

Seng Heng Engineering Pte Ltd

Engineered For Quality, Built To Last

Distributor

中華五金有限公司

CHUNG WAH METAL CO., LTD.

A COMPANY DRIVEN TO EXCELLENCE









Single Source Solution
Seng Heng Engineering is a single-source solution provider of fasteners, turnkey machining and corrosion resistant coating products with 70 years of experience.

Capacity and Capability
We provide a total solutions' package and on-time delivery anywhere in the world.

With our new machining and coating facilities in Singapore, we have the capabilities to customize any fasteners and turnkey solutions to our customers' requirements.

In addition, raw materials are stocked in our special automated retrieval system for full traceability records which meet our customer stringent requirement.

Continuous Growth
Through the years, we have forged long-term partnerships with OEM, EPC contractors and Oil companies to support their needs. Seventy years on, we remain committed to our customers' trust and loyalty, motivated by a genuine passion for continuous improvement on our products, quality standards and services.

We keep up with global trend and employ the latest in technology. This includes a sophisticated ERP system for order processing, coupled with online traceability software for efficient product tracking to guarantee that your orders are in good hands. Likewise, we adopted a highly flexible manufacturing system that produces a wide range of products, in small or large scale, on demand.







MECHANICAL REQUIREMENTS
ALLOY AND STAINLESS STEEL ASTM A193 FOR HIGH TEMPERATURE SERVICE

ALLOY	ASTM	AISI	UNS	W.-Nr.	Dia	Tensile Strength min, MPa	Yield Strength min,0,2% MPa	Elongation in 4 D, min, %	Reduction of Area min, %	HB
B5	A193	501	S50100	1.7362	up to 4, incl	690	550	16	50	-
B6	A193	410	S41000	1.4006	up to 4, incl	760	585	15	50	-
B7	A193	4140	G41400	1.7225	21/2 and under	860	720	16	50	<321
					over 21/2 to 4	795	655	16	50	<302
					over 4 to 7	690	515	18	50	<277
B7M	A193	4140	G41400	1.7225	21/2 and under	690	550	18	50	<235
					over 21/2 to 4	690	550	18	50	<235
					over 4 to 7	690	515	18	50	<235
B16	A193	-	K14072	1.7711	21/2 and under	860	725	18	50	<321
					over 21/2 to 4	760	655	17	45	<302
					over 4 to 7	690	585	16	45	<277
B8	A193	304	S30400	1.4301	all size	515	205	30	50	<223
B8A	A193	304	S30400	1.4301	all size	515	205	30	50	<192
B8T	A193	321	S32100	1.4541	all size	515	205	30	50	<223
B8TA	A193	321	S32100	1.4541	all size	515	205	30	50	<192
B8C	A193	347	S34700	1.4550	all size	515	205	30	50	<223
B8CA	A193	347	S34700	1.4550	all size	515	205	30	50	<192
B8M	A193	316	S31600	1.4401	all size	515	205	30	50	<223
B8MA	A193	316	S31600	1.4401	all size	515	205	30	50	<192
B8cl2	A193	304	S30400	1.4301	3/4 and under	860	690	12	35	<321
B8Tcl2	A193	321	S32100	1.4541	over 3/4 to 1	795	550	15	35	<321
B8Ccl2	A193	347	S34700	1.4550	over 1 to 11/4	725	450	20	35	<321
					over 11/4 to 11/2	690	345	28	45	<321
B8Mcl2	A193	316	S31600	1.4401	3/4 and under	760	665	15	45	<321
					over 3/4 to 1	690	550	20	45	<321
					over 1 to 11/4	655	450	25	45	<321
					over 11/4 to 11/2	620	345	30	45	<321
B8Mcl2B	A193	316	S31600	1.4401	2 and under	655	515	25	40	<321
					over 2 to 21/2	620	450	30	40	<321
					over 21/2 to 3	550	380	30	40	<321
B8Mcl2C	A193	316	S31600	1.4401	2 and under	585	450	30	60	<321
					over 2	585	415	30	60	<321

MECHANICAL REQUIREMENTS
ALLOY AND STAINLESS STEEL ASTM A320 FOR LOW TEMPERATURE SERVICE

ALLOY	ASTM	AISI	UNS	W.-Nr.	Dia	Tensile Strength min, MPa	Yield Strength min,0,2% MPa	Elongation in 4 D, min, %	Reduction of Area min, %	HB	Impact test -101°C aver.(min) Joules	Impact test -73°C aver.(min) Joules
L7	A 320	4140	G41400	1.7225	21/2 and under	860	725	16	50		27 (20)	
L7M	A 320	4140	G41400	1.7225	all size	690	550	18	50	<235		27 (20)
L43	A 320	4340	G43400	1.6565	4 and under	860	725	16	50		27 (20)	
B8	A 320	304	S30400	1.4301	all size	515	205	35	50	<223		
B8A	A 320	304	S30400	1.4301	all size	515	205	35	50	<192		
B8T	A 320	321	S32100	1.4541	all size	515	205	35	50	<223		
B8TA	A 320	321	S32100	1.4541	all size	515	205	35	50	<192		
B8C	A 320	347	S34700	1.4550	all size	515	205	35	50	<223		
B8ACA	A 320	347	S34700	1.4550	all size	515	205	35	50	<192		
B8M	A 320	316	S31600	1.4401	all size	515	205	35	50	<223		
B8MA	A 320	316	S31600	1.4401	all size	515	205	35	50	<192		
B8cl2	A 320	304	S30400	1.4301	3/4 and under	860	690	12	35	<321		
B8Tcl2	A 320	321	S32100	1.4541	over 3/4 to 1	725	450	20	35	<321		
B8Ccl2	A 320	347	S34700	1.4550	over 1 to 11/4	795	550	15	35	<321		
					over 11/4 to 11/2	690	345	28	45	<321		
B8Mcl2	A 320	316	S31600	1.4401	3/4 and under	760	655	15	45	<321		
					over 3/4 to 1	690	550	20	45	<321		
					over 1 to 11/4	655	450	25	45	<321		
					over 11/4 to 11/2	620	345	30	45	<321		

MECHANICAL REQUIREMENTS
HIGH TEMPERATURE RESISTING ALLOYS

ALLOY	ASTM	UNS	W.-Nr.	Heat Treatment	Dia	Tensile Strength min, MPa	Yield Strength min,0,2% MPa	Elongation in 4 D, min, %	Reduction of Area min, %	HB
600	B166	N06600	2.4816	solution annealed	under 1/2	655	310	20		
				solution annealed	1/2 to 3	620	275	25		
				solution annealed	over 3	585	240	30		
660**	A453	S66286	1.4980	sol+prec.harden	all size	895	585	15	18	248 - 341
662A**	A453	S66220	-	sol+prec.harden	all size	895	585	15	18	255 - 321
665B**	A453	S66545	1.4943	sol+prec.harden	all size	860	550	15	18	248 - 321
** Stress Rupture Test : temperature 650°C, stress >485 MPa; time to rupture >100 hours; elong. > 5%										
718	B637	N07718	2.4668	sol+prec.harden	all size	1275	1034	12	15	>331
X-750	B637	N07750	2.4669	solution annealed	all size	965	620	8	>310	
800H	B408	N08810	1.4876	solution annealed	all size	450	170	30		
80A	B637	N07080	2.4952	solution annealed	all size	930	620	20		

MECHANICAL REQUIREMENTS
CORROSION RESISTING ALLOYS

ALLOY	ASTM	UNS	W.-Nr.	Heat Treatment	Dia	Tensile Strength min, MPa	Yield Strength min,0,2% MPa	Elongation in 4 D, min, %	Reduction of Area min, %	HRC
400	F468	N04400	2.4360	solution annealed	1/4 to 7/8	550	275	20		75-103HRB
				solution annealed	1 to 11/2	480	205	20		60-103HRB
500	F468	N05500	2.4375	sol+prec.harden	1/4 to 7/8	900	620	20		24-37
				sol+prec.harden	1 to 11/2	900	590	20		24-37
600	B166	N06600	2.4816	solution annealed	under 1/2	655	310	20		
				solution annealed	1/2 to 3	620	275	25		
				solution annealed	over 3	585	240	30		
625 G1	B446	N06625	2.4856	solution annealed	up to 4	825	415	30		
625 G2	B446	N06625	2.4856	solution annealed	all size	690	275	30		
660**	A453	S66286	1.4980	sol+prec.harden	all size	895	585	15	18	248-341HB
662A**	A453	S66220	-	sol+prec.harden	all size	895	585	15	18	255-321HB
665B**	A453	S66545	1.4943	sol+prec.harden	all size	860	550	15	18	248-321HB
** Stress Rupture Test : temperature 650°C, stress >485 MPa; time to rupture >100 hours; elong. > 5%										
276	F468	N10276	2.4819	solution annealed	all size	760	310	25		20-32
B2	B335	N10665	2.4617	solution annealed	all size	760	350	40		
C22	B574	N06022	2.4602	solution annealed	all size	690	310	45		
718	B637	N07718	2.4668	sol+prec.harden	all size	1275	1034	12	15	

CHEMICAL REQUIREMENTS
(COMPOSITION, percent)

