Schmidt + Clemens Group

Centralloy® G 4859

MATERIAL DATA SHEET

Designation: GX10NiCrNb32-20

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Contents:

Features

Centralloy® G 4859 is an air melted iron base alloy with low carbon content, consisting essentially of Fe-Cr-Ni matrix. The composition has been optimised to combine adequate high temperature strength and structural stability.

Due to the balance of niobium and carbon, the cast austenitic iron-chromium-nickel matrix is strengthened by formation of interdendritic MC type carbides with M being mainly Nb. With this optimum control of composition, relaxation in heavy cross sections during weld fabrication and under thermal shock conditions in service, results in superior crack resistance.

In comparison with cast high carbon heat resistant steels the stable austenitic structure of the alloy exhibits excellent tensile and creep ductility values after exposure in the temperature range of 650°C to 1000°C. Also, RT-ductility values are maintained after ageing at these service temperatures.

Product Forms

Centralloy® G 4859 was designed as centrispun tube material to meet specific design criteria in terms of creep rupture strength, thermal fatigue resistance, ductility especially after thermal ageing and weldability. It is available as centrispun tubes, vertically spun, statically cast parts and investment cast product forms.

Other forms may be supplied upon request. Further information regarding these topics and maximum and minimum sizes, may be obtained from the sales department.

Chemical Composition(*)

	mass percentage
Carbon	0.1
Silicon	1
Manganese	1.5
Chromium	20
Nickel	32
Niobium	1
Iron	Balance

(*) This is a typical composition which may be slightly modified according to the application.

Applications

Tubular systems requiring excellent thermal shock resistance combined with sufficient stress rupture strength, creep resistance and ageing ductility.

Main high temperature applications for the material are:

Process:	max. operating temperature, °C
Steam cracking (transfer lines)	1000
Pyrolysis furnace outlet lines, collectors	1000
Steam reformer (outlet header)	1000
Styrene, EDC	1000

Physical Properties

Density at 20°C: 8.0 g/cm³

Typical physical properties

δ, °C	α, 10^{-6}/K	λ, W/m K	a, $10^{-6}m^2/s$	c_p, J/kg K	E, GPa	ρ, nΩm
20	-	11.5	3.1	472	172	1010
100	-	13.1	3.3	487	155	1040
200	-	14.8	3.6	503	148	1080
300	15.0	16.4	3.9	512	142	1120
400	16.0	18.1	4.2	520	132	1150
500	16.3	19.6	4.4	530	122	1180
600	16.5	21.2	4.6	541	117	1200
700	16.7	22.8	4.9	551	109	1220
800	17.0	24.3	5.2	559	103	1240
900	18.0	25.7	5.5	565	99	1260
1000	18.5	27.3	5.7	571	95	1270

