

Understanding Unbrako

technical brochure



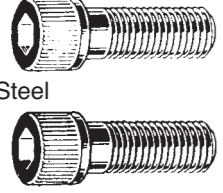
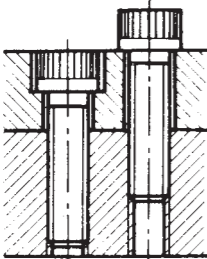

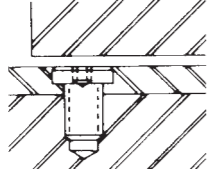
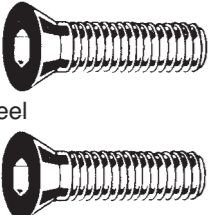
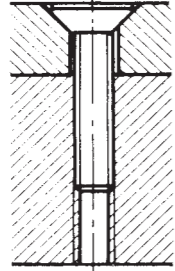
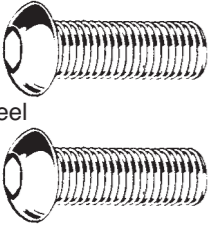
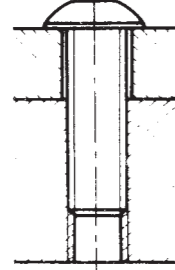

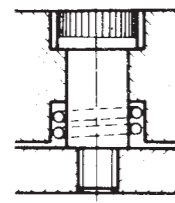
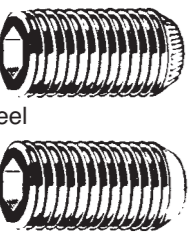
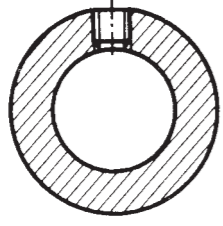
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Due to a continuous policy of research and development Unbrako reserve the right to alter the specification of any product without prior notice.

Performance data listed is for standard production items only. Non stock items may vary due to variables in methods of manufacture. It is recommended that the user verify performance on any non-standard parts for critical applications.

QUICK SELECTION GUIDE

Type	Application	Features
Socket Head Cap Screws  Alloy Steel Stainless Steel		Suitable for all high tensile applications. Use stainless for corrosive-cryogenic or elevated temperatures.
Socket Low Head Cap Screw  Alloy Steel		Suitable for use in parts too thin for std. SHCS; and for applications with limited clearances.
Countersunk Socket Head Screws  Alloy Steel Stainless Steel		Controlled angle under the head ensures maximum flushness and sidewall contact. Non-slip Hex socket prevents marring of material. Note: Inclined angle under the head varies as follows: BSW & BSF Threads - 90°C UNC & UNF Threads - 82°C Metric Threads - 90°C Above M20 - 60°C
Button Head Screws  Alloy Steel Stainless Steel		Low heads streamline design. Use them in materials too thin to countersink; also for non-critical loading requiring heat treated screws.
Shoulder Screws  Alloy Steel		Replaces costly special parts - shafts, pivots, pins, guides, linkages and trunnion mountings. Also standard for tool and die industries.
Socket Set Screws  Alloy Steel Stainless Steel		Fasten collars, sleeves, gears, knobs on shafts. Locate machine parts Cone, half dog, oval, cup and self locking knurled cup points are standard.

QUICK SELECTION GUIDE

Maximum Operating Temperature Unplated	Material	Corrosion Resistance	Magnetic or Non-Magnetic	Page
300°C	High Grade Unbrako Alloy Steel	Plating Optional	Magnetic	4 to 18
430°C	Austenitic Stainless Steel	Excellent	Non-Magnetic	
300°C	High Grade Unbrako Alloy Steel	Plating Optional	Magnetic	11
300°C	High Grade Unbrako Alloy Steel	Plating Optional	Magnetic	19 to 26
430°C	Austenitic Stainless Steel	Excellent	Non-Magnetic	
300°C	High Grade Unbrako Alloy Steel	Plating Optional	Magnetic	27 to 30
430°C	Austenitic Stainless Steel	Excellent	Non-Magnetic	
300°C	High Grade Unbrako Alloy Steel	Fair	Magnetic	41 to 44
300°C	High Grade Unbrako Alloy Steel	Plating Optional	Magnetic	31 to 39
430°C	Austenitic Stainless Steel	Excellent	Non-Magnetic	

SOCKET HEAD CAP SCREWS

If you use fasteners, you know their importance in today's technology. Higher pressures, higher stresses and higher speeds demand stronger, more reliable joints, and stronger, more reliable fasteners to hold them together. Parts must stay together. A single failure can destroy valuable equipment or stop an assembly line. Reliability must be total.

This is why industry is using more and more socket head cap screws, the strongest threaded fasteners you buy "off the shelf". They have the extra strength and fatigue resistance required for total reliability in high strength fastening.

Tensile and Fatigue Strength

Unbrako socket head cap screws have the highest levels of strength and fatigue resistance in the industry. They exceed all government and industry standards. Instead of the usual range of 1220 N/mm², minimum tensile strength levels of Unbrako cap screws are consistently 1300 N/mm². At the same time ductility and fatigue resistance are not sacrificed.

When you buy tension fasteners (which is what socket head cap screws basically are) you're buying clamping force - the ability to hold things together. The additional strength offered by Unbrako screws can save pounds, if you use the screws correctly.

The extra strength of Unbrako screws allows the use of either fewer fasteners of the same size, or the same number of smaller screws to achieve the same clamping force. With fewer fasteners you save on drilling and tapping and have fewer screws to buy and install. If you go the other way, smaller screws generally cost less and permit reduced assembly size, saving space, material and weight.

If you have dynamic stress or varying load conditions, the exceptional fatigue resistance of Unbrako screws gives you an additional bonus of built-in protection against fatigue failure.

Design

One of three major factors in the superiority of Unbrako socket head screws is design. For example, socket depth is carefully controlled. The socket is deep enough for full tightening without reaming and cracking, but not deep enough to weaken the head area and cause failure.

Inspired by our research and development of aerospace fasteners, another major feature on Unbrako socket screws is the Radiused-Root-Runout. The root of the thread runout is also radiused to eliminate the usual sharp 'V' - a major point of weakness in other threads. Fatigue life in this critical area is increased as much as 300% in certain sizes.

Class 4g 6g tolerances are standard, the closest without selective assembly. They combine maximum cross-section with smooth assembly, and assure better mating of parts.

The elliptical fillet at the juncture of head and shank is another aerospace-inspired Unbrako development. This compound curve more than doubles fatigue life in the head

area without reduction of critical bearing area. Discontinuity is minimised and stress concentrations are reduced, providing an added margin of safety. Heads are correctly proportioned to screw size, assuring full clamping force without indentation and loss of preload.

Properties

Second major factor in Unbrako socket screw superiority is their physical properties. These are no accident. Consistently higher stress levels area direct result of customised heat treatment. Carbon content of furnace atmospheres is closely controlled, since carburisation (too much carbon) makes screws brittle, while decarburisation (too little carbon) results in soft surface with poor strength and resistance to wear. Every melt of Unbrako steel is pre-tested and its treatment tailored to produce a consistent part.

Manufacturing Control

Closely controlled manufacturing is the third factor. Rigid control of every operation of a socket screw is necessary in order to guarantee performance.

Heads of standard Unbrako socket screws are forged, not machined. Machining cuts metal fibres, breaks flow lines, creates planes of weakness at stress points. Forging, on the other hand, forms metal, produces uniform grain flow, makes heads stronger by compressing the metal. Head bearing area is strictly perpendicular to screw body to avoid strains and misalignment. Fillet areas are precisely controlled, with fillets made glass smooth to eliminate surface irregularities where cracks can start.

Radiused threads of standard Unbrako screws are rolled, not ground or cut. Rolled threads are more uniform and closer tolerances can be maintained because thread roll dies and rolling techniques produce smoother surfaces and more accurate size control. High points and planes of weakness are avoided.

Plating

Plating becomes more critical as the demand for plated screws increases. Unbrako socket screws that are to be plated are accurately controlled to be within tolerance after plating. Precision plating thickness brings screws to correct dimensions, while rigid control of the plating process guards against screw failure from hydrogen embrittlement. This is a brittle condition caused by hydrogen diffusing into the base material during cleaning and electroplating. It can cause screw failure long after the screw is tightened, but can be avoided by the extreme care Unbrako take in processing plated socket screws.

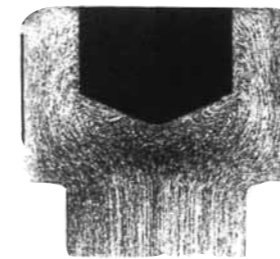
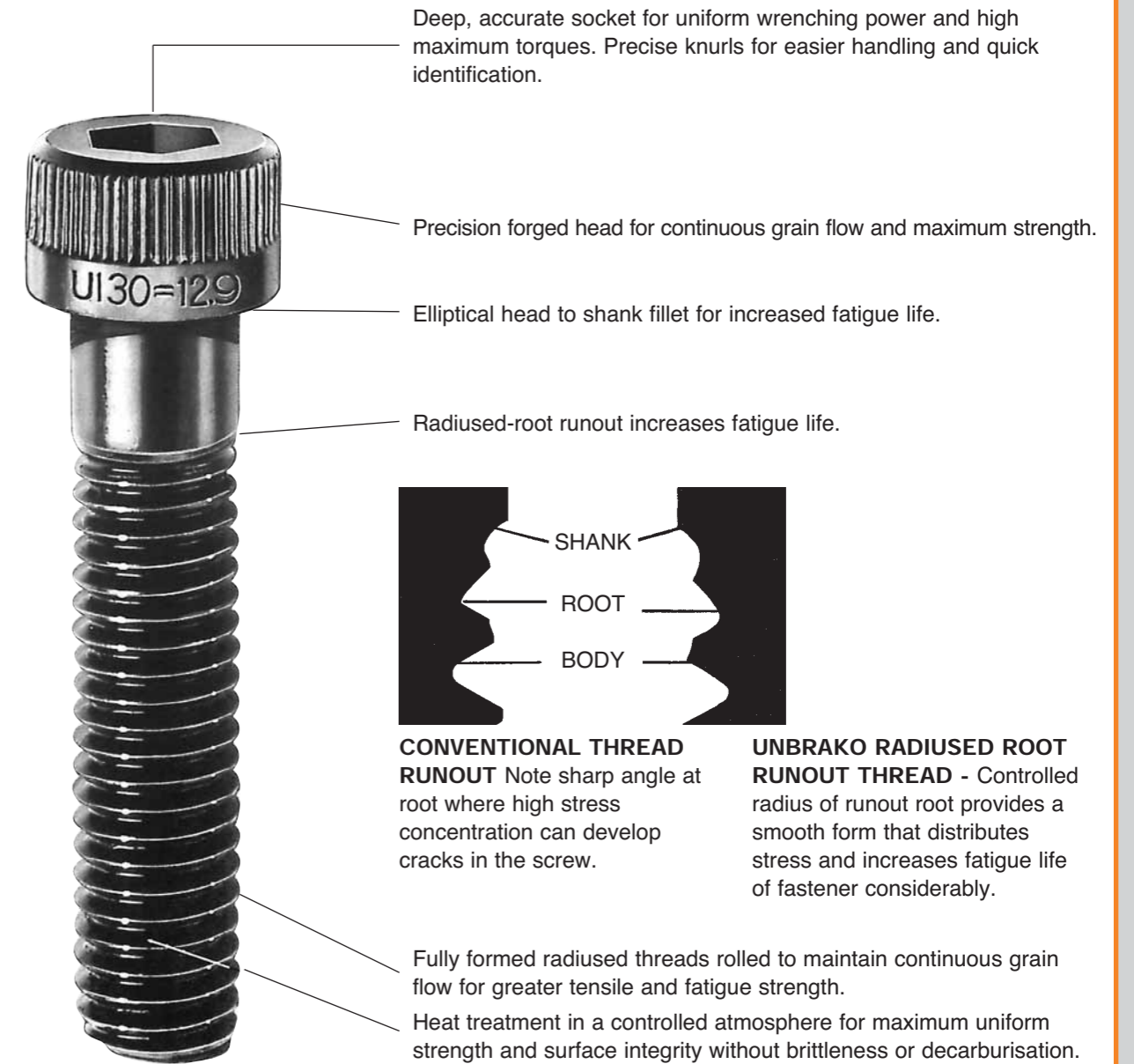
Unbrako Socket Screws pay off in Savings

You get extra safety and reliability in Unbrako socket screws, plus significant economies, both in the cost of the fasteners and the cost of their installation. Furthermore, they protect the reputation of your product, which can well depend on the fasteners that hold it together.

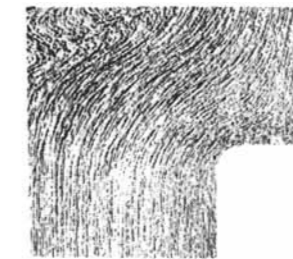
These are considerations too important to overlook as production costs continue to rise and reliability requirements become more exacting.

"YOU'RE SAFER WITH UNBRAKO"

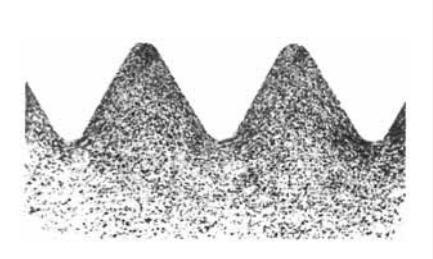
UNBRAKO DEVELOPMENTS MEAN - Extra Strength Where It Counts



Accurate control of socket depth gives more wrench engagement than other screws, permitting full tightening without cracking or reaming the socket, yet maintaining ample metal in the crucial fillet area for maximum head strength.

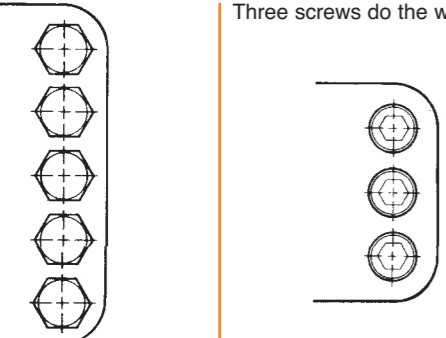
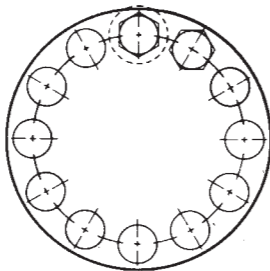
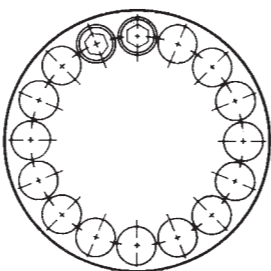


Controlled head forging forms uniform grain flow with unbroken flow lines, makes heads stronger, prevents failure in vital fillet area and adds to fatigue strength of the screw.

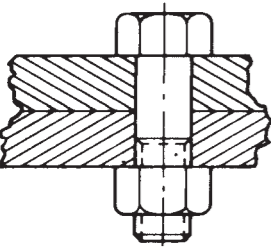
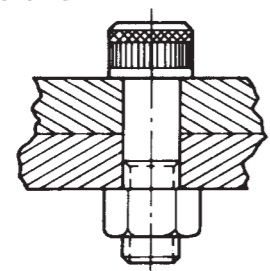
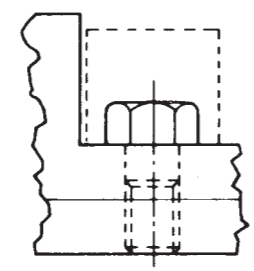
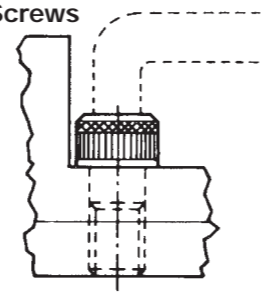


Cross-section of radiused fully formed threads. Contour following flow lines provide extra shear strength in threads, resist stripping and provide high fatigue resistance. Note the large root radius, an Unbrako socket screw development that increases fatigue life of the threads.

APPLICATIONS

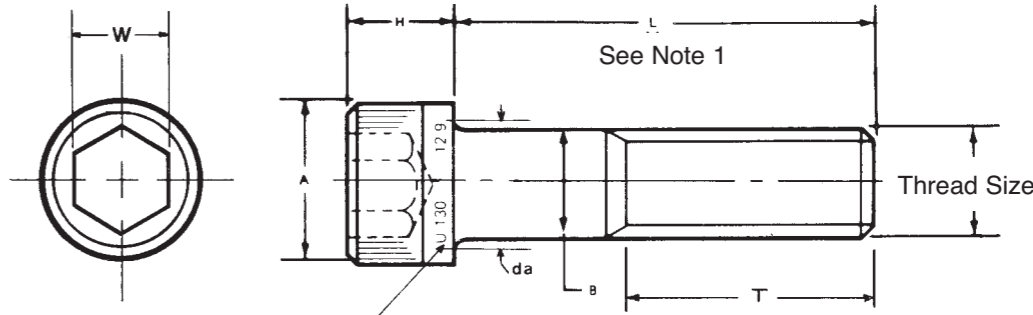
FEWER HOLES TO DRILL AND TAP 		COMPACT SPACING Clearance for socket wrench 		No wrench clearance necessary 	
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Old Method 5 - M10 Screws @ 800 N/mm ² tensile 640 N/mm ² yield = 5 x 640 x 58 = 186 kN max. load	Unbrako Method 3 - M10 Screws @ 1300 N/mm ² tensile 1170 N/mm ² yield = 3 x 1170 x 58 = 204 kN max. load	Old Method 12 - M16 Hexagon Head Screws @ 800 N/mm ² tensile strength Total strength = 1206 kN	Unbrako Method 16 - M16 Socket Head Cap Screws @ 1300 N/mm ² tensile strength Total strength = 2940 kN
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HIGH TENSILE AND YIELD STRENGTH Ordinary Bolts 		Socket Head Cap Screws 	
HIGH SHEAR STRENGTH Ordinary Bolts 		Socket Head Cap Screws 	

Old Method 800 N/mm ² M12 Bolt tensile = 67 kN yield = 54 kN	Unbrako Method 1300 N/mm ² M12 Unbrako Bolt tensile = 110 kN yield = 99 kN Extra Unbrako Joint Strength: tensile = 64% Increase yield = 83% Increase	Old Method 800 N/mm ² M12 Bolt Shear Strength = 40 kN	Unbrako Method 1300 N/mm ² M12 Unbrako Bolt Shear Strength = 66 kN Extra Unbrako Shear Strength = 26 kN less wrenching space needed
Example (shown above) - against adjacent machine parts Unbrako Screw requires 50% less space for clearance. In counterbored screw application Unbrako Screws require minimum counterbore since no wrench clearance is necessary.			

SOCKET HEAD CAP SCREWS - ISO Metric



Identification for M5 diameter and larger

Applicable or Similar Specifications:
 Product BS 4168
 DIN 912
 ISO 4762
 Grade BS 6104 Grade 12.9
 ISO 898/1 Grade 12.9

DIMENSIONS AND TIGHTENING TORQUES - ISO Metric Threads

Thread Size (B Max.)	Pitch	A Max.	da Max.	H Max.	W Nom.	SEE NOTE 2 L	Length of Thread T (Ref)	Maximum Tightening Torques					
								Unplated		Plated		Induced Load	
								Nm	lbf.in.	Nm	lbf.in.	kN	lbf.
M3	0.50	5.50	3.60	3.00	2.5	20	18	2.1	18.6	1.6	14.2	3.99	890
M4	0.70	7.00	4.70	4.00	3.0	25	20	4.6	40.7	3.5	31.0	6.75	1510
M5	0.80	8.50	5.70	5.00	4.0	25	22	9.5	84.1	7.1	62.8	11.10	2480
M6	1.00	10.00	6.80	6.00	5.0	30	24	16.0	142.0	12.0	106.0	15.60	3480
M8	1.25	13.00	9.20	8.00	6.0	35	28	39.0	345.0	29.0	257.0	28.70	6400
M10	1.50	16.00	11.20	10.00	8.0	40	32	77.0	682.0	58.0	513.0	45.70	10200
M12	1.75	18.00	13.70	12.00	10.0	50	36	135.0	1200.0	101.0	894.0	66.70	14900
(M14)	2.00	21.00	15.70	14.00	12.0	55	40	215.0	1900.0	161.0	1420.0	91.30	20400
M16	2.00	24.00	17.70	16.00	14.0	60	44	330.0	2920.0	248.0	2190.0	126.00	28100
(M18)	2.50	27.00	20.20	18.00	14.0	65	48	455.0	4030.0	341.0	3020.0	153.00	34100
M20	2.50	30.00	22.40	20.00	17.0	70	52	650.0	5750.0	488.0	4320.0	197.00	44000
(M22)	2.50	33.00	24.40	22.00	17.0	70	56	870.0	7700.0	652.0	5770.0	245.00	54700
M24	3.00	36.00	26.40	24.00	19.0	80	60	1100.0	9740.0	825.0	7300.0	284.00	63400
M27	3.00	40.00	30.40	27.00	19.0	90	66	1650.0	14600.0	1238.0	11000.0	374.00	83400
M30	3.50	45.00	33.40	30.00	22.0	100	72	2250.0	19900.0	1688.0	15000.0	454.00	101000
M33	3.50	50.00	36.40	33.00	24.0	100	78	3050.0	27000.0	2287.0	20200.0	550.00	123000
M36	4.00	54.00	39.40	36.00	27.0	110	84	3850.0	34100.0	2888.0	25000.0	664.00	148000
M42	4.50	63.00	45.60	42.00	32.0	130	96	6270.0	55500.0	4700.0	41600.0	889.00	198000

ALL DIMENSIONS IN MILLIMETRES. SIZES IN BRACKETS ARE NON-PREFERRED STANDARDS.