ALLOY	C	Mn max	P max	S max	Si max	Cr	Ni	Mo	Ti	OTHERS				
600	0,15	1,00	-	0,02	0,50	14,0-17,0	> 72,00	-	-	Cu 0,50	-	Fe6,0-10,0	-	-
660	0,08	2,00	0,04	0,03	1,00	13,5-16,0	24,0-27,0	1,00-1,50	1,90-2,35	V 0,1-0,5	Al 0,35max	-	B 0,001-0,01	-
662A	0,08	0,4-1,0	0,04	0,03	0,4-1,0	12,0-15,0	24,0-28,0	2,00-3,50	1,80-2,10	Cu 0,50	Al 0,35max	-	B 0,001-0,01	-
665B	0,08	1,25-2,0	0,04	0,03	0,1-0,8	12,0-15,0	24,0-28,0	1,25-2,25	2,70-3,30	Cu 0,25	Al 0,25max	-	B 0,01-0,07	-
718	0,08	0,35	0,02	0,02	0,35	17,0-21,0	50,0-55,0	2,80-3,30	0,65-1,15	Cu 0,30	Al 0,20-0,8	Cb+Ta4,75-5,5	B 0,006 max	Co 1,00 A
X-750	0,08	1,00	-	0,01	0,50	14,0-17,0	> 70,00	-	2,25-2,75	Cu 0,50	Al 0,40-1,0	Cb+Ta0,70-1,2	Fe 5,0-9,0	Co 1,00 A
800H	0,10	1,50	-	0,02	1,00	19,0-23,0	30,0-35,0	-	0,15-0,60	Cu 0,75	Al 0,15-0,6	-	Fe > 39,5	-
80A	0,10	1,00	-	0,02	1,00	18,0-21,0	balance	-	1,80-2,70	-	Al 0,50-1,8	-	Fe 3,00 max	-
400	0,30	2,00	-	0,02	0,50	-	63,0-70,0	-	-	Cu balance	-	-	Fe 2,50 max	B
500	0,25	1,50	-	0,01	0,50	-	63,0-70,0	-	0,35-0,85	Cu balance	Al 2,30-3,15	-	Fe 2,00 max	B
625	0,10	0,50	0,02	0,02	0,50	20,0-23,0	>58,00	8,0-10,0	0,40 max	-	Al 0,4max	Cb+Ta3,15-4,15	Fe 5,00 max	Co 1,00 A
276	0,01	1,00	0,04	0,03	0,08	14,5-16,5	balance	15,0-17,0	-	-	W 3,0-4,5	W 3,0-4,5	Fe 4,0-7,0	Co 2,5
B2	0,02	1,00	0,04	0,03	0,10	1,00 max	balance	26,0-30,0	-	-	-	-	Fe 2,00 max	Co 1,00 A
C22	0,02	0,50	0,02	0,02	0,08	20,0-22,5	balance	12,5-14,5	-	-	W 2,5-3,5	W 2,5-3,5	Fe 2,0-6,0	Co 2,5

CHEMICAL REQUIREMENTS
(COMPOSITION, percent)

ALLOY	C	Mn max	P max	S max	Si max	Cr	Ni	Mo	V	Ti	Al max	Cb+Ta
B5	0,10 min	1,00	0,04	0,03	1,00	4,00-6,00	-	0,40-0,65	-	-	-	-
B6	0,15 min	1,00	0,04	0,03	1,00	11,5-13,5	-	-	-	-	-	-
B7	0,37-0,49	0,65-1,10	0,04	0,04	0,15-0,35	0,75-1,20	-	0,15-0,25	-	-	-	-
B7M	0,37-0,49	0,65-1,10	0,04	0,04	0,15-0,35	0,75-1,20	-	0,15-0,25	-	-	-	-
B16	0,36-0,47	0,45-0,70	0,04	0,04	0,15-0,35	0,80-1,15	-	0,50-0,65	0,25-0,35	-	0,015	-
B8	0,08 max	2,00	0,05	0,03	1,00	18,0-20,0	8,0-11,0	-	-	-	-	-
B8A	0,08 max	2,00	0,05	0,03	1,00	18,0-20,0	8,0-11,0	-	-	-	-	-
B8C	0,08 max	2,00	0,05	0,03	1,00	17,0-19,0	9,0-12,0	-	-	-	-	10xC min
B8CA	0,08 max	2,00	0,05	0,03	1,00	17,0-19,0	9,0-12,0	-	-	-	-	10xC min
B8M	0,08 max	2,00	0,05	0,03	1,00	16,0-18,0	10,0-14,0	2,0-3,0	-	-	-	-
B8MA	0,08 max	2,00	0,05	0,03	1,00	16,0-18,0	10,0-14,0	2,0-3,0	-	-	-	-
B8T	0,08 max	2,00	0,05	0,03	1,00	17,0-19,0	9,0-12,0	-	-	5xC min	-	-
B8TA	0,08 max	2,00	0,05	0,03	1,00	17,0-19,0	9,0-12,0	-	-	5xC min	-	-
B8cl2	0,08 max	2,00	0,05	0,03	1,00	18,0-20,0	8,0-11,0	-	-	-	-	-
B8Ccl2	0,08 max	2,00	0,05	0,03	1,00	17,0-19,0	9,0-12,0	-	-	-	-	10xC min
B8Mcl2	0,08 max	2,00	0,05	0,03	1,00	16,0-18,0	10,0-14,0	2,0-3,0	-	-	-	-
B8Tcl2	0,08 max	2,00	0,05	0,03	1,00	17,0-19,0	9,0-12,0	-	-	5xC min	-	-
L7	0,38-0,48	0,75-1,00	0,04	0,04	0,15-0,35	0,80-1,10	-	0,15-0,25	-	-	-	-
L7M	0,38-0,48	0,75-1,00	0,04	0,04	0,15-0,35	0,80-1,10	-	0,15-0,25	-	-	-	-
L43	0,38-0,43	0,60-0,85	0,04	0,04	0,15-0,35	0,70-0,90	1,65-2,00	2,0-3,0	-	-	-	-

MECHANICAL REQUIREMENTS
CARBON, ALLOY AND STAINLESS STEEL NUTS ASTM A 194

ALLOY	ASTM	AISI	UNS	W.-Nr.	Dia	HB	HRC	HRB
2	A 194	1040	K04002	1.1191	all size	159 to 327		
2H	A 194	1040	K04002	1.1191	11/2 and under	248 to 327	24 to 28	
					over 11/2	212 to 327	38 max	95 min
2HM	A 194	1040	K04002	1.1191	all size	159 to 237	22 max	
4L	A 194	-	K14510	-	all size	248 to 327	24 to 38	
3	A 194	501	S50100	1.7362	all size	248 to 327	24 to 38	
6 - 6F	A 194	410	S41000	1.4006	all size	228 to 271	20 to 28	
7L	A 194	4140	G41400	1.7225	all size	248 to 327	24 to 38	
7M	A 194	4140	G41400	1.7225	all size	159 to 237	22 max	
8	A 194	304	S30400	1.4301	all size	126 to 300		60 to 105
8C	A 194	347	S34700	1.4550	all size	126 to 300		60 to 105
8M	A 194	316	S31600	1.4401	all size	126 to 300		60 to 105
8T	A 194	321	S32100	1.4541	all size	126 to 300		60 to 105
8A	A 194	304	S30400	1.4301	all size	126 to 192		60 to 90
8CA	A 194	347	S34700	1.4550	all size	126 to 192		60 to 90
8MA	A 194	316	S31600	1.4401	all size	126 to 192		60 to 90
8TA	A 194	321	S32100	1.4541	all size	126 to 192		60 to 90

CHEMICAL REQUIREMENTS
(COMPOSITION, percent)

ALLOY	C	Mn max	P max	S max	Si max	Cr	Ni	Mo	V	Ti	Al max	Cb+Ta
2-2H	0,40 min	1,00	0,04	0,05	0,40	-	-	-	-	-	-	-
2HM	0,40 min	1,00	0,04	0,05	0,40	-	-	-	-	-	-	-
3	0,10 min	1,00	0,04	0,03	1,00	4,0 - 6,0	-	0,40-0,65	-	-	-	-
4L	0,40-0,50	0,70-0,90	0,035	0,04	0,15-0,35	-	-	0,20-0,30	-	-	-	-
6	0,15 max	1,00	0,04	0,03	1,00	11,5-13,5	-	-	-	-	-	-
6F	0,15 max	1,25	0,06	0,15	1,00	12,0-14,0						
7L-7M	0,37-0,49	0,65-1,10	0,04	0,04	0,15-0,35	0,75-1,20	-	0,15-0,25	-	-	-	-
16	0,36-0,47	0,45-0,70	0,04	0,04	0,15-0,35	0,80-1,15	-	0,50-0,65	0,25-0,35	-	0,015	-
8-8A	0,08 max	2,00	0,05	0,03	1,00	18,0-20,0	8,0-10,50					
8C-8CA	0,08 max	2,00	0,05	0,03	1,00	17,0-19,0	9,0-12,0	-	-	-	-	10xC min
8M-8MA	0,08 max	2,00	0,05	0,03	1,00	16,0-18,0	10,0-14,0	2,0-3,0				
8T-8TA	0,08 max	2,00	0,05	0,03	1,00	17,0-19,0	9,0-12,0	-	-	5xC min		

MECHANICAL REQUIREMENTS
CORROSION RESISTING ALLOYS WITH HIGH YIELD LIMITS

ALLOY	ASTM	UNS	W.-Nr.		Heat Treatment	Dia	Tensile Strength min, MPa	Yield Strength min,0,2% MPa	Elongation in 4 D, min, %	Reduction of Area min, %	HB
F51	A182	S31803	1.4462	Duplex	solution annealed	all size	620	450	25	50	
F44	A182	S31254	1.4529	Super Duplex	solution annealed	all size	650	300	35	50	
F53	A182	S32750	1.4468		solution annealed	all size	800	550	15		<310
F55	A182	S32760	1.4496	Super Duplex	sol + prec. harden	all size	750-895	550	25	45	
-	A479	S32550	1.4515	Super Duplex	solution annealed	all size	760	550	15		
500	F467	N05500	2.4375		sol + prec. harden	1/4 to 7/8	900	620	20		24-37 HRC
					sol + prec. harden	1 to 11/2	900	590	20		24-37 HRC
660**	A453	S66286	1.4980		sol + prec. harden	all size	895	585	15	18	248 - 341

** Stress Rupture Test : temperature 650°C, stress >385 MPa; time to rupture >100 hours; elong. > 5%

CHEMICAL REQUIREMENTS
(COMPOSITION, percent)

ALLOY	UNS	C	Mn max	P max	S max	Si max	Cr max	Ni	Mo	Ti	W	OTHERS	
F51	S31803	0,03	2,00	0,03	0,02	1,00	21,0-23,0	4,50-6,50	2,5-3,5		-	-	N 0,08-0,20
F44	S31254	0,02	1,00	0,03	0,01	0,80	19,5-20,5	17,5-18,5	6,0-6,5		-	Cu 0,50-1,0	N 0,18-0,22
F53	S32750	0,03	1,20	0,04	0,02	0,80	24,0-26,0	6,0-8,0	3,0-5,0		-	Cu 0,50	N 0,24-0,32
F55	S32760	0,03	1,00	0,03	0,01	1,00	24,0-26,0	6,0-8,0	3,00-4,00		0,5-1,0	Cu 0,50-1,0	N 0,20-0,30
-	S32550	0,04	1,50	0,04	0,03	1,00	24,0-27,0	4,50-6,50	2,9-3,9		-	Cu 1,50-2,5	N 0,10-0,25
660	S66286	0,08	2,00	0,04	0,03	1,00	13,5-16,0	24,0-27,0	1,00-1,50	1,90-2,35	0,1-0,5	B 0,001-0,01	Al 0,35max
500	N05500	0,25	1,50	-	0,01	0,50	Al 2,3-3,15	63,0-70,0	1,00-1,50	0,35-0,85		Cu balance	Fe 2,00max

