Schmidt + Clemens Group

Centralloy® ET 45 Micro

MATERIAL DATA SHEET

Designation: GX45NiCrSiNb45-35

Schmidt + Clemens GmbH + Co. KG · Edelstahlwerk Kaiserau · P.O. Box 1140 · 51779 Lindlar, Germany

Contents:

Features

Centralloy® ET 45 Micro is an air melted nickel-base alloy consisting essentially of a Ni-Cr-Fe-Si matrix. The high chromium level, rare earth additions and primary carbide formation provide the best compromise between good high temperature corrosion resistance and high temperature creep rupture strength.

The presence of carbon leads to the formation of a series of carbides:

a) Intergranularly occuring primary carbides, nitrides or carbonitrides of general form M(C,N) where M is usually niobium, titanium and zirconium. These greatly affect the generation of good high temperature properties. The phase is visible in unetched micro specimens, its color varying from the orange/yellow of the nitride to the grey/mauve of the carbide.

b) Chromium-rich intergranular carbides of the M_7C_3 and $M_{23}C_6$ types. These carbides have a profound influence on properties due to the decomposition and re-precipitation reactions in service producing secondary carbides in a rather uniform dispersion. By this mechanism dislocation movement is impeded with the result of significant strengthening at elevated temperatures.

Product Forms

Centralloy® ET 45 Micro was designed as centrispun tube material to meet specific design criteria in terms of carburisation and oxidation resistance, creep rupture strength and weldability. It is available as centrispun tubes, vertically spun, statically cast and investment cast product forms.

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

Chemical Composition(*)

	mass percentage
Carbon	0.45
Silicon	1.60
Manganese	1.00
Chromium	35.00
Iron	16.00
Niobium	1.00
Titanium	Additions
Zirconium	Additions
Rare earth elements	Additions
Nickel	Balance

