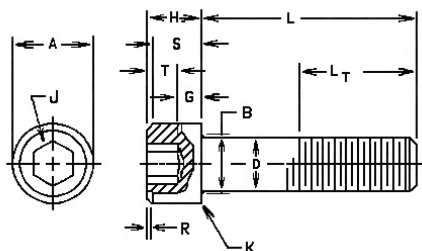


Kerr Lakeside Socket Screw Products



- **2430 Catalog Items**
- **97% Service Level**
- **Inch and Metric “Made in USA” Programs**
- **In-stock Orders Shipped Same Day**
- **Products meet Applicable ASTM and ASME Specifications**
- **Accredited by A2LA to ISO 17025**
- **Certified to: ISO 9001-2000**



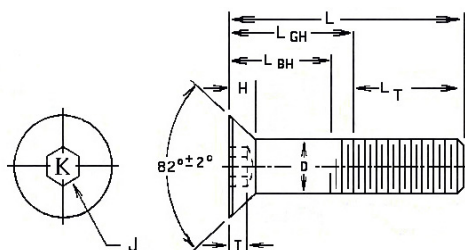
Inch Series Socket Head Cap Screws

ASME B18.3, ASTM A574

Medium Carbon Alloy Steel, heat treated to Rc 39-45 through 1/2" diameter, Rc 37-45 for 5/8" diameter and larger. Minimum Tensile 180 ksi through 1/2" diameter. Minimum Tensile 170 ksi 5/8" diameter and greater.

Threads re-rolled to eliminate thread nicks on diameters 5/16" and above

Catalog diameters through #2 - 2".

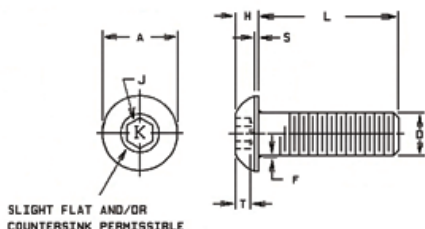


Inch Series Flat Head Cap Screws

ASME B 18.3, ASTM F835

Medium Carbon Alloy Steel, Rc 37-44 Minimum tensile strength 145 ksi 1/2" and smaller. Minimum tensile strength 135 ksi over 1/2". Threads re-rolled to eliminate thread nicks on diameters 5/16" and above.

Catalog diameters through #2 - 1"



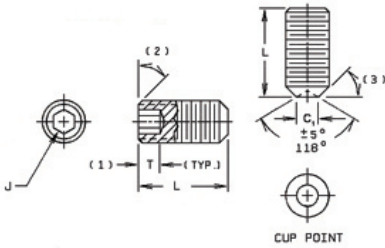
SLIGHT FLAT AND/OR COUNTERSINK PERMISSIBLE

Inch Series Button Head Cap Screws

ASME B 18.3, ASTM F835

Medium Carbon Alloy Steel, Rc 37-44 Minimum tensile strength 145 ksi 1/2" and smaller. Minimum tensile strength 135 ksi over 1/2" Threads re-rolled to eliminate thread nicks on diameters 5/16" and above

Catalog diameters #2 - 5/8".



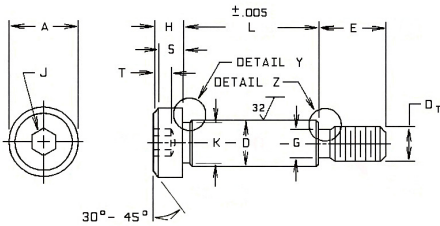
Inch Series Socket Set Screws

ASME B18.3, ASTM F 912.