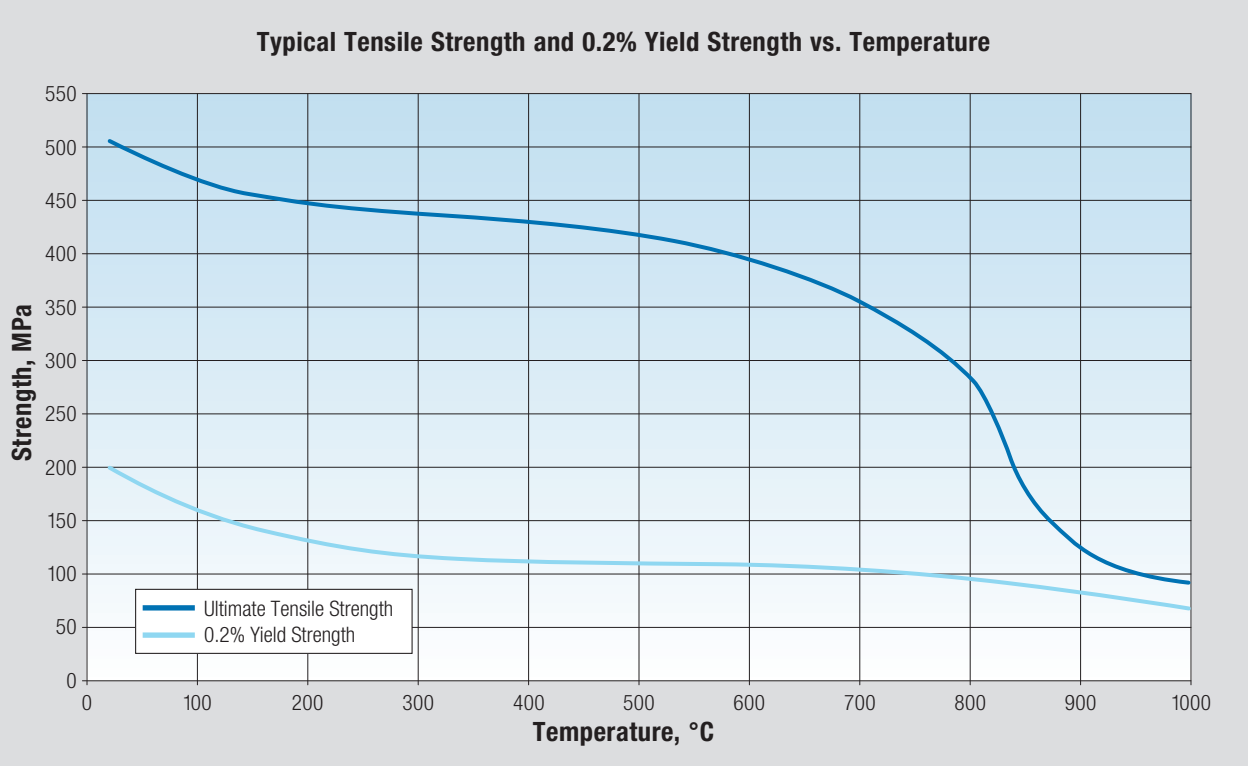
δ: Temperature
α: Mean coefficient of linear thermal expansion (reference temperature: 20°C)
λ: Thermal conductivity
a: Thermal diffusivity
c_p: Mean specific heat
E: Modulus of Elasticity (dynamic values)
ρ: Electrical resistivity

