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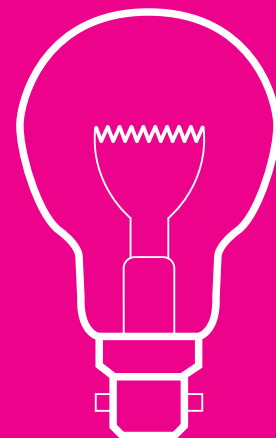
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Power generation

High Temperature Blading and Bolting Steels



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Introduction

With over 100 years in the business, our experience goes far beyond the confines of just steel manufacturing. We can advise on both material selection and supply routes, adding real value to a project from day one. Corus experts support design engineers across a wide variety of disciplines, helping our customers make the correct decision early in the design process.

Special engineering steels are used throughout the power generation industry for components where high temperature properties, strength, toughness, resistance to creep, fatigue and corrosion are paramount. Consistency and reliability are absolutely key. We not only provide single and remelted steels that endure the extreme operating conditions that prevail in turbine applications, we work in partnership with our customers to ensure that product performance is matched by sustainable and efficient supply.

Quality policy

Corus Engineering Steels is committed to the achievement of customer requirements and expectations and to continuous improvement in productivity, quality, service, costs and technology. The commitment is demonstrated by:

- the achievement of prescriptive quality assurance standards such as BSEN ISO 9001, ISO/TS 16949, SAE AS 9100, and company approvals within the market sectors which it serves
- the adoption of team working which serves to focus the attention of all employees on the quality of their work
- the development of an informed and motivated workforce with a positive commitment to professional excellence
- the setting of quantitative objectives whereby continuous improvements in performance against agreed goals can be readily measured
- the development of new and improved products designed to meet customer requirements
- the emphasis on prevention rather than detection in the drive to zero defects
- the assistance given to our customers and reaction to their concerns
- the optimum utilisation of facilities leading to 100% deliveries on time
- a reduction in process costs and increase in yields
- the development of suppliers and subcontractors

The relevant oil and gas industry approvals, and major approvals gained in other quality engineering sectors, include:

Alstom Energy
 Baker Oil Tools
 Boeing Commercial Airplane
 British Aerospace
 BS EN ISO 9001
 Caterpillar
 Det Norske Veritas
 EN/AS 9100
 GKN ADD
 Halliburton
 Lloyds RS
 National Oilwell
 QUASCO
 Ramnas Bruck
 Reed Tool Company
 Rolls Royce
 Schlumberger
 Siemens/Westinghouse
 Statoil
 TS16949
 T.U.V.
 Weir Materials Limited

Product range

Product		Metric (mm)		Imperial (in)		
Primary Products						
Rolled	Blooms	211	- 457	8 ¹ / ₄	- 18	
	Billets	50	- 211	2	- 8 ¹ / ₄	
	Slabs	width	100	- 500	3 ⁷ / ₈	- 19 ⁵ / ₈
		thickness	50	- 330	2	- 12 ¹⁵ / ₁₆
	Rounds	76	- 381	3	- 15	
Rerolled Products						
Lengths	Rounds	*25	- 105	1	- 4 ¹ / ₈	
	Hexagons	25	- 80	1	- 3 ¹ / ₈	
	Squares	25	- 48	1	- 1 ⁷ / ₈	
Coils	Rounds	15.5	- 60	5 ⁷ / ₈	- 2 ⁹ / ₁₆	
	Hexagons	15	- 52	1 ⁹ / ₃₂	- 2 ¹ / ₁₆	
	Squares	15	- 50	1 ⁹ / ₃₂	- 2	

Slab width and thickness combinations available on request.

Maximum turned bar size 350mm or 14in diameter.

Surface finish and heat treatment conditions as specified.

* Smaller sizes by agreement.

