

Estimated Mechanical Properties and Machinability of Hot Rolled and Cold Drawn Carbon Steel Bars—SAE J414a

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PREPRINT

ESTIMATED MECHANICAL PROPERTIES AND MACHINABILITY OF HOT ROLLED AND

φ COLD DRAWN CARBON STEEL BARS—SAE J414a

SAE Information Report

Report of Iron and Steel Technical Committee approved January 1950 and completely revised August 1977.

Mechanical Properties—The mechanical properties listed in Tables 1, 2, and 3 are given as a matter of general information. They do not form a part or requirement of any specification unless each instance is approved by the source of supply. The properties in Tables 1, 2, and 3 can generally be expected from bars in sizes ranging from 3/4–1 1/4 in (20–30 mm) based on the standard round tensile test specimen with 2-in (50-mm) gage length.

Sizes under 3/4 in (20 mm) will show slightly higher strength than those shown in the Tables. The mass effect of larger sections has a direct influence on mechanical properties and results in slightly lower values as the section increases.

Properties of turned and polished or turned and ground types of cold finished material will correspond to the hot rolled values.

The cold drawn properties are based on conventional production from hot rolled bars. When required, these properties may be varied by modified cold drawing practices or a combination of cold drawing practice plus ther-

mal treatment for grades SAE 1050 and lower in carbon. Grades higher in cold drawing practices or a combination of cold drawing practice plus ther-

Machinability Ratings—The machinability ratings listed are based on a value of 100% for SAE 1212 cold drawn. This value involves turning at a cutting speed of 180 surface feet (55 m) per min for feeds up to 0.007 in (0.18 mm) per revolution and depths of cut up to 0.250 in (6.4 mm) using appropriate cutting fluids with high speed steel tools, SAE Grade T-1 (18-4-1) hardened to 63/65 RC.

Relative machinability data shown in the Tables represent results obtained from various experimental data and actual shop production information obtained from results of machining cold drawn bars on single and multiple spindle automatic machines. Various factors influence machinability and, therefore, results shown in Tables are average and may be affected to some degree by amount of cold reduction, mechanical properties, grain size, and microstructure.

TABLE 1—ESTIMATED MECHANICAL PROPERTIES AND MACHINABILITY RATINGS OF NONRESULFURIZED CARBON STEEL BARS, MANGANESE 1.00% MAXIMUM

UNS No.	SAE and/or AISI No.	Type of Processing	Tensile Strength,		Yield Strength,		Elongation in 2 in, %	Reduction in Area, %	Brinell Hardness	Average Machinability Rating (Cold Drawn 1212=100%)
			psi	MPa	psi	MPa				
G10060	1006	Hot Rolled	43 000	300	24 000	170	30	55	86	50
		Cold Drawn	48 000	330	41 000	280	20	45	95	
G10080	1008	Hot Rolled	44 000	303	24 500	170	30	55	86	55
		Cold Drawn	49 000	340	41 500	290	20	45	95	
G10100	1010	Hot Rolled	47 000	320	26 000	180	28	50	95	55
		Cold Drawn	53 000	370	44 000	300	20	40	105	
G10120	1012	Hot Rolled	48 000	330	26 500	180	28	50	95	55
		Cold Drawn	54 000	370	45 000	310	19	40	105	
G10150	1015	Hot Rolled	50 000	340	27 500	190	28	50	101	60
		Cold Drawn	56 000	390	47 000	320	18	40	111	
G10160	1016	Hot Rolled	55 000	380	30 000	210	25	50	111	70
		Cold Drawn	61 000	420	51 000	350	18	40	121	
G10170	1017	Hot Rolled	53 000	370	29 000	200	26	50	105	65
		Cold Drawn	59 000	410	49 000	340	18	40	116	
G10180	1018	Hot Rolled	58 000	400	32 000	220	25	50	116	70
		Cold Drawn	64 000	440	54 000	370	15	40	126	
G10190	1019	Hot Rolled	59 000	410	32 500	220	25	50	116	70
		Cold Drawn	66 000	460	55 000	380	15	40	131	
G10200	1020	Hot Rolled	55 000	380	30 000	210	25	50	111	65
		Cold Drawn	61 000	420	51 000	350	15	40	121	
G10210	1021	Hot Rolled	61 000	420	33 000	230	24	48	116	70
		Cold Drawn	68 000	470	57 000	390	15	40	131	
G10220	1022	Hot Rolled	62 000	430	34 000	230	23	47	151	70
		Cold Drawn	69 000	480	58 000	400	15	40	137	
G10230	1023	Hot Rolled	56 000	370	31 000	210	25	50	111	65
		Cold Drawn	62 000	430	52 500	360	15	40	121	
G10250	1025	Hot Rolled	58 000	400	32 000	220	25	50	116	65
		Cold Drawn	64 000	440	54 000	370	15	40	126	

^aACD represents annealed cold drawn.

^bNCD represents normalized cold drawn.

^cSACD represents spheroidized annealed cold drawn.

(Table continued on next page)

The φ symbol is for the convenience of the user in locating areas where technical revisions have been made to the previous issue of the report. If the symbol is next to the report title, it indicates a complete revision of the report.