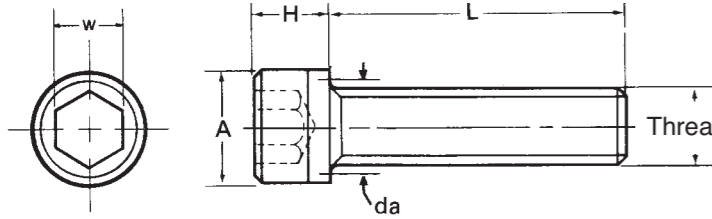
MECHANICAL PROPERTIES

Material	Unbrako High Grade Alloy Steel	
Heat Treatment	Rc 40-43	
Screw Size	≤M16	>M16
Tensile Strength	1300 N/mm ²	1250 N/mm ²
Yield Strength	1170 N/mm ²	1124 N/mm ²
Shear Strength	780 N/mm ²	750 N/mm ²
Min. Elongation	9%	9%

NOTES:

- Thread and Grip Lengths are shown on Pages 8 & 9.
- Screws with lengths equal or shorter than listed in column 'L' will be threaded to head.
- Thread Class:** 4g 6g
- da:** Transition Diameter
- Working Temperature:** -50°C +300°C
- Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma_{0.2} = 1080 \text{ N/mm}^2$ and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated.

SOCKET HEAD CAP SCREWS - ISO Metric Micro Screws



Applicable or Similar Specifications:

Product BS 4168
DIN 912
ISO 4762
Grade BS 6104 Grade 12.9
ISO 898/1 Grade 12.9

DIMENSIONS AND TIGHTENING TORQUES - ISO Metric Threads

Thread Size	Pitch	A Max.	da Max.	H Max.	Length L		W Nom.	Maximum Tightening Torques				Induced Load	
					Min.	Max.		Unplated		Plated		N	lbf.
								Nm	lbf.in.	Nm	lbf.in.		
M1.4	0.30	2.6	1.8	1.4	3	6	1.27	0.20	1.8	0.15	1.3	733	164
M1.6	0.35	3.0	2.0	1.6	3	6	1.50	0.29	2.6	0.22	2.0	930	208
(M1.7)	0.35	3.0	2.1	1.7	3	6	1.50	0.35	3.1	0.26	2.3	1100	246
M1.8	0.35	3.4	2.3	1.8	3	6	1.50	0.44	3.9	0.33	2.9	1300	291
M2	0.40	3.8	2.6	2.0	3	12	1.50	0.60	5.3	0.45	4.0	1550	347
(M2.3)	0.40	4.0	2.9	2.3	4	15	2.00	0.95	8.4	0.71	6.3	2230	500
M2.5	0.45	4.5	3.1	2.5	4	15	2.00	1.21	10.7	0.90	8.0	2590	580
(M2.6)	0.45	4.5	3.2	2.6	4	15	2.00	1.37	12.1	1.03	9.1	2860	640

ALL DIMENSIONS IN MILLIMETRES. SIZES IN BRACKETS ARE NON-PREFERRED STANDARDS.

MECHANICAL PROPERTIES

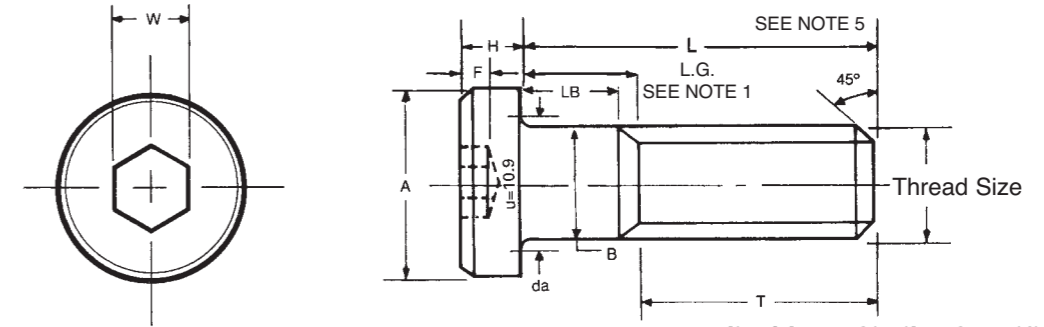
Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 40-43
Tensile Strength 1300 N/mm²
Yield Strength 1170 N/mm²
Shear Strength 780 N/mm²
Min. Elongation 9%

NOTES:

- Thread Class:** 4g 6g
- da:** Transition Diameter
- Working Temperature:** -50°C +300°C
- Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma 0.2 = 1080 \text{ N/mm}^2$ and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated.

Length 'L' Tolerance (mm)		
Screws Over	Up to and including	Tolerance
-	3.0	±0.20
3.0	6.0	±0.24
6.0	-	±0.25

SOCKET HEAD CAP SCREWS - Low Head ISO Metric



Applicable or Similar Specifications:

Grade BS 6104 Grade 10.9
ISO 898/1 Grade 10.9

DIMENSIONS and TIGHTENING TORQUES - ISO Metric Threads

Thread Size (B max.)	Pitch	A Max.	da Max.	F Min.	H Max.	T Min.	W Nom.	Maximum Tightening Torques				Induced Load	
								Unplated		Plated		kN	lbf.
								Nm	lbf.in.	Nm	lbf.in.		
M4	0.70	7.0	4.7	1.48	2.8	20	3	3.8	33.6	2.9	25.7	5.65	1270
M5	0.80	8.5	5.7	1.85	3.5	22	4	8.0	70.8	6.0	53.1	9.20	2068
M6	1.00	10.0	6.8	2.09	4.0	24	5	13.0	115.0	9.8	86.7	13.00	2920
M8	1.25	13.0	9.2	2.48	5.0	28	6	32.0	283.0	24.0	212.0	23.90	5370
M10	1.50	16.0	11.2	3.36	6.5	32	8	64.0	566.0	48.0	425.0	38.00	8540
M12	1.75	18.0	14.2	4.26	8.0	36	10	110.0	974.0	83.0	735.0	55.50	12470
M16	2.00	24.0	18.2	4.76	10.0	44	12	275.0	2434.0	206.0	1820.0	105.00	23600
M20	2.50	30.0	22.4	6.07	12.5	52	14	550.0	4870.0	405.0	3585.0	164.00	36800

ALL DIMENSIONS IN MILLIMETRES.

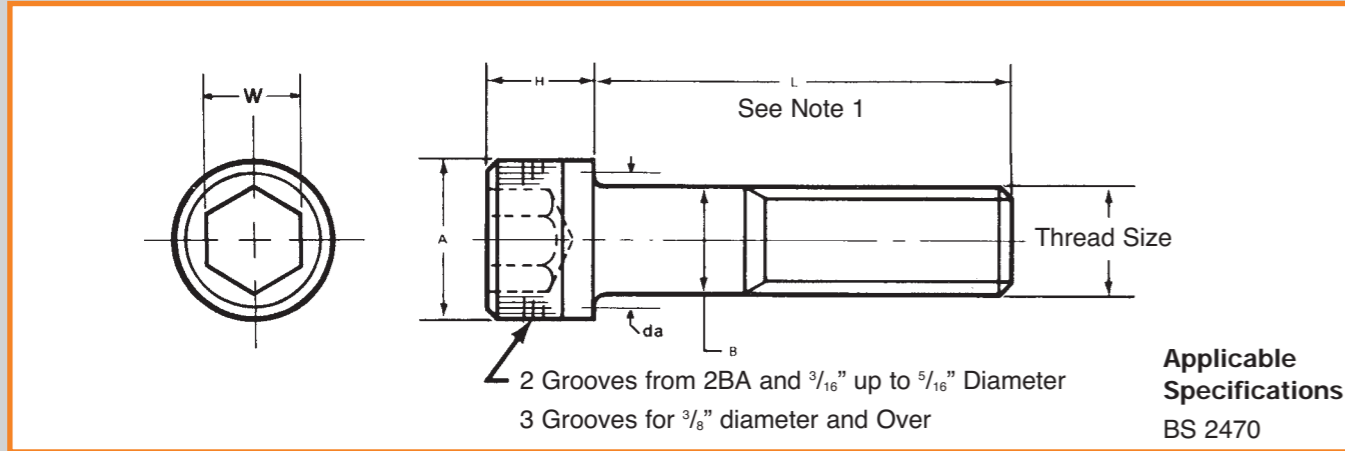
MECHANICAL PROPERTIES

Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 33-39
Tensile Strength 1040 N/mm²
Yield Strength 940 N/mm²
Shear Strength 624 N/mm²
Min. Elongation 9%

NOTES:

- Thread and Grip Lengths are shown on Pages 8 & 9.
- Thread Class:** 4g 6g
- da:** Transition Diameter
- Working Temperature:** -50°C +300°C
- See Page 9 for Length Tolerance.
- Sizes M5 and larger are stamped U 10.9. Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma 0.2 = 900 \text{ N/mm}^2$ and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated.

SOCKET HEAD CAP SCREWS - 1936 Series BA, BSW and BSF Threads



DIMENSIONS AND TIGHTENING TORQUES - BA, BSW and BSF Threads

Thread Size	Threads Per Inch BA	A Max.	B Max.	da Max.	H Max.	W Nom.	Maximum Tightening Torques lbf. in.				Induced Load lbf.	
							Unplated Plated		BA			
8BA	59.1	0.140	0.0866	0.1026	0.087	1/16	5.0		4	359		
7BA	52.9	0.161	0.0984	0.1144	0.098	1/16	8.5		6	467		
6BA	47.9	0.187	0.1102	0.1282	0.110	5/64	12.0		9	589		
5BA	43.1	0.219	0.1260	0.1460	0.126	3/32	19.0		15	779		
4BA	38.5	0.219	0.1417	0.1617	0.142	3/32	24.0		18	991		
3BA	34.8	0.250	0.1614	0.1854	0.161	1/8	35.0		27	1297		
2BA	31.4	0.312	0.1850	0.2130	0.187	5/32	49.0		37	1729		
1BA	28.2	0.312	0.2087	0.2367	0.209	5/32	80.0		60	2210		
OBA	25.4	0.375	0.2362	0.2642	0.236	3/16	144.0		108	2849		
	BSW BSF						BSW BSF	BSW BSF	BSW BSF	BSW BSF		
1/8	40	-	0.219	0.1250	0.1460	3/32	14	-	11	-	721	-
3/16	24	32	0.312	0.1875	0.2155	5/32	44	50	33	38	1538	1753
1/4	20	26	0.375	0.2500	0.2780	3/16	108	144	81	108	2772	2951
			lbf.ft.									
5/16	18	22	0.437	0.3125	0.3465	7/32	23	23	18	18	4588	4956
3/8	16	20	0.562	0.3750	0.4150	5/16	44	49	33	37	6813	7364
7/16	14	18	0.625	0.4375	0.4835	5/16	68	74	51	55	9365	10180
1/2	12	16	0.750	0.5000	0.5520	3/8	101	111	76	83	12140	13390
9/16	12	16	0.812	0.5625	0.6225	3/8	154	169	116	124	16452	17847
5/8	11	14	0.875	0.6250	0.6890	1/2	184	193	138	145	20020	21470
3/4	10	12	1.000	0.7500	0.8280	9/16	297	308	223	231	29680	30480
7/8	9	11	1.125	0.8750	0.9630	9/16	518	488	389	366	41030	43180
1	8	10	1.312	1.0000	1.1000	5/8	758	789	569	592	53890	56920
1 1/8	7	9	1.500	1.1250	1.2350	3/4	934	993	700	744	49820	52890
1 1/4	7	9	1.750	1.2500	1.3700	3/4	1318	1390	988	1043	63230	66760
1 3/8	6	8	1.875	1.3750	1.5050	3/4	1330	1418	997	1063	57990	61880
1 1/2	6	8	2.000	1.5000	1.6400	1	2291	2430	1717	1823	91640	97230
1 5/8	5	8	2.250	1.6250	1.7500	1	-	3132	-	2349	-	115600
1 3/4	5	7	2.500	1.7500	1.9100	1 1/4	3610	3874	2708	2905	123800	132800
2	4 1/2	7	2.750	2.0000	2.1800	1 3/8	5425	5907	4073	4430	162900	177200

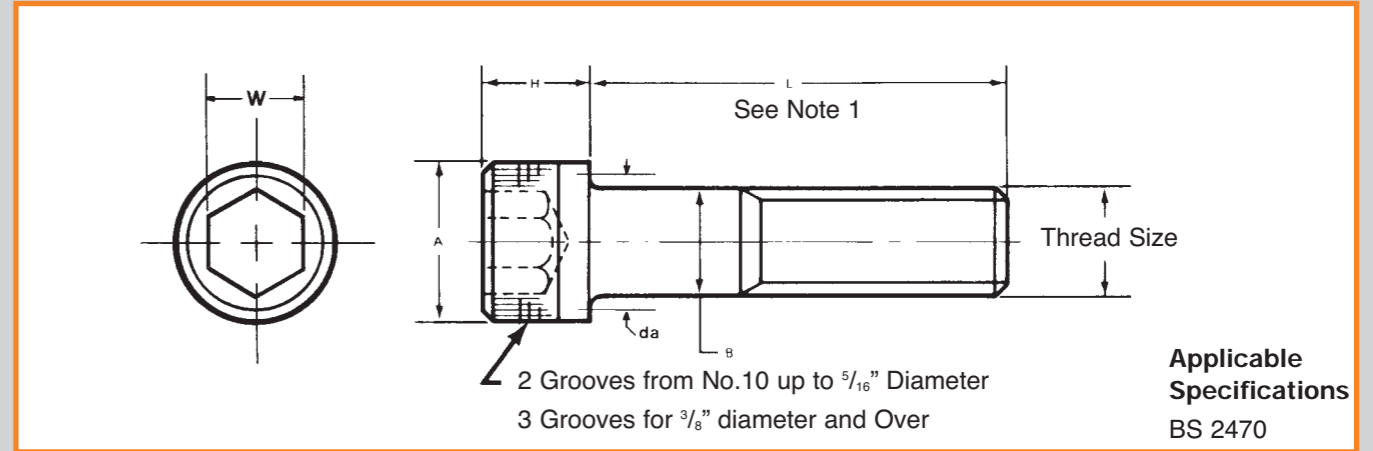
MECHANICAL PROPERTIES

Material	Unbrako High Grade Alloy Steel
Heat Treatment	Rc 39-43
Screw Size	≤0.500 >0.500
Tensile Strength	190,000 lbf/in ² 180,000 lbf/in ²
Yield Strength	170,000 lbf/in ² 162,000 lbf/in ²
Shear Strength	114,000 lbf/in ² 108,000 lbf/in ²
Min. Elongation	9% 9%

NOTES:

- For body and thread lengths see pages 14 & 15.
- Thread Class:** BA - Close
BSW and BSF - Medium
- da:** Transition Diameter
- Working Temperature:** -50°C +300°C

SOCKET HEAD CAP SCREWS - 1936 Series UNC and UNF Threads



DIMENSIONS AND TIGHTENING TORQUES - UNC and UNF Threads

Thread Size	Threads Per Inch		A Max.	B Max.	da Max.	H Max.	W Nom.	Maximum Tightening Torques lbf. in.				Induced Load lbf.	
	UNC	UNF						Unplated		Plated		UNC	UNF
								UNC	UNF	UNC	UNF		
No.4	40	48	0.183	0.1120	0.1300	0.112	5/64	13.2	14.5	9.9	10.9	640	720
No.5	40	44	0.205	0.1250	0.1450	0.125	3/32	19.6	20.5	14.7	15.4	860	920
No.6	32	40	0.226	0.1380	0.1580	0.138	3/32	24.5	27.6	18.4	20.7	960	1120
No.8	32	36	0.270	0.1640	0.1880	0.164	1/8	45.5	48.0	34.1	36.0	1540	1640
No.10	24	32	0.312	0.1900	0.2180	0.190	5/32	65.4	75.5	49.1	56.6	1880	2240
No.12	24	28	0.343	0.2160	0.2440	0.216	5/32	102.0	109.0	76.5	81.8	2650	2890
1/4	20	28	0.375	0.2500	0.2780	0.250	1/16	153	176.0	115.0	132.0	3470	4150
												lbf.ft.	
5/16	18	24	0.437	0.3125	0.3465	0.312	7/32	26.3	29.3	19.7	22.0	5830	6680
3/8	16	24	0.562	0.3750	0.4150	0.375	5/16	46.8	53.2	35.1	39.9	8700	10300
7/16	14	20	0.625	0.4375	0.4835	0.437	5/16	75.0	84.0	56.3	63.0	12000	13900
1/2	13	20	0.750	0.5000	0.5520	0.500	3/8	115.0	129.0	86.3	96.8	16100	18800
9/16	12	18	0.812	0.5625	0.6225	0.562	3/8	165.0	185.0	124.0	139.0	20800	23900
5/8	11	18	0.875	0.6250	0.6890	0.625	1/2	228.0	258.0	171.0	194.0	25800	30400
3/4	10	16	1.000	0.7500	0.8280	0.750	9/16	363.0	405.0	273.0	304.0	34600	39900
7/8	9	14	1.125	0.8750	0.9630	0.875	9/16	575.0	510.0	430.0	380.0	47100	48600
1	8	12	1.312	1.0000	1.1100	1.000	5/8	788.0	700.0	590.0	525.0	56600	58200
1 1/8	7	12	1.500	1.1250	1.2350	1.125	3/4	1250.0	1115.0	935.0	835.0	76320	85580
1 1/4	7	12	1.750	1.2500	1.3700	1.250	3/4	1750.0	1560.0	1310.0	1170.0	96990	107300
1 3/8	6	12	1.875	1.3750	1.5050	1.375	3/4	2320.0	2070.0	1740.0	1550.0	115500	131500
1 1/2	6	12	2.000	1.5000	1.6400	1.500	1	3040.0	2710.0	2280.0	2030.0	132000	137000
1 3/4	5	12	2.500	1.7500	1.9100	1.750	1 1/4	4990.0	4450.0	3740.0	3335.0	186000	194000
2	4	12	2.750	2.0000	2.1800	2.000	1 3/8	7490.0	6680.0	5615.0	5010.0	216500	227000

ALL DIMENSIONS IN INCHES.

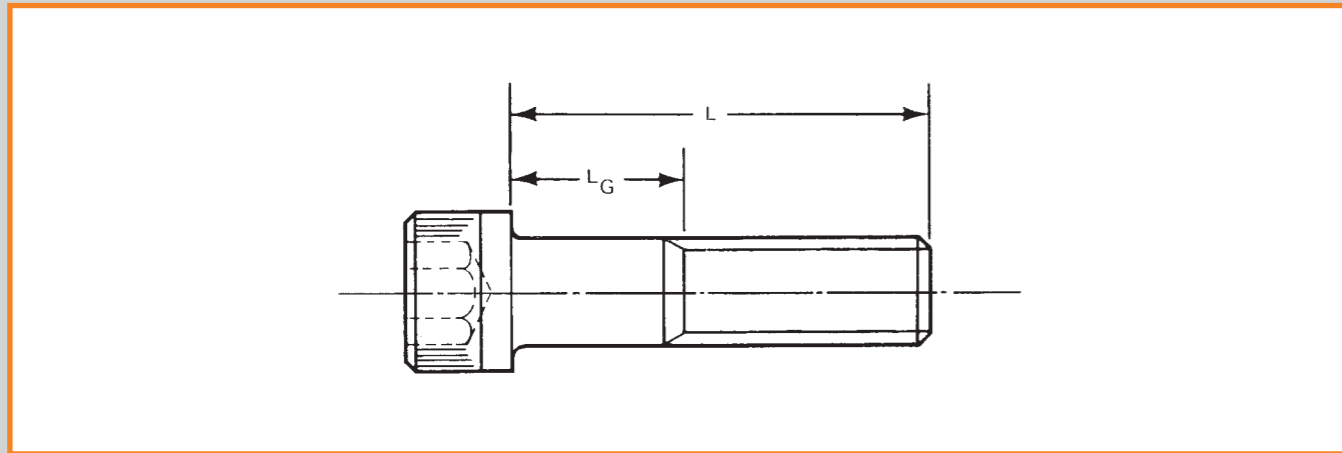
MECHANICAL PROPERTIES

Material	Unbrako High Grade Alloy Steel
Heat Treatment	Rc 39-43
Screw Size	≤0.500 >0.500
Tensile Strength	190,000 lbf/in ² 180,000 lbf/in ²
Yield Strength	170,000 lbf/in ² 162,000 lbf/in ²
Shear Strength	114,000 lbf/in ² 108,000 lbf/in ²
Min. Elongation	9% 9%

NOTES:

- For body and thread lengths see pages 16 & 17.
- Thread Class:** #0 through 1" dia. - 3A
over 1" dia. - 2A
- da:** Transition Diameter
- Working Temperature:** -50°C +300°C
- Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma 0.2 = 155$ K.S.I. and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated. Above 0.625" dia. $\sigma 0.2 = 140$ K.S.I.

