Size Inches
3-1/8	R31	8	7/8 X 6
4-1/16	R37	8	1-1/8 X 7
5-1/8	R41	8	1-1/4 X 7-3/4
7-1/16	R45	12	1-1/8 X 8
9	R49	12	1-3/8 X 9
11	R53	16	1-3/8 X 9-1/2
13-5/8	R57	20	1-3/8 X 10-1/4
16-3/4	R66	20	1-5/8 X 11-3/4
20-3/4	R74	20	2 X 14-1/2
26-3/4	BX168	24	2 X 17

**BOLTING DIMENSIONS FOR API FLANGES
5000 LB. W.P.**

Nominal Size Inches	Gasket API Number	Number Of Studs	Stud Bolt Size Inches
2-1/16	R24	8	7/8 X 6
2-9/16	R27	8	1 X 6-1/2
3-1/8	R35	8	1-1/8 X 7-1/4
4-1/16	R39	8	1-1/4 X 8
5-1/8	R44	8	1-1/2 X 10
7-1/16	R46	12	1-3/8 X 10-3/4
9	R50	12	1-5/8 X 12
11	R54	12	1-7/8 X 13-3/4
13-5/8	BX160	16	1-5/8 X 12-1/2
16-3/4	BX162	16	1-7/8 X 14-1/2
18-3/4	BX163	20	2 X 17-1/2
21-1/4	BX165	24	2 X 18-3/4

10,000 LB W.P.

Nominal Size Inches	Gasket API Number	Number Of Studs	Stud Bolt Size Inches
1-13/16	BX151	8	3/4 X 5
2-1/16	BX152	8	3/4 X 5-1/4
2-9/16	BX153	8	7/8 X 6
3-1/16	BX154	8	1 X 6-3/4
4-1/16	BX155	8	1-1/8 X 8
5-1/8	BX169	12	1-1/8 X 8-3/4
7-1/16	BX156	12	1-1/2 X 11-1/4
9	BX157	16	1-1/2 X 13
11	BX158	16	1-3/4 X 15
13-5/8	BX159	20	1-7/8 X 17-1/4
16-3/4	BX162	24	1-7/8 X 17-1/2
18-3/4	BX164	24	2-1/4 X 22-1/2
21-1/4	BX166	24	2-1/4 X 24-1/2

**BOLTING DIMENSIONS FOR API FLANGES
15,000 LB. W.P.**

Nominal Size Inches	Gasket API Number	Number Of Studs	Stud Bolt Size Inches
1-13/16	BX151	8	7/8 X 5-1/2
2-1/16	BX152	8	7/8 X 6
2-9/16	BX153	8	1 X 6-3/4
3-1/16	BX154	8	1-1/8 X 7-1/2
4-1/16	BX155	8	1-3/8 X 9-1/4
5-1/8	BX169	12	1-1/2 X 11-1/2
7-1/16	BX156	16	1-1/2 X 12-3/4
9	BX157	16	1-7/8 X 15-3/4
11	BX158	20	2 X 19-1/4
13-5/8	BX159	20	2-1/4 X 21-1/4
18-3/4	BX164	20	3 X 26-3/4

**BOLTING DIMENSIONS FOR API FLANGES
20,000 LB. W.P.**

Nominal Size Inches	Gasket API Number	Number Of Studs	Stud Bolt Size Inches
1-13/16	BX151	8	1 X 7-1/2
2-1/16	BX152	8	1-1/8 X 8-1/4
2-9/16	BX153	8	1-1/4 X 9-1/4
3-1/16	BX154	8	1-3/8 X 10
4-1/16	BX155	8	1-3/4 X 12-1/4
7-1/16	BX156	16	2 X 17-1/2
9	BX157	16	2-1/2 X 22-1/2
11	BX158	16	2-3/4 X 23-3/4
13-5/8	BX159	20	3 X 30

SERIES A, CLASS 150
FLANGE SIZE, NPS

Size	Qty of Studs	Stud Size	Stud Length
26	24	1-1/4	8-1/2
28	28	1-1/4	8-3/4
30	28	1-1/4	9
32	28	1-1/2	10
34	32	1-1/2	10-1/4
36	32	1-1/2	10-3/4
38	32	1-1/2	10-1/2
40	36	1-1/2	10-3/4
42	36	1-1/2	11-1/4
44	40	1-1/2	11-3/4
46	40	1-1/2	11-3/4
48	44	1-1/2	12-1/4
50	44	1-3/4	13
52	44	1-3/4	13-1/4
54	44	1-3/4	13-3/4
56	48	1-3/4	14
58	48	1-3/4	14-1/4
60	52	1-3/4	14-1/2