Medium Carbon Alloy Steel, Rc 45-53

Point Styles Offered: plain cup, knurl, cone, flat, half dog and full dog point

Catalog diameters #2 - 1-1/2"
in cup point



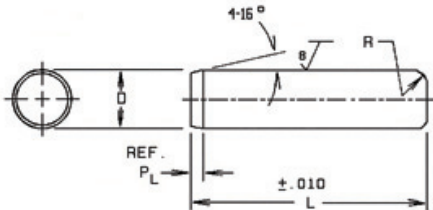
Inch Series Socket Shoulder Screws

ASME B18.3

Tensile Strength 140 ksi minimum

Heat treated to Rc 32-45

Catalog diameters 1/4" - 1"



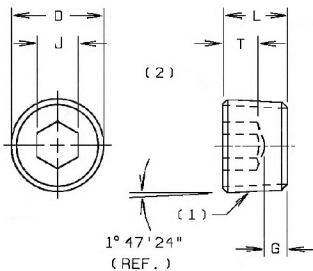
Inch Series Dowel Pins

ASME B 18.8.2

Alloy Steel, core hardness Rc 47-58

Case hardness Rc 60 minimum

Catalog diameters 1/8 - 1"



Inch Series Socket Pressure Plugs

ASME B1.20.3.

Dryseal Type and Flush Types offered.

(Dryseal Type Shown in Drawing)

Alloy Steel Dryseal and Flush Type heat treated to Rc 36-43. Brass Dryseal

Catalog diameters 1/16 - 2"
Dryseal Alloy Steel

Catalog diameters 1/16 - 1/2"
Dryseal Brass

Catalog diameters 1/16 - 1-1/4"
Flush Type Alloy

Metric Socket Head Cap Screws

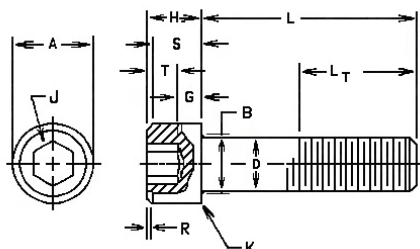
Property Class 12.9

ASME B18.3.1M, ASTM A574M

Medium Carbon Alloy Steel, heat treated
to Rc 38-44

Minimum Tensile Strength is 1220 MPa

Threads re-rolled to eliminate thread
nicks on diameters M8 and above



Catalog diameters M4 - M24

Metric Socket Flat Head Cap Screws

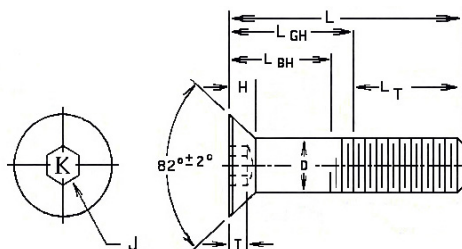
Property Class 12.9

ASME B18.3.5M, ASTM F835M

Tensile strength full size, minimum 980

MPa due to head configuration

Specimen 1220 MPa minimum tensile



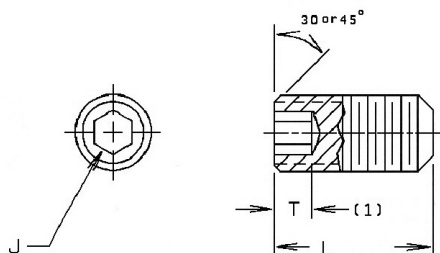
Catalog diameters M3 - M12

Metric Cup Point Socket Set Screws

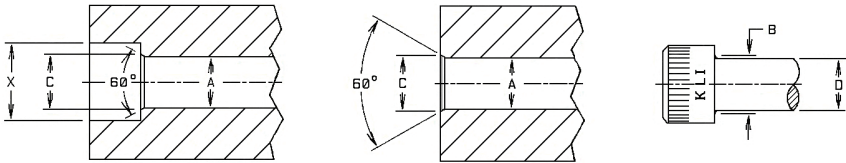
ASME B18.3.6M, ASTM F912M

Alloy Steel heat treated to Rc 45-53.