MECHANICAL REQUIREMENTS
CORROSION RESISTING ALLOYS WITH LOW DENSITY

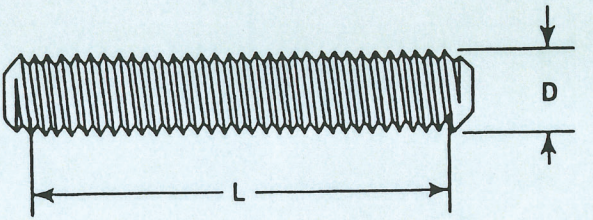
ALLOY	ASTM	UNS	W.-Nr.	Tensile Strength min, MPa	Yield Strength min,0,2% MPa	Elongation in 4 D, min, %	Reduction of Area min, %
Ti gr. 1	B348	R50250	3.7025	240	170	24	30
Ti gr. 2	B348	R50400	3.7035	345	275	20	30
Ti gr. 3	B348	R50400	3.7055	450	380	18	30
Ti gr. 4	B348	R50400	3.7065	550	483	15	25
Ti gr. 5	B348	R56400	3.7165	895	828	10	25
Ti gr. 6	B348	R54520	-	828	795	10	25
Ti gr. 7	B348	R52400	3.7235	345	275	20	30
Ti gr. 9	B348	R58030	-	620	483	15	25
Ti gr. 11	B348	R52250	3.7225	240	170	24	30
Ti gr. 12	B348	R53400	-	483	345	18	25

CHEMICAL REQUIREMENTS
(COMPOSITION, percent)

ALLOY	C max	Ni	Mo	V	Ti	Al max	Fe	O max	H max	N max	Sn	Pd	residual each max	residual total max
Ti gr.1	0,08	-	-	-	balance	-	0,20 max	0,18	0,015	0,03	-	-	0,10	0,40
Ti gr.2	0,08	-	-	-	balance	-	0,30 max	0,25	0,015	0,03	-	-	0,10	0,40
Ti gr.3	0,08	-	-	-	balance	-	0,30 max	0,35	0,015	0,05	-	-	0,10	0,40
Ti gr.4	0,08	-	-	-	balance	-	0,50 max	0,40	0,015	0,05	-	-	0,10	0,40
Ti gr.5	0,08	-	-	3,50-4,5	balance	5,5-6,75	0,40 max	0,20	0,015	0,05	-	-	0,10	0,40
Ti gr.6	0,08	-	-	-	balance	4,00-6,0	0,50 max	0,20	0,015	0,03	2,0-3,0	-	0,10	0,40
Ti gr.7	0,08	-	-	-	balance	-	0,30 max	0,25	0,015	0,03	-	0,12-0,25	0,10	0,40
Ti gr.9	0,08	-	-	2,00-3,0	balance	2,50-3,5	0,25 max	0,15	0,015	0,03	-		0,10	0,40
Ti gr.11	0,08	-	-	-	balance	-	0,20 max	0,18	0,015	0,03	-	0,12-0,25	0,10	0,40
Ti gr.12	0,08	0,6-0,9	0,2-0,4	-	balance	-	0,30 max	0,25	0,015	0,03	-	-	0,10	0,40

IMPERIAL RANGE 5/16" - 5"
METRIC RANGE M6 - M125

STUDBOLTS SIZE AND DIMENSION TOLERANCE



SECTIOND D - STUD BOLTS FOR PRESSURE - TEMPERATURE PIPING

LENGTH

INCH SERIES
The length of the stud bolt, measured parallel to the axis, is the distance from first thread to first thread. First thread is defined as the intersection of the major diameter of the thread with the base of the point.

METRIC SERIES
The length of the stud bolt, measured parallel to the axis, is the distance from each stud bolt, including the end point.

Length inch	Length inch	Tolerance mm
to 12	± 0,062	± 1,5748
over 12 to 18	± 0,125	± 3,175
over 18	± 0,250	± 6,35

THREADS

Nominal size or diameter INCH SERIES	**1" and smaller** UNIFIED COARSE THREAD SERIES CLASS 2A ASME B1.1	**1 1/8" and larger** UNIFIED 8 THREAD SERIES CLASS 2A ASME B1.1
Nominal size or diameter METRIC SERIES	**M33 and smaller** METRIC COARSE THREAD SERIES CLASS 6g ISO 68 / ISO 965	**M36 and larger** METRIC FINE AND COARSE PITCH THREADS CLASS 6g ISO 68 / ISO 965

IMPERIAL RANGE 3/8" - 4"

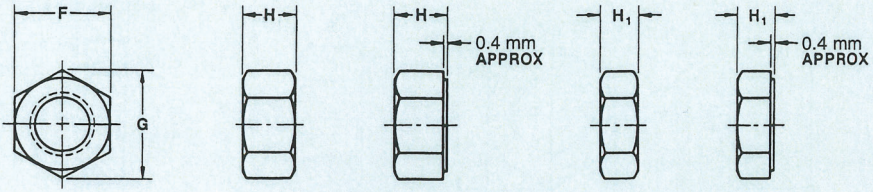
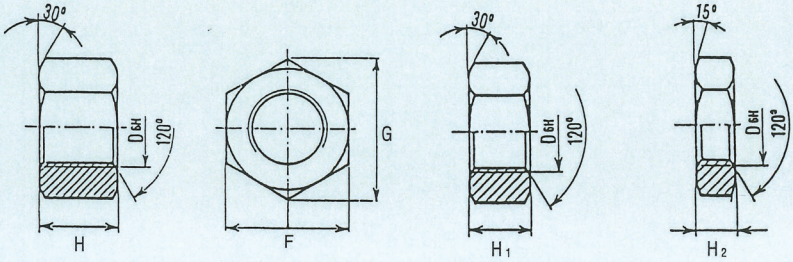


TABLE 9 - DIMENSIONS OF HEAVY HEX NUTS AND HEAVY HEX JAM NUTS

DIMENSIONS OF HEAVY HEX NUTS and HEAVY HEX JAM NUTS in mm.
ASME B 18.2.2 - TABLE 9

Nom. Size	F Width Across Flats		G Width Across Corners		H Thickness Heavy Hex Nuts		H1 Thickness Heavy Hex Jam Nuts	
	max	min	max	min	max	min	max	min
3/8"	17,48	16,99	20,17	19,38	9,58	8,66	6,40	5,49
7/16"	19,05	18,49	22,00	21,08	11,20	10,24	7,24	6,27
1/2"	22,23	21,59	25,65	24,61	12,80	11,79	8,05	7,04
9/16"	23,83	23,09	27,51	26,34	14,43	13,36	8,86	7,80
5/8"	26,97	26,19	31,17	29,85	16,03	14,91	9,68	8,56
3/4"	31,75	30,78	36,65	35,10	19,25	18,03	11,33	10,11
7/8"	36,53	35,41	42,16	40,36	22,48	21,16	12,95	11,63
1"	41,28	40,01	47,65	45,62	25,70	24,28	14,61	13,18
1 1/8"	46,02	44,60	53,16	50,88	28,93	27,41	16,23	14,71
1 1/4"	50,80	49,23	58,65	56,11	31,78	30,15	19,08	17,45
1 3/8"	55,58	53,82	64,16	61,37	35,00	33,27	20,70	18,97
1 1/2"	60,33	58,42	69,65	66,60	38,23	36,40	22,35	20,52
1 5/8"	65,07	63,02	75,16	71,83	41,45	39,52	23,98	22,05
1 3/4"	69,85	67,61	80,65	77,09	44,68	42,65	25,63	23,60
1 7/8"	74,63	72,24	86,16	82,35	47,90	45,77	27,25	25,12
2"	79,38	76,84	91,64	87,60	51,13	48,91	28,91	26,67
2 1/4"	88,90	86,06	102,64	98,09	57,18	54,74	31,78	29,34
2 1/2"	98,43	95,25	113,64	108,59	63,63	60,99	38,23	35,59
2 3/4"	107,95	104,44	124,64	119,08	70,08	67,23	41,50	38,66
3"	117,48	113,67	135,64	129,59	76,53	73,48	44,78	41,73
3 1/4"	127,00	122,89	146,66	140,08	82,60	79,35	47,65	44,40
3 1/2"	136,53	132,08	157,66	150,57	89,05	85,60	50,95	47,50
3 3/4"	146,05	141,27	168,66	161,06	95,50	91,85	54,20	50,55
4"	155,58	150,50	179,65	171,58	101,96	98,09	57,51	53,64

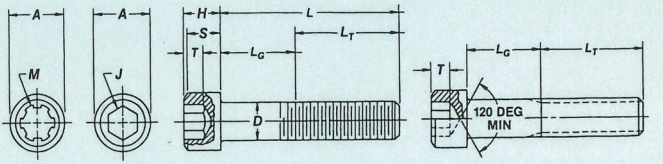
METRIC RANGE M8 - M100



DIMENSIONS OF HEX NUTS WITH METRIC COARSE AND FINE PITCH THREAD in mm.

