

# Material Specifications | Carbon Steel

BS 3146 Part 1, 1974	Grade	Material	Chemical Composition %																				Mechanical Properties								Characteristics	Typical Applications		
			C		Si		Mn		Ni		Cr		Mo		Va		Cu		Sn		S		P		UTS N/mm <sup>2</sup>		0.2% PS N/mm <sup>2</sup>		EI %	Izo d ft lbs			HB	
			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max			Min	Max
CLA 1	A	Carbon Steels	0.15	0.25	0.2	0.6	0.4	1	-	0.4*	-	0.3*	-	0.1*	-	-	-	0.3*	-	-	0.04	-	0.04	430	-	195	-	15	-	121	174	Plain carbon steels offering a range of tensile properties (via heat-treatment) with good ductility	Engineering steels for low and medium strength applications, e.g. brackets, housings, links	
	B		0.25	0.35	0.2	0.6	0.4	1	-	0.4*	-	0.3*	-	0.1*	-	-	-	0.3*	-	-	0.04	-	0.04	500	-	215	-	13	-	143	183			
	C		0.35	0.45	0.2	0.6	0.4	1	-	0.4*	-	0.3*	-	0.1*	-	-	-	0.3*	-	-	0.04	-	0.04	540	-	245	-	11	-	163	207			
CLA 2		1 1/2% Manganese Steel	0.18	0.25	0.2	0.5	1.2	1.7	-	0.4*	-	0.3*	-	0.1*	-	-	0.3*	-	-	0.04	-	0.04	550	700	310	-	13	30	152	201	Superior properties to plain carbon steels, having a high yield strength, good ductility and toughness.	Medium strength applications where a degree of shock resistance is required, e.g. links, levers		
CLA 3		700 N/mm <sup>2</sup> to 850 N/mm <sup>2</sup> Alloy Steel																														A range of tensile strengths are possible with good ductility and shock resistance;	Alloy steels for medium to high strength applications, where ductility and good shock and fatigue strengths are required, e.g. brackets, levers, air-frame parts, hydraulic machinery.	
CLA 4		850 N/mm <sup>2</sup> to 1000 N/mm <sup>2</sup> Alloy Steel																														readily machinable in the softened condition.		
CLA 5	A	High Tensile Steel																																
	B																																	
CLA 7		3% Cr Mo Steel	0.15	0.25	0.3	0.8	0.3	0.6	-	0.4**	2.5	3.5	0.35	0.6	-	-	0.3**	-	-	0.04	-	0.04	620	770	480	-	14	25	179	223	A combination of properties with medium tensile strength, good ductility and resistance to thermal shock. Useful corrosion and creep resistant properties.	Structural parts and parts operating at temperatures upto 400C.		
CLA 8		Carbon Steel for Surface Hardening	0.37	0.45	0.2	0.6	0.5	0.8	-	0.4*	-	0.3*	-	0.1*	-	-	0.3*	-	-	0.04	-	0.04	540	-	245	-	15	-	-	-	A capability local or surface harden to a minimum of 500 HV but retaining a good core strength.	Low to medium strength components requiring a high local surface hardness, e.g. pawls, ratchets, triggers.		



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			Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max			Min	Max				
CLA 9		Carbon Steel for Case Hardening	0.1	0.18	0.2	0.6	0.6	1	-	0.4*	-	0.3*	-	0.1*					-	0.3*	-	0.04	-	0.04	495	-	215	-	15	20			A low-carbon case hardening steel for carburizing or cyanide treatment, giving a low tensile strength core hence good shock resistance.	Components requiring a good shock resistance with high surface hardness, e.g. ratchets and operating levers		
CLA 10		3% Ni Case Hardening Steel	0.1	0.18	0.2	0.6	0.3	0.6	2.75	3.5	-	0.3*	-	0.1*					-	0.3*	-	0.04	-	0.04	700	-	350	-	14	30			A case-hardening steel for carburizing or cyanide treatment having a dense, tough core with reasonable shock resistance.	Parts subject to reciprocating or intermittent loading, e.g. high speed connecting links and levers.		
CLA 11		3% Cr Mo Nitriding Steel	0.2	0.3	0.3	0.8	0.3	0.6	-	0.4*	2.9	3.5	0.4	0.7	-	0.02*	-	0.3*	-	0.03*	-	0.04	-	0.04	850	1000	600	-	8	15	248	302	A 3% Cr-Mo steel for surface hardening by nitriding to 900 HV but retaining a high strength core with good ductility and shock resistance.	Moving parts where abrasion or wear resistance are required, e.g. crank-pins, crank-shafts, sewing machine loopers, etc.		
CLA 12	A	1% Cr Abrasion Resisting Steel	0.45	0.55	0.3	0.8	0.5	1	-	0.4*	0.8	1.2	-	0.1*				-	0.3*	-	0.04	-	0.04	700	-					8		207	-	A steel with a capability of good through hardness and abrasion resistance.	Hardened parts subject to wear and abrasion. Grades B & C are suitable for heavy duty conditions.	
	B		0.45	0.55	0.3	0.8	0.5	1	-	0.4*	0.8	1.2	-	0.1*				-	0.3*	-	0.04	-	0.04													
	C		0.55	0.65	0.3	0.8	0.5	1	-	0.4*	0.8	1.5	0.2	0.4					-	0.3*	-	0.04	-	0.04												
CLA 13		Ni Mo Case Hardening Steel	0.12	0.2	0.2	0.6	0.3	0.7	1.5	2	-	0.3*	0.2	0.3					-	0.3*	-	0.04	-	0.04	700	-	350	-	14	30			A case carburizing steel, but with a medium strength core and reasonable shock resistance. An alternative to CLA 10.	Parts subject to reciprocating or intermittent loading, e.g. high speed connecting links and levers		