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

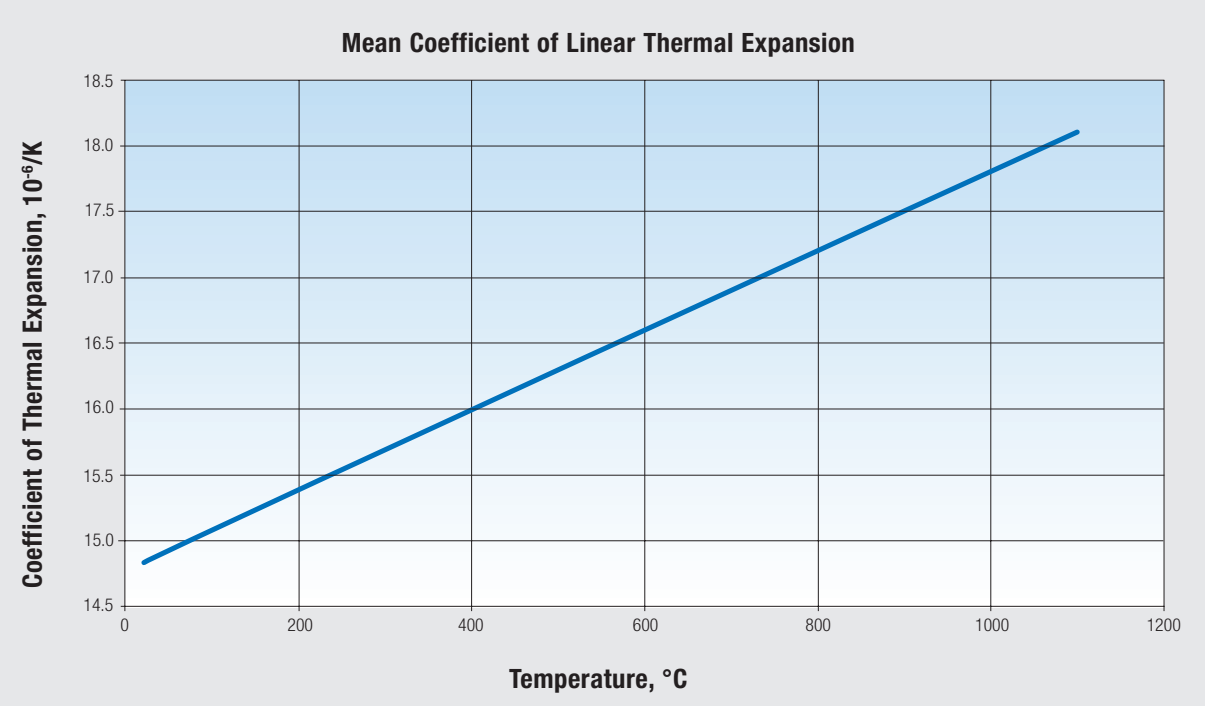
Applications

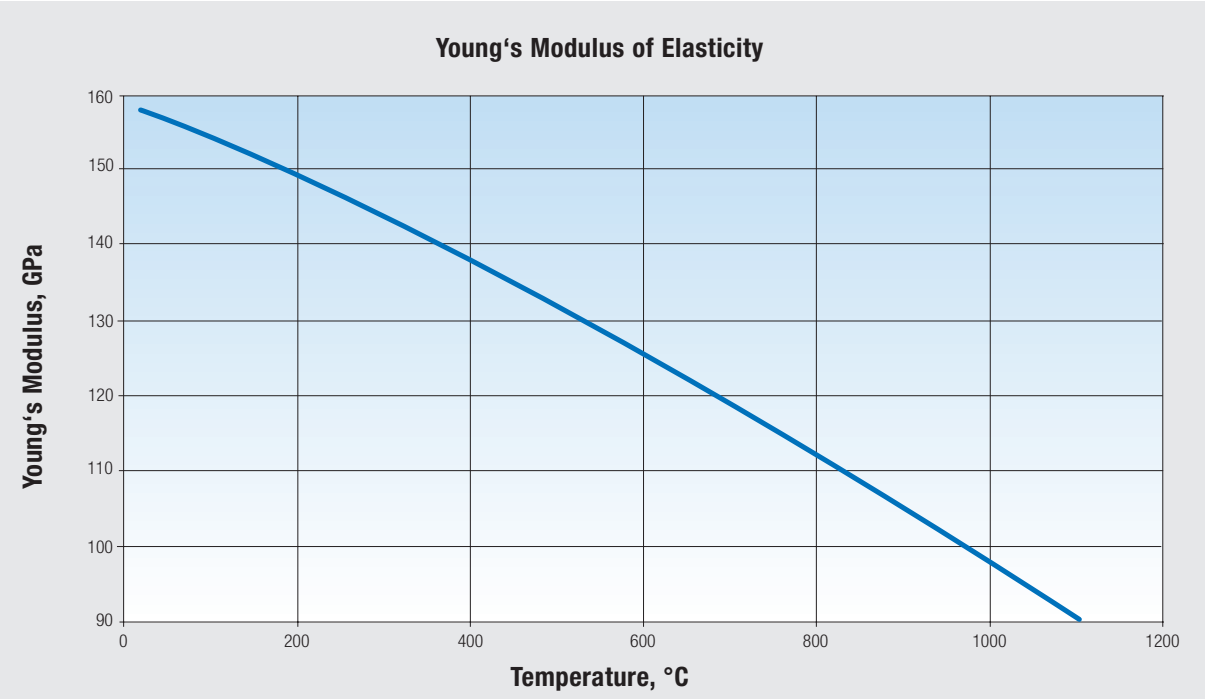
Tubular systems requiring superior carburisation and oxidation resistance combined with high creep rupture strength and high creep resistance. No heat treatment is required for most applications of this alloy. Main high temperature applications for the material are:

Process:	max. operating temperature, °C
Steam cracking	1150
Direct reduction of iron ore	1150