Nom. Size	F Width Across Flats		G Width Across Corners		H ISO 4033-exUNI 5587		H1 DIN 934 ISO 4032-exUNI 5588		H2 DIN 936 ISO 4035-exUNI 5589	
	max	min	max	min	max	min	max	min	max	min
M 8	13,00	12,73	15,00	14,38	8,00	7,64	6,50	6,14	5	4,7
M 10	17,00	16,73	19,60	18,90	10,00	9,64	8,00	7,64	6	5,7
M 12	19,00	18,67	21,90	21,10	12,00	11,57	10,00	9,64	7	6,64
M 14	22,00	21,67	25,40	24,49	14,00	13,57	11,00	10,30	8	7,64
M 16	24,00	23,67	27,70	26,75	16,00	15,57	13,00	12,30	8	7,64
M 18	27,00	26,67	31,10	30,14	18,00	17,57	15,00	14,30	9	8,64
M 20	30,00	29,67	34,60	33,53	20,00	19,48	16,00	14,90	9	8,64
M 22	32,00	31,61	36,90	35,72	22,00	21,48	18,00	16,90	10	9,64
M 24	36,00	35,38	41,50	39,98	24,00	23,48	19,00	17,70	10	9,64
M 27	41,00	40,38	47,30	45,63	27,00	26,48	22,00	20,70	12	11,57
M 30	46,00	45,38	53,10	51,28	30,00	29,48	24,00	22,70	12	11,57
M 33	50,00	49,26	57,70	55,80	33,00	32,38	26,00	24,70	14	13,57
M 36	55,00	54,26	63,50	61,31	36,00	35,38	29,00	27,40	14	13,57
M 39	60,00	59,26	69,30	66,96	39,00	38,38	31,00	29,40	16	15,57
M 42	65,00	64,26	75,00	72,61	42,00	41,38	34,00	32,40	16	15,57
M 45	70,00	69,26	80,80	78,26	45,00	44,38	36,00	34,40	18	17,57
M 48	75,00	74,26	86,50	83,91	48,00	47,38	38,00	36,40	18	17,57
M 52	80,00	79,26	92,40	89,56	52,00	51,38	42,00	40,40	20	19,48
M 56	85,00	84,15	98,10	95,07	56,00	55,26	45,00	43,40	22	21,48
M 60	90,00	89,13	103,90	100,72	60,00	59,26	48,00	46,40	24	23,48
M 64	95,00	94,13	109,70	106,37	64,00	63,26	51,00	49,10	26	25,48
M 68	100,00	99,13	115,50	112,02	68,00	67,26	54,00	52,10	26	25,48
M 72	105,00	104,13	121,25	117,67	72,00	71,26	58,00	56,10	28	27,48
M 76	110,00	109,13	127,00	123,32	76,00	75,26	61,00	59,10	30	29,48
M 80	115,00	114,13	132,80	128,97	80,00	79,26	64,00	62,10	32	31,38
M 85	120,00	119,13	138,60	134,62	85,00	84,13	68,00	66,10	34	33,38
M 90	130,00	129,00	150,10	145,77	90,00	89,13	72,00	70,10	36	35,38
M 95	135,00	134,00	155,90	151,42	95,00	94,13	76,00	74,10	38	37,38
M 100	145,00	144,00	167,40	162,72	100,00	99,13	80,00	78,10	40	39,38

IMPERIAL RANGE 3/8" - 3"
METRIC RANGE M8 - M52

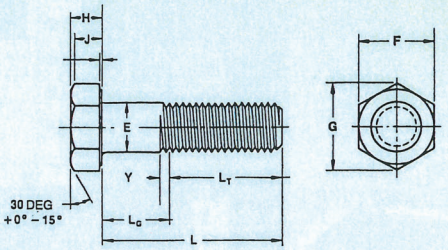


DIMENSIONS OF SOCKET HEAD CAP SCREWS in mm.
ANSI/ASME B 18.3 - TABLE 1A

Nom. Size	D Body Diameter		A Head Diameter		H Head Height		S Head Side Height	J Hexagon Socket Size	T Key Engage-ment	LT Thread Length
	max mm	min mm	max mm	min mm	max mm	min mm	min mm	Nom mm	min mm	min mm
3/8"	9,5	9,1	14,3	14,0	9,5	9,3	8,6	7,9	4,6	31,8
7/16"	11,1	10,7	16,7	16,3	11,1	10,9	10,0	9,5	5,4	35,1
1/2"	12,7	12,2	19,1	18,7	12,7	12,5	11,4	9,5	6,2	38,1
5/8"	15,9	15,4	23,8	23,4	15,9	15,6	14,3	12,7	7,8	44,5
3/4"	19,1	18,5	28,6	28,1	19,1	18,8	17,1	15,9	9,4	50,8
7/8"	22,2	21,6	33,3	32,8	22,2	21,9	20,0	19,1	11,0	57,2
1"	25,4	24,8	38,1	37,6	25,4	25,1	22,9	19,1	12,6	63,5
1 1/8"	28,6	27,9	42,9	42,3	28,6	28,2	25,7	22,2	14,1	71,4
1 1/4"	31,8	31,1	47,6	47,0	31,8	31,4	28,6	22,2	15,7	79,2
1 3/8"	34,9	34,2	52,4	51,8	34,9	34,5	31,4	25,4	17,3	87,4
1 1/2"	38,1	37,3	57,2	56,5	38,1	37,7	34,3	25,4	18,9	95,3
1 3/4"	44,5	43,6	66,7	66,0	44,5	44,0	40,0	31,8	22,1	111,3
2"	50,8	49,9	76,2	75,4	50,8	50,4	45,7	38,1	25,3	127,0
2 1/4"	57,2	56,2	85,7	84,9	57,2	56,7	51,4	44,5	28,4	142,7
2 1/2"	63,5	62,5	95,3	94,4	63,5	63,0	57,2	44,5	31,6	158,8
2 3/4"	69,9	68,9	104,8	103,9	69,9	69,3	62,9	50,8	34,8	174,8
3"	76,2	72,2	114,3	113,4	76,2	75,7	68,6	57,2	38,0	190,5

DIMENSIONS OF SOCKET HEAD CAP SCREWS in mm.
ISO 4762 - UNI 5931

Nom. Size	D Body Diameter		A Head Diameter		H Head Height		J Hex Socket Size		T Key Engage-ment	LT Thread Length
	max	min	max	min	max	min	max	min	min	
M 8	8,00	7,78	13,27	12,73	8,00	7,64	6,14	6,02	4,00	28
M 10	10,00	9,78	16,27	15,73	10,00	9,64	8,18	8,03	5,00	32
M 12	12,00	11,73	18,27	17,73	12,00	11,57	10,18	10,03	6,00	36
M 14	14,00	13,73	21,33	20,67	14,00	13,57	12,21	12,03	7,00	40
M 16	16,00	15,73	24,33	23,67	16,00	15,57	14,21	14,03	8,00	44
M 18	18,00	17,73	27,33	26,67	18,00	17,57	14,21	14,03	9,00	48
M 20	20,00	19,67	30,33	29,67	20,00	19,48	17,23	17,05	10,00	52
M 22	22,00	21,67	33,39	32,61	22,00	21,48	17,23	17,05	11,00	56
M 24	24,00	23,67	36,39	35,61	24,00	23,48	19,28	19,70	12,00	60
M 27	27,00	26,67	40,39	39,61	27,00	26,48	19,28	19,70	13,50	66
M 30	30,00	29,67	45,39	44,61	30,00	29,48	22,28	22,07	15,50	72
M 33	33,00	32,61	50,39	49,61	33,00	32,38	24,28	24,07	18,00	78
M 36	36,00	35,61	54,46	53,54	36,00	35,38	27,28	27,07	19,00	84
M 39	39,00	38,61	58,46	57,54	39,00	38,38	27,28	27,07	21,00	90
M 42	42,00	41,61	63,46	62,54	42,00	41,38	32,33	32,08	24,00	96
M 45	45,00	44,61	67,46	66,54	45,00	44,38	32,33	32,08	26,00	102
M 48	48,00	47,61	72,46	71,54	48,00	47,38	36,33	36,08	28,00	108
M 52	52,00	51,54	78,54	77,48	52,00	51,26	36,33	36,08	31,00	115



DIMENSIONS OF HEX CAP SCREWS (FINISHED HEX BOLTS) - ANSI/ASME B 18.2.1 - TABLE 4 in mm.

Nom. Size	E Body Diameter		F Width Across Flats		G Width Across Corners		H Height		J Wrenching Height	LT Thread Length for Screw		Y Transition Thread Length
	max	min	max	min	max	min	max	min	min	6 in. and Shorter basic	Over 6 in. basic	max
3/8"	9,5	9,4	14,3	14,0	16,5	16,0	6,2	5,7	4,1	25,4	31,8	7,9
7/16"	11,1	10,9	15,9	15,5	18,3	17,7	7,4	6,9	5,0	28,6	34,9	9,1

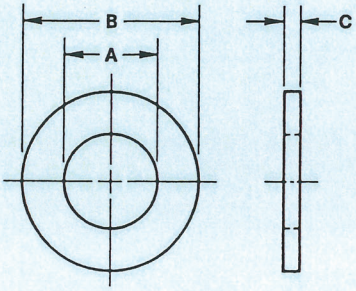
DIMENSIONS OF HEAVY HEX BOLTS - ANSI/ASME B 18.2.1 TABLE 3 in mm.

1/2"	13,1	12,2	22,2	21,6	25,7	24,6	9,2	7,7	5,5	31,8	38,1	9,8
5/8"	16,3	15,4	27,0	26,2	31,2	29,8	11,3	9,3	6,8	38,1	44,5	11,6
3/4"	19,5	18,5	31,8	30,8	36,7	35,1	13,3	11,6	8,2	44,5	50,8	12,7
7/8"	22,7	21,6	36,5	35,4	42,2	40,4	15,3	13,5	9,6	50,8	57,2	14,1
1"	26,0	24,8	41,3	40,0	47,7	45,6	17,8	15,0	10,6	57,2	63,5	15,9
1 1/8"	29,2	27,9	46,0	44,6	53,2	50,9	19,8	16,7	11,7	63,5	69,9	18,1
1 1/4"	32,4	31,1	50,8	49,2	58,6	56,1	22,3	19,0	13,5	69,9	76,2	18,1
1 3/8"	35,7	34,2	55,6	53,8	64,2	61,4	23,9	20,6	14,5	76,2	82,6	21,2
1 1/2"	38,9	37,3	60,3	58,4	69,6	66,6	26,3	22,9	16,3	82,6	88,9	21,2
1 3/4"	45,3	43,6	69,9	67,6	80,4	77,1	30,4	26,8	19,0	95,3	101,6	25,4
2"	51,8	49,9	79,4	76,8	91,6	87,6	35,3	29,8	21,0	108,0	114,3	28,2
2 1/4"	58,5	56,2	88,9	86,1	102,6	98,1	39,3	33,7	23,7	120,7	127,0	28,2
2 1/2"	65,0	62,5	98,4	95,3	113,6	108,3	43,4	37,6	26,5	133,4	139,7	31,8
2 3/4"	71,8	68,9	108,0	104,4	124,6	119,1	47,5	41,5	29,2	146,1	152,4	31,8
3"	78,3	75,2	117,5	113,7	135,6	129,6	52,3	46,1	32,8	158,8	165,1	31,8