SOCKET HEAD CAP SCREWS - 1936 Series BA, BSW and BSF Threads



GRIP LENGTH - BA, BSW and BSF Threads

Thread Size	Basic Thread Length See Note 2 (Page)	Length 'L'																								
		3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6		
8BA	.625		.250	.250	.625	.875	1.125																			
7BA	.625		.250	.250	.625	.875	1.125	1.375																		
6BA	.750		.250	.250	.750	.750	1.250	1.250	1.750																	
5BA	.750		.250	.250	.750	.750	1.250	1.250	1.750	2.000																
4BA	.750			.500	.500	1.000	1.000	1.500	1.500	2.000	2.000															
3BA	.875			.375	.375	.875	.875	1.375	1.375	1.875	1.875	2.375														
2BA	.875			.375	.375	.875	.875	1.375	1.375	1.875	1.875	2.375	2.375	2.875	2.875											
1BA	1.000				.500	.500	1.000	1.000	1.500	1.500	2.000	2.000	2.500	2.500	3.000	3.000	3.500	3.500	4.000							
0BA	1.000				.500	.500	1.000	1.000	1.500	1.500	2.000	2.000	2.500	2.500	3.000	3.000	3.500	3.500	4.000							
1/8	.750		.250	.250	.750	.750	1.250	1.250	1.750																	
3/16	.875			.375	.375	.875	.875	1.375	1.375	1.875	1.875	2.375	2.375	2.875	2.875											
1/4	1.000				.500	.500	1.000	1.000	1.500	1.500	2.000	2.000	2.500	2.500	3.000	3.000	3.500	3.500	4.000							
5/16	1.125					.625	.625	1.125	1.125	1.625	1.625	2.125	2.125	2.625	2.625	3.125	3.125	3.625	3.625	4.125	4.125	4.625				
3/8	1.250					.500	.500	1.000	1.000	1.500	1.500	2.000	2.000	2.500	2.500	3.000	3.000	3.500	3.500	4.000	4.000	4.500				
7/16	1.375						.625	.625	1.125	1.125	1.625	1.625	2.125	2.125	2.625	2.625	3.125	3.125	3.625	3.625	4.125	4.125	4.625			
1/2	1.500							.750	.750	.750	1.500	1.500	1.500	2.250	2.250	2.250	3.000	3.000	3.000	3.750	3.750	3.750				
9/16	1.625								.875	.875	.875	1.625	1.625	1.625	2.375	2.375	2.375	3.125	3.125	3.125	3.875	3.875				
5/8	1.750									.750	.750	.750	1.500	1.500	1.500	2.250	2.250	2.250	3.000	3.000	3.000	3.750	3.750			
3/4	2.000											1.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	3.000	3.000	3.000	3.000			
7/8	2.250												1.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	3.000	3.000	3.000			
1	2.500													1.000	1.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	3.000	3.000		

Sizes to the left of the heavy lines will be threaded to head.

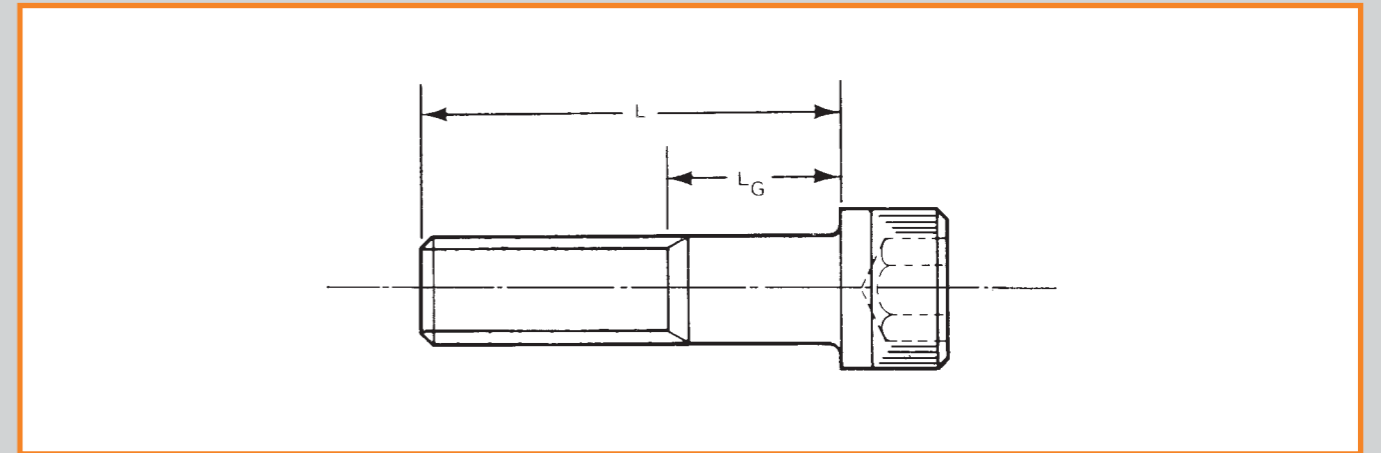
ALL DIMENSIONS IN INCHES.

BSW and BSW Thread Lengths of Large Diameter Screws

Thread Size	Length 'L'							
	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2
1 1/8			2.812					
1 1/4			3.125					
1 3/8				3.437				
1 1/2					3.750			
1 5/8						4.062		
1 3/4						4.375		
2							5.000	

Sizes to the left of the heavy lines will be threaded to head.

SOCKET HEAD CAP SCREWS - 1936 Series BA, BSW and BSF Threads



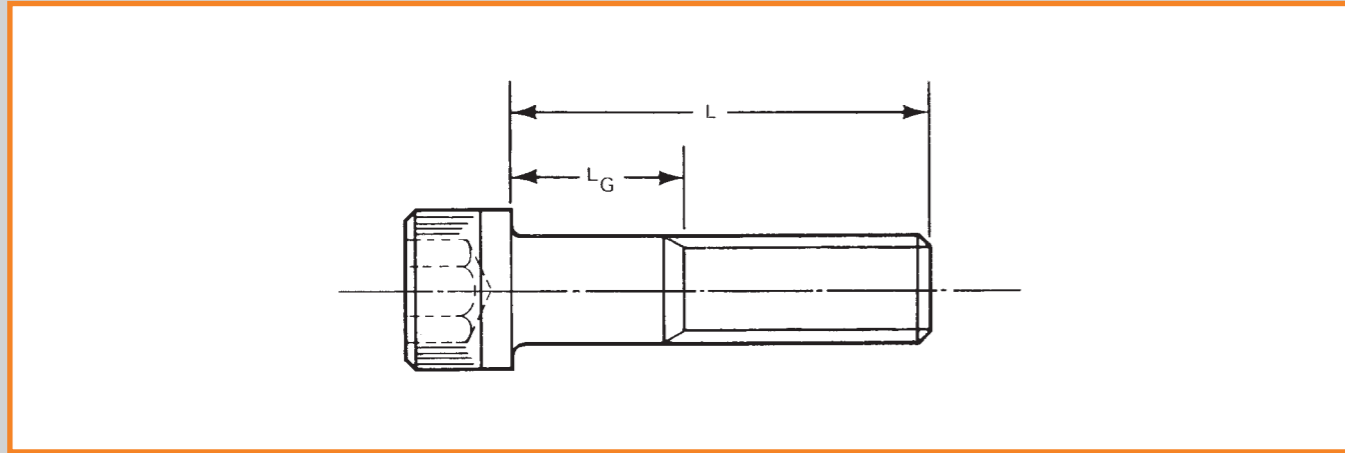
Length 'L'																									
6	6 1/4	6 1/2	6 3/4	7	7 1/4	7 1/2	7 3/4	8	8 1/2	9	9 1/2	10	11	12	13	14	15	16	17	18	19	20			
For sizes longer than shown between heavy lines see Note 2.																									
4.625	5.125																								
4.500	5.000	5.000	5.500	5.500	6.000	6.000																			
4.625	4.625	5.125	5.125	5.625	5.625	6.125	6.125	6.625	6.625	7.125	7.625														
4.500	4.500	4.500	5.250	5.250	5.250	6.000	6.000	6.000	7.000	7.000	8.000	8.000													
3.875	4.625	4.625	4.625	5.375	5.375	5.375	6.125	6.125	6.875	6.875	7.875	7.875													
3.750	4.500	4.500	4.500	5.250	5.250	5.250	6.000	6.000	6.750	6.750	7.750	7.750	9.250	10.250											
4.000	4.000	4.000	4.000	5.000	5.000	5.000	5.000	6.000	6.000	7.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000								
3.000	4.000	4.000	4.000	4.000	5.000	5.000	5.000	5.000	6.000	6.000	7.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000	14.000	15.000					
3.000	3.000	4.000	4.000	4.000	4.000	5.000	5.000	5.000	5.000	6.000	6.000	7.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000		

Length 'L' Tolerance		
Screws Over	Up to and including	Tolerance
-	1"	±0.016"
1"	6"	±0.031"
6"	16"	±0.062"
16"	-	±0.125"

NOTES:

- Dimensional and tightening information on Page 12.
- Sizes longer than those between the heavy lines shall have a grip length calculated thus - $L_G = L - \text{Basic Thread Length}$.
- Tolerance on the grip length shall be $+0 - 2\frac{1}{2}$ pitches.
- Tolerance on the thread length shall be $+2\frac{1}{2}$ pitches - 0.
- Screws up to and including 1" dia. ordered to an intermediate length between the heavy lines shall have a grip length equal to that of the screw of the next shorter length.

SOCKET HEAD CAP SCREWS - 1936-1960 Series UNC and UNF Threads



GRIP LENGTH - UNC and UNF Threads

Thread Size	Basic Thread Length See Note 2 (Page)	Length 'L'																							
		3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6	
No. 0*	.500	.250	.250	.500	.750																				
No. 1*	.625	.250	.250	.625	.875																				
No. 2*	.625	.250	.250	.625	.875	1.125																			
No. 3*	.625	.250	.250	.625	.875	1.125	1.375																		
No. 4	.750		.250	.250	.750	.750	1.250	1.250																	
No. 5	.750		.250	.250	.750	.750	1.250	1.250	1.750																
No. 6	.750			.500	.500	1.000	1.000	1.500	1.500	2.000															
No. 8	.875			.375	.375	.875	.875	1.375	1.375	1.875	1.875	2.375													
No. 10	.875			.375	.375	.875	.875	1.375	1.375	1.875	1.875	2.375	2.375	2.875	2.875										
No. 12	.875			.375	.375	.875	.875	1.375	1.375	1.875	1.875	2.375	2.375	2.875	2.875										
1/4	1.000			.500	.500	1.000	1.000	1.500	1.500	2.000	2.000	2.500	2.500	3.000	3.000	3.500	3.500	4.000							
5/16	1.125				.625	.625	1.125	1.125	1.625	1.625	2.125	2.125	2.625	2.625	3.125	3.125	3.625	3.625	4.125	4.125	4.625				
3/8	1.250				.500	.500	1.000	1.000	1.500	1.500	2.000	2.000	2.500	2.500	3.000	3.000	3.500	3.500	4.000	4.000	4.500				
7/16	1.375				.625	.625	1.125	1.125	1.625	1.625	2.125	2.125	2.625	2.625	3.125	3.125	3.625	3.625	4.125	4.125	4.625				
1/2	1.500					.750	.750	.750	1.500	1.500	1.500	2.250	2.250	2.250	3.000	3.000	3.000	3.750	3.750	3.750					
9/16	1.625					.875	.875	.875	1.625	1.625	1.625	2.375	2.375	2.375	3.125	3.125	3.125	3.875	3.875						
5/8	1.750					.750	.750	.750	1.500	1.500	1.500	2.250	2.250	2.250	3.000	3.000	3.000	3.750	3.750						
3/4	2.000								1.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	3.000	3.000	3.000	3.000					
7/8	2.250									1.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	3.000	3.000	3.000					
1	2.500										1.000	1.000	1.000	1.000	2.000	2.000	2.000	2.000	3.000	3.000					

Sizes to the left of the heavy lines will be threaded to head.

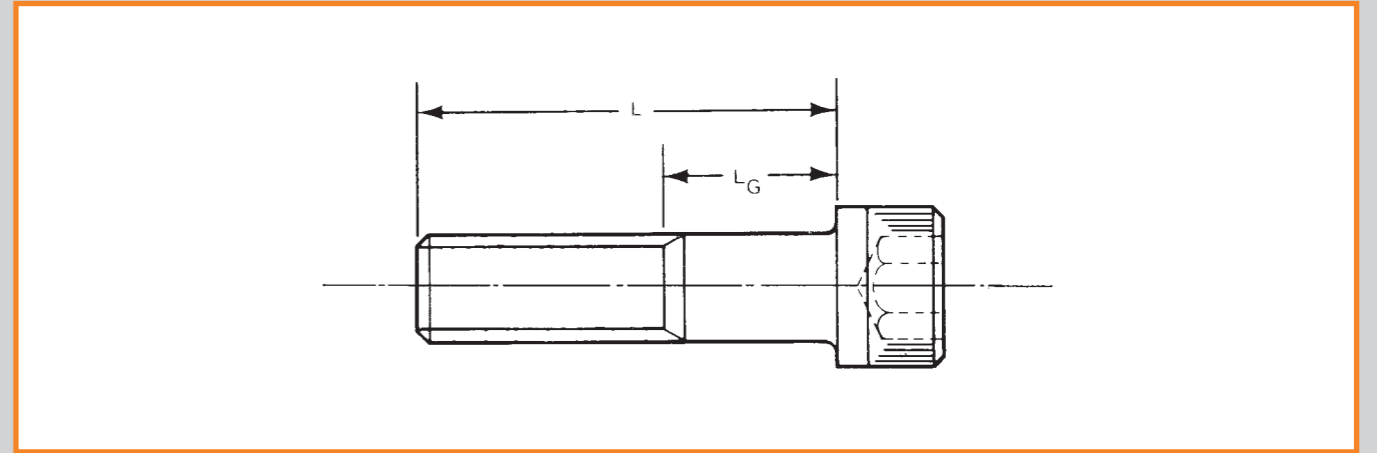
ALL DIMENSIONS IN INCHES.
*Available in 1960 Series only.

UNC and UNF Thread Lengths of Large Diameter Screws

Thread Size	Length 'L'							
	3	3 1/2	4	4 1/2	5	5 1/2	6	6 1/2 and over
1 1/8 UNF		2.812						
1 1/8 UNC			2.812					
1 1/4 UNF			3.125					
1 1/4 UNC			3.125					
1 3/8 UNF			3.437					
1 3/8 UNC				3.437				
1 1/2 UNF				3.750				
1 1/2 UNC					3.750			
1 3/4 UNF						4.375		
2 UNC							5.000	

Sizes to the left of the heavy lines will be threaded to head.

SOCKET HEAD CAP SCREWS - 1936-1960 Series UNC and UNF Threads



6	6 1/4	6 1/2	6 3/4	7	7 1/4	7 1/2	7 3/4	8	8 1/2	9	9 1/2	10	11	12	13	14	15	16	17	18	19	20	
For sizes longer than shown between heavy lines see Note 2.																							
4.625	5.125																						
4.500	5.000	5.000	5.500	5.500	6.000	6.000																	
4.625	4.625	5.125	5.125	5.625	5.625	6.125	6.125	6.125	6.625	7.125	7.625												
4.500	4.500	4.500	5.250	5.250	5.250	6.000	6.000	6.000	6.000	7.000	7.000	8.000	8.000										
3.875	4.625	4.625	4.625	5.375	5.375	5.375	6.125	6.125	6.875	6.875	7.875	7.875											
3.750	4.500	4.500	4.500	5.250	5.250	5.250	6.000	6.000	6.750	6.750	7.750	7.750	9.250	10.250									
4.000	4.000	4.000	4.000	5.000	5.000	5.000	5.000	6.000	6.000	7.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000						
3.000	4.000	4.000	4.000	4.000	5.000	5.000	5.000	5.000	6.000	6.000	7.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000	14.000	15.000			
3.000	3.000	4.000	4.000	4.000	4.000	5.000	5.000	5.000	5.000	6.000	6.000	7.000	7.000	8.000	9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000

1936 SERIES

Screws Over	Length 'L' Tolerance	
	Up to and Including	Tolerance
-	1"	±.016"
1"	6"	±.031"
6"	16"	±.062"
16"	-	±0.125"

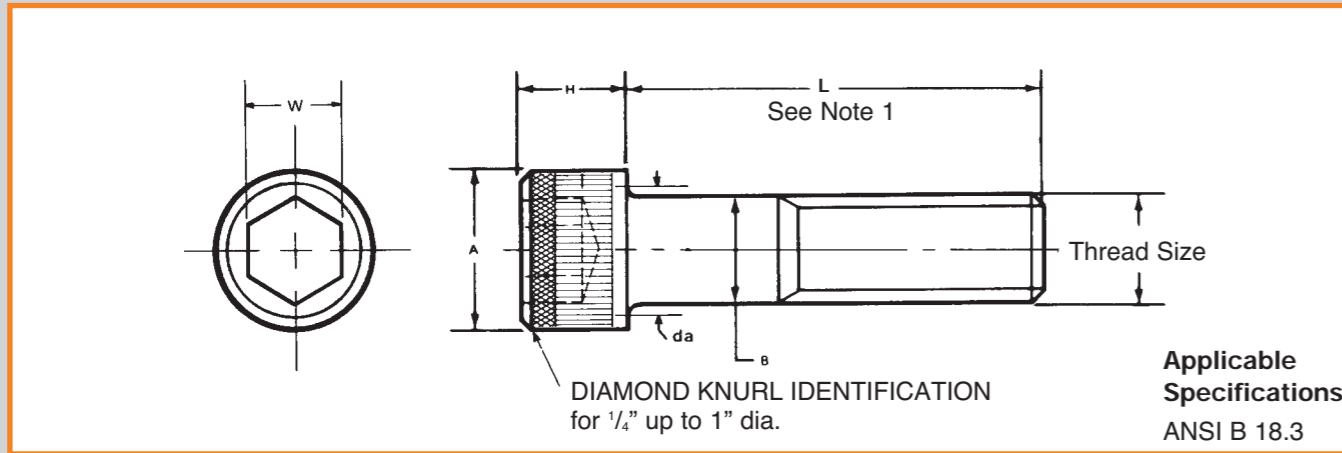
1960 SERIES

Thread Size	Length 'L' Tolerance			
	Length			
	Up to 1" Incl.	Over 1" to 2 1/2"	Over 2 1/2" to 6"	Over 6"
No 0 - 3/8"	-0.030"	-0.040"	-0.060"	-0.120"
7/16" - 3/4"	-0.030"	-0.060"	-0.080"	-0.120"
7/8" - 1 1/2"	-0.030"	-0.100"	-0.140"	-0.200"
Over 1 1/2"	-	-0.180"	-0.200"	-0.240"

NOTES:

1. Dimensional and tightening information for 1960 Series on Page 18 and 1936 Series on Page 13.
2. Sizes longer than those between the heavy lines shall have a grip length calculated thus -
 $L_G = L - \text{Basic Thread Length}$.
3. Tolerance on the grip length shall be +0 - 2 1/2 pitches.
4. Tolerance on the thread length shall be +2 1/2 pitches - 0.
5. Screws up to and including 1" dia. ordered to an intermediate length between the heavy lines shall have a grip length equal to that of the screw of the next shorter length.