Physical Properties

Density: 8.1 g/cm³
Thermal Conductivity (20°C): 14.0 W/mK

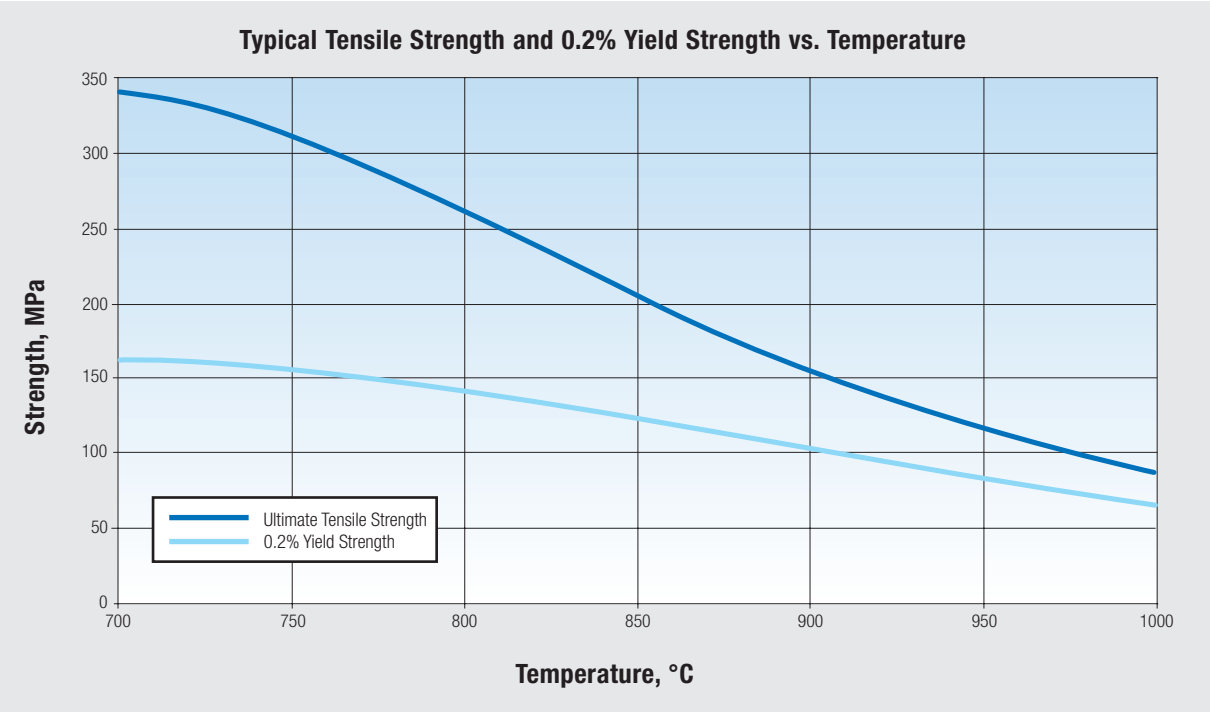


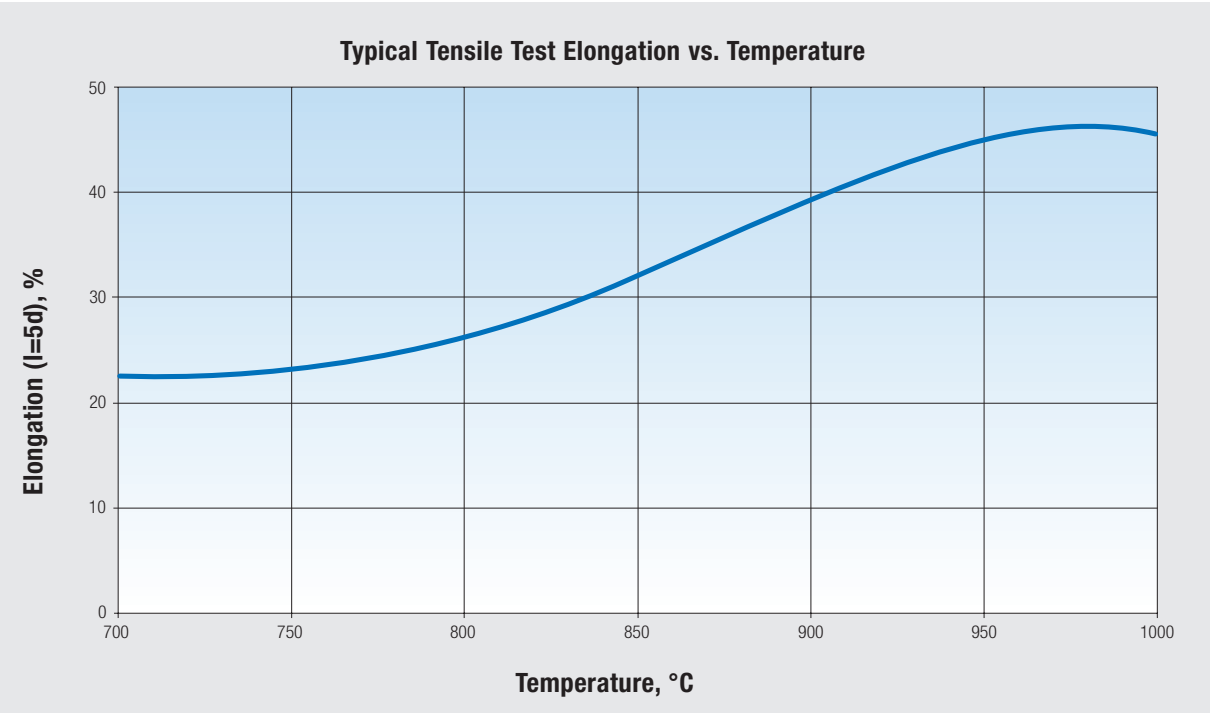


Mechanical Properties
(only for wall thickness less than 25 mm in the as cast condition)