Catalog diameters M3- M20



Inch Socket Head Cap Screws-1960 Series Drill and Counterbore Sizes



Nominal Size	Basic Screw Diameter	A Close Fit Nominal	A Close Fit Decimal	A Normal Fit Nominal	A Normal Fit Decimal	X Counterbore Size Hole X	C Transition Diameter B Maximum (see chamfering note)
#2	0.0860	3/32	0.0937	38*	0.1065	3/16	0.102
#3	0.0900	38*	0.1065	31*	0.1200	7/32	0.115
#4	0.1120	1/8	0.1250	29*	0.1360	7/32	0.130
#5	0.1250	9/64	0.1406	23*	0.1540	1/4	0.145
#6	0.1380	23*	0.1540	18*	0.1695	9/32	0.158
#8	0.1640	15*	0.1800	10*	0.1935	5/16	0.188
#10	0.1900	5*	0.2055	2*	0.2210	3/8	0.218
1/4	0.2500	17/64	0.2656	9/32	0.2812	7/16	0.278
5/16	0.3125	21/64	0.3281	11/32	0.3437	17/32	0.346
3/8	0.3750	25/64	0.3906	13/32	0.4062	5/8	0.415
7/16	0.4375	29/64	0.4531	15/32	0.4687	23/32	0.483
1/2	0.5000	33/64	0.5156	17/32	0.5312	13/16	0.552
5/8	0.6250	41/64	0.6406	21/32	0.6562	1	0.689
3/4	0.7500	49/64	0.7656	25/32	0.7812	1 3/16	0.828
7/8	0.8750	57/64	0.8906	29/32	0.9062	1 3/8	0.963
1	1.0000	1 1/64	1.0156	1 1/32	1.0312	1 5/8	1.100
1 1/4	1.2500	1 9/32	1.2812	1 5/16	1.3215	2	1.370
1 1/2	1.5000	1 17/32	1.5312	1 9/16	1.5825	2 3/8	1.640
1 3/4	1.7500	1 25/32	1.7812	1 13/16	1.8125	2 3/4	1.910
2	2.0000	2 1/32	2.0312	2 1/16	2.0625	3 1/8	2.180

Inch Socket Head Cap Screws-1960 Series Mechanical Properties

Nominal Size	Tensile Strength Min. psi	Yield Strength Min. psi	Elongation In 2 inches Percent min.	Reduction Of area Percent min.	Minimum Hardness Rockwell C
#2 through 1/2	180,000	162,000	8	35	39
Over 1/2 inch	170,000	153,000	10	40	37

Tensile, Yield and Shear Strengths - Inch Series SHCS

Nominal Size	Basic Screw Diameter	Thread Stress Area UNRC	Thread Stress Area UNRF	Tensile Strength Pounds Min. UNRC	Tensile Strength Pounds Min. UNRF
#2	0.0860	0.00370	0.00394	665	710
#3	0.0990	0.00487	0.00523	875	940
#4	0.1120	0.00604	0.00661	1090	1190
#5	0.1250	0.00796	0.00830	1430	1490
#6	0.1380	0.00909	0.01015	1640	1825
#8	0.1640	0.01400	0.01474	2520	2650
#10	0.1900	0.01750	0.02000	3150	3600
1/4	0.2500	0.03180	0.03640	5725	6550
5/16	0.3125	0.05240	0.05800	9430	10440
3/8	0.3750	0.07750	0.08780	13950	15805
7/16	0.4375	0.10630	0.11870	19135	21365
1/2	0.5000	0.14190	0.15990	25540	28780
5/8	0.6250	0.22600	0.25600	38400	43500
3/4	0.7500	0.33400	0.37300	56750	63400
7/8	0.8750	0.46200	0.50900	78500	86500
1	1.0000	0.60600	0.66300	103000	112700
1 1/4	1.2500	0.96900	1.07300	164700	182400
1 1/2	1.5000	1.40500	1.58100	238800	268800

The mechanical properties listed are for applications at room temperature. Socket head cap screws in applications over 400°F or below -20°F will exhibit a reduction in the properties listed resulting in loss of some tensile, yield, and fatigue strength.