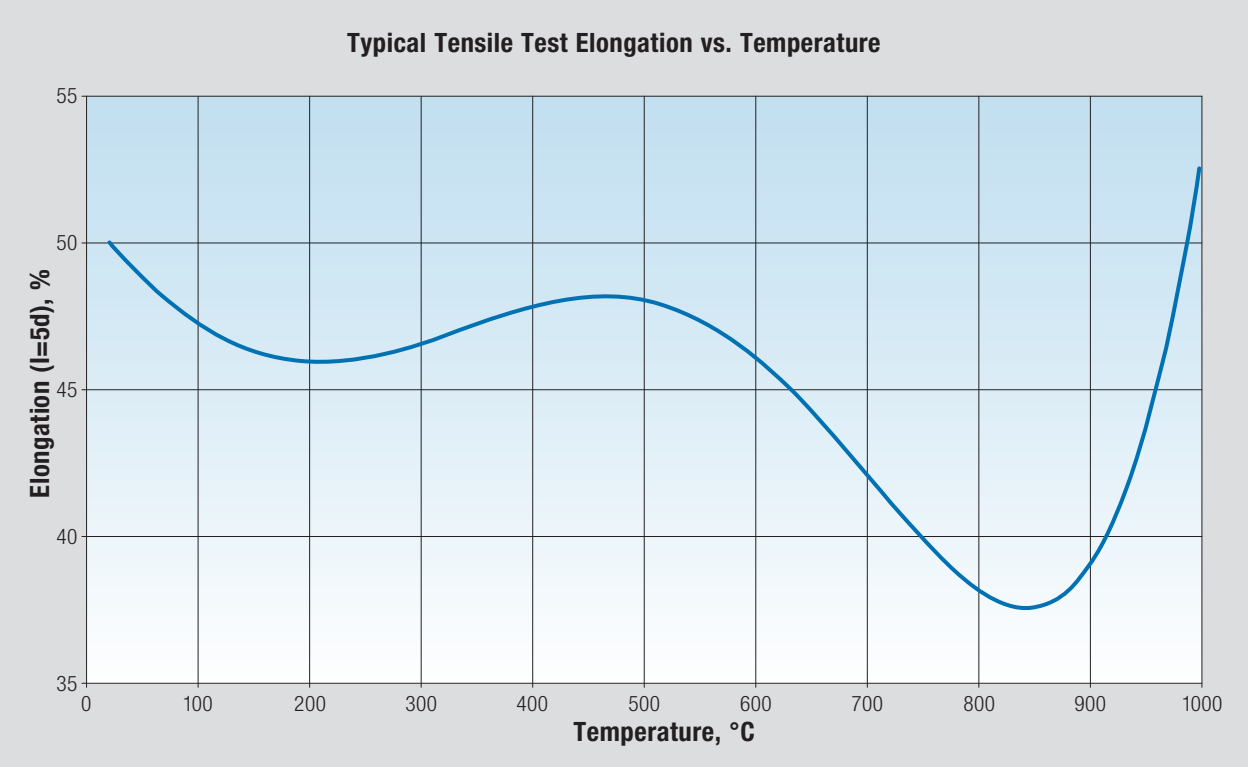
Mechanical Properties

(only for wall thickness less than 25 mm, in the as cast conditions)

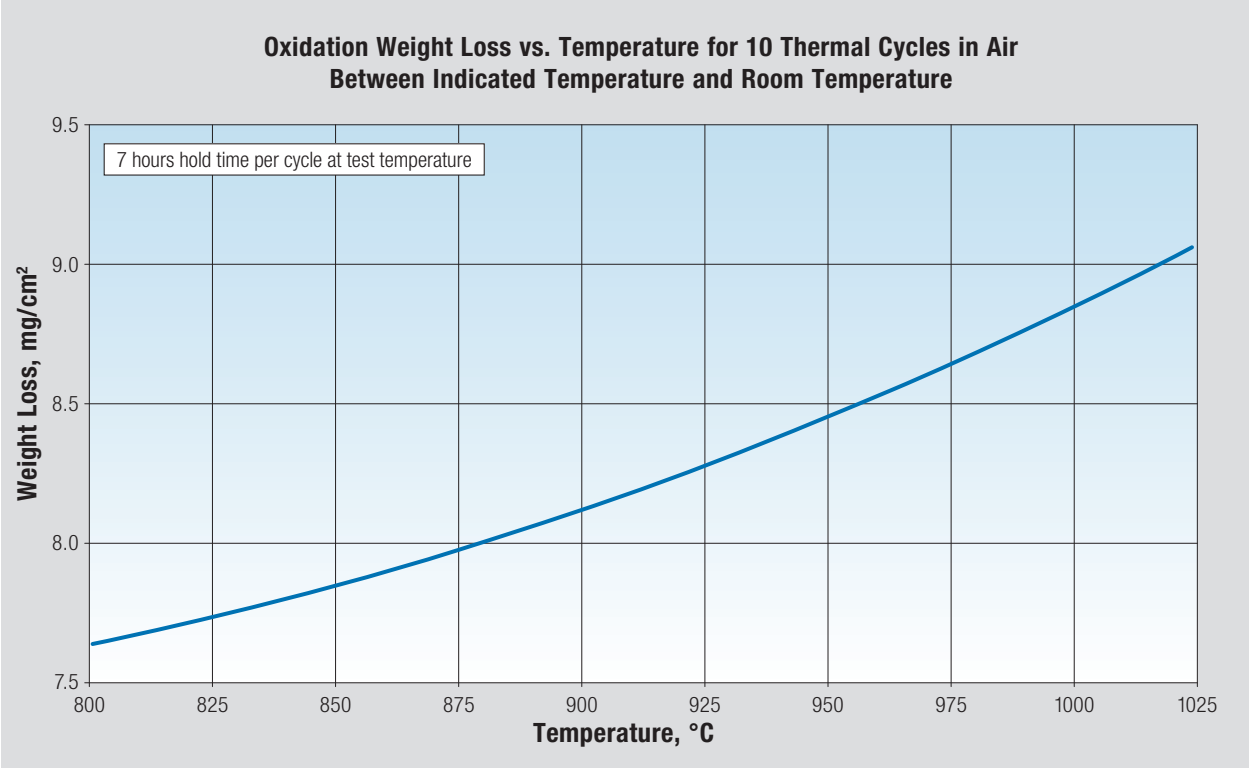
Tensile properties

Minimum tensile properties at 20°C:	0.2% Yield strength:	180 MPa
	Ultimate tensile strength:	440 MPa
	Elongation, (l=5d):	25% for centricast tubes
		20% for static castings