DIMENSIONS OF HEXAGONAL BOLTS in mm.
ISO 4014-DIN 931-exUNI 5737 - 4017-DIN 933-exUNI 5739

Nom. Size	E Body Diameter		F Width Across Flats		G Width Across Corners	H Height		LT Thread Length		
	max	min	max	min	min	max	min	up to 120	up to 200	over 200
M 8	8,00	7,64	13,00	12,57	14,20	5,54	5,06	22	28	
M 10	10,00	9,64	16,00	15,57	17,59	6,69	6,11	26	32	45
M 12	12,00	11,57	18,00	17,57	19,85	7,79	7,21	30	36	49
M 14	14,00	13,57	22,00	21,16	23,91	9,09	8,51	34	40	53
M 16	16,00	15,57	24,00	23,16	26,17	10,29	9,71	38	44	57
M 18	18,00	17,57	27,00	26,16	29,56	11,85	11,15	42	48	61
M 20	20,00	19,48	30,00	29,16	32,95	12,85	12,15	46	52	65
M 22	22,00	21,48	32,00	31,00	35,03	14,35	13,65	50	56	69
M 24	24,00	23,48	36,00	35,00	39,55	15,35	14,65	54	60	73
M 27	27,00	26,48	41,00	40,00	45,20	17,35	16,65	60	66	79
M 30	30,00	29,48	46,00	45,00	50,85	19,12	18,28	66	72	85
M 33	33,00	32,38	50,00	49,00	55,37	21,42	20,58	72	78	91
M 36	36,00	35,38	55,00	53,80	60,79	22,92	22,08	78	84	97
M 39	39,00	38,38	60,00	58,80	66,44	25,42	24,58	84	90	103
M 42	42,00	41,38	65,00	63,10	71,30	26,42	25,58	90	96	109
M 45	45,00	44,38	70,00	66,10	76,95	28,42	27,58	96	102	115
M 48	48,00	47,38	75,00	73,10	82,60	30,42	29,58	102	108	121
M 52	52,00	51,26	80,00	78,10	88,25	33,50	32,50		116	129

IMPERIAL RANGE 1/4" - 4"
METRIC RANGE M6 - M100



DIMENSIONS OF PLAIN WASHERS in mm.
ISO 7089-DIN 125-exUNI 6592
ASME B18.22.1 1965 (R1981)

Nom. Size		A	B	C
M 6	1/4"	6,4	12,5	1,6
M 7		7,4	14	1,6
M 8	5/16"	8,4	17	1,6
M 10	3/8"	10,5	21	2
M 12	7/16"	13	24	2,5
M 14	1/2"	15	28	2,5
M 16	9/16"	17	30	3
M 16	5/8"	17	30	3
M 18		19	34	3
M 20	3/4"	21	37	3
M 22	7/8"	23	39	3
M 24		25	44	4
M 27	1"	28	50	4
M 30	1 1/8"	31	56	4
M 33	1 1/4"	34	60	5
M 36	1 3/8"	37	66	5
M 39	1 1/2"	40	72	6
M 42	1 5/8"	43	78	7
M 45	1 3/4"	46	85	7
M 48	1 7/8"	50	92	8
M 52	2	54	98	8
M 56	2 1/4"	58	105	9
M 60		62	110	9
M 64	2 1/2"	66	115	9
M 68		70	120	10
M 72	2 3/4"	74	125	10
M 76	3"	78	135	10
M 80		82	140	12
M 85	3 1/4"	88	145	12
M 90	3 1/2"	93	160	12
M 95	3 3/4"	99	165	12
M 100	4"	104	175	14

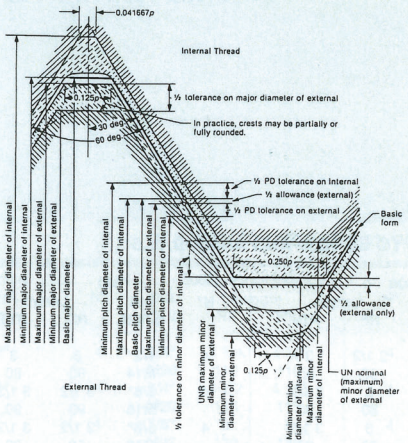
Special and larger dimensions produced to order

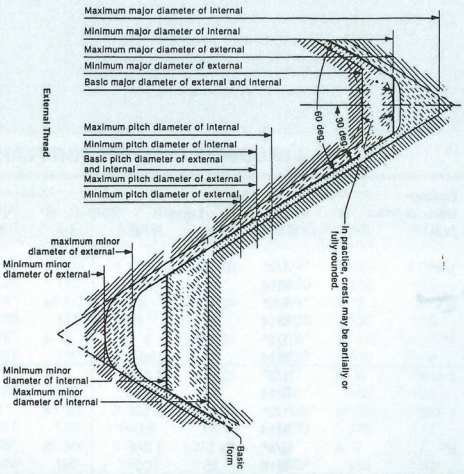
UNC THREAD SERIE ASME B 1.1. class 2A and 2B

Nom. Size	Threads	EXTERNAL mm. Major Diameter max	Major Diameter min	Pitch Diameter max	Pitch Diameter min	Minor max	INTERNAL mm. Major min	Minor Diameter min	Minor Diameter max	Pitch Diameter min	Pitch Diameter max	Weight x 1 mm
1/4"	20	6,322	6,116	5,497	5,403	**4,765**	**6,350**	4,978	5,258	5,525	5,646	0,000186
5/16"	18	7,907	7,686	6,990	6,888	**6,175**	**7,938**	6,401	6,731	7,021	7,155	0,000301
3/8"	16	9,492	9,253	8,461	8,349	**7,544**	**9,548**	7,798	8,153	8,494	8,639	0,000441
7/16"	14	11,077	10,815	9,898	9,779	**8,852**	**11,113**	9,144	9,550	9,934	10,089	0,000604
1/2"	13	12,662	12,385	11,392	11,265	**10,264**	**12,700**	10,592	11,024	11,430	11,595	0,000799
9/16"	12	14,247	13,957	12,873	12,741	**11,651**	**14,288**	11,989	12,446	12,913	13,086	0,001021
5/8"	11	15,834	15,527	14,336	14,196	**13,002**	**15,875**	13,386	13,868	14,376	14,559	0,001266
3/4"	10	19,004	18,677	17,353	17,203	**15,888**	**19,050**	16,307	16,840	17,399	17,595	0,001855
7/8"	9	22,177	21,824	20,343	20,183	**18,715**	**22,225**	19,177	19,761	20,391	20,599	0,002549
1"	8	25,349	24,968	23,287	23,114	**21,453**	**25,400**	21,971	22,606	23,338	23,561	0,003340
1 1/8"	7	28,519	28,103	26,162	25,979	**24,067**	**28,575**	24,638	25,349	26,218	26,457	0,004216
1 1/4"	7	31,694	31,278	29,337	29,149	**27,242**	**31,750**	27,813	28,524	29,393	29,637	0,005302
1 3/8"	6	34,864	34,402	32,113	31,910	**29,670**	**34,925**	28,435	31,115	32,174	32,438	0,006353
1 1/2"	6	38,039	37,577	35,288	35,082	**32,845**	**38,100**	33,528	34,290	35,349	35,616	0,007671
1 5/8"	6	41,212	40,749	38,461	38,252	**36,185**	**41,275**	36,703	37,465	38,524	38,796	0,009112
1 3/4"	6	44,387	43,924	41,636	41,425	**39,347**	**44,450**	39,878	40,640	41,699	41,974	0,010679
1 7/8"	6	47,562	47,099	44,811	44,597	**42,522**	**47,625**	43,053	43,815	44,874	45,154	0,012369
2"	4,5	50,726	50,168	47,061	46,820	**43,802**	**50,800**	44,679	45,593	47,135	47,450	0,013643
2 1/4"	4,5	57,076	56,518	53,411	53,165	**50,152**	**57,150**	51,029	51,943	53,485	53,805	0,017573
2 1/2"	4	63,421	62,817	59,296	59,032	**55,631**	**63,500**	56,617	57,582	59,375	59,718	0,021659
2 3/4"	4	69,769	69,164	65,644	65,377	**61,979**	**69,850**	62,967	63,932	65,725	66,073	0,026544
3"	4	76,119	75,514	71,994	71,722	**68,329**	**76,200**	69,317	70,282	72,075	72,428	0,031928
3 1/4"	4	82,466	81,862	78,341	78,064	**74,676**	**82,550**	75,667	76,632	78,425	78,783	0,037806
3 1/2"	4	88,816	88,212	84,691	84,412	**81,026**	**88,900**	82,017	82,982	84,775	85,138	0,044183
3 3/4"	4	95,164	94,559	91,039	90,754	**87,373**	**95,250**	88,367	89,332	91,125	91,493	0,051054
4"	4	101,514	100,909	97,389	97,102	**93,723**	**101,600**	94,717	95,682	97,475	93,605	0,058425
4 1/4"	4	107,864	107,259	103,739	103,447	**100,302**	**107,950**	101,067	102,032	103,825	104,204	0,066292
4 1/2"	4	114,211	113,607	110,086	109,792	**106,650**	**114,300**	109,792	110,086	110,175	110,559	0,074653
4 3/4"	4	120,561	119,957	116,436	116,139	**113,000**	**120,650**	113,767	114,732	116,525	116,914	0,083513
5"	4	126,909	126,304	122,784	122,481	**119,347**	**127,000**	120,117	121,082	122,875	123,266	0,092867