Kerr Lakeside - Inch Socket Head Cap Screws Recommended Tightening Torques

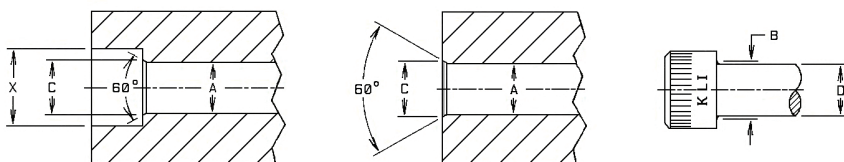
Nominal Size	Basic Screw Diameter	Tension Induced In Screws Tightened as Recommended (pounds)		Recommended Tightening Torque (inch-pounds)	Recommended Tightening Torque (inch-pounds)
		UNRC	UNRF	UNRC	UNRF
#2	0.0860	390	410	7.5	8
#3	0.0990	510	550	11	12
#4	0.1120	630	690	16	18
#5	0.1250	830	870	24	24
#6	0.1380	950	1070	30	34
#8	0.1640	1460	1550	55	58
#10	0.1900	1840	2100	79	90
1/4	0.2500	3530	4040	200	230
5/16	0.3125	5820	6450	415	460
3/8	0.3750	8620	9770	740	845
7/16	0.4375	11830	13180	1190	1305
1/2	0.5000	15760	17800	1800	2065
5/8	0.6250	23740	26890	3400	3800
3/4	0.7500	35080	39150	6000	6750
7/8	0.8750	41590	45830	8250	9200
1	1.0000	54350	59662	12500	13000
1 1/4	1.2500	87225	86600	25000	27750
1 1/2	1.5000	126450	142280	43500	49000

These values are designed to induce approximately 75% of the screw's yield strength in steel to steel joints where the nut factor, also called "K" factor is 0.20. Plain socket head cap screws generally have a "K" factor between 0.19 and 0.25 when used in an as received condition. The "K" factor of coated or plated screws differs, as does the "K" factor of screws used with lubricants.

Hex Key/Socket Screw Product Application

Nominal Hex Key Size	Socket Head Cap Screws	Flat Head Socket Cap Screws	Button Head Socket Cap Screws	Socket Shoulder Screws	Socket Set Screws	Pressure Plugs
Nominal Screw Sizes						
0.028	---	---	---	---	#0	---
0.035	---	#0	#0	---	#1 #2	---
0.050	#0	#1 #2	#1 #2	---	#3 #4	---
1/16	#1	#3 #4	#3 #4	---	#5 #6	---
5/64	#2 #3	#5 #6	#5 #6	---	#8	---
3/32	#4 #5	#8	#8	---	#10	---
7/64	#6	---	---	---	---	---
1/8	---	#10	#10	1/4	1/4	---
9/64	#8	---	---	---	---	---
5/32	#10	1/4	1/4	5/16	5/16	1/16
3/16	1/4	5/16	5/16	3/8	3/8	1/8
7/32	---	3/8	3/8	---	7/16	---
1/4	5/16	7/16	---	1/2	1/2	1/4
5/16	3/8	1/2	1/2	5/8	5/8	3/8
3/8	7/16 1/2	5/8	5/8	3/4	3/4	1/2
7/16	---	---	---	---	---	---
1/2	5/8	3/4	---	1	7/8	---
9/16	---	7/8	---	---	1 1/8	3/4
5/8	3/4	1	---	1 1/4	1 1/4 1 3/8	1
3/4	7/8 1	1 1/8	---	---	1 1/2	1 1/4
7/8	1 1/8 1 1/4	1 1/4 1 3/8	---	1 1/2	---	---
1	1 3/8 1 1/2	1 1/2	---	1 3/4	1 3/4 2	1 1/2 2

Metric Socket Head Cap Screws - Property Class 12.9 Drill and Counterbore Sizes



Nominal Size	A Close Fit Nominal Size	A Normal Fit Nominal Size	X Counterbore Size Hole X	C Countersink Diameter B Maximum (see chamfering note)
M2	2.20	2.40	4.40	2.6
M3	3.40	3.70	6.50	3.6
M4	4.40	4.80	8.25	4.7
M5	5.40	5.80	9.75	5.7
M6	6.40	6.80	11.25	6.8
M8	8.40	8.80	14.25	9.2
M10	10.50	10.80	17.25	11.2
M12	12.50	12.80	19.25	14.2
M16	16.50	16.75	25.50	18.2
M20	20.50	20.75	31.50	22.4
M24	24.50	24.75	37.50	26.4
M30	30.75	31.75	47.50	33.4
M36	37.00	37.50	56.50	39.4

* Wire Drill Size

Chamfer or break edges of holes with transition diameter less than listed as B maximum. Smaller holes than listed could interfere with the proper seating of the head, increasing the likelihood of fatigue failures.