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES A, CLASS 300
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	28	1-5/8	10-1/4
28	28	1-5/8	10-3/4
30	28	1-3/4	11-1/2
32	28	1-7/8	12-1/4
34	28	1-7/8	12-1/2
36	32	2	13
38	32	1-1/2	12-1/4
40	32	1-5/8	13
42	32	1-5/8	13-1/4
44	32	1-3/4	14
46	28	1-7/8	14-1/2
48	32	1-7/8	15
50	32	2	15-3/4
52	32	2	16
54	28	2-1/4	17-1/4
56	28	2-1/4	17-1/4
58	32	2-1/4	17-3/4
60	32	2-1/4	18

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES A, CLASS 400
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	28	1-3/4	11-1/2
28	28	1-7/8	12-1/4
30	28	2	13
32	28	2	13-1/2
34	28	2	13-3/4
36	32	2	14
38	32	1-3/4	14-1/4
40	32	1-7/8	15
42	32	1-7/8	15-1/4
44	32	2	16
46	36	2	16-1/2
48	28	2-1/4	17-1/2
50	32	2-1/4	18
52	32	2-1/2	18-1/4
54	28	2-1/2	19-1/2
56	32	2-1/2	19-3/4
58	32	2-1/2	20-1/2
60	32	2-3/4	21-1/4

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES A, CLASS 600
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	28	1-7/8	13-1/4
28	28	2	13-3/4
30	28	2	14
32	28	2-1/4	14-3/4
34	28	2-1/4	15
36	28	2-1/2	15-3/4
38	28	2-1/4	17-1/2
40	32	2-1/4	18
42	28	2-1/2	19-1/4
44	32	2-1/2	19-3/4
46	32	2-1/2	20-1/4
48	32	2-3/4	21-1/2
50	28	3	22-1/2
52	32	3	23
54	32	3	23-1/2
56	32	3-1/4	24-3/4
58	32	3-1/4	25
60	28	3-1/2	26-1/2

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES A, CLASS 900
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	20	2-3/4	17-1/2
28	20	3	18-1/4
30	20	3	18-3/4
32	20	3-1/4	20
34	20	3-1/2	21
36	20	3-1/2	21-1/2
38	20	3-1/2	23
40	24	3-1/2	23-1/2
42	24	3-1/2	24-1/2
44	24	3-3/4	25-1/2
46	24	4	26-3/4
48	24	4	27-1/2

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES B, CLASS 150
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	36	3/4	5-1/2
28	40	3/4	5-3/4
30	44	3/4	5-3/4
32	48	3/4	5-3/4
34	40	7/8	6-1/4
36	44	7/8	6-1/2
38	40	1	7
40	44	1	7
42	48	1	7-1/4
44	52	1	7-1/2
46	40	1-1/8	7-3/4
48	44	1-1/8	8
50	48	1-1/8	8-1/4
52	52	1-1/8	8-1/2
54	56	1-1/8	8-1/2
56	60	1-1/8	8-3/4
58	48	1/4	9
60	52	1/4	9-1/4

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES B, CLASS 300
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	32	1-1/4	10-1/4
28	36	1-1/4	10-1/4
30	36	1-3/8	10-3/4
32	32	1-1/2	11-3/4
34	36	1-1/2	11-3/4
36	32	1-5/8	12
38	36	1-5/8	12-3/4
40	40	1-5/8	13
42	36	1-3/4	13-1/2
44	40	1-3/4	14-1/4
46	36	1-7/8	14-1/2
48	40	1-7/8	14-1/2
50	44	1-7/8	15-1/4
52	48	1-7/8	15-3/4
54	48	1-7/8	15-1/4
56	36	2-1/4	17-1/4
58	40	2-1/4	17-1/4
60	40	2-1/4	17

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES B, CLASS 400
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	28	1-3/8	10-3/4
28	24	1-1/2	11-1/2
30	28	1-1/2	12
32	28	1-5/8	12-3/4
34	32	1-5/8	13
36	28	1-3/4	14
38	32	1-3/4	14-1/4
40	32	1-7/8	15
42	32	1-7/8	15-1/4
44	32	2	16
46	36	2	16-1/2
48	28	2-1/4	17-1/2
50	32	2-1/4	18
52	32	2-1/4	18-1/4
54	28	2-1/2	19-1/2
56	32	2-1/2	19-3/8
58	32	2-1/2	20
60	32	2-3/4	21-1/4

