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CARBON & LOW ALLOY STEELS **Sulphur and Phosphorous 0.035% max unless stated otherwise. *Residuals. The total amount of these elements shall not exceed 0.80%. **Residuals. † Where indicated thus, 0.2% Proof Stress values are for information only.**

INVESTMENT CASTING SPECIFICATION BS 3146 Part 1	TYPE	CHEMICAL COMPOSITION %														U.T.S. N/mm²		P.S. N/mm²	Elong	IZOD	Hardness		NEAREST EQUIVALENT SPECIFICATIONS					CHARACTERISTICS & TYPICAL APPLICATIONS
		C		Si		Mn		Ni		Cr		Mo		OTHERS									BS 970		BS			
		Min	Max	Min	Max	Min	Max	Min	Max	Min	Max	Min	Max		Min	Max	Min	%	ft.lbs	Min	Max	En	(1972)	HC100	A.I.S.I.	Afnor	Werkstoff	
CLA 1A	Mild	0.15	0.25	0.2	0.6	0.4	1.0	--	0.4*	--	0.3*	--	0.1*	Cu 0.3max*	430	--	195†	15	--	121	174	3	070M20		C1020/1/2/3	C20d	1.0443	Plain Carbon Steels with a range of tensile properties (via heat treatment)
CLA 1B	Steel	0.25	0.35	0.2	0.6	0.4	1.0	--	0.4*	--	0.3*	--	0.1*	Cu 0.3max*	500	--	215†	13	--	143	183	3	080M30	HC1	C1030	C30d	1.0551	with good ductility for low and medium strength applications
CLA 1C		0.35	0.45	0.2	0.6	0.4	1.0	--	0.4*	--	0.3*	--	0.1*	Cu 0.3max*	540	--	245†	11	--	163	207	8	080M40		C1040	C40d	1.0553	e.g. brackets, housings, links.
CLA 2	1½% Manganese	0.18	0.25	0.2	0.5	1.2	1.7	--	0.4*	--	0.3*	--	0.1*	Cu 0.3max*	550	700	310†	13	30	152	201	14A	150M19	HC2	C1027	20 MNC 6	1.5060	Superior properties to plain carbon steel. Medium strength applications where degree of shock resistance required e.g. links, levers.
CLA 3	45-55 ton Steel	0.35	0.45	0.2	0.6	0.5	0.8	--	0.4	0.9	1.5	0.2	0.4	BS3146 only specifies the mechanical properties, plus S & P contents. Analysis shown is for reference only.	700	850	495	11	25	201	255	19	709M40	HC3	4140	40 NCD 6	1.6582	A range of tensile strengths possible with good ductility and shock resistance. Readily machineable. Medium and high strength applications where ductility shock and fatigue strength required e.g. brackets, levers, airframe parts, hydraulic machinery.
CLA 4	55-65 ton Steel	0.35	0.45	0.2	0.6	0.5	0.8	1.3	1.8	0.9	1.5	0.2	0.4		850	1000	585	11	15	248	302	24	817M40	HC7 HC9	4337	32 NCD 10	1.6580	
CLA 5A	65-75 ton	0.22	0.32	0.3	0.7	0.3	0.8	--	0.4	2.5	3.5	0.4	0.7		1000	--	880	9	30	269	321	40B	722M28	HC8/	--	40 NCD 10	--	
5B	Steel	0.22	0.32	0.3	0.7	0.3	0.8	--	0.4	2.5	3.5	0.4	0.7		1160	--	1000	5	10	341	388	40B	722M28	HC10	--			
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	Cu 0.3max**	620	770	480	14	25	179	223	29	722M24	HC4	--	20 CD 12	1.7273	Medium strength, good ductility and resistance to thermal shock. Useful corrosion and creep resistance for parts operating up to 400ºC
CLA 8	Carb. Steel Surf. Harden	0.37	0.45	0.2	0.6	0.5	0.8	--	0.4*	--	0.3*	--	0.1*	Cu 0.3max*	540	--	245†	15	--	--	--	8	080M40	--	C1040	C40d	1.1191	Local or surface hardening to minimum 500HV but retaining good core strength. Pawls, ratchets, triggers.
CLA 9	Carb. Steel Case Harden	0.10	0.18	0.2	0.6	0.6	1.0	--	0.4*	--	0.3*	--	0.1*	Cu 0.3max*	495	--	215†	15	20	--	--	32	080M15	--	C1016	C14d	1.1141	Low Carbon case hardening for carburising or cyanide treatment. Low tensile core gives good shock resistance. Ratchets, operating levers.
CLA 10	3% Ni Case Harden	0.10	0.18	0.2	0.6	0.3	0.6	2.75	3.5	--	0.3**	--	0.1**	Cu 0.3max**	700	--	350†	14	30	--	--	33	--	HC5	--	12 N 12	1.5637	Carburising or cyanide hardening with tough core and reasonable shock resistance. Reciprocating or intermittent loading - high speed connecting links and levers.
CLA 11	3% Cr Mo Nitriding	0.2	0.30	0.3	0.8	0.3	0.6	--	0.4**	2.9	3.5	0.4	0.7	V 0.02max** Cu 0.3max** Sn 0.03max**	850	1000	600	8	15	248	302	40B	722M24	HC6	--	20 CD 12	1.7365	Nitride hardening to 900HV retaining high strength core, good ductility and shock resistance. Moving parts with wear resistance - crank pins and shafts, sewing machine loopers.
CLA 12A	1% Cr	0.45	0.55	0.3	0.8	0.5	1.0	--	0.4**	0.8	1.2	--	0.1**	Cu 0.3max**	700	--	--	8	--	207	--	--	--	--	5147	50 C5	1.7228	Steels with capability of good through hardness and wear resistance
12B	Abrasion	0.45	0.55	0.3	0.8	0.5	1.0	--	0.4**	0.8	1.2	--	0.1**	Cu 0.3max**	700	--	--	8	--	293	--	--	--	--	5147			Grades B and C suitable for heavy duty conditions.
12C	Resisting	0.55	0.65	0.3	0.8	0.5	1.0	--	0.4**	0.8	1.2	0.2	0.4	Cu 0.3max**	700	--	--	8	--	341	--	--	--	--	4150	60 CD5	1.7229	
CLA 13	Ni Mo Case Harden	0.12	0.20	0.2	0.6	0.3	0.7	1.5	2.0	--	0.3**	0.2	0.3	Cu 0.3max**	700	--	350†	14	30	--	--	34	665H17	--	4617	18 ND 7	--	Case carburising, medium strength core and reasonable shock resistance Alternative to CLA 10.