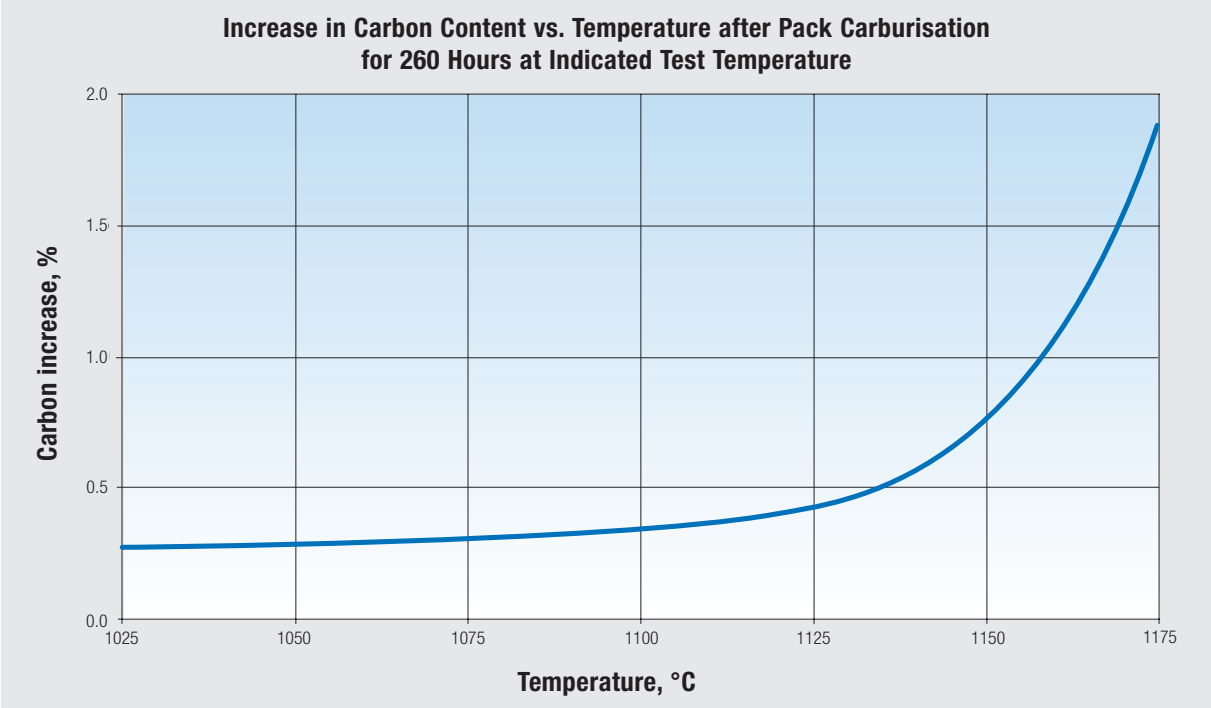
Tensile properties

Minimum tensile properties at 20°C:	0.2% Yield strength:	245 MPa