SOCKET HEAD CAP SCREWS - 1960 Series UNC and UNF Threads



DIMENSIONS AND TIGHTENING TORQUES - UNC and UNF Threads

Thread Size	Threads Per Inch		A Max.	B Max.	da Max.	H Max.	W Nom.	Maximum Tightening Torques lbf. in.				Induced Load lb. f.	
	UNC	UNF						Unplated		Plated		UNC	UNF
								UNC	UNF	UNC	UNF		
No.0	-	80	0.096	0.060	0.074	0.060	0.050	-	2.1	-	1.6	-	190
No.1	64	72	0.118	0.073	0.087	0.073	1/16	3.7	3.9	2.7	2.9	280	300
No.2	56	64	0.140	0.0860	0.1020	0.086	5/16	6.2	6.7	4.6	5.0	400	430
No.3	48	56	0.161	0.0990	0.1150	0.099	5/16	9.3	10.2	7.0	7.6	520	580
No.4	40	48	0.183	0.1120	0.1300	0.112	3/32	13.2	14.5	9.9	10.9	640	720
No.5	40	44	0.205	0.1250	0.1450	0.125	3/32	19.6	20.5	14.7	15.4	860	920
No.6	32	40	0.226	0.1380	0.1580	0.138	3/32	24.5	27.6	18.4	20.7	960	1120
No.8	32	36	0.270	0.1640	0.1880	0.164	1/8	45.5	48.0	34.1	36.0	1540	1640
No.10	24	32	0.312	0.1900	0.2180	0.190	5/32	65.4	75.5	49.1	56.6	1880	2240
No.12	24	28	0.343	0.2160	0.2440	0.216	5/32	102.0	109.0	76.5	81.8	2650	2890
1/4	20	28	0.375	0.2500	0.2780	0.250	1/16	153.0	176.0	115.0	132.0	3470	4150
lbf. ft.													
5/16	18	24	0.468	0.3125	0.3465	0.312	1/4	26.3	29.3	19.7	22.0	5830	6680
3/8	16	24	0.562	0.3750	0.4150	0.375	5/16	46.8	53.2	35.1	39.9	8700	10300
7/16	14	20	0.625	0.4375	0.4835	0.437	3/8	75.0	84.0	56.3	63.0	12000	13900
1/2	13	20	0.750	0.5000	0.5520	0.500	3/8	115.0	129.0	86.3	96.8	16100	18800
9/16	12	18	0.843	0.5625	0.6225	0.562	7/16	165.0	185.0	124.0	139.0	20800	23900
5/8	11	18	0.937	0.6250	0.6890	0.625	1/2	228.0	258.0	171.0	194.0	25800	30400
3/4	10	16	1.125	0.7500	0.8280	0.750	5/8	363.0	405.0	273.0	304.0	34600	39900
7/8	9	14	1.312	0.8750	0.9630	0.875	3/4	586.0	646.0	440.0	485.0	48000	54600
1	8	12	1.500	1.0000	1.1100	1.000	3/4	879.0	962.0	660.0	722.0	63100	71000
1 1/8	7	12	1.687	1.1250	1.2350	1.125	7/8	1250.0	1400.0	938.0	1050.0	79500	92200
1 1/4	7	12	1.875	1.2500	1.3700	1.250	7/8	1760.0	1825.0	1320.0	1460.0	102000	109000
1 3/8	6	12	2.062	1.3750	1.5050	1.375	1	2320.0	2620.0	1730.0	1970.0	120000	143000
1 1/2	6	12	2.250	1.5000	1.6400	1.500	1	2730.0	2730.0	2300.0	2580.0	132000	137000
1 3/4	5	12	2.625	1.7500	1.9100	1.750	1 1/4	4990.0	4490.0	3630.0	4155.0	186000	194000
2	4 1/2	12	3.000	2.0000	2.1800	2.000	1 3/8	7270.0	7750.0	5450.0	6270.0	264000	295000

ALL DIMENSIONS IN INCHES.

MECHANICAL PROPERTIES

Material	Unbrako High Grade Alloy Steel	
Heat Treatment	Rc 39-43	
Screw Size	≤0.500	>0.500
Tensile Strength	190,000 lbf/in ²	180,000 lbf/in ²
Yield Strength	170,000 lbf/in ²	162,000 lbf/in ²
Shear Strength	114,000 lbf/in ²	108,000 lbf/in ²
Min. Elongation	9%	9%

NOTES:

- For body and thread lengths see pages 16 & 17.
- Thread Class:** #0 through 1" dia. - 3A
over 1" dia. - 2A
- da:** Transition Diameter
- Working Temperature:** -50°C +300°C
- Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma = 0.2 = 155$ K.S.I. and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated. Above 0.625" dia. $\sigma = 0.2 = 140$ K.S.I.

COUNTERSUNK SOCKET HEAD SCREWS

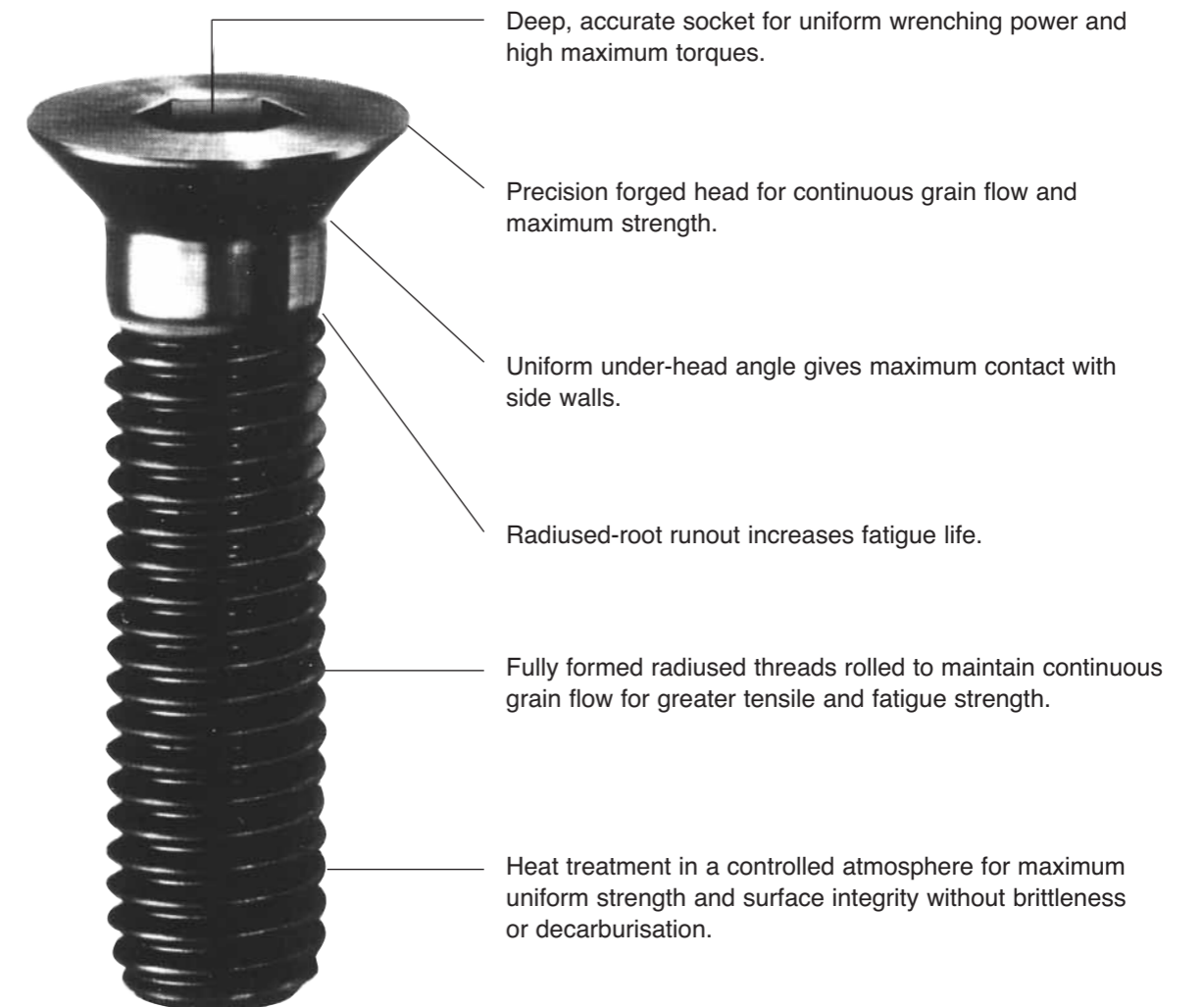
Modern equipment and machinery requires stronger more reliable joints to hold their parts together - and stronger more reliable fasteners. The requirement for dependability also holds true for fasteners used to hold thin section metals together in applications that also require a neat smooth surface.

That's why Unbrako countersunk screws are so widely used for fastening of plates, strips, mouldings, and other thin section parts. Unbrako countersunk screws provide reliable fastening and a smooth, attractive, flush mounting that enhances the appearance of the product on which they are used.

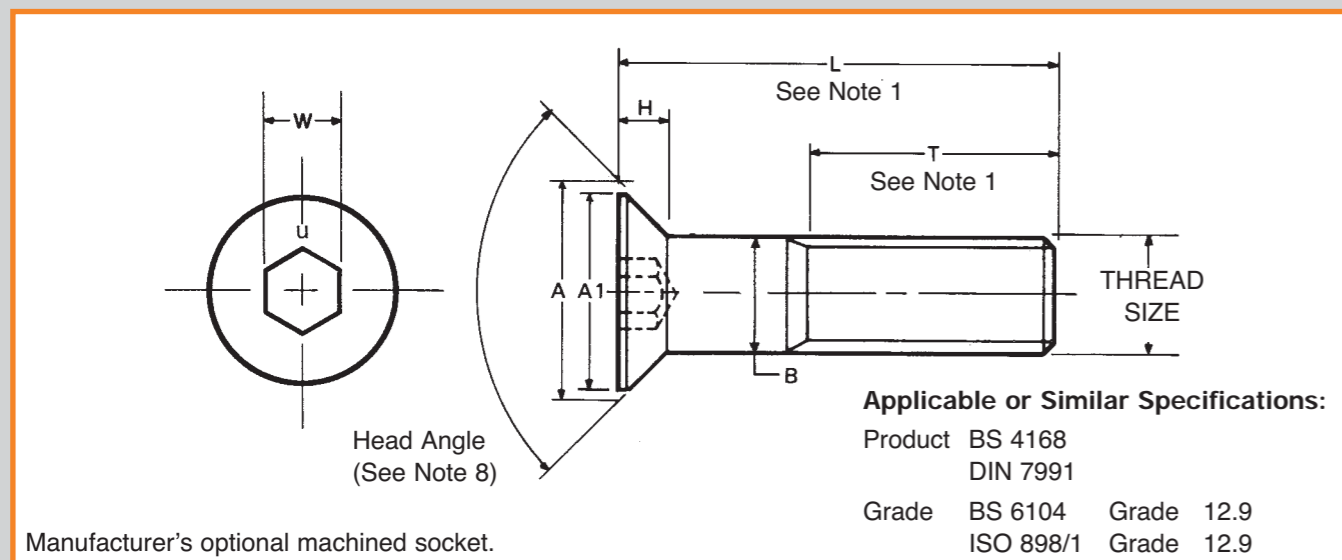
Unbrako countersunk screws provide more clamping force because they are manufactured from

high grade alloy steel, and held to exacting tolerances to ensure the highest degree of dimensional uniformity. The closely controlled head angle assures flush seating, and close all-round head contact by initially contacting at the upper portion of the head bearing area in the countersunk hole. Closely controlled threads mean tighter and more secure fits, and stronger assemblies. Deep accurate non-slip sockets provide maximum key engagement for full tightening without marring the surrounding surface.

Unbrako countersunk screws are available with either plain or plated finish. Stainless steel screws are also available.



COUNTERSUNK SOCKET HEAD SCREWS - ISO Metric



DIMENSIONS AND TIGHTENING TORQUES - ISO Metric Threads

Thread Size (B Max.)	Pitch	A Max. (See Note 2)	A1 Max. (See Note 3)	B Max.	H Ref.	W Nom.	Maximum Tightening Torques				Tensile Load kN
							Unplated		Plated		
							Nm	lbf.in.	Nm	lbf.in.	
M3	0.50	6.72	5.82	2.98	1.86	2.0	1.4	12	1.1	9	5.28
M4	0.70	8.96	7.80	3.98	2.48	2.5	3.4	30	2.6	22	9.22
M5	0.80	11.2	9.78	4.98	3.10	3.0	6.8	60	5.1	45	14.90
M6	1.00	13.44	11.73	5.97	3.72	4.0	11.0	97	8.3	73	21.10
M8	1.25	17.92	15.73	7.97	4.96	5.0	28.0	248	21.0	186	38.40
M10	1.50	22.40	19.67	9.97	6.20	6.0	55.0	486	41.0	365	60.90
M12	1.75	26.88	23.67	11.97	7.44	8.0	95.0	840	71.0	630	88.50
(M14)	2.00	30.24	26.67	13.96	8.12	10.0	150.0	1330	112.0	990	121.00
M16	2.00	33.60	29.67	15.96	8.80	10.0	237.0	2100	177.0	1570	165.00
(M18)	2.50	36.96	32.61	17.96	9.48	12.0	340.0	3000	255.0	2250	202.00
M20	2.50	40.32	35.61	19.96	10.11	12.0	480.0	4250	360.0	3190	257.00
(M22)	2.50	37.38	35.61	21.96	13.32	14.0	637.0	5640	477.0	4220	318.00
M24	3.00	40.42	38.61	23.96	14.22	14.0	746.0	6600	585.0	5180	371.00

ALL DIMENSIONS IN MILLIMETRES. SIZES IN BRACKETS ARE NON-PREFERRED STANDARDS.

MECHANICAL PROPERTIES

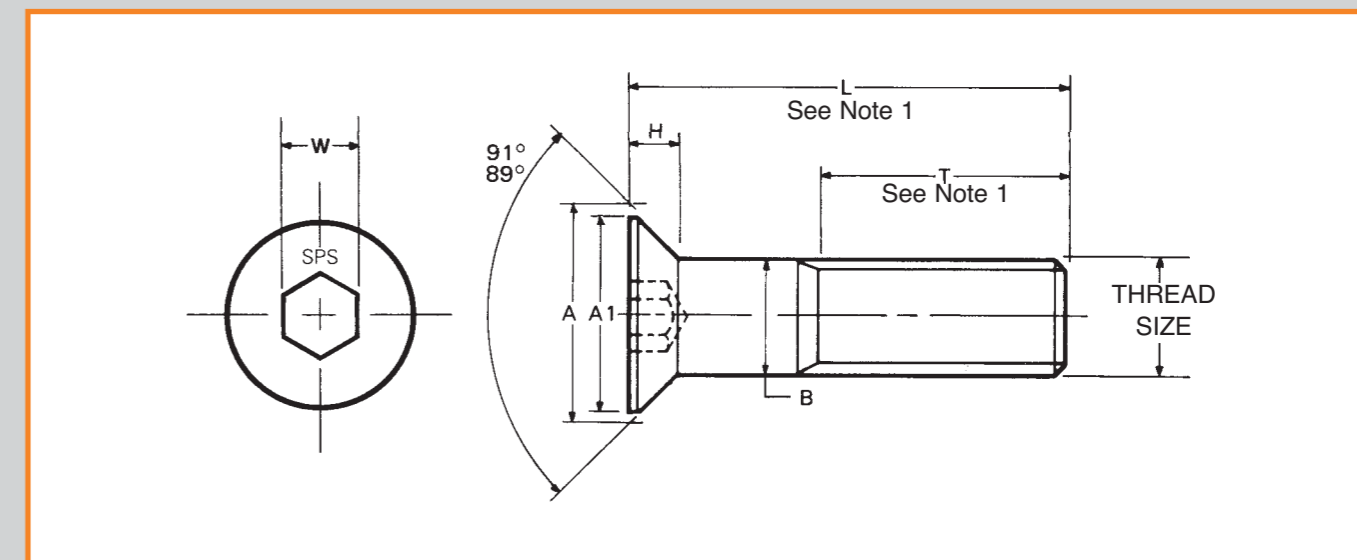
Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 39-44
Shear Strength 630 N/mm²
Min. Elongation 9%

NOTES:

- For overall and thread lengths see pages 22 & 23.
- A - Maximum theoretical sharp corner.
- A1 - Absolute minimum head diameter.
- G - Transition diameter.
- Thread Class: 4g 6g
- Working Temperature: -50°C +300°C
- Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma 0.2 = 720 \text{ N/mm}^2$ and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated.
- For sizes up to and including M20 Head Angle shall be 92°/90°, over M20 Head Angle be 62°/60°.

N.B. Because of their head configurations, countersunk head screws may not meet the minimum ultimate tensile load for property class 12.9, specified in table 6 OF BS 6104: Part 1: 1981. They are nevertheless required to meet the other material and property requirements for property class 12.9 in BS 6104: Part 1.

COUNTERSUNK SOCKET HEAD SCREWS - BA, BSW and BSF Threads



DIMENSIONS AND TIGHTENING TORQUES - BA, BSW and BSF Threads

Thread Size	Threads Per Inch	BA	A Max. (See Note 2)	A1 Max. (See Note 3)	B Max.	H Ref.	W Nom.	Maximum Tightening Torques lbf.in.				Tensile Load lbf.	
								Unplated		Plated			
								Unplated	Plated	BA	BA		
8BA	59.1		.164	.147	.0866	.038	.050	2.0	1.5		638		
6BA	47.9		.211	.189	.1102	.050	.050	4.0	3.0		1050		
5BA	43.1		.239	.215	.1260	.056	1/16	6.0	5.0		1390		
4BA	38.5		.269	.243	.1417	.063	1/16	8.5	6.5		1760		
3BA	34.8		.307	.277	.1614	.072	5/64	14.0	10.5		2310		
2BA	31.4		.351	.319	.1850	.083	3/32	32.0	24.0		3070		
1BA	28.2		.396	.360	.2087	.093	3/32	35.0	26.0		3929		
0BA	25.4		.449	.408	.2362	.106	1/8	72.0	54.0		5070		
		BSW	BSF					BSW	BSF	BSW	BSF	BSW	BSF
1/8	40	-	.239	.215	.1250	.057	1/16	9.0	-	7.0	-	1280	-
3/16	24	32	.356	.323	.1875	.084	3/32	27.5	32	20.5	24	2730	3120
1/4	20	26	.475	.432	.2500	.112	5/32	95.0	98	71.0	74	5130	5710
5/16	18	22	.594	.542	.3125	.140	3/16	217.0	232	163.0	174	8440	9080
								lbf.ft.					
3/8	16	20	.712	.651	.3750	.168	7/32	26.0	32	19.5	24	12500	13400
7/16	14	18	.831	.761	.4375	.196	1/4	39.0	42	29.0	32	17100	18500
1/2	12	16	.950	.870	.5000	.225	5/16	72.0	85	54.0	64	22200	24300
9/16	12	16	1.069	.979	.5625	.253	5/16	103.0	112	77.0	837	29300	31700
5/8	11	14	1.187	1.089	.6250	.281	3/8	136.0	138	102.0	104	36400	38900
3/4	10	12	1.425	1.308	.7500	.337	3/8	138.0	140	104.0	105	53700	56400
7/8	9	11	1.662	1.526	.8750	.393	1/2	338.0	356	253.0	266	74200	77800
1	8	10	1.900	1.745	1.0000	.450	9/16	506.0	535	380.0	401	97300	102700
1 1/8	7	9	2.138	1.964	1.1250	.506	5/8	718.0	763	537.0	572	122500	130200
1 1/4	7	9	2.375	2.183	1.2500	.562	5/8	1013.0	1070	760.0	802	155600	164300

ALL DIMENSIONS IN INCHES.

MECHANICAL PROPERTIES

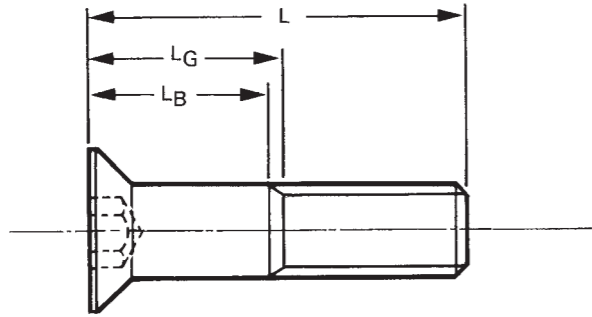
Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 39-44
Shear Strength 96,000 lbf/in²
Min. Elongation 9%

NOTES:

- For overall and thread lengths see page 24.
- A - Maximum theoretical sharp corner.
- A1 - Absolute minimum head diameter.
- da - Transition diameter.
- Thread Class: BA - Close
BSW and BSF - Medium
- Working Temperature: -50°C +300°C

N.B. Because of their head configurations, countersunk head screw tensile loads, are based on 160,000 lbf/in².