8UN THREAD SERIE ASME B 1.1. class 2A and 2B

Nom. Size	Threads	EXTERNAL mm. Major Diameter max	Major Diameter min	Pitch Diameter max	Pitch Diameter min	Minor max	INTERNAL mm. Major min	Minor Diameter min	Minor Diameter max	Pitch Diameter min	Pitch Diameter max	Weight x 1 mm
1 1/8"	8	28,522	28,141	26,459	26,284	**24,625**	**28,575**	25,781	25,146	26,741	26,513	0,004313
1 1/4"	8	31,697	31,316	29,634	29,456	**27,800**	**31,750**	28,956	28,321	29,921	29,688	0,005410
1 3/8"	8	34,869	34,488	32,807	32,624	**30,973**	**34,925**	32,131	31,496	33,099	32,863	0,006630
1 1/2"	8	38,044	37,663	35,982	35,796	**34,148**	**38,100**	35,306	34,671	36,279	36,038	0,007975
1 5/8"	8	41,219	40,838	39,157	38,969	**37,323**	**41,275**	38,481	37,846	39,459	39,213	0,009445
1 3/4"	8	44,392	44,011	42,329	42,139	**40,495**	**44,450**	41,656	41,021	42,636	42,388	0,011037
1 7/8"	8	47,567	47,186	45,504	45,309	**43,670**	**47,625**	44,831	44,196	45,817	45,563	0,012755
2"	8	50,742	50,361	48,679	48,481	**46,845**	**50,800**	48,006	47,371	48,994	48,738	0,014597
2 1/4"	8	57,089	56,708	55,027	54,823	**53,193**	**57,150**	54,356	53,721	55,352	55,088	0,018652
2 1/2"	8	63,439	63,058	61,377	61,168	**59,543**	**63,500**	60,706	60,071	61,707	61,438	0,023205
2 3/4"	8	69,787	69,406	67,724	67,513	**65,890**	**69,850**	67,056	66,421	68,062	67,788	0,028253
3"	8	76,134	74,229	74,071	73,856	**72,238**	**76,200**	73,406	72,771	74,419	74,138	0,033797
3 1/4"	8	82,484	82,103	80,421	80,201	**78,704**	**82,550**	79,121	79,756	80,488	80,775	0,039841
3 1/2"	8	88,834	88,453	86,771	86,548	**85,054**	**88,900**	85,471	86,106	86,838	86,130	0,046380
3 3/4"	8	95,181	94,800	93,119	92,890	**91,402**	**95,250**	91,821	92,456	93,118	93,485	0,053414
4"	8	101,531	101,150	99,469	99,238	**97,752**	**101,600**	98,171	98,806	99,538	99,840	0,060948
4 1/4"	8	107,879	107,848	105,816	105,580	**104,099**	**107,950**	104,521	105,156	105,888	106,192	0,071689
4 1/2"	8	114,229	113,848	112,166	111,928	**110,449**	**114,300**	110,871	111,506	112,238	112,547	0,080377
4 3/4"	8	120,576	120,595	118,514	118,273	**116,797**	**120,650**	117,221	117,856	118,588	118,902	0,094337
5"	8	126,926	126,545	124,864	124,617	**123,147**	**127,000**	123,571	124,206	124,938	125,258	0,099239





ISO METRIC THREAD WITH TRIANGULAR PROFILE ISO 724-DIN 13 class 6g and 6H

Nom. Size	Threads	EXTERNAL mm. Major Diameter max	Major Diameter min	Pitch Diameter max	Pitch Diameter min	Minor max	INTERNAL mm. Major min	Minor Diameter min	Minor Diameter max	Pitch Diameter min	Pitch Diameter max	Weight x 1 mm
M 6	1,00	5,974	5,794	5,324	5,212	**4,783**	**6,000**	5,350	5,500	4,917	5,153	0,000175
M 8	1,25	7,972	7,760	7,160	7,042	**6,619**	**8,000**	7,188	7,348	6,647	6,912	0,000316
M 10	1,50	9,968	9,732	8,994	8,892	**8,344**	**10,000**	9,026	9,206	8,376	8,676	0,000498
M 12	1,75	11,966	11,701	10,829	10,700	**10,072**	**12,000**	10,863	11,063	10,106	10,441	0,000722
M 14	2	13,962	13,682	12,663	12,530	**11,797**	**14,000**	12,701	12,913	11,835	12,210	0,000988
M 16	2	15,962	15,682	14,663	14,530	**13,797**	**16,000**	14,701	14,913	13,835	14,210	0,001324
M 18	2,5	17,958	17,623	16,334	16,230	**15,252**	**18,000**	16,376	16,600	15,294	15,744	0,001643
M 20	2,5	19,958	19,623	18,334	18,216	**17,252**	**20,000**	18,376	18,600	17,294	17,744	0,002071
M 22	2,5	21,958	21,623	20,334	20,196	**19,252**	**22,000**	20,376	20,600	19,294	19,744	0,002547
M 24	3	23,952	23,577	22,003	21,866	**20,704**	**24,000**	22,051	22,316	20,752	21,252	0,002982
M 27	3	26,952	26,577	25,003	24,866	**23,704**	**27,000**	25,051	25,316	23,752	24,252	0,003851
M 30	3,5	29,947	29,522	27,674	27,516	**26,158**	**30,000**	27,727	28,007	26,211	26,771	0,004718
M 33	3,5	32,947	32,522	30,674	30,500	**29,158**	**33,000**	30,727	31,007	29,211	29,771	0,005796
M 36	3	35,952	35,577	34,003	33,830	**31,610**	**36,000**	33,402	33,702	31,670	32,270	0,007122
M 39	3	38,952	38,577	37,003	36,800	**34,610**	**39,000**	36,402	36,702	34,670	35,270	0,008434
M 42	3	41,952	41,577	40,003	39,800	**37,066**	**42,000**	39,077	39,392	37,129	37,799	0,009857
M 45	3	44,952	44,577	43,003	42,800	**40,066**	**43,000**	42,077	42,392	40,129	40,799	0,011391
M 48	3	47,952	47,577	46,003	45,800	**42,516**	**48,000**	44,752	45,087	42,587	43,297	0,013036
M 52	3	51,952	51,577	50,003	49,800	**46,516**	**52,000**	46,752	49,087	46,587	47,297	0,015402
M 56	4	55,940	55,465	53,342	51,130	**49,971**	**56,000**	52,428	52,783	50,046	50,796	0,017527
M 60	4	59,940	59,465	57,342	57,130	**53,971**	**60,000**	56,428	56,783	54,046	54,796	0,020255
M 64	4	63,940	63,465	61,342	61,180	**57,425**	**64,000**	60,103	60,478	57,505	58,305	0,023179
M 68	4	67,940	67,465	65,342	65,130	**61,425**	**68,000**	64,103	64,478	61,505	62,305	0,026301
M 72	4	71,940	71,465	69,342	69,130	**65,425**	**72,000**	68,103	68,478	65,505	66,305	0,029619
M 76	4	75,940	75,465	73,342	73,130	**69,425**	**76,000**	72,103	72,478	69,505	70,305	0,033135
M 80	4	79,940	79,465	77,342	77,106	**74,509**	**80,000**	77,402	77,717	75,670	76,270	0,036848
M 85	4	84,940	84,465	82,342	82,110	**80,177**	**85,000**	82,402	82,717	80,670	81,270	0,041766
M 90	4	89,940	89,465	87,342	87,110	**85,177**	**90,000**	87,402	87,717	85,670	86,270	0,046992
M 95	4	94,940	94,465	92,342	92,110	**90,177**	**95,000**	92,402	92,737	90,670	91,270	0,052527
M 100	4	99,940	99,465	97,342	97,110	**95,177**	**100,000**	97,402	97,737	95,670	96,270	0,058369

STUDBOLT DIMENSIONS FOR ALL FLANGE TYPES

STUDBOLT LENGTHS FOR FLANGES TO BS 1560 AND ASME B.16.5

Rating	150				300				600			
Nom. Size	N°	DIA STUD	Length RF	Length RTJ	N°	DIA STUD	Length RF	Length RTJ	N°	DIA STUD	Length RF	Length RTJ
1/2"	4	1/2"	2 1/4		4	1/2"	2 1/2	3"	4	1/2"	3	3
		M14	60			M14	65	80		M14	80	80
3/4"	4	1/2"	2 1/2		4	5/8"	3	3 1/2	4	5/8"	3 1/2	3 1/2
		M14	65			M16	80	90		M16	90	90
1"	4	1/2"	2 1/2	3	4	5/8"	3	3 1/2	4	5/8"	3 1/2	3 1/2
		M14	65	80		M16	80	90		M16	90	90
1 1/4"	4	1/2"	2 3/4	3 1/4	4	5/8"	3 1/4	3 3/4	4	5/8"	3 3/4	3 3/4
		M14	70	85		M16	85	100		M16	100	100
1 1/2"	4	1/2"	2 3/4	3 1/4	4	3/4"	3 1/2	4	4	3/4"	4 1/4	4 1/4
		M14	70	85		M20	90	105		M20	110	110
2"	4	5/8"	3 1/4	3 3/4	8	5/8"	3 1/2	4	8	5/8"	4 1/4	4 1/4
		M16	85	100		M16	90	105		M16	110	110
2 1/2"	4	5/8"	3 1/2	4	8	3/4"	4	4 1/2	8	3/4"	4 3/4	4 3/4
		M16	90	105		M20	105	115		M20	125	125
3"	4	5/8"	3 1/2	4	8	3/4"	4 1/4	4 3/4	8	3/4"	5	5
		M16	90	105		M20	110	125		M20	130	130
4"	8	5/8"	3 1/2	4	8	3/4"	4 1/2	5	8	7/8"	6 3/4	5 3/4
		M16	90	105		M20	115	130		M22	150	150
5"	8	3/4"	3 3/4	4 1/4	8	3/4"	4 3/4	5 1/4	8	1"	6 3/4	6 1/2
		M20	100	110		M20	125	135		M27	170	170
6"	8	3/4"	4	4 1/2	12	3/4"	4 3/4	5 1/2	12	1"	6 3/4	6 3/4
		M20	105	115		M20	125	140		M27	175	175
8"	8	3/4"	4 1/4	4 3/4	12	7/8"	5 1/2	6	12	1 1/8"	7 1/2	7 3/4
		M20	110	125		M22	140	155		M30	195	200
10"	12	7/8"	4 1/2	5	16	1"	6 1/4	63/4	16	1 1/4"	8 1/2	8 1/2
		M22	115	130		M27	160	175		M33	220	220
12"	12	7/8"	4 3/4	5 1/4	16	1 1/8"	6 3/4	7 1/4	20	1 1/4"	8 3/4	8 3/4
		M22	125	135		M30	175	185		M33	225	225
14"	12	1"	5 1/4	5 3/4	20	1 1/8"	7	7 1/2	20	1 3/8"	9 1/4	9 1/4
		M27	135	150		M30	180	195		M36	235	235
16"	12	1"	5 1/4	5 3/4	20	1 1/4"	7 1/2	8	20	1 1/2"	10	10
		M27	135	150		M33	195	205		M39	255	255
18"	12	1 1/8"	5 3/4	6 1/4	24	1 1/4"	7 3/4	8 1/4	20	1 5/8"	10 3/4	10 3/4
		M30	150	160		M33	200	210		M42	275	275
20"	12	1 1/8"	6 1/4	6 3/4	24	1 1/4"	8	8 3/4	24	1 5/8"	11 1/4	11 1/2
		M30	160	175		M33	205	225		M42	290	295
24"	12	1 1/4"	6 3/4	7 1/4	24	1 1/2"	9	10	24	1 7/8"	13	13 1/4
		M33	175	185		M39	230	255		M48	335	340