Metric Socket Head Cap Screws - Property Class 12.9 Tensile, Yield and Shear Strengths

Nominal Size	Thread Stress Area mm ²	Yield Strength kN	Tensile Strength kN	Single Shear Strength Threads kN	Single Shear Strength Body kN
M2x0.4	2.07	2.28	2.53	15.7	1.99
M3x0.5	5.03	5.53	6.14	3.81	4.70
M4x0.7	8.78	9.63	10.7	6.63	8.39
M5x0.8	14.2	15.6	17.3	10.7	13.4
M6x1.0	20.1	22.1	24.5	15.2	19.5
M8x1.25	36.6	40.1	44.6	27.7	34.8
M10x1.50	58.0	63.7	70.8	43.9	55.0
M12x1.75	84.3	92.7	103	63.9	79.1
M16x2.0	157	173	192	119	142
M20x2.5	245	269	299	185	222
M24x3.0	353	388	431	267	327
M30x3.5	561	616	684	424	506
M36x4.0	817	897	997	618	729

The mechanical properties listed are for applications at room temperature. Socket head cap screws in applications over 400°F or below -20°F will exhibit a reduction in the properties listed resulting in loss of some tensile, yield, and fatigue strength.

Metric Socket Head Cap Screws - Property Class 12.9 Recommended Installation Torque Values

Nominal Size	Tension Induced At Recommended Torque kN	Recommended Tightening Torque Nm
M2x0.4	1.71	0.68
M3x0.5	4.15	2.49
M4x0.7	7.22	5.78
M5x0.8	11.7	11.7
M6x1.0	16.6	19.9
M8x1.25	30.1	48.1
M10x1.50	47.8	95.6
M12x1.75	68.6	164
M16x2.0	130	416
M20x2.5	202	808
M24x3.0	291	1397
M30x3.5	462	2772
M36x4.0	672	4838

These values are designed to induce approximately 75% of the screw's yield strength in steel to steel joints where the nut factor, also called "K" factor is 0.20. Plain socket head cap screws generally have a "K" factor between 0.19 and 0.25 when used in an as received condition. The "K" factor of coated or plated screws differs as does the "K" factor of screws used with lubricants.

Metric Hex Key/Socket Screw Products Application

Nominal Hex Key Size	Socket Head Cap Screws	Flat Head Socket Cap Screws	Button Head Socket Cap Screws	Socket Shoulder Screws	Socket Set Screws
0.7	---	---	---	---	M1.6
0.9	---	---	---	---	M2
1.3	---	---	---	---	M2.5
1.5	M1.6	---	---	---	M3
2	M2.5	M3	M3	---	M4
2.5	M3	M4	M4	---	M5
3	M4	M5	M5	M6.5	M6
4	M5	M6	M6	M8	M8
5	M6	M8	M8	M10	M10
6	M8	M10	M10	M12	M12
8	M10	M12	M12	M16	M16
10	M12	M16	M16	M20	M20
12	M14	M20	---	M25	M24
14	M16	---	---	---	---
17	M20	---	---	---	---
19	M24	---	---	---	---
22	M30	---	---	---	---
24	---	---	---	---	---
27	M36	---	---	---	---

Tolerance Grade and Position Symbols for Classes for ISO Metric Threads

		External Threads		Internal Threads		
Amount	Tolerance Grade			Tolerance Grade		
	Major Diameter	Pitch Diameter	Tolerance Position (allowance)	Minor Diameter	Pitch Diameter	Tolerance Position (allowance)
0	---	---	h	---	---	H
Small	---	3		---	---	
	4	4		4	4	
	---	5		5	5	
	6	6	g	6	6	G
	---	7		7	7	
	8	8		8	8	
	---	g		---	---	
Large			e			---

ISO metric internal threads are identified by the use of capital letters for the tolerance position. ISO metric external threads are identified by the use of lower case letters for the tolerance position.

As an example: M6 x 1.0 - 4g6g indicates a metric thread form “M”, “6” mm nominal diameter. The fastener is externally threaded as noted by the lower case “g”. The tolerance position and grade of the major diameter is listed first - “4g”, followed by the tolerance position and grade of the pitch diameter-”6g”. Standard Property Class 12.9 socket screw products manufactured in the United States have 4g6g thread tolerances as the form most closely resembles the 3A thread form used on inch series socket products. When plating or coating of threads is desired, a thread form with greater allowance should be selected.