COUNTERSUNK SOCKET HEAD SCREWS - ISO Metric

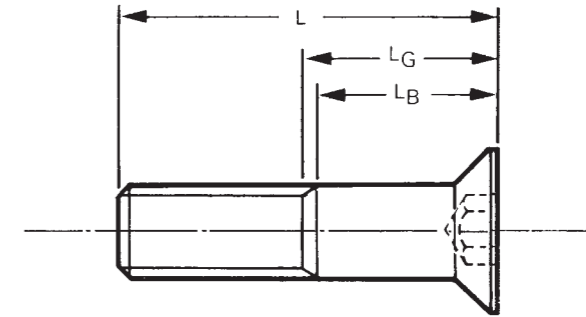


BODY AND GRIP LENGTHS - ISO Metric Threads

Thread Size	Body and Grip Lengths	Length 'L'										
		30	35	40	45	50	55	60	65	70	80	90
M3	LB. Max.	To Head	14.5	19.5	24.5	29.5	34.5					
	LG. Max.		17.0	22.0	27.0	32.0	37.0					
M4	LB. Max.	To Head	11.5	16.5	21.5	26.5	31.5	36.5	41.5	46.5	56.5	
	LG. Max.		15.0	20.0	25.0	30.0	35.0	40.0	45.0	50.0	60.0	
M5	LB. Max.	→ To Head	14.0	19.0	24.0	29.0	34.0	39.0	44.0	54.0	64.0	
	LG. Max.		18.0	23.0	28.0	33.0	38.0	43.0	48.0	58.0	68.0	
M6	LB. Max.	→ To Head	16.0	21.0	26.0	31.0	36.0	41.0	51.0	61.0		
	LG. Max.		21.0	26.0	31.0	36.0	41.0	46.0	56.0	66.0		
M8	LB. Max.	→ To Head	15.75	20.75	25.75	30.75	35.75	45.75	55.7			
	LG. Max.		22.0	27.0	32.0	37.0	42.0	52.0	62.0			
M10	LB. Max.	→ To Head	20.5	25.5	30.5	40.5	50.5					
	LG. Max.		28.0	33.0	38.0	48.0	58.0					
M12	LB. Max.	→ To Head	20.2	25.2	35.2	45.2						
	LG. Max.		29.0	34.0	44.0	54.0						
M14	LB. Max.	→ To Head	20.0	30.0	40.0							
	LG. Max.		30.0	40.0	50.0							
M16	LB. Max.	→ To Head	26.0	36.0								
	LG. Max.		36.0	46.0								
M18	LB. Max.	→ To Head	29.5									
	LG. Max.		42.0									
M20	LB. Max.	→										
	LG. Max.											
M22	LB. Max.	→										
	LG. Max.											
M24	LB. Max.	→										
	LG. Max.											

ALL DIMENSIONS IN MILLIMETRES.

COUNTERSUNK SOCKET HEAD SCREWS - ISO Metric

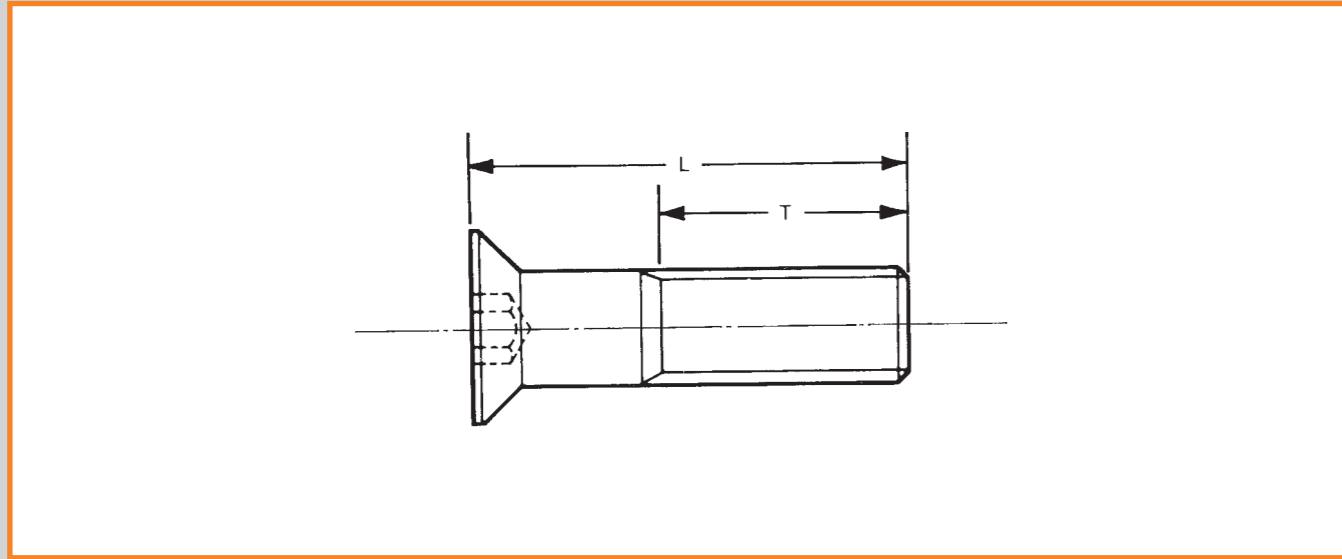


	100	110	120	130	140	150	160	180	200	220	240
	74.0										
	78.0										
	71.0	81.0	91.0								
	76.0	86.0	96.0								
	65.7	75.7	85.7	95.7	105.7	115.7					
	72.0	82.0	92.0	102.0	112.0	122.0					
	60.5	70.5	80.5	90.5	100.5	110.5					
	68.0	78.0	88.0	98.0	108.0	118.0					
	55.2	65.2	75.2	85.2	95.2	105.2					
	64.0	74.0	84.0	94.0	104.0	114.0					
	50.0	60.0	70.0	80.0	90.0	100.0					
	60	70.0	80.0	90.0	100.0	110.0					
	46.0	56.0	66.0	76.0	86.0	96.0	106.0	126.0			
	56.0	66.0	76.0	86.0	96.0	106.0	116.0	136.0			
	39.5	49.5	59.5	69.5	79.5	89.5	99.5	119.5	139.5		
	52.0	62.0	72.0	82.0	92.0	102.0	112.0	132.0	156.0		
	To Head	45.5	55.5	65.5	75.5	85.5	95.5	115.5	135.5		
	→	58.0	68.0	78.0	88.0	98.0	108.0	128.0	148.0		
	→ To Head	51.5	61.5	71.5	81.5	91.5	111.5	131.5	151.5		
	→	64.0	74.0	84.0	94.0	104.0	124.0	144.0	164.0		
	→	To Head	55.0	65.0	75.0	85.0	105.0	125.0	145.0	165.0	
	→	70.0	80.0	90.0	100.0	120.0	140.0	160.0	180.0		

Length 'L' Tolerance (mm)		
Screws Over	Up to and Including	Tolerance
-	50	±0.25
50	80	±0.50
80	120	±0.70
120	250	±0.80
250	-	±1.00

- NOTES:**
- Dimensions and tightening information on page 20.
 - Dimensions for LB and LG are calculated from the following formula.
 $T_{ref} = (2 \times \text{Nominal Dia.}) + 12\text{mm}$
 $LG_{max} = \text{Nominal length 'L' minus 'T'}$
 $LB_{max} = \text{Nominal length 'L' minus ('T' + 5 P)}$
 - LG is the max. distance from top of the head to the first complete thread. LB is the max. length of unthreaded portion measured from the top of head.
 - Concentricity. - body diameter to thread within 0.1mm per 20mm of body length
T.I.R. taken directly under the head when screw is held by the full threads closest to the head of the screw.
 - The axis of the conical bearing surface shall be parallel to the axis of the body within $1/2^\circ$

COUNTERSUNK SOCKET HEAD SCREWS - BA, BSW and BSF Threads



THREAD LENGTHS FOR STANDARD SCREW DIAMETERS - BA, BSW and BSF Threads

Thread Size	Length 'L'																					
	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	5 1/4	5 1/2	5 3/4	6	
	Length of Thread 'T'																					
8BA	1																					
6BA	1	1																				
5BA	1	1																				
4BA	1	1	1	1																		
3BA	1	1	1	1																		
2BA	1	1	1	1																		
1BA	1	1	1	1																		
OBA	1	1	1	1	1 1/8	1 1/4	1 3/8	1 1/2														
1/8	1	1																				
3/16	1	1	1																			
1/4	1	1	1	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2										
5/16		1 1/8	1 1/8	1 1/8	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8									
3/8			1 1/4	1 1/4	1 1/4	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2						
7/16			1 3/8	1 3/8	1 3/8	1 3/8	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2						
1/2						1 1/2	1 1/2	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4	2 7/8	3		
9/16									1 5/8	1 5/8	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4	2 7/8	3
5/8									1 3/4	1 3/4	1 3/4	1 3/4	1 7/8	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4	2 7/8	3
3/4								2	2	2	2	2	2 1/8	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4	2 7/8	3		
7/8									2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 1/4	2 3/8	2 1/2	2 5/8	2 3/4	2 7/8	3		
1									2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 1/2	2 5/8	2 3/4	2 7/8	3	
1 1/8													2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 3/4	2 7/8	3	
1 1/4													3	3	3	3	3	3	3	3	3	

ALL DIMENSIONS IN INCHES.

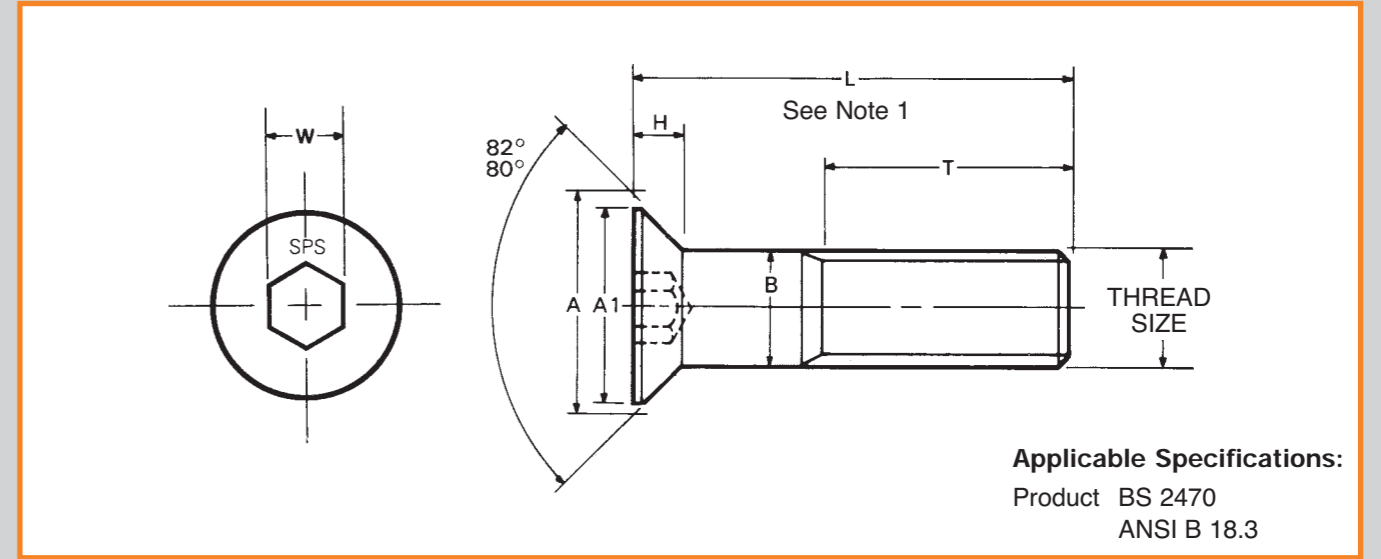
Length 'L' Tolerance		
Screws Over	Up to and including	Tolerance
-	2"	±0.10"
2"	4"	±0.20"
4"	-	±0.30"

Thread Length Tolerance -0 +2 1/2 Pitches

NOTES:

1. Dimensions and tightening information on Page 21.

COUNTERSUNK SOCKET HEAD SCREWS - UNC and UNF Threads



Applicable Specifications:
Product BS 2470
ANSI B 18.3

DIMENSIONS AND TIGHTENING TORQUES - UNC and UNF Threads

Thread Size	Threads Per Inch		A Max. (See Note 2)	A1 Min. (See Note 3)	B Max.	H Ref.	W Nom.	Typical Tightening Torques lbf. in				Tensile Loads lb. f.	
	UNC	UNF						Unplated		Plated			
								UNC	UNF	UNC	UNF	UNC	UNF
No.0	-	80	.138	.117	.0600	.044	.035	-	1.6	-	1.2	-	265
No.1	64	72	.168	.143	.0730	.054	.050	2.6	2.9	1.9	2.1	390	390
No.2	56	64	.197	.168	.0860	.064	.050	4.4	4.8	3.3	3.6	555	555
No.3	48	56	.226	.193	.0990	.073	1/16	6.7	8.5	5.0	6.3	725	725
No.4	40	48	.255	.218	.1120	.083	1/16	8.9	10.0	6.6	7.5	960	1,040
No.5	40	44	.281	.240	.1250	.090	5/64	13.0	14.0	9.0	10.0	1,260	1,310
No.6	32	40	.307	.263	.1380	.097	5/64	16.0	19.0	12.0	14.0	1,440	1,620
No.8	32	36	.359	.311	.1640	.112	3/32	30.0	32.0	22.0	24.0	2,220	2,240
No.10	24	32	.411	.359	.1900	.127	1/8	44.0	51.0	33.0	38.0	2,780	3,180
1/4	20	28	.531	.480	.2500	.161	5/32	100.0	120.0	75.0	90.0	5,070	5,790
5/16	18	24	.656	.600	.3125	.198	3/16	210.0	240.0	157.0	180.0	8,350	9,250
3/8	16	24	.781	.720	.3750	.234	7/32	380.0	430.0	285.0	322.0	12,400	14,000
7/16	14	20	.844	.781	.4375	.234	1/4	600.0	680.0	450.0	510.0	16,900	18,900
1/2	13	20	.938	.872	.5000	.251	5/16	930.0	1050.0	697.0	787.0	22,800	25,600
5/8	11	18	1.188	1.112	.6250	.324	3/8	1800.0	2000.0	1350.0	1500.0	36,000	40,800
3/4	10	16	1.438	1.355	.7500	.396	1/2	3200.0	3560.0	2400.0	2670.0	53,200	59,300
7/8	9	14	1.688	1.604	.8750	.468	9/16	5400.0	6000.0	4050.0	4500.0	73,500	81,000
1	8	12	1.938	1.841	1.0000	.540	5/8	8200.0	8900.0	6150.0	6675.0	96,300	106,000

ALL DIMENSIONS IN INCHES.

MECHANICAL PROPERTIES

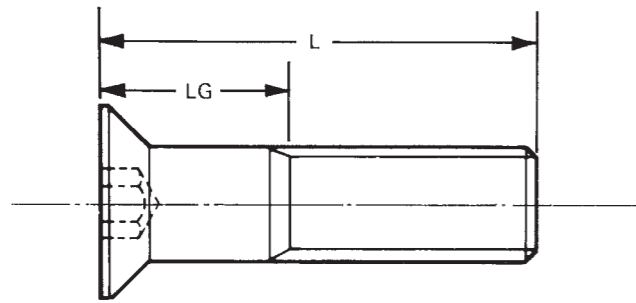
Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 39-43
Shear Strength 96,000 lbf/in²
Min. Elongation 9%

NOTES:

- For overall and thread lengths see page 26.
- A - Maximum theoretical sharp corner.
- A1 - Absolute minimum head diameter.
- da - Transition diameter.
- Thread Class:** 3A
- Working Temperature:** -50°C +300°C
- Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma = 0.2 = 100$ K.S.I. and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated.

N.B. Because of their head configurations, countersunk head screw tensile loads, are based on 160,000 lbf/in².

COUNTERSUNK SOCKET HEAD SCREWS - UNC and UNF Threads



Applicable Specifications:
BS 2470
ANSI B 18.3

THREAD LENGTHS FOR STANDARD SCREW DIAMETERS - UNC and UNF Threads

Thread Size	Length 'L'																			
	3/4	7/8	1	1 1/4	1 1/2	1 3/4	2	2 1/4	2 1/2	2 3/4	3	3 1/4	3 1/2	3 3/4	4	4 1/4	4 1/2	4 3/4	5	
Nº 0	0.25	0.25	0.50	0.75																
Nº 1		0.25	0.25	0.62	0.88															
Nº 2		0.25	0.25	0.62	0.88	1.12														
Nº 3		0.25	0.25	0.62	0.88	1.12	1.38													
Nº 4				0.50	0.50	1.00	1.00	1.50												
Nº 5				0.50	0.50	1.00	1.00	1.50												
Nº 6				0.50	0.50	1.00	1.00	1.50	1.50	2.00										
Nº 8				0.38	0.38	0.88	0.88	1.38	1.38	1.88	1.88	2.38								
Nº 10					0.62	0.62	1.12	1.12	1.62	1.62	2.12	2.12	2.62	2.62	3.12					
1/4						0.75	0.75	1.25	1.25	1.75	1.75	2.25	2.25	2.75	2.75	3.25	3.25	3.75	3.75	
5/16							0.88	0.88	1.38	1.38	1.88	1.88	2.38	2.38	2.88	2.88	3.38	3.38	3.88	
3/8								1.00	1.00	1.50	1.50	2.00	2.00	2.50	2.50	3.00	3.00	3.50	3.50	
7/16									1.12	1.12	1.62	1.62	2.12	2.12	2.62	2.62	3.12	3.12	3.62	
1/2									1.00	1.00	1.00	1.75	1.75	1.75	2.50	2.50	2.50	3.25	3.25	
5/8												1.50	1.50	1.50	2.25	2.25	2.25	3.00	3.00	
3/4													1.50	1.50	1.50	1.50	2.50	2.50	2.50	
7/8														1.50	1.50	1.50	1.50	2.50	2.50	
1															1.50	1.50	1.50	1.50	2.50	

ALL DIMENSIONS IN INCHES.

Thread Size	Length 'L' Tolerance			
	Length			
	To 1" inclusive	1" to 2 1/2" inclusive	2 1/2" to 6" inclusive	Over 6"
Nº 0 - 3/8"	0.030"	0.040"	0.060"	0.120"
7/16" - 3/4"	0.030"	0.060"	0.080"	0.120"
7/8" - 1"	0.050"	0.100"	0.140"	0.200"

NOTES:

1. Dimensions and tightening information on Page 25.
2. Tolerance on the grip length LG shall be +0 - 2 1/2 pitches.

BUTTON HEAD SOCKET SCREWS

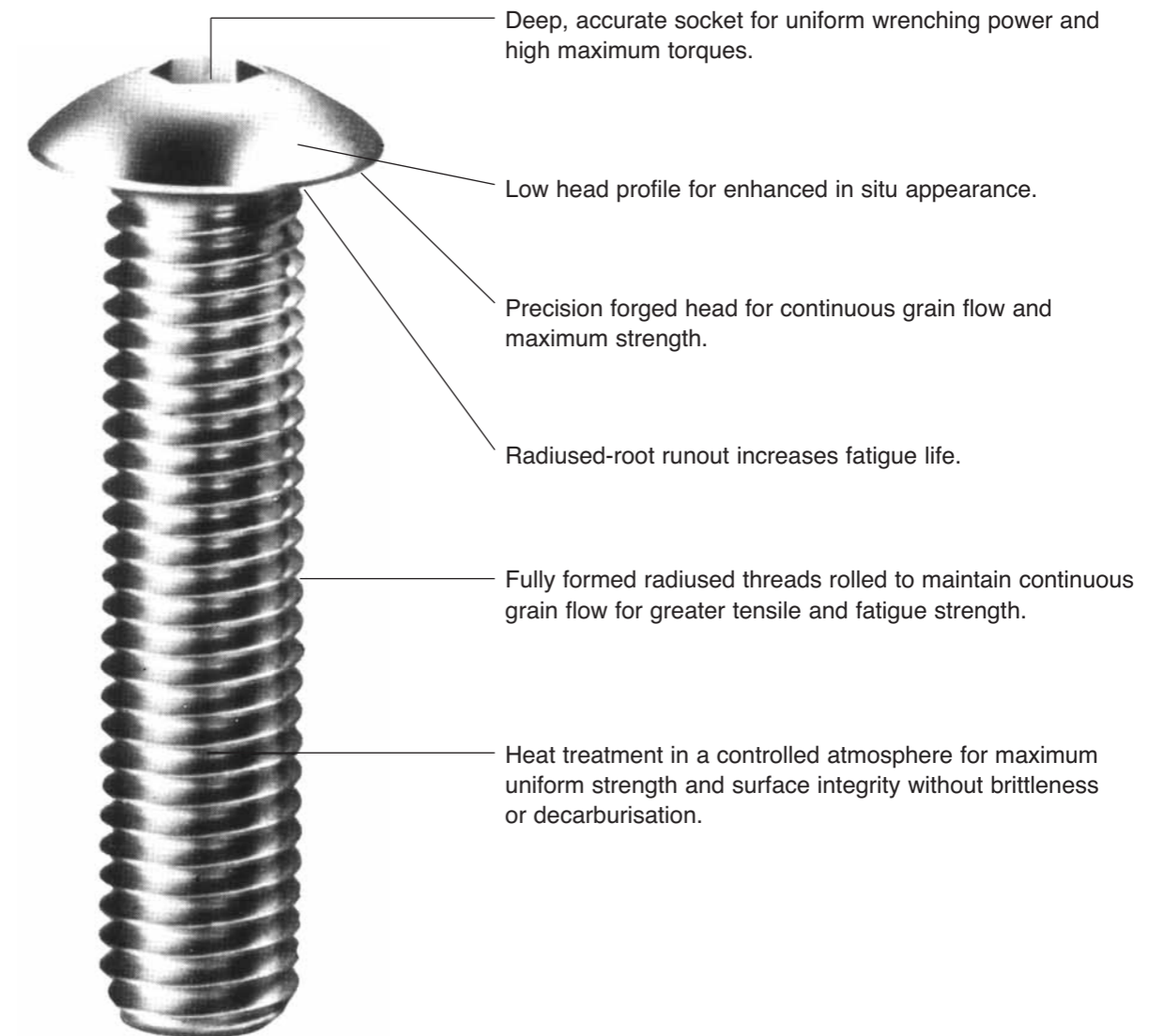
Unbrako button head screws are ideally suited for use in materials too thin to countersink and in non-critical loading applications. Their low head profile gives them smooth, aesthetic appearance, and their deep accurate sockets ensure non-slip wrench engagement to prevent marring of the surface in which they are installed.