STUDBOLT LENGTHS FOR FLANGES TO BS 1560 AND ASME B.16.5

Rating Nom. Size	900 N°	900 DIA STUD	900 Length RF	900 Length RTJ	1500 N°	1500 DIA STUD	1500 Length RF	1500 Length RTJ	2500 N°	2500 DIA STUD	2500 Length RF	2500 Length RTJ
1/2"	4	3/4"	4 1/4	4 1/4	4	3/4"	4 1/4	4 1/4	4	3/4"	43/4	4 3/4
		M20	110	110		M20	110	110		M20	110	125
3/4"	4	3/4"	4 1/2	4 1/2	4	3/4"	4 1/2	4 1/2	4	3/4"	5	5
		M20	115	115		M20	115	115		M20	130	130
1"	4	7/8"	5	5	4	7/8"	5	5	4	7/8"	5 1/2	5 1/2
		M22	130	130		M22	130	130		M22	140	140
1 1/4"	4	7/8"	5	5	4	7/8"	5	5	4	1"	6	6
		M22	130	130		M22	130	130		M27	155	155
1 1/2"	4	1"	5 1/2	5 1/2	4	1"	5 1/2	5 1/2	4	1 1/8"	5 3/4	5 3/4
		M27	140	140		M27	140	140		M30	175	175
2"	8	7/8"	5 3/4	5 3/4	8	7/8"	5 3/4	5 3/4	8	1"	7	7
		M22	150	150		M22	150	150		M27	180	180
2 1/2"	8	1"	6 1/4	6 1/4	8	1"	6 1/4	6 1/4	8	1 1/8"	7 3/4	8
		M27	160	160		M27	160	160		M30	200	205
3"	8	7/8"	5 3/4	5 3/4	8	1 1/8"	7	7	8	1 1/4"	8 3/4	9
		M22	150	150		M30	180	180		M33	225	230
4"	8	1 1/8"	6 3/4	6 3/4	8	1 1/4"	7 3/4	7 3/4	8	1 1/2"	10	10 1/4
		M30	175	175		M33	200	200		M39	255	265
5"	8	1 1/4"	7 1/2	7 1/2	8	1 1/2"	9 3/4	9 3/4	8	1 3/4"	11 3/4	12 1/4
		M33	195	195		M39	250	250		M45	300	315
6"	12	1 1/8"	7 1/2	7 3/4	12	1 3/8"	10 1/4	10 1/2	8	2"	13 1/2	14
		M30	195	200		M36	265	270		M52	345	360
8"	12	1 3/8"	8 3/4	8 3/4	12	1 5/8"	11 1/2	12 3/4	12	2"	15	15 1/2
		M36	225	225		M42	295	325		M52	385	395
10"	16	1 3/8"	9 1/4	9 1/4	12	1 7/8"	13 1/4	13 1/2	12	2 1/2"	19 1/4	20
		M36	235	235		M48	340	345		M64	490	510
12"	20	1 3/8"	10	10	16	2"	14 3/4	15 1/4	12	2 3/4"	21 1/4	22
		M36	255	255		M52	375	390		M68	540	560
14"	20	1 1/2"	10 3/4	11	16	2 1/4"	16	16 3/4				
		M39	275	280		M56	410	430				
16"	20	1 5/8"	11 1/4	11 1/2	16	2 1/2"	17 1/2	18 1/2				
		M42	290	295		M64	445	470				
18"	20	1 7/8"	12 3/4	13 1/4	16	2 3/4"	19 1/2	20 3/4				
		M48	325	340		M68	500	530				
20"	20	2"	13 3/4	14 1/4	16	3"	21 1/4	22 1/4				
		M52	350	365		M76	540	570				
24"	20	2"	17 1/4	18	16	3 1/2"	24 1/4	25 1/2				
		M52	440	460		M80	620	650				

WEIGHT TABLES

HEAVY HEX NUTS and HEAVY HEX JAM NUTS

Kg. /1000 pcs.

Nom. Size	HEAVY HEX	HEAVY HEX JAM	REGULAR HEX	REGULAR HEX JAM
1/4"	5,4	2,8	3,3	2,3
5/16"	8,2	5,9	5,0	3,5
3/8"	14,9	11,0	7,2	4,7
7/16"	20,0	15,6	12,9	8,5
1/2"	31,4	21,8	17,0	12,0
9/16"	39,3	28,1	26,4	16,8
5/8"	50,3	42,7	33,2	22,5
-	-	-	-	
3/4"	88,0	79,7	53,9	34,8
7/8"	129,0	103,0	86,1	54,5
-	-	-	-	
1"	184,0	162,0	128,0	79,9
1 1/8"	254,0	225,0	172,0	106,1
1 1/4"	330,3	264,0	241,0	160,7
1 3/8"	431,3	322,0	298,0	195,8
1 1/2"	550,0	417,0	401,0	260,2
1 5/8"	713,4	546,0	-	-
1 3/4"	858,9	675,0	-	-
1 7/8"	1.052,3	639,0	-	-
2"	1.290,0	989,0	-	-
2 1/4"	1.818,2	1.088,0	-	-
-	-	-	-	-
2 12"	2.497,0	1.575,0	-	-
-	-	-	-	-
2 3/4"	3.175,0	2.019,0	-	-
3"	3.920,0	2.570,0	-	-
-	-	-	-	-
3 1/4"	4.860,0	3.190,0	-	-
3 1/2"	6.420,0	4.005,0	-	-
3 3/4"	7.800,0	4.802,0	-	-
4"	9.770,0	5.722,0	-	-

HEX METRIC NUTS

Kg. /1000 pcs.

Nom. Size	ISO 4033 UNI 5587	ISO 4032 UNI 5588	ISO 4035 UNI 5589
M 6	2,8	-	-
M 8	5,7	4,6	3,5
-	-	-	-
M 10	12,6	10,0	7,7
M 12	18,1	15,1	11,6
M 14	30,0	23,5	17,6
M 16	37,4	30,4	23,0
M 18	52,2	43,5	33,2
M 20	73,4	58,7	43,8
M 22	88,0	72,0	54,1
M 24	124,2	98,3	73,3
M 27	177,0	144,2	108,6
M 30	252,8	202,2	153,0
M 33	328,0	258,4	196,4
M 36	445,2	358,6	271,1
M 39	588,5	467,8	354,9
M 42	729,8	590,8	450,0
M 45	941,0	752,8	575,1
M 48	1.135,4	898,9	688,3
M 52	1.393,0	1.125,1	865,3
M 56	1.646,0	1.322,7	-
M 60	1.968,8	1.575,0	-
M 64	2.282,7	1.819,0	-
M 68	2.710,0	-	-
M 72	3.217,0	-	-
M 76	3.700,0	-	-
M 80	4.028,0	-	-
M 85	4.537,3	-	-
M 90	5.846,4	-	-
M 95	6.300,0	-	-
M 100	8.060,0	-	-

WASHERS - WEIGHT TABLE

Nom. Size		Kg. /1000 pcs.	Nom. Size		Kg. /1000 pcs.	Nom. Size		Kg. /1000 pcs.
M 6	1/4"	1,1						
M 7		1,4	M 27	1"	42,3	M 60		458
M 8	5/16"	2,2	M 30	1 1/8"	53,6	M 64	2 1/2"	492
M 10	3/8"	4,1	M 33	1 1/4"	75,3	M 68		586
M 12	7/16"	6,3	M 36	1 3/8"	92,1	M 72	2 3/4"	626
M 14	1/2"	8,6	M 39	1 1/2"	133	M 76	3"	749
M 16	9/16-5/8"	11,3	M 42	1 5/8"	183	M 80		953
M 18		14,7	M 45	1 3/4"	220	M 85	3 1/4"	983
M 20	3/4"	17,2	M 48	1 7/8"	294	M 90	3 1/2"	1.250
M 22	7/8"	18,3	M 52	2"	330	M 95	3 3/4"	1.290
M 24		32,3	M 56	2 1/4"	425	M 100	4"	1.710

WEIGHT TABLE - STUDBOLTS WITHOUT NUTS - ANSI TYPE (Kg./Piece)