Diameter and Thread Pitch Comparison

Inch Series Size	Nom. Dia. In.	Threads Per Inch	Metric Size	Dia. In.	Pitch In mm	Equiv. TPI (app.)		Inch Series Size	Nom. Dia. In.	Threads Per Inch	Metric Size	Dia. In.	Pitch In mm	Equiv. TPI (app.)
			M1.4	0.055	0.302	85127		1/4	0.250	2028				
#0	0.060	80						5/16	0.3125	1824				
			M1.6	0.063	0.3502	74127					M8	0.315	1.251.0	2025
#1	0.073	6472						3/8	0.375	1624				
			M2	0.079	0.4025	64101					M10	0.393	1.51.25	1720
#2	0.086	5664						7/16	0.4375	1420				
			M2.5	0.098	0.45035	5674					M12	0.472	1.751.25	14.520
#3	0.099	4856						1/2	0.500	1320				
#4	0.112	4048									M14	0.551	21.5	12.517
			M3	0.118	0.5035	5174		5/8	0.625	1118				
#5	0.125	4044									M16	0.630	21.5	12.517
#6	0.138	3240												
			M4	0.157	0.705	3651		3/4	0.750	1016				
#8	0.164	3236									M20	0.787	2.51.5	1017
#10	0.190	2432												
			M5	0.196	0.805	3251		7/8	0.875	914				
			M6	0.236	1.0075	2534					M24	0.945	32	8.512.5
								1	1.000	812				

Research has shown that there are over 100 possible inch/metric fastener mismatches possible among commonly used sizes. Care must be taken not to mix the types together.

Additional technical information about Kerr Lakeside Socket Screw Products may be found in our Technical Handbook

Competitive Socket Product Comparison Inch Series

	Kerr Lakeside	Holo-Krome	Unbrako
Complies with NAAMS Standards	Yes	Yes	Yes
Approved by Ford	Yes	Yes	Yes
Approved by Chrysler	Yes	Yes	Yes
Approved by General Motors	Yes	Yes	Yes
Manufactured to ASTM A574 Standards	Yes	Yes	Yes
Conform to ASME B18.3	Yes	Yes	Yes
Material Selection	Alloy Steel	Alloy Steel	Alloy Steel
Tensile Strength	to 1/2 inch 180,000 Over 1/2 inch 170,000	to 1/2 inch 180,000 Over 1/2 inch 170,000	to 1/2 inch 190,000 Over 1/2 inch 180,000
AZLA AND ISO Accreditation	BOTH	ISO	?
Hardness	39 - 45 RC	39-45 RC	38 - 43 RC
1/4-20 Socket Cap Tensile	5725	5725	6050
1/4-20 Socket Cap Recommended Torque	200 inch pounds	200 inch pounds	200 inch pounds
5/8-11 Socket Cap Tensile	38400	38400	40700
5/8-11 Socket Cap Recommended Torque	3400	3400	3400
3/8 Shoulder Bolt Tensile	7600	7600	7060
3/8 Shoulder Bolt Recommended Torque	265	265	265
3/8 Shoulder Bolt Single Shear	10,280	10,280	10,500
5/16-18 Flat Socket Cap Tensile	7600	7600	8350
5/16-18 Flat Socket Cap Shear	8590 Shoulder 5430 Thrd	5430 Thread	7360 Shoulder
5/16-18 Flat Socket Cap Rec Torque	245	200	200
1/2-13 Button Socket Cap Tensile	20,600	20,600	22,800
1/2-13 Button Socket Cap Shear	14,700 Threads	14,700 Threads	18,500 Body
1/2-13 Button Socket Cap Rec Torque	1200 Inch Pounds	1000 Inch Pounds	1000 Inch Pounds
Rerolling of threads after heat treat	Yes 5/16 and over	NO	NO
Thread Lap inspection during production	Yes	NO	?
Manufacturing base	USA	USA	Ireland / USA
Information Source	Jan 07 Product Guide	HK website Jan 07	Eng Guide #5519-RevD
Full Traceability	Yes	Yes	Yes
Underhead Fillet	Yes	Yes	Yes
Radiused thread	Yes	Yes	Yes
Rolled threads	Yes	Yes	Yes
Range of offering (# of Listed Items)	2430 - Jan, 05 Price list	1895 - Jan, 07 Price list	1593 - July 06 Price list
Fillrate	97% plus	?	?