Unbrako button head screws are made from high grade alloy steel and every manufacturing operation is closely controlled. Heads are forged for greater strength and full formed radius-root rolled threads

assure close tolerances, maximum strength and superior fatigue resistance. Deep accurate sockets allow full tightening, and customised heat treatment of each heat of steel ensures maximum strength and hardness without brittleness.

Unbrako button head screws are available in plain or plated finishes. Stainless steel screws are also available.

Unbrako flange button head screws in Metric are also available. Please refer to our separate brochure for technical data.



BUTTON HEAD SOCKET SCREWS - ISO Metric

See Notes 3 & 6

Applicable or Similar Specifications:
 Product BS 4168
 Grade BS 6104 Grade 12.9
 ISO 898/1 Grade 12.9

DIMENSIONS AND TIGHTENING TORQUES - ISO Metric Threads

Thread Size	Pitch	A Max.	da Max.	D Max.	H Max.	Q Max.	R Ref.	W Nom.	Maximum Tightening Torques				
									Unplated		Plated		
									Nm lbf.in.	Tensile Loads	kN		
M3	0.50	5.70	3.60	3.31	1.65	.38	3.00	2.0	1.4	12	1.1	9	5.28
M4	0.70	7.60	4.70	3.93	2.20	.38	4.20	2.5	3.4	30	2.6	22	9.22
M5	0.80	9.50	5.70	4.50	2.75	.50	5.20	3.0	6.8	60	5.1	45	14.90
M6	1.00	10.50	6.80	5.90	3.30	.80	5.60	4.0	11.0	97	8.3	73	21.10
M8	1.25	14.00	9.20	7.00	4.40	.80	7.50	5.0	28.0	248	21.0	186	38.40
M10	1.50	17.50	11.20	8.20	5.50	.80	10.00	6.0	55.0	486	41.0	363	60.90
M12	1.75	21.00	13.70	10.50	6.60	.80	11.00	8.0	95.0	840	71.0	630	88.50

ALL DIMENSIONS IN MILLIMETRES.

MECHANICAL PROPERTIES

Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 39-44
Shear Strength 630 N/mm²
Min. Elongation 9%

NOTES:

- Thread Class:** 4g 6g
- da** - Transition diameter.
- Full thread length to within 2 1/2 pitches of head.
- Working Temperature:** -50°C +300°C
- Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma 0.2 = 720 \text{ N/mm}^2$ and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated.
- Length tolerance = $\pm 0.25\text{mm}$.

N.B. Because of their head configurations, button head screws may not meet the minimum ultimate tensile load for property class 12.9, specified in table 6 OF BS 6104: Part 1: 1981. They are nevertheless required to meet the other material and property requirements for property class 12.9 in BS 6104: Part 1.

BUTTON HEAD SOCKET SCREWS - BA, BSW and BSF Threads

Applicable Specifications:
 Product BS 2470

DIMENSIONS AND TIGHTENING TORQUES - BA, BSW and BSF Threads

Thread Size	Threads Per Inch		A Max.	B Max.	da Max.	D Max.	H Max.	L (See Note 1)	Q Max.	R Ref.	T Min. (See Note 1)	W Nom.	Maximum Tightening Torques lbf. in.					
	BA	BSF											Unplated Plated		BA			
													BA	Tensile Load lb. f.		BA	BA	
6BA	47.9		.213	.1102	.1302	.102	.059	.500	.015	.140	.500	1/16	7	5.5	1050			
5BA	43.1		.238	.1260	.1460	.131	.066	.500	.015	.146	.500	5/64	11	8.0	1390			
4BA	38.5		.262	.1417	.1617	.131	.073	.625	.015	.163	.625	5/64	15	12.0	1760			
3BA	34.8		.312	.1614	.1914	.149	.087	.750	.015	.190	.750	3/32	23	17.0	2310			
2BA	31.4		.361	.1850	.2150	.186	.101	1.000	.020	.218	1.000	1/8	35	27.0	3070			
0BA	25.4		.437	.2362	.2762	.232	.132	1.000	.031	.254	1.000	5/32	75	56.0	5070			
	BSW	BSF											BSW	BSF	BSW	BSF	BSW	BSF
3/16	24	32	.361	.1875	.2175	.186	.101	1.000	.020	.218	1.000	1/8	32	36	24	27	2730	3120
1/4	20	26	.437	.2500	.2900	.232	.132	1.000	.031	.254	1.000	5/32	80	89	60	67	5130	5710
5/16	18	22	.547	.3125	.3520	.268	.166	1.000	.031	.314	1.000	3/16	165	177	124	133	8440	9080
													lbf. ft.					
3/8	16	20	.656	.3750	.4150	.304	.199	1.500	.031	.373	1.500	7/32	24	26	18	19	12500	13400
7/16	14	18	.750	.4375	.4780	.340	.232	1.500	.031	.417	1.500	1/4	39	42	29	31	17100	18500
1/2	12	16	.875	.5000	.5600	.414	.265	2.000	.046	.486	2.000	5/16	58	63	43	47	22200	24300
5/8	11	14	1.000	.6250	.6850	.486	.331	2.000	.062	.528	2.000	3/8	118	126	88	95	36400	38900
3/4	10	12	1.218	.7500	.8100	.613	.398	2.000	.078	.670	2.000	1/2	210	220	157	165	53700	56400

ALL DIMENSIONS IN INCHES.

Length 'L' Tolerance		
Screws Over	Up to and including	Tolerance
-	1"	± 0.10 "
1"	2"	+0.031" -0.016"
2"	6"	± 0.031 "
6"	-	± 0.062 "

MECHANICAL PROPERTIES

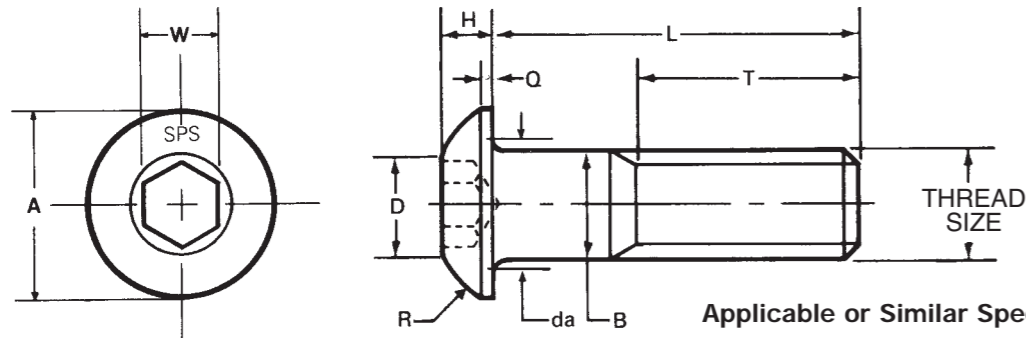
Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 39-44
Shear Strength 96,000 lbf/in²
Min. Elongation 9%

N.B. Because of their head configurations, button head screws tensile loads, are based on 160,000 lbf/in².

NOTES:

- Thread Length** - Screw lengths equal to or shorter than listed in column 'L' will be threaded to head. For screw lengths longer than 'L', 'T' designates the minimum thread length. The maximum thread length is not specified.
- Thread Class:** BA - Close
BSW and BSF - Medium
- da** - Transition diameter.
- Working Temperature:** -50°C +300°C

BUTTON HEAD SOCKET SCREWS - UNC and UNF Threads



Applicable or Similar Specifications:
BS 2470
ANSI B 18.3

DIMENSIONS AND TIGHTENING TORQUES - UNC and UNF Threads

Thread Size	Threads Per Inch		A Max.	B Max.	da Max.	D Max.	H Max.	L (See Note 1)	Q Max.	R Ref.	T Min. (See Note 1)	W Nom.	Maximum Tightening Torques lbf. in.				Loads lb. f.	
	UNC	UNF											Unplated Plated		UNC	Tensile	UNC	UNF
	UNC	UNF											UNC	UNC	UNC			
N°4	40	48	.213	.1120	.1320	.102	.059	.500	.015	.140	.500	1/16	8.9	10	6.6	7.5	960	1040
N°5	40	44	.238	.1250	.1450	.131	.066	.500	.015	.146	.500	5/64	13.0	14	9.7	10.0	1260	1310
N°6	32	40	.262	.1380	.1580	.131	.073	.625	.015	.163	.625	5/64	16.0	19	12.0	14.0	1440	1620
N°8	32	36	.312	.1640	.1940	.149	.087	.750	.015	.190	.750	3/32	30.0	32	22.0	24.0	2220	2240
N°10	24	32	.361	.1900	.2200	.186	.101	1.000	.020	.218	1.000	1/8	44.0	51	33.0	38.0	2780	3180
1/4	20	28	.437	.2500	.2900	.232	.132	1.000	.031	.254	1.000	5/32	100.0	120	75.0	90.0	5070	5790
5/16	18	24	.547	.3125	.3520	.268	.166	1.000	.031	.314	1.000	3/16	210.0	240	157.0	180.0	8350	9250
													lbf. ft.					
3/8	16	24	.656	.3750	.4150	.304	.199	1.250	.031	.373	1.000	7/32	380	430	285	322	12400	14000
7/16	14	20	.750	.4375	.4780	.340	.232	1.500	.031	.417	1.500	1/4	600	680	450	510	16900	18900
1/2	13	20	.875	.5000	.5600	.414	.265	2.000	.046	.486	2.000	5/16	930	1050	697	787	22800	25600
5/8	11	18	1.000	.6250	.6850	.486	.331	2.000	.062	.528	2.000	3/8	1800	2000	1350	1500	36000	40800
3/4	10	16	1.218	.7500	.8100	.613	.398	2.000	.078	.670	2.000	1/2	3200	3560	2400	2670	53200	59300

ALL DIMENSIONS IN INCHES.

Length 'L' Tolerance		
Screws Over	Up to and including	Tolerance
-	1"	±0.16"
1"	2"	+0.031" -0.016"
2"	6"	±0.031"
6"	-	±0.062"

NOTES:

- Thread Length** - Screw lengths equal to or shorter than listed in column 'L' will be threaded to head. For screw lengths longer than 'L', 'T' designates the minimum thread length. The maximum thread length is not specified.
- Thread Class: 3A**
- da** - Transition diameter.
- Max. Working Temperature:** -50°C +300°C
- Torques calculated in accordance with VDI 2230 "Systematic calculation of high duty bolted joints" with $\sigma 0.2 = 100$ K.S.I. and $\mu = 0.125$ for plain finish and $\mu = 0.094$ for plated.

MECHANICAL PROPERTIES

Material	Unbrako High Grade Alloy Steel
Heat Treatment	Rc 39-44
Shear Strength	96,000 lbf/in ²
Min. Elongation	9%

N.B. Because of their head configurations, button head screws tensile loads, are based on 160,000 lbf/in².

SOCKET SET SCREWS

In contrast to other types of fasteners, set screws are primarily used in compression. They must hold fast against three types of forces, torsional (rotational), axial (lateral movement) and vibrational. To be effective, socket set screws should produce a strong clamping action which resists the relative motion between the assembled parts, because of the compression developed by tightening the set screw. Since holding power is proportional to seating torque, the tighter you can seat the screw, the higher the compression force will be.

But there is a limit to how much you can tighten the average set screw. If you're not careful, you'll ream or crack the socket, or strip the threads. So you're never sure if the screw is tight enough, and whether it will stay tight.

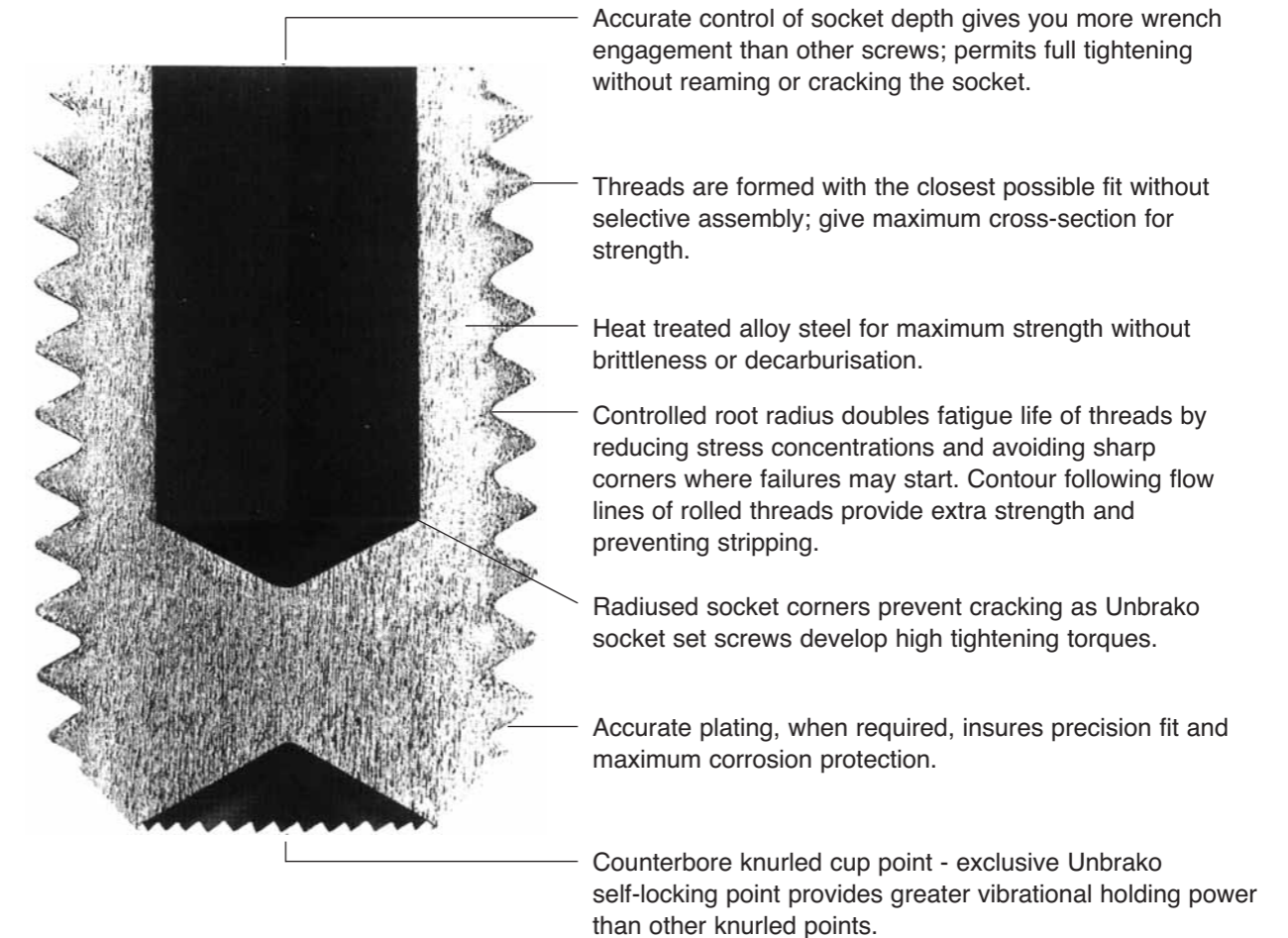
But you can be sure that Unbrako set screws will 'stay put' because you can tighten them until the key twists off, with no damage to the screws. Unbrako recommend tightening torques as much as 40% higher than other set screws, giving you extra holding power and additional safety and reliability.

Unbrako socket set screws hold tighter because

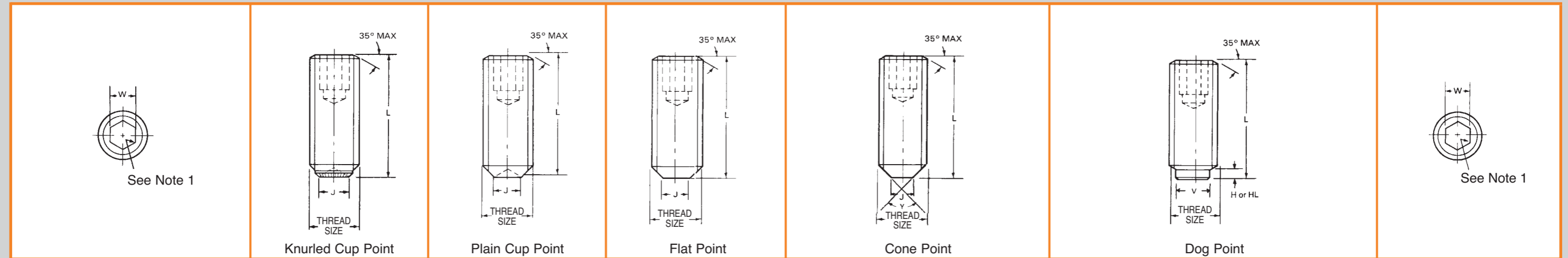
they are stronger than other set screws. The superior strength and dimensional uniformity of Unbrako set screws permit use of consistently higher seating torques than with other set screws. Consequently you can often save money because you can reduce the size or the number of set screws you require in your assembly.

Here are some of the reasons why Unbrako set screws are so strong and stay tight. Unbrako set screws are made of high grade alloy steel and heat treated to a minimum hardness of Rc 45. (Stainless steel set screws are available). Deep accurate sockets give more key engagement for extra wrenching areas. Radiused socket corners minimise points of weakness where cracks may start. Distribute stresses. Fully formed rolled threads provide greater strength and resistance to stripping. Controlled heat treatment assures uniform hardness without brittleness.

Unbrako socket set screws are available in knurled cup, cone, half dog, flat and plain cup point styles in plain or plated finishes. Stainless steel set screws are available in plain cup points only.



SOCKET SET SCREWS - ISO Metric



DIMENSIONS AND TIGHTENING TORQUES - ISO Metric Threads

Thread Size	Pitch	W Nom.	Knurled Cup Point		Plain Cup		Flat Point		J Max.	Cone Point		Dog Point				Maximum Tightening Torque Nm	
			J Max.	L Minimum Preferred	J Max.	L Minimum Preferred	J Max.	L Minimum Preferred		L Minimum Preferred	y° ± 2°	L (See Note 4)	H Half Dog Max.	HL Full Dog Max.	V Max.	lbf.in.	Nm
M3	0.50	1.5	1.30	3.0	1.4	3.0	2.0	3.0	Sharp	4.0	4.00	5.00	1.00	1.75	2.00	0.87	7.7
M4	0.70	2.0	2.10	3.0	2.0	3.0	2.5	3.0	Sharp	4.0	5.00	6.00	1.25	2.25	2.50	2.20	19.5
M5	0.80	2.5	2.40	4.0	2.5	4.0	3.5	4.0	Sharp	5.0	6.00	6.00	1.50	2.75	3.50	4.60	41.0
M6	1.00	3.0	3.30	5.0	3.0	4.0	4.0	4.0	1.5	6.0	8.00	8.00	1.75	3.25	4.00	7.80	69.0
M8	1.25	4.0	4.30	6.0	5.0	5.0	5.5	5.0	2.0	6.0	10.00	10.00	2.25	4.30	5.50	18.00	160.0
M10	1.50	5.0	5.25	8.0	6.0	6.0	7.0	6.0	2.5	8.0	12.00	12.00	2.75	5.30	7.00	36.00	320.0
M12	1.75	6.0	6.60	10.0	8.0	8.0	8.5	8.0	3.0	10.0	14.00	16.00	3.25	6.30	8.50	62.00	550.0
(M14)	2.00	6.0	8.10	12.0	9.0	10.0	10.0	10.0	4.0	12.0	14.00	20.00	3.80	7.36	10.00	62.00	550.0
M16	2.00	8.0	9.10	14.0	10.0	12.0	12.0	12.0	4.0	14.0	18.00	20.00	4.30	8.36	12.00	150.00	1330.0
(M18)	2.50	10.0	10.30	16.0	12.0	14.0	13.0	12.0	5.0	16.0	20.00	25.00	4.80	9.36	13.00	290.00	2570.0
M20	2.50	10.0	11.50	18.0	14.0	16.0	15.0	14.0	5.0	18.0	22.00	25.00	5.30	10.36	15.00	290.00	2570.0
(M22)	2.50	12.0	12.65	20.0	16.0	18.0	17.0	16.0	6.0	20.0	28.00	30.00	5.80	11.43	17.00	475.00	4200.0
M24	3.00	12.0	14.65	20.0	16.0	20.0	18.0	20.0	6.0	20.0	28.00	30.00	6.30	12.43	18.00	475.00	4200.0

ALL DIMENSIONS IN MILLIMETRES. SIZES IN BRACKETS ARE NON-PREFERRED STANDARDS.

