

BS 3146 : Part 1 : 1974			Comparable Specifications							Mechanical Properties					Characteristics	Typical Applications
Specification	Grade	Type of Steel	Afmr (see NF A 32-054)	D.I.N.	Werkstoff	A.I.S.I	BS 3100: 1976	BS 970: 1972	EN	UTS N/mm2	0.2% PS N/mm2	El %	Izod ft lbs	HB		
CLA 1	A	Carbon Steels	XC 18	GS 45	1.0443	C1020/1/2/3	A1	050A22	3	430	195*	15		121 174	Plain carbon steels offering a range of tensile properties (via heat treatment)	Engineering steels for low and medium strength applications, e.g.
	B		XC 32	GS 52	1.0551	C1030	A2	060A32	5	500	215*	13		143 183		
	C		XC 42M	GS 60	1.0553	C1040	A3	060A42	8	540	254*	11		163 207		
CLA 2		1.5%Mn Steel	20 M 6	20 Mn 6	1.506	C1027	A4	150M19	14A	550 700	310* -	13	30	152 201	Superior properties to plain carbon steels, having a high yield strength,	Medium strength applications where a degree of shock resistance is
CLA 3		(45-55 Ton) 700-850 N/mm2 Alloy	42 CD 4	42 Cr Mo 4	1.7225	4140	BT1	709M40	19	700 850	495 -	11	25	201 255	A range of tensile strengths are possible with good ductility and shock resistance; readily machineable in the softened condition	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, borers
CLA 4		(55-65 Ton) 850-1000 N/mm2	35 NCD 6	34 Cr Ni Mo 6	1.6582	4340	BT2	817M40	24	850 1000	585 -	11	15	248 302		
CLA 5	A	High Tensile	40 NCD 10					826M31(Z)		1000	880	9	30	269 321		
	B	Steels								1160	1000	5	10	341 388		
CLA 7		3% Cr Mo Steel	35 CD 12 - M	24 Cr Mo 10	1.7273		B4	722M24	29	620 770	480 -	14	25	179 223	A combination of properties with medium tensile strength, good ductility and resistance to thermal	Structural parts and parts operating at temperatures up to 400°C
CLA 8		Carbon Steel Surface Hardening	XC 42 - TS - M	Ck 45	1.1191	C1040	AW2	060A40	8	540 -	245* -	15			A capability to local or surface harden to a minimum of 500 HV but retaining	Low to medium strength components requiring a high local surface
CLA 9		Carbon Steel Case Hardening	XC 15	Ck 15	1.1141	C1016	AW1	080A15	32	495 -	215* -	15	20		A low-carbon case hardening steel for carburizing or cyanide treatment, giving a low tensile strength core	Components requiring good shock resistance with high surface hardness, e.g. ratchets and operating levers
CLA 10		3% Ni Case Hardening Steel	20 NCD 12 - TS - M	10 Ni 14	1.5637				33	700 -	350* -	14	30		A case-hardening steel for carburizing or cyanide treatment having a dense,	Parts subject to reciprocating or intermittent loading, e.g. high speed
CLA 11		3% Cr Mo Nitriding Steel	20 CD 12	27 Cr Mo 13.5	1.7365		B4	722M24	40	850 1000	600 -	8	15	248 302	A3% Cr-Mo steel for surface hardening by nitriding to 900 HV but retaining a	Moving parts where abrasion or wear resistance are required e.g. crank-pins
CLA 12	A & B	1% Cr Abrasion Resisting Steel	50 C 4	50 Cr Mo 4 60	1.7228	5147	BW2; BW3;			700 -		8		207 -	A steel with a capability of good through hardness and abrasion	Hardened parts subject to wear and abrasion. Grade B and C are suitable
	C		60 CD 5	Cr Mo 4	1.7229	4150	BW4									
CLA 13		Ni Mo Steel	15 ND 8			4617		665H17	34	700 -	350* -	14	30		A case carburizing steel, but with a medium strength core and reasonable	Parts subject to reciprocating or intermittent loading, e.g. high speed

\* Where indicated thus, 0.2% Proof Stress values are for information only.