L	3/8"	7/16"	1/2"	9/16"	5/8"	3/4"	7/8"	1"	1 1/8"	1 1/4"	1 3/8"	1 1/2"
25	0,011	0,015	-	-	-	-	-	-	-	-	-	-
30	0,013	0,018	-	-	-	-	-	-	-	-	-	-
35	0,015	0,021	-	-	-	-	-	-	-	-	-	-
40	0,018	0,024	0,032	-	-	-	-	-	-	-	-	-
45	0,020	0,027	0,036	-	-	-	-	-	-	-	-	-
50	0,022	0,030	0,040	0,051	0,063	0,092	0,127	0,166	0,215	-	-	-
55	0,024	0,033	0,044	0,056	0,069	0,101	0,139	0,183	0,236	-	-	-
60	0,026	0,036	0,048	0,061	0,076	0,111	0,152	0,199	0,258	-	-	-
65	0,029	0,039	0,052	0,066	0,082	0,120	0,165	0,216	0,279	-	-	-
70	0,031	0,042	0,056	0,071	0,088	0,129	0,177	0,233	0,301	-	-	-
75	0,033	0,045	0,060	0,076	0,094	0,138	0,190	0,249	0,322	-	-	-
80	0,035	0,048	0,063	0,081	0,101	0,147	0,203	0,266	0,343	0,431	0,529	-
85	0,037	0,051	0,067	0,086	0,107	0,157	0,215	0,283	0,365	0,458	0,562	-
90	0,040	0,054	0,071	0,092	0,113	0,166	0,228	0,299	0,386	0,485	0,595	-
95	0,042	0,057	0,075	0,097	0,120	0,175	0,241	0,316	0,408	0,512	0,628	-
100	0,044	0,060	0,079	0,102	0,126	0,184	0,253	0,332	0,429	0,539	0,661	-
105	0,046	0,063	0,083	0,107	0,132	0,194	0,266	0,349	0,451	0,566	0,694	-
110	0,048	0,066	0,087	0,112	0,139	0,203	0,279	0,366	0,472	0,592	0,727	-
115	0,051	0,069	0,091	0,117	0,145	0,212	0,291	0,382	0,494	0,619	0,760	-
120	-	0,072	0,095	0,122	0,151	0,221	0,304	0,399	0,515	0,646	0,793	0,954
125	-	0,075	0,099	0,127	0,157	0,230	0,317	0,416	0,537	0,673	0,826	0,993
130	-	0,078	0,103	0,132	0,164	0,240	0,329	0,432	0,558	0,700	0,859	1,033
135	-	-	0,107	0,137	0,170	0,249	0,342	0,449	0,580	0,727	0,892	1,073
140	-	-	0,111	0,142	0,176	0,258	0,355	0,465	0,601	0,754	0,925	1,113
145	-	-	0,115	0,147	0,183	0,267	0,367	0,482	0,623	0,781	0,958	1,152
150	-	-	0,119	0,153	0,189	0,277	0,380	0,499	0,644	0,808	0,991	1,192
155	-	-	-	-	0,195	0,286	0,393	0,515	0,665	0,835	1,024	1,232
160	-	-	-	-	0,202	0,295	0,405	0,532	0,687	0,862	1,057	1,272
165	-	-	-	-	0,208	0,304	0,418	0,548	0,708	0,889	1,090	1,311
170	-	-	-	-	0,214	0,313	0,431	0,565	0,730	0,916	1,123	1,351
175	-	-	-	-	0,220	0,323	0,443	0,582	0,751	0,943	1,156	1,391
180	-	-	-	-	0,227	0,332	0,456	0,598	0,773	0,970	1,189	1,431
185	-	-	-	-	-	-	0,469	0,615	0,794	0,996	1,222	1,470
190	-	-	-	-	-	-	0,481	0,632	0,816	1,023	1,255	1,510
195	-	-	-	-	-	-	0,494	0,648	0,837	1,050	1,288	1,550
200	-	-	-	-	-	-	0,507	0,665	0,859	1,077	1,321	1,590
205	-	-	-	-	-	-	-	0,681	0,880	1,104	1,354	1,629
210	-	-	-	-	-	-	-	0,698	0,902	1,131	1,387	1,669
215	-	-	-	-	-	-	-	0,715	0,923	1,158	1,421	1,709
220	-	-	-	-	-	-	-	0,731	0,945	1,185	1,454	1,749
225	-	-	-	-	-	-	-	0,748	0,966	1,212	1,487	1,788
230	-	-	-	-	-	-	-	0,765	0,987	1,239	1,520	1,828
235	-	-	-	-	-	-	-	0,781	1,009	1,266	1,553	1,868
240	-	-	-	-	-	-	-	0,798	1,030	1,293	1,586	1,908
245	-	-	-	-	-	-	-	-	-	1,320	1,619	1,947
250	-	-	-	-	-	-	-	-	-	1,347	1,652	1,987
255	-	-	-	-	-	-	-	-	-	1,373	1,685	2,027
260	-	-	-	-	-	-	-	-	-	1,400	1,718	2,066
265	-	-	-	-	-	-	-	-	-	1,427	1,751	2,106
270	-	-	-	-	-	-	-	-	-	1,454	1,784	2,146
275	-	-	-	-	-	-	-	-	-	-	1,817	2,186
280	-	-	-	-	-	-	-	-	-	-	1,850	2,225
285	-	-	-	-	-	-	-	-	-	-	1,883	2,265
290	-	-	-	-	-	-	-	-	-	-	-	2,305
295	-	-	-	-	-	-	-	-	-	-	-	2,345
300	-	-	-	-	-	-	-	-	-	-	-	2,384
305	-	-	-	-	-	-	-	-	-	-	-	2,424
310	-	-	-	-	-	-	-	-	-	-	-	2,464
315	-	-	-	-	-	-	-	-	-	-	-	2,504

WEIGHT TABLE - STUDBOLTS WITHOUT NUTS - ANSI TYPE (Kg./Piece)

L	1 5/8"	1 3/4"	1 7/8"	2"	2 1/4"	2 1/2"	2 3/4"	3"	3 1/4"	3 1/2"	3 3/4"	4"
120	1,129	1,320	1,526	1,746	2,232	-	-	-	-	-	-	-
125	1,176	1,374	1,589	1,819	2,325	-	-	-	-	-	-	-
130	1,223	1,429	1,653	1,891	2,418	-	-	-	-	-	-	-
135	1,270	1,484	1,716	1,964	2,511	3,125	3,806	4,554	-	-	-	-
140	1,317	1,539	1,780	2,037	2,604	3,241	3,947	4,723	-	-	-	-
145	1,364	1,594	1,843	2,110	2,697	3,356	4,088	4,891	-	-	-	-
150	1,411	1,649	1,907	2,182	2,790	3,472	4,229	5,060	5,967	6,946	8,000	9,129
155	1,458	1,704	1,971	2,255	2,883	3,588	4,370	5,228	6,166	7,177	8,267	9,434
160	1,505	1,759	2,034	2,328	2,976	3,704	4,511	5,397	6,365	7,409	8,534	9,738
165	1,552	1,814	2,098	2,401	3,069	3,819	4,652	5,566	6,564	7,640	8,800	10,042
170	1,599	1,869	2,161	2,473	3,162	3,935	4,793	5,734	6,763	7,872	9,067	10,347
175	1,646	1,924	2,225	2,546	3,255	4,051	4,933	5,903	6,961	8,103	9,334	10,651
180	1,693	1,979	2,288	2,619	3,348	4,167	5,074	6,072	7,160	8,335	9,600	10,955
185	1,740	2,034	2,352	2,692	3,441	4,282	5,215	6,240	7,359	8,566	9,867	11,260
190	1,787	2,089	2,416	2,764	3,534	4,398	5,356	6,409	7,558	8,798	10,134	11,564
195	1,835	2,144	2,479	2,837	3,627	4,514	5,497	6,578	7,757	9,029	10,400	11,868
200	1,882	2,199	2,543	2,910	3,720	4,629	5,638	6,746	7,956	9,261	10,667	12,173
205	1,929	2,254	2,606	2,983	3,813	4,745	5,779	6,915	8,155	9,492	10,934	12,477
210	1,976	2,309	2,670	3,055	3,906	4,861	5,920	7,084	8,354	9,724	11,200	12,781
215	2,023	2,364	2,733	3,128	3,999	4,977	6,061	7,252	8,553	9,955	11,467	13,086
220	2,070	2,419	2,797	3,201	4,092	5,092	6,202	7,421	8,752	10,187	11,734	13,390
225	2,117	2,474	2,861	3,274	4,185	5,208	6,343	7,590	8,950	10,418	12,000	13,694
230	2,164	2,529	2,924	3,346	4,278	5,324	6,484	7,758	9,149	10,650	12,267	13,998
235	2,211	2,584	2,988	3,419	4,371	5,440	6,625	7,927	9,348	10,881	12,534	14,303
240	2,258	2,639	3,051	3,492	4,464	5,555	6,766	8,096	9,547	11,113	12,800	14,607
245	2,305	2,694	3,115	3,565	4,557	5,671	6,907	8,264	9,746	11,344	13,067	14,911
250	2,352	2,749	3,178	3,637	4,650	5,787	7,048	8,433	9,945	11,576	13,334	15,216
255	2,399	2,804	3,242	3,710	4,743	5,903	7,189	8,602	10,144	11,808	13,600	15,520
260	2,446	2,859	3,306	3,783	4,836	6,018	7,330	8,770	10,343	12,039	13,867	15,824
265	2,493	2,914	3,369	3,856	4,929	6,134	7,471	8,939	10,542	12,271	14,134	16,129
270	2,540	2,969	3,433	3,928	5,022	6,250	7,612	9,108	10,740	12,502	14,400	16,433
275	2,587	3,024	3,496	4,001	5,115	6,366	7,753	9,276	10,939	12,734	14,667	16,737
280	2,634	3,079	3,560	4,074	5,208	6,481	7,894	9,445	11,138	12,965	14,934	17,042
285	2,681	3,134	3,623	4,147	5,301	6,597	8,035	9,614	11,337	13,197	15,201	17,346
290	2,728	3,189	3,687	4,219	5,394	6,713	8,175	9,782	11,536	13,428	15,467	17,650
295	2,775	3,244	3,750	4,292	5,487	6,828	8,316	9,951	11,735	13,660	15,734	17,955
300	2,822	3,299	3,814	4,365	5,580	6,944	8,457	10,120	11,934	13,891	16,001	18,259
305	2,869	3,354	3,878	4,438	5,673	7,060	8,598	10,288	12,133	14,123	16,267	18,563
310	2,916	3,409	3,941	4,510	5,766	7,176	8,739	10,457	12,332	14,354	16,534	18,868
315	2,963	3,464	4,005	4,583	5,859	7,291	8,880	10,626	12,531	14,586	16,801	19,172
320	3,011	3,519	4,068	4,656	5,952	7,407	9,021	10,794	12,729	14,817	17,067	19,476
325	3,058	3,574	4,132	4,729	6,045	7,523	9,162	10,963	12,928	15,049	17,334	19,780
330	3,105	3,629	4,195	4,801	6,138	7,639	9,303	11,132	13,127	15,280	17,601	20,085
335	3,152	3,684	4,259	4,874	6,231	7,754	9,444	11,300	13,326	15,512	17,867	20,389
340	3,199	3,739	4,323	4,947	6,324	7,870	9,585	11,469	13,525	15,743	18,134	20,693
345	3,246	3,794	4,386	5,020	6,417	7,986	9,726	11,638	13,724	15,975	18,401	20,998
350	3,293	3,849	4,450	5,092	6,510	8,102	9,867	11,806	13,923	16,206	18,667	21,302
355	3,340	3,904	4,513	5,165	6,603	8,217	10,008	11,975	14,122	16,438	18,934	21,606
360	3,387	3,959	4,577	5,238	6,696	8,333	10,149	12,144	14,321	16,669	19,201	21,911
365	3,434	4,014	4,640	5,311	6,789	8,449	10,290	12,312	14,520	16,901	19,467	22,215
370	3,481	4,069	4,704	5,383	6,882	8,565	10,431	12,481	14,718	17,132	19,734	22,519
375	3,528	4,123	4,768	5,456	6,975	8,680	10,572	12,650	14,917	17,364	20,001	22,824
380	3,575	4,178	4,831	5,529	7,068	8,796	10,713	12,818	15,116	17,596	20,267	23,128
385	3,622	4,233	4,895	5,602	7,161	8,912	10,854	12,987	15,315	17,827	20,534	23,432
390	3,669	4,288	4,958	5,674	7,254	9,027	10,995	13,156	15,514	18,059	20,801	23,737
395	3,716	4,343	5,022	5,747	7,347	9,143	11,136	13,324	15,713	18,290	21,067	24,041
400	3,763	4,398	5,085	5,820	7,440	9,259	11,277	13,493	15,912	18,522	21,334	24,345
405	3,810	4,453	5,149	5,893	7,533	9,375	11,418	13,662	16,111	18,753	21,601	24,650
410	3,857	4,508	5,213	5,965	7,626	9,490	11,558	13,830	16,310	18,985	21,867	24,954

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