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES B, CLASS 600
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	28	1-5/8	13
28	28	1-3/4	13-3/4
30	28	1-7/8	14-3/4
32	28	2	15-1/4
34	24	2-1/4	16-3/4
36	28	2-1/4	17
38	28	2-1/4	17-1/2
40	32	2-1/4	18
42	28	2-1/2	19-1/4
44	32	2-1/2	19-3/4
46	32	2-1/2	20-1/4
48	32	2-3/4	21-1/2
50	28	3	22-1/2
52	32	3	23
54	32	3	23-1/2
56	32	3-1/4	24-3/4
58	32	3-1/4	25
60	28	3-1/2	26-1/2

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SERIES B, CLASS 900
FLANGE, NPS**

Size	Qty of Studs	Stud Size	Stud Length
26	20	2-1/2	16-3/4
28	20	2-3/4	18-1/4
30	20	3	19-1/4
32	20	3	19-3/4
34	20	3-1/4	21
36	24	3	20-3/4
38	20	3-1/2	23
40	24	3-1/2	23-1/2
42	24	3-1/2	24-1/4
44	24	3-3/4	25-1/2
46	24	4	26-3/4
48	24	4	27-1/2

*Blind Flanges or RTJ flanges may need longer studs

Please note: It is the customer's responsibility to confirm the final stud length before production as on larger flanges there may be discrepancies.

**SUGGESTED ASSEMBLY TORQUE VALUES TO
PRODUCE CORRESPONDING BOLT LOADS**

Size	SA193 & ASTM 193 B7 Studs with A194 2H Heavy Hex Nuts			
	Tensile Stress Area A_s Square Inch	Clamp Load P. Lbs.	Tightening Torque	
			Dry	Lubed
			K= .223 Ft. Lbs.	K= .167 Ft. Lbs.
1/2 - 13	0.138	10,350	9672	
9/16 - 12	0.177	13,275	139	104
5/8 - 11	0.220	16,500	192	143
3/4 - 10	0.327	24,525	342	256
7/8 - 9	0.452	33,900	551	413
1 - 8	0.594	44,550	828	620
1-1/8 - 8	0.776	58,200	1217	911
1-1/4 - 8	0.984	73,800	1714	1284
1-3/8 - 8	1.215	91,125	2328	1744
1-1/2 - 8	1.471	110,32	3076	2303
1-5/8 - 8	1.769	132,675	4006	3000
1-3/4 - 8	2.06	154,500	5024	3763
1-7/8 - 8	2.41	180,750	6298	4716
2 - 8	2.74	205,500	7638	5720
2-1/4 - 8	3.52	264,000	11,038	8266
2-1/2 - 8	4.40	330,000	15,331	11,481

NOTES:

1. Tightening torque values from the formula $T=KDP$, where T = tightening torque, lb. ft. K = torque friction coefficient, D = nominal bolt diameter, in.; and P = bolt clamping load developed by tightening, lb.
2. Clamp load is also known as preload or initial load in tension on bolt. Clamp load (lb.) is calculated by arbitrarily assuming useable bolt strength is 75% of bolt proof load (PSI) times the stress area (sq. in.) of threaded section of each bolt size. Higher or lower values of clamp load can be used depending on the application requirements and the judgement of the designer.
3. No proof load has been established by ASTM. Value shown in table are assumed at 95% of yield strength.

**SUGGESTED ASSEMBLY TORQUE VALUES TO
PRODUCE CORRESPONDING BOLT LOADS**

Size	SA320 & ASTM A320 B7M Studs with A194 7ML Heavy Hex Nuts		
	Clamp Load P. Lbs.	Tightening Torque	
		Dry	Lubed
		K= .223 Ft. Lbs.	K= .167 Ft. Lbs.
1/2 – 13	7,866	73	55
9/16 – 12	10,089	105	79
5/8 – 11	12,540	146	109
3/4 – 10	18,639	260	194
7/8 – 9	25,764	419	314
1 – 8	33,858	629	471
1-1/8 – 8	44,232	925	692
1-1/4 – 8	56,088	1303	976
1-3/8 – 8	69,255	1770	1325
1-1/2 – 8	83,847	2337	1750
1-5/8 – 8	100,833	3045	2280
1-3/4 – 8	177,420	3818	2860
1-7/8 – 8	137,370	786	3584
2 – 8	156,180	5805	4347
2-1/4 – 8	200,640	8389	6282
2-1/2 – 8	250,800	11,652	8726

NOTES:

1. Tightening torque values from the formula $T = KDP$, where T = tightening torque, lb. ft. K = torque friction coefficient, D = nominal bolt diameter, in.; and P = bolt clamping load developed by tightening, lb.
2. Clamp load is also known as preload or initial load in tension on bolt. Clamp load (lb.) is calculated by arbitrarily assuming useable bolt strength is 75% of bolt proof load (PSI) times the stress area (sq. in.) of threaded section of each bolt size. Higher or lower values of clamp load can be used depending on the application requirements and the judgement of the designer.
3. No proof load has been established by ASTM. Value shown in table are assumed at 95% of yield strength.