MECHANICAL PROPERTIES

Material Unbrako High Grade Alloy Steel
Hardness Rc 45 Minimum

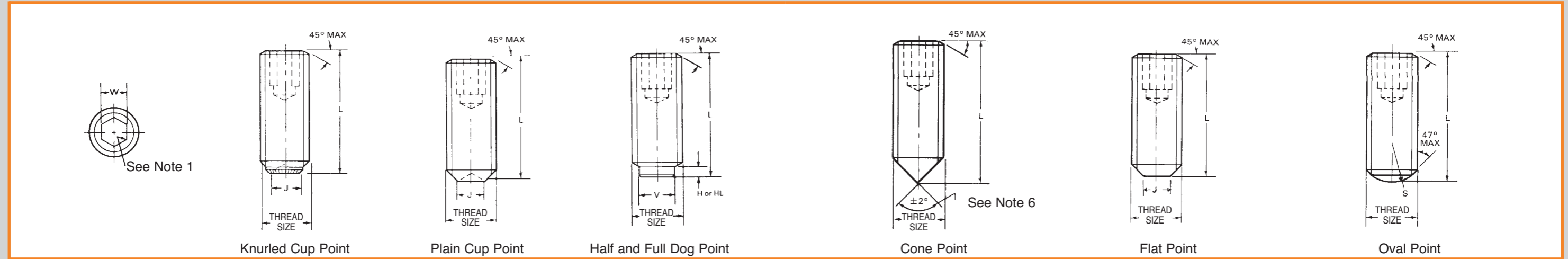
NOTES:

1. Corner of recess must have fillets to minimise stress concentrations.
2. **Thread Class:** 4g 6g
3. **Working Temperature:** -50°C +300°C
4. Screws with length L or below will have half dog point H.
Screws with lengths above L will have full dog point HL.
5. Torques calculated at 75% of the torsional shear strength of the respective Unbrako wrenches.
6. For torque and axial holding power see pages 36 and 37.
7. Micro size Plain Cup Point are shown on page 38.

Length 'L' Tolerance		
Screws Over	Up to and including	Tolerance
-	Screw Diameter	+0.25 -0.00
Screw Diameter	50	±0.25
	50	±0.50
	80	±0.70
	120	±0.80

Applicable or Similar Specifications:	
	BS 4168
Flat Point	DIN 913 ISO 4026
Cone Point	DIN 914 ISO 4027
Dog Point	DIN 915 ISO 4028
Plain Cup	DIN 916 ISO 4029

SOCKET SET SCREWS - UNC, UNF, BA, BSW and BSF Threads



DIMENSIONS AND TIGHTENING TORQUES - UNC, UNF, BA, BSW and BSF Threads

Thread Size	Unified Threads		BA Threads		British Threads			W Nom.	J Max.	Plain & KCP L Minimum Preferred	Dog Point				V Max.	Cone Point L Minimum Preferred	Flat Point L Minimum Preferred	Oval Point	
	Threads Per Inch		Thread Size	Threads Per Inch	Thread Size	Threads Per Inch					H Half Dog Max.	L Min. Pref. Half Dog	HL Full Dog Max.	L Min. Pref. Full Dog				S Max.	
	UNC	UNF				BSW	BSF												
N°0		80						.028	.033*	.062*	.017	.094	.033	.094	.040	.062	.062	.062	.057
N°1		72						.035	.040*	.062*	.021	.094	.039	.094	.049	.062	.062	.062	.065
N°2	56	64	8BA	59.1				.035	.047*	.062*	.024	.094	.048	.125	.057	.125	.094	.094	.072
N°3	48	56	7BA	52.9				.050	.54*	.094*	.027	.125	.054	.125	.066	.125	.094	.094	.088
N°4	40	48	6BA	47.9				.050	.061	.094	.030	.125	.066	.188	.075	.125	.094	.094	.093
N°5	40	44	5BA	43.1	1/8	40		1/16	.067	.094	.033	.125	.070	.188	.083	.125	.094	.094	.104
N°6	32	40	4BA	38.5				1/16	.074	.094	.038	.125	.080	.188	.092	.125	.094	.094	.119
N°8	32	36	3BA	34.8	5/32	32		5/64	.087	.094	.043	.125	.090	.250	.109	.125	.094	.125	.135
N°10	24	32	2BA	31.4	3/16	24	32	3/32	.098	.094	.049	.125	.100	.250	.127	.125	.125	.125	.151
N°12	24	28	1BA	28.2				3/32	.113	.188	.059	.188	.120	.250	.144	.188	.188	.188	.166
1/4	20	28	0BA	25.4	1/4	20	26	1/8	.130	.188	.067	.188	.135	.312	.156	.188	.188	.188	.197
5/16	18	24			5/16	18	22	5/32	.169	.250	.082	.250	.166	.375	.203	.188	.188	.188	.244
3/8	16	24			3/8	16	20	3/16	.206	.250	.099	.375	.198	.437	.250	.250	.250	.250	.291
7/16	14	20			7/16	14	18	7/32	.242	.250	.114	.375	.229	.500	.296	.312	.250	.250	.338
1/2	13	20			1/2	12	16	1/4	.281	.312	.130	.375	.260	.500	.343	.375	.312	.312	.385
9/16	12	18			9/16	12	16	1/4	.319	.375	.148	.437	.291	.625	.390	.437	.375	.375	.432
5/8	11	18			5/8	11	14	5/16	.362	.437	.164	.437	.323	.750	.468	.500	.437	.437	.479
3/4	10	16			3/4	10	12	3/8	.440	.500	.196	.500	.385	.875	.562	.562	.500	.500	.573
7/8	9	14			7/8	9	11	1/2	.518	.562	.227	.625	.448	1.000	.656	.625	.562	.625	.666
1	8	12			1	8	10	9/16	.594	.625	.260	.750	.510	1.000	.750	.750	.625	.750	.760
1 1/8	7	12			1 1/8	7	9	9/16	.675	.750	.291	.873	.573	1.500	.843	.875	.750	.750	.853
1 1/4	7	12			1 1/4	7	9	5/8	.758	.875	.323	1.000	.635	1.500	.937	1.000	.875	.875	.948
1 3/8	6	12			1 3/8	6	8	5/8	.833	1.000	.353	1.125	.697	1.750	1.031	1.000	1.000	1.000	1.062
1 1/2	6	12			1 1/2	6	8	3/4	.911	1.000	.385	1.250	.760	1.750	1.125	1.000	1.250	1.250	1.156

ALL DIMENSIONS IN INCHES

MECHANICAL PROPERTIES

Material Unbrako High Grade Alloy Steel
Hardness Rc 45 Minimum

NOTES:

1. Corner of recess must have fillets to minimise stress concentrations.
2. **Thread Class:** BA - Close
BSW and BSF - Medium
UNC and UNF - 3A
3. **Working Temperature:** -50°C +300°C
4. *denotes Plain Cup only.
5. For torque and axial holding power see pages 36 and 37.
6. Inclined angle is 90°, except when length equals diameter or less when inclined angle is 118°.

Length 'L' Tolerance

Screws Over	Up to and including	Tolerance
-	5/8"	±0.010"
5/8"	2"	±0.020"
2"	6"	±0.031"
6"	-	±0.062"

Applicable or Similar Specifications:

UNC/UNF	BS 2470
	ANSI B 18.3
BA/BSW/BSF	BS 2470

SOCKET SET SCREWS

- Torsional and axial holding power - seated against steel shaft. Based on recommended seating torques.

ISO Metric Threads



Thread Size	Seating Torque Nm	Axial Holding Power (kN)	Shaft diameter (shaft hardness Rc 15 to Rc 35)																							
			Torsional holding power Nm																							
			1.4	1.6	1.8	2.0	3.0	4.0	5.0	6.0	8.0	10	12	14	16	18	20	25	30	40	50	60	70	80	90	100
M1.4	.10	.19	.13	.15	.17	.19	.29	.38	.48																	
M1.6	.10	.22	.15	.18	.20	.22	.33	.44	.55	.66																
M1.8	.10	.25	.18	.20	.23	.25	.38	.50	.63	.75	1.0															
M2.0	.21	.29	.20	.23	.26	.29	.44	.58	.73	.87	1.2	1.5														
M2.5	.60	.53		.42	.48	.53	.80	1.10	1.30	1.60	2.1	2.7	3.2													
M2.6	.60	.56			.50	.56	.84	1.10	1.40	1.70	2.2	2.8	3.4	3.9	4.5											
M3	.87	.71				.71	1.07	1.40	1.80	2.10	2.8	3.6	4.3	5.0	5.7	6.4	7.1									
M4	2.20	1.70				1.70	2.60	3.40	4.30	5.10	6.8	8.5	10.0	12.0	14.0	15.0	17.0	21								
M5	4.60	2.50					3.80	5.00	6.30	7.50	10.0	13.0	15.0	18.0	20.0	23.0	25.0	31	38							
M6	7.80	4.20							11.00	13.00	17.0	21.0	25.0	29.0	34.0	38.0	42.0	53	63	84						
M8	18.00	6.70								20.00	27.0	34.0	40.0	47.0	54.0	60.0	67.0	84	101	134	168	201				
M10	36.00	9.30									37.0	47.0	56.0	65.0	74.0	84.0	93.0	116	140	186	233	279				
M12	62.00	12.00										60.0	72.0	84.0	96.0	108.0	120	150	180	240	300	360	420			
M14	62.00	15.00											90.0	105.0	120.0	135.0	150.0	188	225	300	375	450	525	600		
M16	150.00	18.00												126.0	144.0	162.0	180.0	225	270	360	450	540	630	720	810	
M18	290.00	21.00													168.0	189.0	210.0	263	315	420	525	630	735	840	945	1050
M20	290.00	23.00														207.0	230.0	288	345	460	575	690	805	920	1040	1150
M22	475.00	26.00															260.0	325	390	520	650	780	910	1040	1170	1300
M24	475.00	29.00																363	435	580	725	870	1020	1160	1310	1450

ALL DIMENSIONS IN MILLIMETRES

UNC, UNF, BA, BSW and BSF Threads

Thread Size	Seating Torque lbf. in.	Axial Holding Power (lbf.)	Shaft diameter (shaft hardness Rc 15 to Rc 35)																							
			Torsional Holding Power lbf.in.																							
			1/16	3/32	1/8	5/32	3/16	7/32	1/4	5/16	3/8	7/16	1/2	9/16	5/8	3/4	7/8	1	1 1/4	1 1/2	1	2	2 1/2	3	3 1/2	4
N°0	1.0	50	1.5	2.3	3.1	3.9	4.7	5.4	6.2																	
N°1	1.8	65	2.0	3.0	4.0	5.0	6.1	7.1	8.1	10.0																
N°2/8BA	1.8	85	2.6	4.0	5.3	6.6	8.0	9.3	10.6	13.2	16.0															
N°3/7BA	5.0	120	3.2	5.6	7.5	9.3	11.3	13.0	15.0	18.7	22.5	26.3														
N°4/6BA	5.0	160		7.5	10.0	12.5	15.0	17.5	20.0	25.0	30.0	35.0	40.0													
N°5/5BA	10.0	200			12.5	15.6	18.7	21.8	25.0	31.2	37.5	43.7	50.0	56.2	62											
N°6/4BA	10.0	250				19.0	23.0	27.0	31.0	39.0	47.0	55.0	62.0	70.0	78	94	109									
N°8/3BA	20.0	385				30.0	36.0	42.0	48.0	60.0	72.0	84.0	96.0	108.0	120	144	168	192								
N°10/2BA	36.0	540					51.0	59.0	68.0	84.0	101.0	118.0	135.0	152.0	169	202	236	270	338							
1/4/0BA	87.0	1,000						125.0	156.0	187.0	218.0	250.0	281.0	312	375	437	500	625	750							
5/16	165.0	1,500							234.0	280.0	327.0	375.0	421.0	468	562	656	750	937	1125	1310	1500					
3/8	290.0	2,000								375.0	437.0	500.0	562.0	625	750	875	1000	1250	1500	1750	2000					
7/16	430.0	2,500									545.0	625.0	702.0	780	937	2095	1250	1560	1875	2210	2500	3125				
1/2	620.0	3,000										750.0	843.0	937	1125	1310	1500	1875	2250	2620	3000	3750	4500			
9/16	620.0	3,500												985.0	1090	1310	1530	1750	2190	2620	3030	3500	4370	5250	6120	
5/8	1,325.0	4,000													1250	1500	1750	2000	2500	3000	3500	4000	5000	6000	7000	8000
3/4	2,400.0	5,000														1875	2190	2500	3125	3750	4375	5000	6250	7500	8750	10000
7/8	5,200.0	6,000															2620	3000	3750	4500	5250	6000	7500	9000	10500	12000
1	7,200.0	7,000																3500	4375	5250	6120	7000	8750	10500	12250	14000

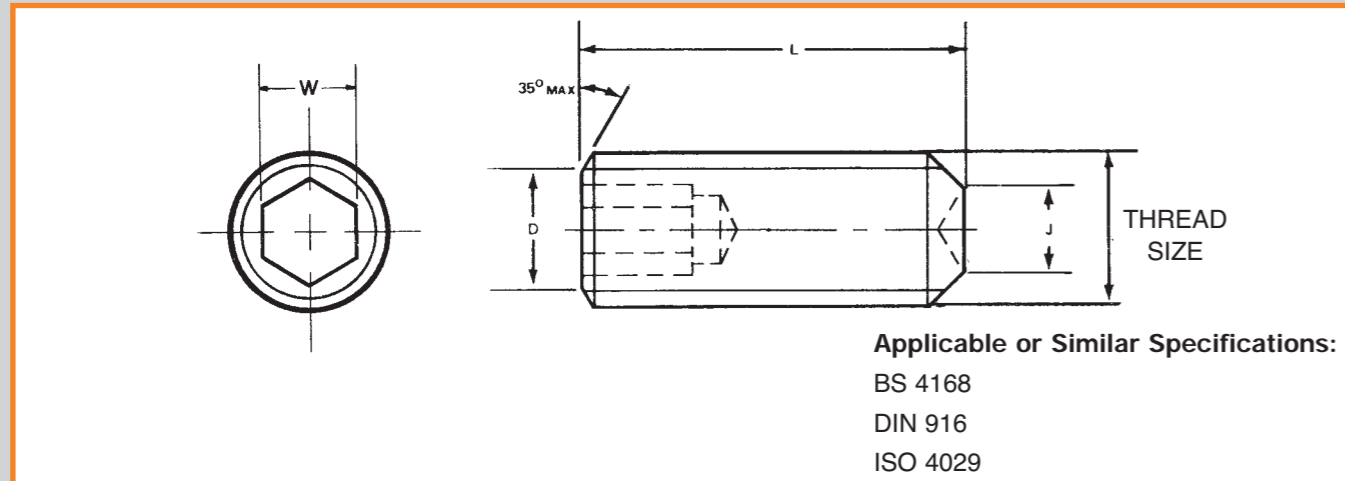
ALL DIMENSIONS IN INCHES.

NOTES:

Tabulated axial and torsional holding powers are typical strengths and should be used accordingly, with specific safety factors appropriate to the given application and load conditions.

Good results have been obtained with a factor of 1.5-2.0 under static load conditions (i.e. where a collar is supporting a vertical load on a post) and of 4.0-8.0 for various dynamic conditions. Values in bold type in the chart indicate recommended set screw sizes on the basis that screw diameter should be roughly one-half shaft diameter.

SOCKET SET SCREWS - ISO Metric Microsize Plain Cup Point



DIMENSIONS AND TIGHTENING TORQUES - ISO Metric Threads

Thread Size	Pitch	D Max.	J Max.	Range of Length 'L'		W Nom.	Maximum Tightening Torques	
				Min.	Max.		Nm	lbf. in.
M1.4	0.30	0.90	0.70	2.5	5.0	0.71	0.10	0.9
M1.6	0.35	1.00	0.80	2.5	5.0	0.71	0.10	0.9
M1.8	0.35	1.20	0.90	2.5	5.0	0.71	0.10	0.9
M2.0	0.40	1.32	1.00	2.5	10.0	0.89	0.21	1.8
M2.5	0.45	1.75	1.20	3.0	10.0	1.27	0.60	5.3

ALL DIMENSIONS IN MILLIMETRES.

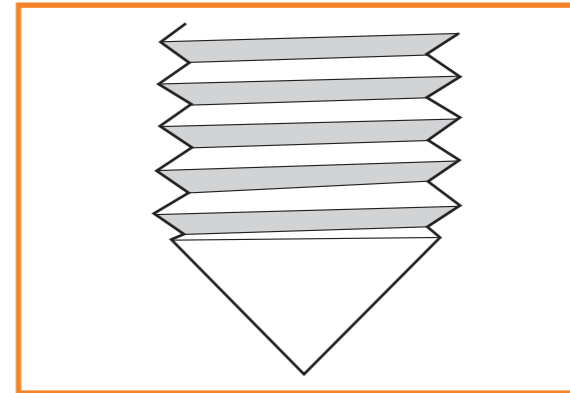
MECHANICAL PROPERTIES

Material Unbrako High Grade Alloy Steel
Hardness Rc 45 Minimum

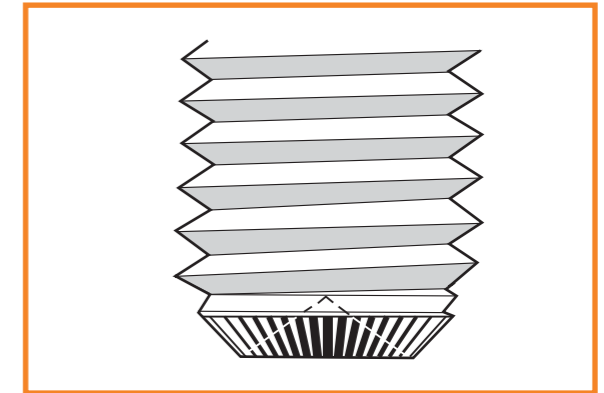
NOTES:

- Thread Class:** 4g 6g
- Working Temperature:** -50°C +300°C
- For torque and axial holding power see pages 36 & 37.

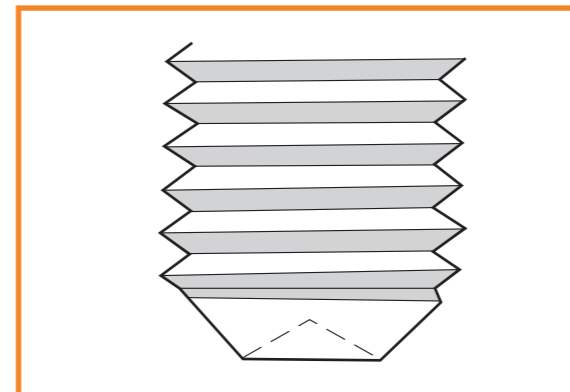
SOCKET SET SCREWS



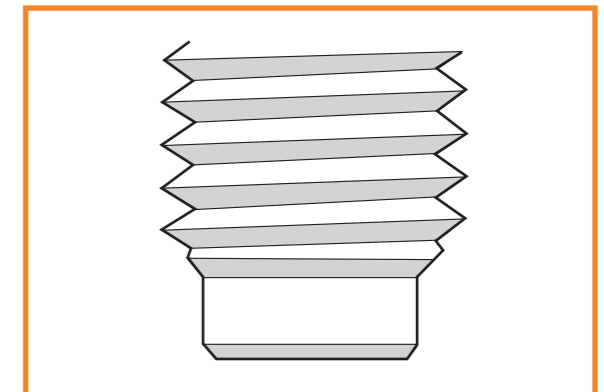
Cone Point - Use for permanent location of parts. Deep penetration gives highest axial and torsional holding power. Unbrako cone point set screws are ideally suited for use as pivots and for applications where fine adjustments are necessary.