High Strength Bolted Joints

The design and application of high strength bolted joints is both art and science. Experience with a particular application is the best guide for future design of like joints. Reoccurring, or even sporadic difficulties with a fastener ion application require that the design and installation process be reviewed along with maintenance procedures. Presented here are some ideas, formulas and practitioner's tips on fastening with high strength socket products. When designing new bolted joints it is important to **TEST CRITICAL APPLICATIONS**.

The bolted joint is a clamping system in which it is necessary that the clamp, or fasteners, always offer greater useful load, than the material being clamped. The fasteners can also be termed a "spring" which stores energy. The energy is used to keep the mating materials compressed, and the bolt under tension, under both initial installation loads, as well as loads seen during the service life of the joint.

Tensile strength is important for carrying static or constant loads. Fatigue strength is critical in resisting dynamic or changing loads. Fatigue strength is, in part, dependent upon characteristics manufactured into the fastener and a sufficient amount of preload or clamping force.

The Design of Bolted Joints

The bolted joint should be designed to develop sufficient clamp loads to prevent the mating materials from separating, leaking or slipping. This should be accomplished while also preventing the fastener from failing, and determining the preferred fastener failure mode is it does become stressed beyond capacity.

The design process might proceed as follows:

1. Determine the basic geometry of the joint, considering whether it is a single axis or multiple axes joint. Select joint materials.
2. Calculate the magnitude, direction and introduction point of the external forces acting upon the joint and if the forces are static or dynamic.
3. Determine the temperature range of the joint and the thermal expansion rates of the various components.
4. Select the fastener size, material, strength level, drive style, and thread type.
5. Estimate the required clamp load required to keep the joint functional. Develop a force diagram for the joint.
6. Calculate the clamped material's capacity to resist embedment while considering other setting force losses.
7. Calculate the safety factors desired for various functions of the joint.
8. TEST.

Fastener Failure Worksheet

1. Brand name or head marking on fasteners
2. Product type, diameter, and length
3. Lot Code
4. Failure location – threads, body, or Underhead
5. Lubrication – brand name, manufacturer and type, coefficient of friction
6. Plating or coating – type, process used, name of applicator
7. Installation method – for rundown, for final tightening
8. Installation torque – value if used
9. Service temperatures
10. Joint material – type and hardness
11. Recurring failure? Y/N, frequency
12. Details of joint design
13. Samples of failed screws
14. Other user provided details

Kerr Lakeside Cold Formed Special Products



Kerr Lakeside has the capability to cold form products from #8 diameter by 3/8 inch long to 1 1/8 inch diameter, 9 inches long. Commonly used materials are low carbon and medium carbon alloy steels.

Products may include:

- Hex Flange Screws
- 6 or 12 Point External Lobe Screws
- 12 Point Flange Screws
- 6 Point Internal Lobe Screws
- Various Stud and Special Head Configurations

Fax your inquiries to us at 216-261-9798 or email to: info@kerrlakeside.com

Kerr Lakeside Screw Machine Products



Kerr Lakeside has over 50 screw machines at its facility with a variety of capabilities. We can machine products to over 2 ½ inches in diameter.

Materials quoted include:

- Low Carbon Steel
- Medium Carbon Alloy Steel
- Brass
- Aluminum
- Stainless Steels

Parts manufactured include:

- Plugs
- Caps
- Special Set Screws
- Pins
- Studs
- Special Parts

Fax your inquiries to us at 216-261-9798, or email them to info@kerrlakeside.com

Kerr Lakeside Provides Technical Training



Kerr Lakeside's technical sales and management staff has developed a comprehensive fastening training presentation and will customize its contents to the needs of both distributors and end users. Topics are wide ranging and oriented toward dealing with bolted joints on a practical level.

The training staff has over 100 years of experience in the fastener industry and members sit on several standards organizations technical committees. Contact John Hollowell, Marketing and Technical Services Manager at 1-800-316-5377 to set up a session for your group!