**SUGGESTED ASSEMBLY TORQUE VALUES TO
PRODUCE CORRESPONDING BOLT LOADS**

Size	SA320 & ASTM A320 L7 Studs with A194 Grade 7L Heavy Hex Nuts			
	Tensile Stress Area A_s Square Inch	Clamp Load P. Lbs.	Tightening Torque	
			Dry	Lubed
			K= .223 Ft. Lbs.	K= .167 Ft. Lbs.
1/2 – 13	0.138	10,350	96	72
9/16 – 12	0.177	13,275	139	104
5/8 – 11	0.220	16,500	192	143
3/4 – 10	0.327	24,525	342	256
7/8 – 9	0.452	33,900	551	413
1 – 8	0.594	44,550	828	620
1-1/8 – 8	0.776	58,200	1217	911
1-1/4 – 8	0.984	73,800	1714	1284
1-3/8 – 8	1.215	91,125	2328	1744
1-1/2 – 8	1.471	110,325	3076	2303
1-5/8 – 8	1.769	132,675	4006	3000
1-3/4 – 8	2.06	154,500	5024	3763
1-7/8 – 8	2.41	180,750	6298	4716
2 – 8	2.74	205,500	7638	5720
2-1/4 – 8	3.52	264,000	11,038	8266
2-1/2 – 8	4.40	330,000	15,331	11,481

NOTES:

1. Tightening torque values from the formula $T = KDP$, where T = tightening torque, lb. ft. K = torque friction coefficient, D = nominal bolt diameter, in.; and P = bolt clamping load developed by tightening, lb.
2. Clamp load is also known as preload or initial load in tension on bolt. Clamp load (lb.) is calculated by arbitrarily assuming useable bolt strength is 75% of bolt proof load (PSI) times the stress area (sq. in.) of threaded section of each bolt size. Higher or lower values of clamp load can be used depending on the application requirements and the judgement of the designer.
3. No proof load has been established by ASTM. Value shown in table are assumed at 95% of yield strength.

**SUGGESTED ASSEMBLY TORQUE VALUES TO
PRODUCE CORRESPONDING BOLT LOADS**

Size	SA320 & ASTM A320 L7M Studs with A194 7ML Heavy Hex Nuts		
	Clamp Load P. Lbs.	Tightening Torque	
		Dry	Lubed
		K= .223 Ft. Lbs.	K= .167 Ft. Lbs.
1/2 – 13	7,866	73	55
9/16 – 12	10,089	105	79
5/8 – 11	12,540	146	109
3/4 – 10	18,639	260	194
7/8 – 9	25,764	419	314
1 – 8	33,858	629	471
1-1/8 – 8	44,232	925	692
1-1/4 – 8	56,088	1303	976
1-3/8 – 8	69,255	1770	1325
1-1/2 – 8	83,847	2337	1750
1-5/8 – 8	100,833	3045	2280
1-3/4 – 8	177,420	3818	2860
1-7/8 – 8	137,370	786	3584
2 – 8	156,180	5805	4347
2-1/4 – 8	200,640	8389	6282
2-1/2 – 8	250,800	11,652	8726

NOTES:

Tightening torque values from the formula $T = KDP$, where T = tightening torque, lb. ft. K = torque friction coefficient, D = nominal bolt diameter, in.; and P = bolt clamping load developed by tightening, lb.

Clamp load is also known as preload or initial load in tension on bolt. Clamp load (lb.) is calculated by arbitrarily assuming useable bolt strength is 75% of bolt proof load (PSI) times the stress area (sq. in.) of threaded section of each bolt size. Higher or lower values of clamp load can be used depending on the application requirements and the judgement of the designer.

No proof load has been established by ASTM. Value shown in table are assumed at 95% of yield strength.