Maximum product lengths are:

Supplied Condition	Primary		Rerolled	
	m	ft	m	ft
Rolled - Billets	13	42	18	59
Rolled - Other products	13	42	18	59
Turned	13	42	9	30
Heat Treated	10.4	34	9	30

Carbon and alloy steels

Grade	Related Standards & Specifications	Summary of Properties
Durehete 900[†]	EN10269, 42CrMo5.6, Steel No 1.7233 BS 1506 631-850	For use up to 480°C
Durehete 950[†]	EN10269, 40CrMoV4.6, Steel No 1.7711 BS 1506 671-850 ASTM A193 B16 DIN 17240 EN1515-1	For use up to 510°C
Durehete 1055[†]	EN10269, 20CrMoVTiB4.10, Steel No 1.7729 BS 1506 681-820, EN1515-1	For use up to 570°C
C35E	EN10269, Steel No 1.1181 EN1515-1	For use up to 350°C
25CrMo4	EN10269, Steel No 1.7218 EN1515-1	For use up to 400°C
21CrMoV5.7	EN10269, Steel No 1.7709 EN1515-1	For use up to 540°C
42CrMo4	EN10269, Steel No 1.7225 ASTM A193 B7 BS 1506 630-860	For use up to 450°C
Steel 91	prEN10276-2, X10CrMoVNb9-1, Steel No 1.4903 ASTM A213 T91 ASTM A182 F91	For use up to 600°C

Chemical analysis

Nominal Chemical Analysis %										
C	Si	Mn	Cr	Mo	Ni	V	Ti	B	Other	
0.40	0.25	0.55	1.30	0.60						
0.40	0.25	0.55	1.10	0.55		0.25				
0.20	0.25	0.50	1.00	1.00		0.70	0.10	0.003	0.04% Al	
0.35	0.25	0.70								
0.25	0.25	0.70	1.00	0.30						
0.20	0.25	0.60	1.25	0.70		0.30				
0.40	0.25	0.80	1.00	0.20						
0.10	0.30	0.50	8.75	0.90		0.20				0.07% Nb 0.05% N

[†]Data sheets including elevated temperature properties available

Compositions and properties listed in the tables are typical. Production to individual requirements and specifications can be arranged on request.

Carbon and alloy steels

Grade	Related Standards & Specifications	Minimum Tensile Properties		
		UTS N/mm ²	0.2%PS N/mm ²	EI %
Durehete 900[†]	EN10269, 42CrMo5.6, Steel No.1.7233	860	700	16
	BS 1506 631-850	850	640	16
Durehete 950[†]	EN10269, 40CrMoV4.6, Steel No.1.7711	850	700	14
	BS 1506 671-850	850	640	14
	ASTM A193 B16 DIN 17240 EN1515-1			
Durehete 1055[†]	EN10269, 20CrMoVTiB4.10, Steel No. 1.7729	820	660	15
	BS 1506 681-820, EN1515-1	820	660	15
C35E	EN10269, Steel No. 1.1181			
	EN1515-1	500	300	22
		500	300	22
25CrMo4	EN10269, Steel No. 1.7218			
	EN1515-1	600	440	18
		600	420	18
21CrMoV5.7	EN10269, Steel No. 1.7709			
	EN1515-1	700	550	16
42CrMo4	EN10269, Steel No. 1.7225			
	ASTM A193 B7 BS 1506 630-860	860	730	14
Steel 91	prEN10276-2, X10CrMoVNb9-1, Steel No 1.4903	670	500	18
	ASTM A213 T91 ASTM A182 F91			

Mechanical properties

R of A %	Limiting Ruling Section	Heat Treatment	Impact (ISO V) Joules
50	≤100mm	Hardened and tempered	50min
50	>100mm to 200mm		40min
45	≤100mm	Hardened and tempered	30min
45	>100mm to 200mm		25min
50	≤100mm	Hardened and tempered	40min
50	>100mm to 200mm		27min
45	≤60mm	Hardened and tempered	55min
45	>60mm to 150mm		39min
60	≤100mm	Hardened and tempered	60min
60	>100mm to 150mm		45min
60	≤160mm	Hardened and tempered	63min
50	≤60mm	Hardened and tempered	50min
35		Hardened and tempered	

[†]Data sheets including elevated temperature properties available

Conversion: 1J = 0.738 ft lbf, 1N/mm² = 0.145 ksi

Composition and properties listed in the tables are typical. Production to individual requirements and specifications can be arranged on request.