BS3146 : Part II : 1975		Comparable Specifications						Mechanical Properties				Characteristics	Typical Applications
Specifi-cation	Type of Steel	Afnor (see NF A 32 - 056)	D.I.N.	Werk-stoff	A.C.I.	A.M.S.	British/USA	UTS N/mm2 Min Max	0.2%PS N/mm2 Min Max	El %	lzod ft lbs		
ANC 11	Nickel 21% Cr 10% Mo 10% Co Alloy	NC 21 DK 10					c242+					Medium strength alloy with excellent resistance to oxidation and thermal fatigue at temperatures over 1000°C:good thermal shock resistance up to 1100°C.	Gas turbine stator blades
ANC 13	Cobalt 26% Cr 10% Ni 7% W Alloy	KC 25 NW	Co Cr 25 Ni W	2.4966		5382E	X40~ Stellite 31~					A high strength heat-resistant alloy. Resistant to oxidation at high temperatures, corrosion, galling and wear. Good resistance to creep and thermal shock.	Impellers, hot metal dies and valve components.
ANC 14	Cobalt 27% Cr 5.5% Mo 2.7% Ni Alloy	KD 27D N	Co Cr 28 Mo	2.4979		5385D	Stellite 8~	650 -	450 -	6		A high strength heat-resistant alloy. Resistant to oxidation at high temperatures and corrosion resistant.Resistant to wear and with good low temperature impact properties.	Impellers, gas turbine components and valve components for high temperature service.
ANC 15	Nickel 28% Mo Alloy	NiMo 28	Ni Mo 30	2.4482		5396	Hastelloy B~					A corrosion and heat-resistant alloy. Good resistance to sulphuric and phosphoric acids:excellent resistance to concentrated, hot hydrochloric acid and acid chlorides. Useful creep strength up to 800°C.	Chemical and petroleum plant components and pickling equipment.
ANC 16	Nickel 17% Mo 16.5% Cr 4.5% W Alloy	NiMo16Cr15	Ni Mo 16 CR W	2.4537	CW 12M	5388C	Hastelloy C~					A corrosion and heat-resistant alloy. Resistant to oxidizing acids (e.g.Nitric) at high temperatures. Useful creep strength up to 800°C.	Chemical and petroleum plant components.
ANC 17	Nickel 9% Si 3% Cu Alloy		Ni Si 10 Cu	2.4566			Hastelloy D~					A corrosion resistant alloy, particularly against hot sulphuric acid.	Chemical and petroleum plant components.
ANC 18	A Nickel 31%	NU 30 Fe	Ni Cu 30 Fe*	2.4360*		4544*	Monel *~					Corrosion resistant alloys with a range of hardness for general engineering purposes. Resistant to superheated steam, sea-water, mineral acids. Retention of strength and toughness up to 450°C.	Power plant, marine equipment, chemical and process industry components.
	B Cu 1%						Monel H*~						
	C 4% Si Alloys						Monel H*~						
ANC 19	PH Nickel-Cr Nb Mo Fe W Alloy	NC 20 Nb DW					P.E.10/~ M.C.102~					A high strength precipitation hardening alloy resistant to thermal shock and oxidation.	Diesel engine combustion chamber inserts.
ANC 20	A Ph - Cr Ni Cu						F.V.520	950 1200	800 -	12	15	A high strength precipitation hardening steel with good corrosion resistance and good weldability.	Marine applications where high strength and good corrosion resistance are required.
	B Mo Steels						F.V.520~	1250 1500	950 -	8	8		
ANC 21	Cr Ni Cu MO Steel				CD4MCu			700 -	500 -	18	10	Good corrosion resistance:comparable to ANC 3 with higher strength.	Marine applications.

