SOCKET HEAD CAP SCREWS - TORQUE DATA - 1960 SERIES

TORQUE-TENSION / TIGHTENING TORQUE DATA

NOMINAL SIZE	BASIC SCREW DIAMETER	TENSION INDUCED IN SCREWS TORQUED AS RECOMMENDED (LBS.)		RECOMMENDED TIGHTENING TORQUE (INCH/LBS.)*	
		UNRC	**UNRF**	**UNRC**	**UNRF**
0	0.0600	–	190	–	2.6
1	0.0730	280	290	4.5	4.8
2	0.0860	390	410	7.5	8.0
3	0.0990	510	550	11.0	12.0
4	0.1120	630	690	16.0	18.0
5	0.1250	830	870	24.0	24.0
6	0.1380	950	1,070	30.0	34.0
8	0.1640	1,460	1,550	55.0	58.0
10	0.1900	1,840	2,100	79.0	90.0
1/4"	0.2500	3,530	4,040	200.0	230.0
5/16"	0.3125	5,820	6,450	415.0	460.0
3/8"	0.3750	8,620	9,770	740.0	845.0
7/16"	0.4375	11,830	13,180	1,190.0	1,305.0
1/2"	0.500	15,760	17,800	1,800.0	2,065.0
5/8"	0.6250	23,740	26,890	3,400.0	3,800.0
3/4"	0.7500	35,080	39,150	6,000.0	6,750.0
7/8"	0.8750	41,590	45,830	8,250.0	9,200.0
1"	1.0000	54,350	59,662	12,500.0	13,000.0
1-1/4"	1.2500	87,225	96,600	25,000.0	27,750.0
1-1/2"	1.5000	126,450	142,280	45,500.0	49,000.0

*These tightening torque values are 75% of the torque required to yield the screw, and apply only for the conditions listed below.
Different percentages of torque-to-yield values are also commonly used for special conditions.

NOTES FOR CHART

These are average values for standard Holo-Krome 1960 Series Alloy Steel Socket Cap Screws with black finish, tested with hardened steel plates, and hardened nuts with the threads and bearing areas lubricated with plain, medium viscosity machine oil.

The relationship between the torque and the induced tension (preload) can be expressed by the empirical formula T= KDP, in which T is the tightening torque in inch pounds; D is the nominal diameter of the screw; P is the tension (in pounds) induced in the screw; and K is the torque coefficient. The torque coefficient is not constant but varies with the material, surface finish and lubricity of the threads and head bearing area of the screws and parts fastened.

For the conditions shown above (standard alloy steel black finished screws clamping hardened steel parts), K will range from 0.19 to 0.25. For cadmium plated screws with steel parts, K will usually fall between 0.13 and 0.17. For zinc plated screws K may fall between 0.30 and 0.34. When the thread and head bearing surfaces are covered with certain types of lubricants, or with anti-seize compounds, K can drop as low as 0.05. At the other extreme, combinations of certain materials, such as austenitic stainless steel screws and parts not lubricated or coated, can result in K values as high as 0.35, or more.

Because the induced tension can vary considerably from one type of assembly to another for any given torque, the above data should be used with caution – particularly in applications where the control of preload is critical and must be obtained by the torque wrench method. For such applications, the relationship between torque and induced tension should be determined experimentally for the actual parts and lubrication practice involved.

TIGHTENING TORQUES. At the tightening torques listed standard Holo-Krome alloy steel 1960 Series screws, used under the conditions described, will be preloaded to approximately 75% of the tension induced at yield. The bearing stress under the head at these preloads will be approximately 80,000 psi, so indentation should not occur when the parts clamped are of steel or cast iron with a hardness equal to or in excess of Rockwell B 85. With softer materials, washers may be required under the heads of the screws to avoid indentation.

In applications where screws are subject to fatigue from dynamic loading, the importance of proper preloading during assembly cannot be overemphasized. The proper preload is especially important for rigid-type (metal-to-metal) joints, where it has been found that the use of a preload greater than the external load will usually eliminate the possibility of fatigue failure. For this reason, the preferred practice for such assemblies is to preload to 75% of the induced tension at yield.

FOR FLEXIBLE TYPE JOINTS, HOWEVER, AND FOR ASSEMBLIES EXPOSED TO ELEVATED TEMPERATURES, MUCH LOWER PRELOADS MAY BE REQUIRED. No general recommendations are possible for such assemblies or service conditions. Each application must be analysed individually, because the preload requirements may vary considerably from one application to another. Users who desire suggestions for the preload or tightening torque to be used for a specific application are invited to contact your Spaenaur Sales Representative.