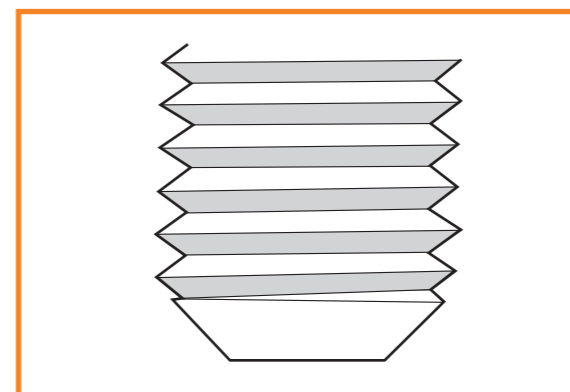
Knurled Cup Point - Use for quick, permanent location of gears, collars, and pulleys on shafts. Exclusive counter-clockwise knurl prevents Unbrako screws from loosening even in poorly tapped holes. Resists severe vibration. On all set screws over 1/4" the cup is counterbored to provide maximum holding power.



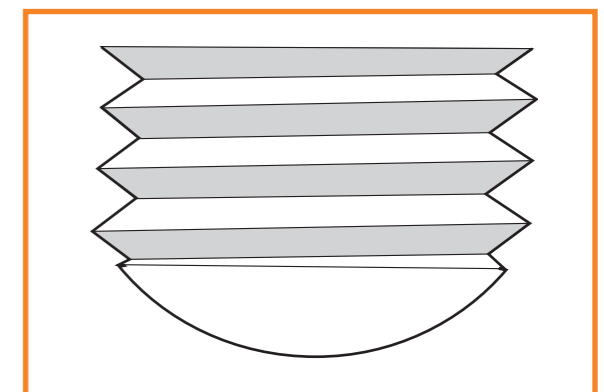
Plain Cup - Use against hardened shafts, in zinc, die castings and other soft materials where high tightening torques are impractical.



Half and Full Dog Point - Use for permanent location of one part to another. The point is usually spotted in a hole drilled in a shaft or on a flat surface milled on the shaft.



Flat Point - Use where parts must be frequently re-set, as it causes little or no damage to the part it bears against. Can be used against hardened shafts (usually with ground flat for better contact) and as adjusting screw. Preferred for thin wall thickness and on soft plugs.



Oval Point - Use for frequent adjustment without deformation of the part it bears against, also for seating against an angular surface. Circular U-grooves or axial V-grooves sometimes put in shaft to permit rotational or longitudinal adjustment.



The perfect combination
is to use genuine
Unbrako hexagon
wrenches with
Unbrako socket screws

Separate Hexagon Wrench brochure available on request.

SOCKET HEAD SHOULDER SCREWS

Unbrako shoulder screws are actually hardened shafts with a knurled head and threaded portion. The shoulder formed where the threads meet the larger diameter body acts as a stop when the screw is threaded into a tapped hole, permitting the screw to be used as a pivot, shaft, or stationary guide.

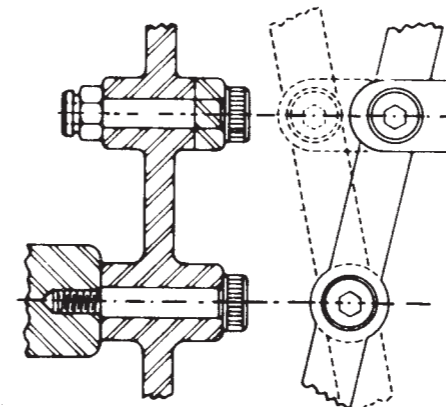
Unbrako shoulder screws are used to operate stripper plates and in pressure pads a wide variety of tool and die work. They are also used as shafts or pivots, holding pulleys, gears, cams and cam followers, ratchets and circular form tools. Stationary guide applications including locating pins in fixtures, latch stops, alignment of stationary members, linkage blocks, and stock guides in dies. Unbrako shoulder screws are especially advantageous in applications where the fastened part must be removed frequently. For instance, when the shoulder screw is used as a

shaft for circular form tools, the screw can be removed to permit sharpening of the tool in a matter of seconds. Assembly is equally as fast.

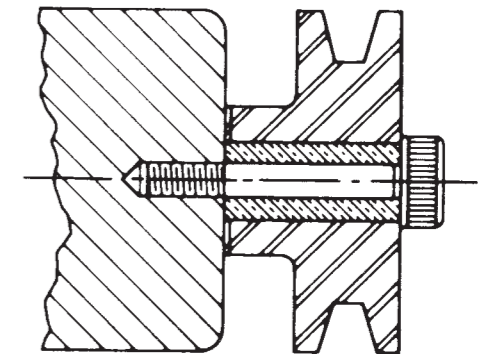
Unbrako shoulder screws are made of high grade alloy steel and have knurled heads for sure gripping and quick assembly. The precision hexagon socket gives maximum wrench engagement to allow tightening to the full strength of the screw. Concentricity between body and threads is closely controlled, permitting easy, accurate assembly. Fully formed radius root threads ensure maximum tensile strength and resist stripping.

Finally, the precision tolerance on the shoulder provides close and accurate mating with the fastened components. Unbrako manufacture to a tolerance position closer than required by international standards.

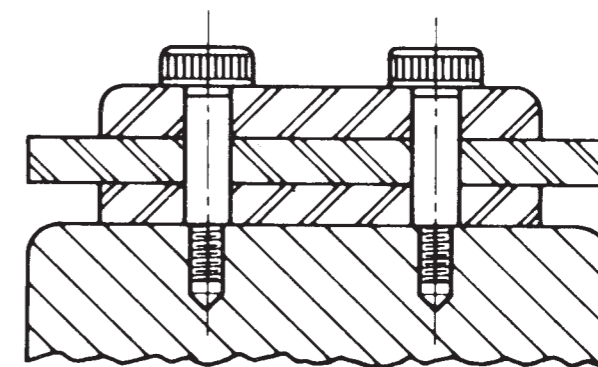
APPLICATIONS



Moving Shaft or Pivot

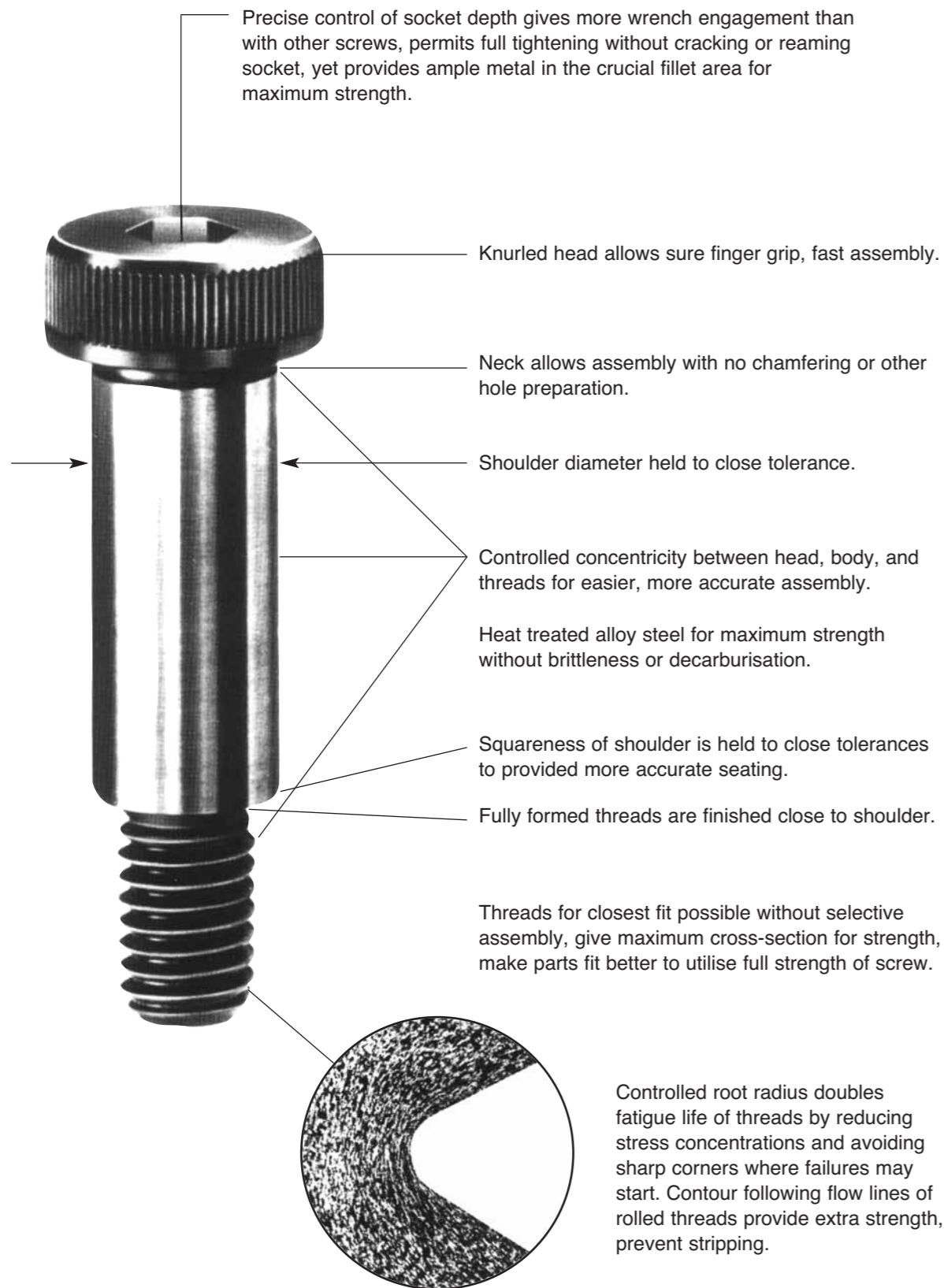


Pulley Shaft Uses

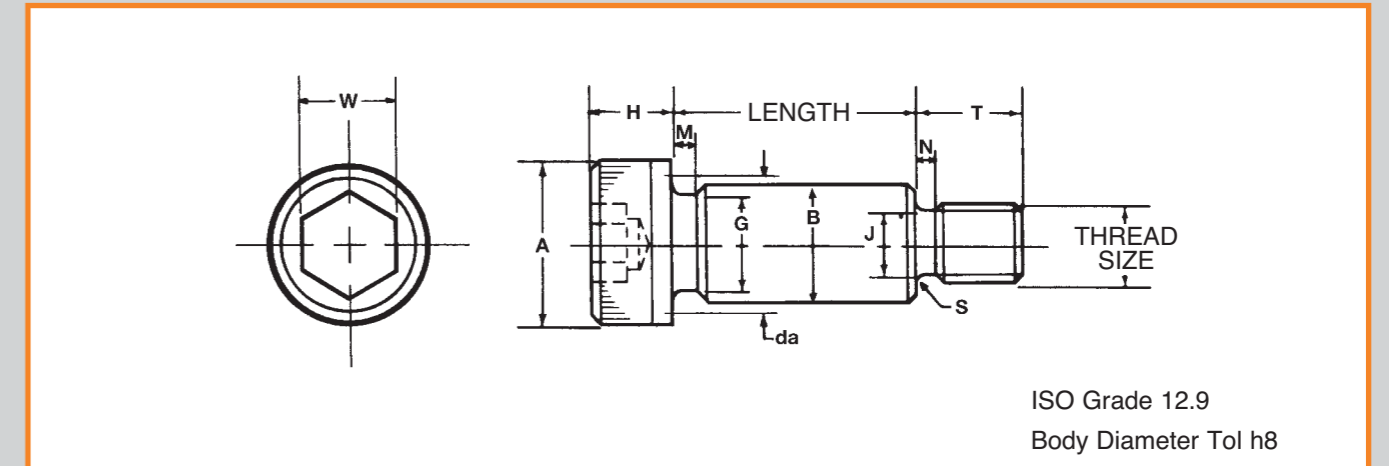


Stationary Guide

SOCKET HEAD SHOULDER SCREWS



SOCKET HEAD SHOULDER SCREWS - ISO Metric



DIMENSIONS - ISO Metric Threads

Body Size	Thread Size	Pitch	A Max.	B			da Max.	G Max.	H Max.	J Max.	M Max.	N Max.	S Max.	T		W Nom.
				Max.	Min.	Max.								Min.		
6.00	M5	0.8	10.00	6.000	5.982	6.80	5.62	4.50	3.84	1.85	2.00	0.55	9.75	9.25	3.0	
8.00	M6	1.0	13.00	8.000	7.978	9.20	7.62	5.50	4.56	1.85	2.50	0.65	11.25	10.75	4.0	
10.00	M8	1.25	16.00	10.000	9.978	11.20	9.62	7.00	6.23	1.85	3.00	0.85	13.25	12.75	5.0	
12.00	M10	1.50	18.00	12.000	11.973	14.20	11.62	9.00	7.89	1.85	3.50	1.05	16.25	15.75	6.0	
16.00	M12	1.75	24.00	16.000	15.973	18.20	15.62	11.00	9.54	1.85	4.00	1.15	18.25	17.75	8.0	
18.00	M14	2.00	27.00	18.000	17.973	20.20	17.62	12.00	11.20	2.50	4.50	1.25	20.25	19.75	10.0	
20.00	M16	2.00	30.00	20.000	19.967	22.40	19.62	14.00	13.20	2.50	4.50	1.25	22.25	21.75	10.0	
22.00	M18	2.50	33.00	22.000	21.967	24.40	21.62	16.00	14.54	2.65	5.60	1.45	25.25	24.75	12.0	
24.00	M20	2.50	36.00	24.000	23.967	26.40	23.62	16.00	16.54	2.65	5.60	1.45	27.25	26.75	12.0	

ALL DIMENSIONS IN MILLIMETRES.

MECHANICAL PROPERTIES

Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 39-43
Shear Strength 730 N/mm²

NOTES:

1.

Nominal	CONCENTRICITY			SQUARENESS	
	Head to Body	Socket to Body	Body to Thread	Head to Body	Body to Thread
6.0	0.15	0.26	0.10	0.15	0.15
8.0	0.16	0.26	0.10	0.18	0.15
10.0	0.20	0.30	0.10	0.24	0.15
12.0	0.24	0.36	0.10	0.27	0.15
16.0	0.32	0.54	0.10	0.34	0.20
18.0	0.36	0.54	0.10	0.38	0.20
20.0	0.40	0.66	0.10	0.42	0.20
22.0	0.44	0.66	0.10	0.45	0.25
24.0	0.48	0.66	0.10	0.50	0.30

2. Straightness

The maximum deviation of the axis of the shoulder.

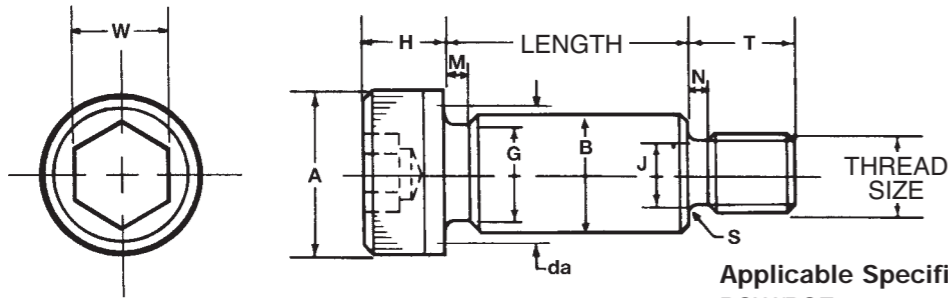
B DIA	SHOULDER LENGTH											
	10	20	30	40	50	60	70	80	90	100	110	120
≤ 8	0.07	0.09	0.11	0.13	0.15	0.17	0.19	0.21	0.23	0.25	0.27	0.29
> 8	0.075	0.10	0.125	0.15	0.175	0.20	0.225	0.25	0.275	0.30	0.325	0.35

3. Squareness, parallelism, concentricity and bow of body to thread pitch dia shall be within 0.05 TIR per centimetre of shoulder length with a maximum 0.70 when seated against the shoulder in a threaded bushing and checked on the shoulder dia at a distance of 5.0 from the bearing face of the head.

- 4. Thread Class: 4g 6g
- 5. da - Transition diameter.
- 6. Working Temperature: -50°C +300°C
- 7. Length Tolerance: +0.25mm -0

N.B. Because of their configuration, these screws cannot be tensile tested.

SOCKET HEAD SHOULDER SCREWS - UNC, UNF, BSW and BSF Threads



Applicable Specifications:
BSW/BSF BS 2470
UNC/UNF ANSI B 18.3
BS 2470

DIMENSIONS - BSW and BSF Threads

Body Size	Thread Size	Threads Per Inch		B							J Max.					T		W Nom.
		BSW	BSF	A Max.	Max.	Min.	da Max.	G Max.	H Max.	BSW	BSF	M Max.	N Max.	S Max.	Max.	Min.		
1/4	3/16	24	32	.375	.2480	.2470	.2760	.235	.188	.129	.138	.093	.083	.023	.375	.355	1/8	
5/16	1/4	20	26	.437	.3105	.3095	.3445	.297	.219	.178	.190	.093	.100	.028	.437	.417	5/32	
3/8	5/16	18	22	.562	.3730	.3720	.4130	.360	.250	.231	.243	.093	.111	.031	.500	.480	3/16	
1/2	3/8	16	20	.750	.4980	.4970	.5500	.485	.313	.285	.299	.093	.125	.035	.625	.595	1/4	
5/8	1/2	12	16	.875	.6230	.6220	.6870	.611	.375	.390	.406	.093	.152	.042	.750	.720	5/16	
3/4	5/8	11	14	1.000	.7480	.7470	.8260	.736	.500	.497	.518	.093	.182	.051	.875	.845	3/8	
7/8	3/4	10	12	1.125	.8730	.8720	.9650	.860	.625	.609	.627	.125	.200	.055	1.000	.970	1/2	
1	3/4	10	12	1.312	.9980	.9970	1.0980	.986	.625	.609	.627	.125	.200	.055	1.000	.970	1/2	
1 1/4	7/8	9	11	1.750	1.2480	1.2470	1.3680	1.236	.750	.716	.743	.125	.222	.062	1.125	1.095	5/8	

ALL DIMENSIONS IN INCHES.

DIMENSIONS - UNC and UNF Threads

Body Size	Thread Size	Threads Per Inch		B							J Max.					T		W Max.
		UNC	UNF	A Max.	Max.	Min.	da Max.	G Max.	H Max.	UNC	UNF	M Max.	N Max.	S Max.	Max.	Min.		
1/4	N°10	24	32	.375	.2480	.2470	.2760	.235	.188	.129	.138	.093	.083	.023	.375	.355	1/8	
5/16	1/4	20	28	.437	.3105	.3095	.3445	.297	.219	.178	.190	.093	.100	.028	.437	.417	5/32	
3/8	5/16	18	24	.562	.3730	.3720	.4130	.360	.250	.231	.243	.093	.111	.031	.500	.480	3/16	
1/2	3/8	16	24	.750	.4980	.4970	.5500	.485	.313	.285	.299	.093	.125	.035	.625	.595	1/4	
5/8	1/2	13	20	.875	.6230	.6220	.6870	.611	.375	.390	.406	.093	.152	.042	.750	.720	5/16	
3/4	5/8	11	18	1.000	.7480	.7470	.8260	.736	.500	.497	.518	.093	.182	.051	.875	.845	3/8	
7/8	3/4	10	16	1.125	.8730	.8720	.9650	.860	.625	.609	.627	.125	.200	.055	1.000	.970	1/2	
1	3/4	10	16	1.312	.9980	.9970	1.0980	.986	.625	.609	.627	.125	.200	.055	1.000	.970	1/2	
1 1/4	7/8	9	14	1.750	1.2480	1.2470	1.3680	1.236	.750	.716	.743	.125	.222	.062	1.125	1.095	5/8	

ALL DIMENSIONS IN INCHES.

MECHANICAL PROPERTIES

Material Unbrako High Grade Alloy Steel
Heat Treatment Rc 39-44
Shear Strength 108,000 lbf/in²

N.B. Because of their configuration, these screws cannot be tensile tested.

NOTES:

- Length** ±0.005
- Concentricity** - Body to head O.D. within 0.002 TIR when checked in a 'V' block. Body to thread P.D. within 0.004 TIR when checked at a distance of 0.188 from the shoulder at the threaded end. Squareness, concentricity, parallelism and bow of body to thread P.D. shall be within 0.005 TIR per inch of body length with a maximum of 0.020 when seated against the shoulder in a threaded bush and checked on the body at a distance of 2M from the underside of the head.
- Squareness** - The bearing surface of the head shall be perpendicular to the axis of the body within a maximum deviation of 2°.
- Thread Class:** BSW and BSF - Medium
UNC and UNF - 3A
- da** - Transition diameter.
- Working Temperature:** -50°C +300°C



The Widest Range in the World

Caution - Information is for general reference only. For more complete specification contact Unbrako.