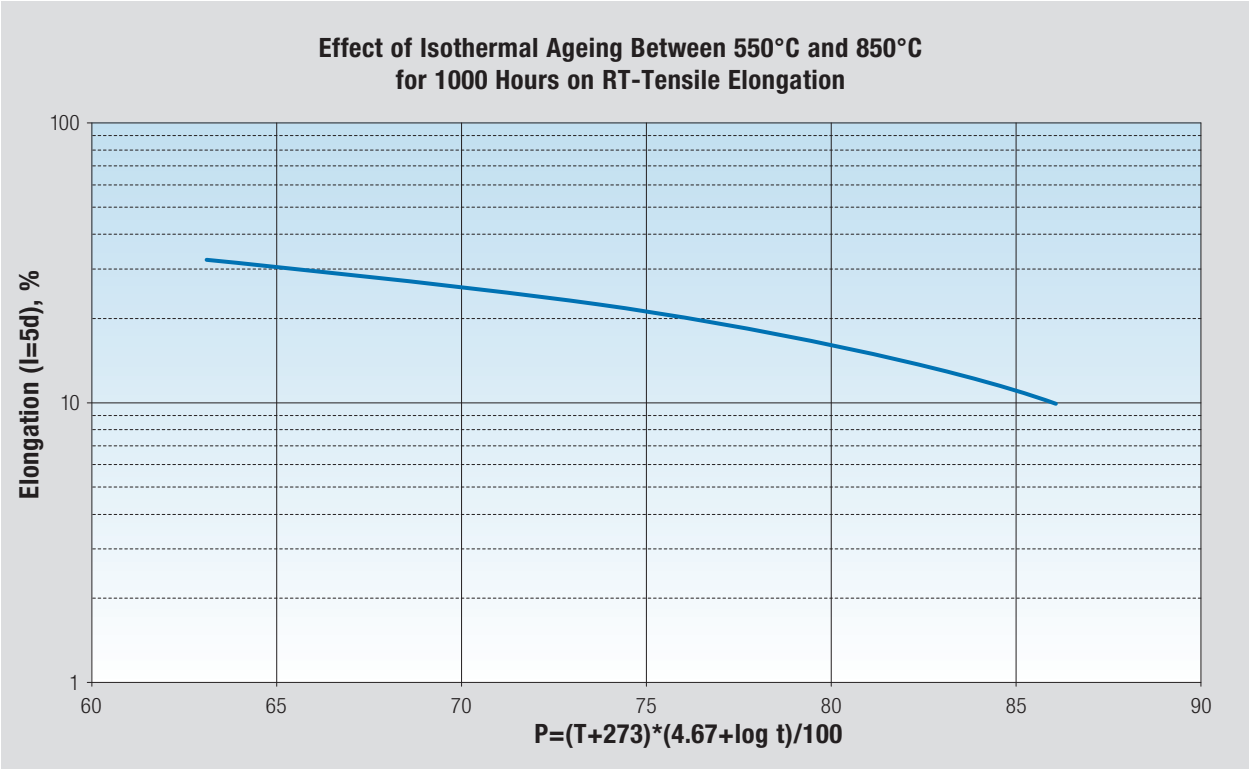




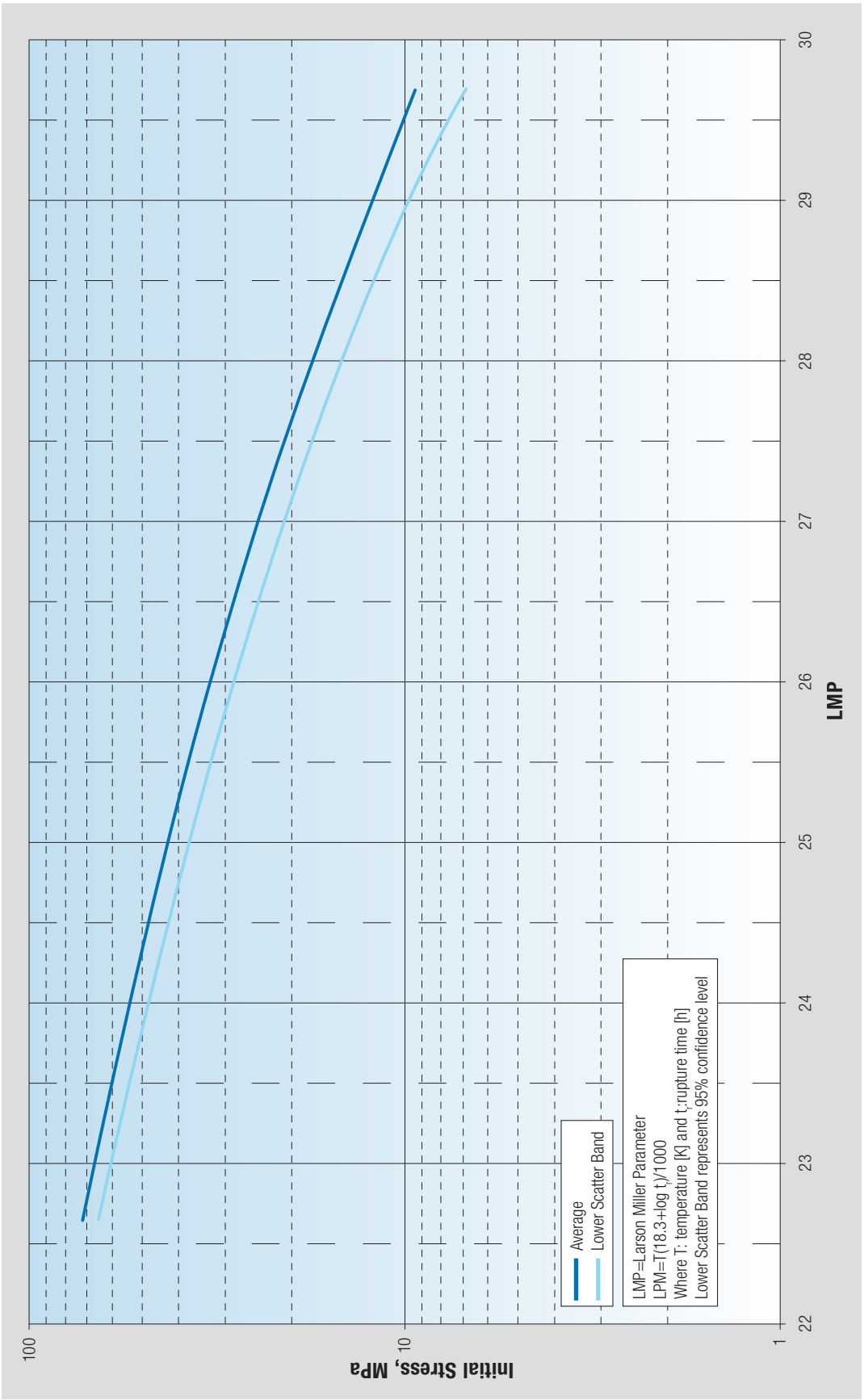
Oxidation Resistance



Ageing Behaviour



Parametric Stress Rupture Strength



Manufacturing Characteristics

Machining

In general terms the machinability of Centralloy® G 4859 is similar to that of other heat resistant alloys with low carbon content.

Welding

Centralloy® G 4859 is readily welded by shielded metal-arc (SMAW), inert gas tungsten-arc (GTAW), and plasma-arc (PAW) processes using matching composition of filler materials.

Approved filler materials are bare welding rods and electrodes. Preheating and postweld heat treatment is not required. Service exposed hardware from a temperature range of 750°C to 1000°C indicates that repair-weldability remains fair and repairs can be made to high quality standards.

Health, Safety and Environmental Information

The operation and maintenance of welding equipment should conform to the provisions of relevant national standards for the protection of personnel and environment.

Mechanical ventilation is advisable, and under certain conditions in confined spaces, it is necessary during welding operations to prevent possible exposure to hazardous fumes, gases or dust that may occur.

Nickel- and iron-base materials may contain, in varying concentrations, the elements chromium, iron, manganese, molybdenum, cobalt, nickel, tungsten and aluminium. Metal dust from welding, grinding, melting and dross handling of these alloy systems may cause adverse environmental and in case of inhalation health effects.

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Services

- Metallurgy and material engineering
- Material analysis and examinations
- Metallurgical defect analysis
- Process and material consulting
- Design of tubes and tube systems
- Material welding services
- Mechanical machining
- Heat treatment
- Convection zones
- Site services and logistics

Production sites

Germany, Spain, United Kingdom, Czech Republic, Malaysia, Saudi Arabia