STUD & BOLT THREAD PITCHES

Bolt Diameter in Inches	Stud UN Thread Per Inch	Bolts UNC Threads Per Inch	Bolts UNC Threads Per Inch	Wrench Size Inches
1/4	20	20	28	
5/16	18	18	24	
3/8	16	16	24	
7/16	14	14	20	
1/2	13	13	20	7/8
9/16	12	12	18	
5/8	11	11	18	1-1/6
3/4	10	10	16	1-1/4
7/8	9	9	14	1-7/16
1	8	8	12	1-5/8
1-1/8	8	7	12	1-13/16
1-1/4	8	7	12	2
1-3/8	8	6	12	2-3/16
1-1/2	8	6	12	2-3/8
1-5/8	8			2-9/16
1-3/4	8	5		2-3/4
1-7/8	8			2-15/16
2	8	4-1/2		3-1/8
2-1/4	8	4-1/2		3-1/2
2-1/2	8	4		3-7/8
2-3/4	8	4		4-1/4
3	8	4		4-5/8
3-1/4	8	4		
3-1/2	8	4		
3-3/4	8	4		
4	8	4		

FASTENER IDENTIFICATION
MARKING

GRADE IDENTIFICATION MARKINGS FOR POPULAR GRADES OF CARBON STEEL, EXTERNALLY THREADED FASTENERS

Grade Identification Marking	Specifications	Material	Nominal Size	Proof Load Stress	Tensile Strength Min. ksi	Hardness Rockwell	
						Min	Max
	ASTM A325 – Type 3 Refer to Note 5	Atmospheric Corrosion Resistant Steel, Quenched and Tempered	1/2 thru 1 over 1 to 1-1/2	85 74	120 105	C24 C19	C35 C31
	ASTM A354 -Grade BC	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 2-1/2 over 2-1/2 thru 4	105 95	125 115	C26 C22	C36 C33
	SAE J429 – Grade 8	Medium Carbon Alloy Steel, Quenched and Tempered	1/4 thru 1-1/2	120	150	C33	C39
	ASTM A354 – Grade BD Refer to Note 6		1/4 thru 2-1/2 over 2-1/2 thru 4	120 105	150 140	C33 C33	C39 C39
	SAE J429 – Grade B2	Low Carbon Martensite Steel, Quenched and Tempered	1/4 thru 1	120	150	C33	C39

**FASTENER IDENTIFICATION
MARKING**

GRADE IDENTIFICATION MARKINGS FOR POPULAR GRADES OF CARBON STEEL, EXTERNALLY THREADED FASTENERS

Grade Identification Marking	Specifications	Material	Nominal Size	Proof Load Stress	Tensile Strength Min. ksi	Hardness Rockwell	
						Min	Max
	ASTM A490 – Type 1	Medium Carbon Alloy Steel, Quenched and Tempered	1/2 thru 1-1/2	120	150 min. 170 max.	C33	C38
	ASTM A490 – Type 2	Low Carbon Martensite Steel, Quenched and Tempered	1/2 thru 1	120	150 min. 170 max.	C33	C38
	ASTM A490 – Type 3 Refer to Note 5	Atmospheric Corrosion Resistant Steel, Quenched and Tempered	1/2 thru 1-1/2	120	150 min. 170 max.	C33	C38
	ASTM A-193- Grade B7	4140 Alloy Steel Quenched and Tempered	1/2 to 3-1/2	120	105 min. 125 max.		

**FASTENER IDENTIFICATION
MARKING**
GRADE IDENTIFICATION MARKINGS FOR POPULAR GRADES OF CARBON STEEL, EXTERNALLY THREADED FASTENERS

Grade Identification Marking	Specifications	Material	Nominal Size	Proof Load Stress	Tensile Strength Min. ksi	Hardness Rockwell	
						Min	Max
	SAE J429 Grade 1	Low or Medium Carbon Steel	1/4 thru 1-1/2	33	60	B70	B100
	SAE J429 Grade 2		1/4 thru 3/4 over 3/4 thru 1-1/2	55 33	74 60	B80 B70	B100 B100
	ASTM A307 – Grade A		1/4 thru 4	-			
	SAE J429 – Grade 5	Medium Carbon Steel, Quenched and Tempered	1/4 thru 1 over 1 thru 1-1/2	85	120	C25	C34
	ASTM A449 – Type 1			74	105	C19	C30
	SAE JASTM A325 – Type 1 Refer to Note 4425 - Grade 8	Medium Carbon Steel, Quenched and Tempered	1/2 thru 1 over 1 to 1-1/2	85	120	C24	C35
	ASTM A325 – Type 2	Low Carbon Martensite Steel, Quenched and Tempered		74	105	C19	C31
							



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