~ Registered trade mark and/or proprietary alloy \* Similar materials

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BS3146 : Part II : 1975			Comparable Specifications								Mechanical Properties						Characteristics	Typical Applications
Specification	Type of Steel		Afnor (see NF A 32 - 056)	D.I.N.	Werkstoff	A.I.S.I.	A.C.I.	A.M.S.	British/USA	BS 970: 1970	EN	UTS N/mm2 Min - Max	0.2%PS N/mm2 Min - Max	El %	Angle of bend°	HB		
ANC 1	A	13% Cr	Z12C13-M	Gx12 Cr 14	1.4008	403	CA 15	5349;53 50D	BS3100:1976*	410 S21	56A	540 -	340** -	15~~	120~~ 9~~	152 - 207	A general engineering type stainless steel, offering a range of strengths and hardnesses. Medium corrosion resistance.	A. Gas, chemical and petroleum industries; high ductility engineering fittings, golf club heads. B. Heat resistant parts not subject to high stresses. C. Cutting blades, pump and steam turbine parts.
	B	Martensitic	Z28CC13-M	Gx20 Cr14	1.4027	420	CA 40		410C21	420 S29	56B	620 -	415** -	13~~		183 - 229		
	C	Steel		Gx22 Cr14		420			420C29	420 S37	56C	695 -	435** -	11~~		201 - 255		
ANC 2		18% Cr 2% Ni Martensitic Steel	Z22 CN 18.02	Gx22 Cr Ni 17	1.4059	431	CB 30	5353	S80	431 S29	57	850 1000	650** -	8		248 - 302	A high tensile stainless steel with improved corrosion resistant properties. Resistant to oxidizing atmosphere up to 760°	Pump and valve parts; highly stressed aircraft and general engineering fittings.
ANC 3	A	Austenitic	ZCN18.10-M	Gx10 Cr Ni 18.8	1.4312	304	CF8	5358;53 41	BS3100:1976	302 S25	58A	460 -	200 -	20~~	120~~		A. Corrosion and acid resistant stainless steel; excellent stability down to 225°C. B. Weldable version of the above usable up to 800°C.	A. Chemical, pharmaceutical textile, dairy and oil industries, e.g. pumps and valves parts. B. Exhaust systems and marine fittings to a certain extent. Corrosion/acid resistant parts not heat-treated after welding.
	B	18% Cr 8% Ni Steels	Z6CN Nb 18.10- M	Gx7 Cr Ni Nb 18.9	1.4552	347	CF 8C	5362E	304C15 347C17	347 S17	58F		200 -	20~~	120~~			
ANC 4	A	Austenitic	Z6 CND 18.12-M	Gx6 Cr Ni Mo 18.10	1.4408	317	CG 8M	5524C	317C16	317 S16	58J	500 -	210** -	12~~	120~~		Stainless steels with good corrosion and acid resistance with medium tensile strength.	
	B	18% Cr 10% Ni	Z6 CND Nb 18.12- M	Gx6 Cr Ni Mo 18.10	1.4408	316	CF 8M		316C16	316 S16	58H	500 -	210** -	12~~	120~~			
	C	3% Mo Steels		Gx7 Cr Ni Mo Nb 18.10	1.4581	318			318C17	320 S17	58H	500 -	210** -	12~~	120~~			
ANC 5	A	Nickel	Z12 CNS 25.21	Ni Cr 25.20	1.4843	310	CK20;HK	5366B	310C45	310 S24							Heat resistant alloys with good strength up to 900°C, resistance to cyclic heating, useful creep resistance up to 650°C and good resistance to scaling	Furnace parts, salt and lead baths, continuous heat treatment belts.
	B	Chromium	Fe N37 C18S	Gx40 Ni Cr Si 36.16	1.4865	330	HU; HT		331C60									
	C	Steels	NC 15 Fe	Ni Cr 60.15	2.4867		HW		334C11									
ANC 6	A	Chromium	Z20 CNS 25.12	Gx35 Cr Ni Si 25.12	1.4837	309	Ch20;HF		309C30		55	460 -		17		Heat resistant alloys with good strength up to 900°C and useful creep strength to 650°C.	Heat treatment parts and superheaters, welding fixtures. High temperature casings. Nozzle guide vanes for gas turbines	
	B	Nickel	Z25 CNS W22					309C30				460 -		17				
	C	Steels	Z15 CNW S22-13									460 -		17				
ANC 8		Nickel 20% Cr 0.4% Ti Alloy	NC 20 T	Ni Cr 20 Ti	2.4630				Nimocast 75* Nimonic 75*	~ ~							A readily weldable heat resistant alloy with excellent resistance to oxidation up to 110°C and with useful strength.	Furnace parts
ANC 9		Nickel 20% Cr 2.5% Ti 1.2% Al Alloy	NC 20 TA	Ni Cr 20 Ti Al	2.4631				Nimocast 80* Nimonic 80*	~ ~							A heat-resistant alloy with good creep and oxidation resistance up to 870°C.	Diesel engine pre-combustion chambers, gas turbine parts.
ANC 10		Nickel 20% Cr 16.5% Co 2.4% Ti 1.3% Al Alloy	NC 20 K17 TA	Ni Cr 20 Co 18 Ti	2.4632				Nimocast 90* Nimonic 90*	~ ~							Increase strength over the ANC 9 alloy with good creep and oxidation resistance up to 870°C.	Turbine and turbocharger rotors

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\* Similar materials

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~~ Not applicable to free machining grades

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