Stainless steels

Grade	Related Standards & Specifications	Summary of Properties
Martensitic Jethete M152	EN 10269 X12CrNiMoV12.3 Steel No 1.4938 & 1.4939	High strength with good oxidation resistance
Jethete M448	Steel No 1.4914	High strength with good oxidation resistance
X20Cr13	EN10088 Steel No 1.4021	For use at lower temperatures
X22CrMoV12.1	EN10269 Steel No 1.4923, NFA 35.578, Z20CDV12	For use up to 580°C
X19CrMoNbVN11.1[†]	EN10269, Steel No 1.4913, NFA 35.558, Z20CDNbV11	For use up to 580°C
AISI 403	ASTM A193 B6	For use at lower temperatures
H46		For use up to 570°C
AISI 422	ASTM A437 B4B	For use up to 570°C
16-5-1	Steel No. 1.4418 X4CrNiMo16-5-1	High strength with good corrosion resistance
Precipitation Hardened SF450	UNS45000	High strength with good oxidation resistance
SF17/4	Steel No 1.4548 ASTM A564 XM-12	High strength with good oxidation resistance
SF520B	Steel No 1.4543	High strength with good oxidation resistance

Chemical analysis

Single Melted	ESR*	C	Si	Mn	Cr	Mo	Ni	V	Nb	N	Other
√	√	0.11	0.20	0.80	11.50	1.60	2.60	0.30		0.03	
√	√	0.13	0.40	1.00	10.50	0.60	1.00	0.15	0.40	0.06	
√		0.20	0.30	0.50	12.80		0.40				
√		0.20	0.30	0.60	11.80	1.00	0.60	0.30			
√		0.20	0.30	0.60	10.80	0.70	0.40	0.20	0.40	0.07	
√	√	0.12	0.30	0.50	12.00		0.40				with or without Nb, Mo, V
√	√	0.18	0.30	0.60	10.80	0.80	0.40	0.25	0.40	0.075	
√	√	0.22	0.30	0.80	11.50	1.00	0.80	0.25			1.0%W
√	√	0.035	0.45	0.75	15.50	1.00	4.85				
	√	0.03	0.50	0.60	14.50	0.80	6.50	0.05	0.70		1.5%Cu
√	√	0.05	0.30	0.90	17.00		4.00		0.30		4%Cu
√	√	0.05	0.40	0.80	14.00	1.50	5.50		0.30		1.5%Cu

[†]Data sheet including elevated temperature properties available

* VAR available on request

Compositions and properties listed in the tables are typical. Production to individual requirements and specifications can be arranged on request.

Stainless steels

Grade	Related Standards & Specifications	UTS N/mm ²	0.2%PS N/mm ²
Martensitic Jethete M152	EN10269 X12CrNiMoV12.3 Steel No.1.4938 & 1.4939	930	760
Jethete 448	Steel No 1.4914	930	760
X20Cr13	EN10088 Steel No 1.4021	700 800	500 600
X22CrMoV12.1	EN10269 Steel No 1.4923, NFA 35.578, Z20CDV 12	800 900	600 700
X19CrMoNbVN11.1[†]	EN10269, Steel No1.4913, NFA 35.558, Z20CDNbV 11	900	750
AISI 403	ASTM A193 B6	690 790	550 690
H46		960	690
AISI 422	ASTM A437 B4B	960	620
16/5/1	Steel No. 1.4418 X4CrNiMo16-5-1	900	700
Precipitation Hardened			
SF450	UNS45000	860 960 1050	670 825 980
SF17/4	Steel No 1.4548 ASTM A564 XM-12	930 1000	725 860
SF520B	Steel No 1.4543	900	700

Mechanical properties

EI %	R of A %	Heat Treatment	Impact (ISO V) Joules
14	40	Hardened and tempered	20 min
10	-	Hardened and tempered	
13 12	55 50	Hardened and tempered	25 min 20 min
14 11	40 35	Hardened and tempered	20 min
12	40	Hardened and tempered	20 min
20 15	60 50	Hardened and tempered	70 min 50 min
15	45	Hardened and tempered	11 min
13	30	Hardened and tempered	14 min
17	50	Hardened and tempered	80 min
14 14 12	45 45 45	Solution treated & aged	82 min 68 min -
16 13	50 45	Solution treated & aged	40 min 27 min
15	50	Solution treated & aged	50 min

[†]Data sheet including elevated temperature properties available

Compositions and properties listed in the tables are typical. Production to individual requirements and specifications can be arranged on request.

Conversion: 1J=0.738 ft lbf, 1N/mm²=0.145ksi

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