	Ultimate tensile strength:	450 MPa
	Elongation (l = 5d):	6% for centricast tubes
		3% for static castings

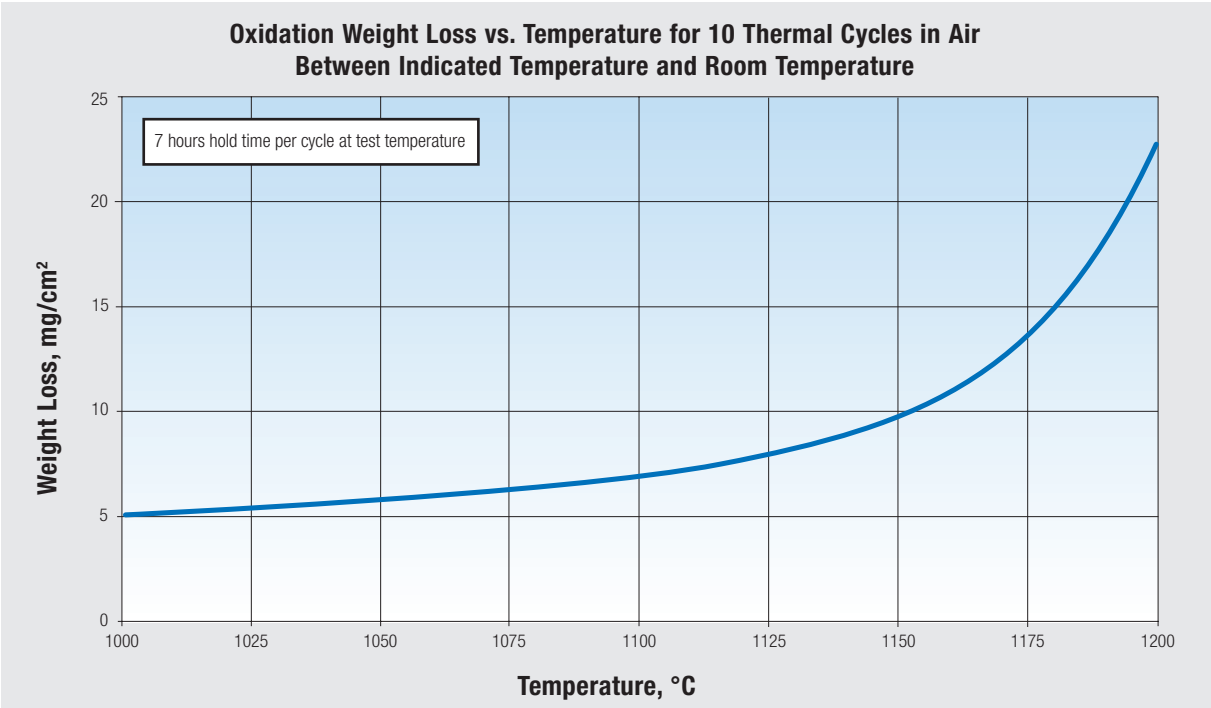




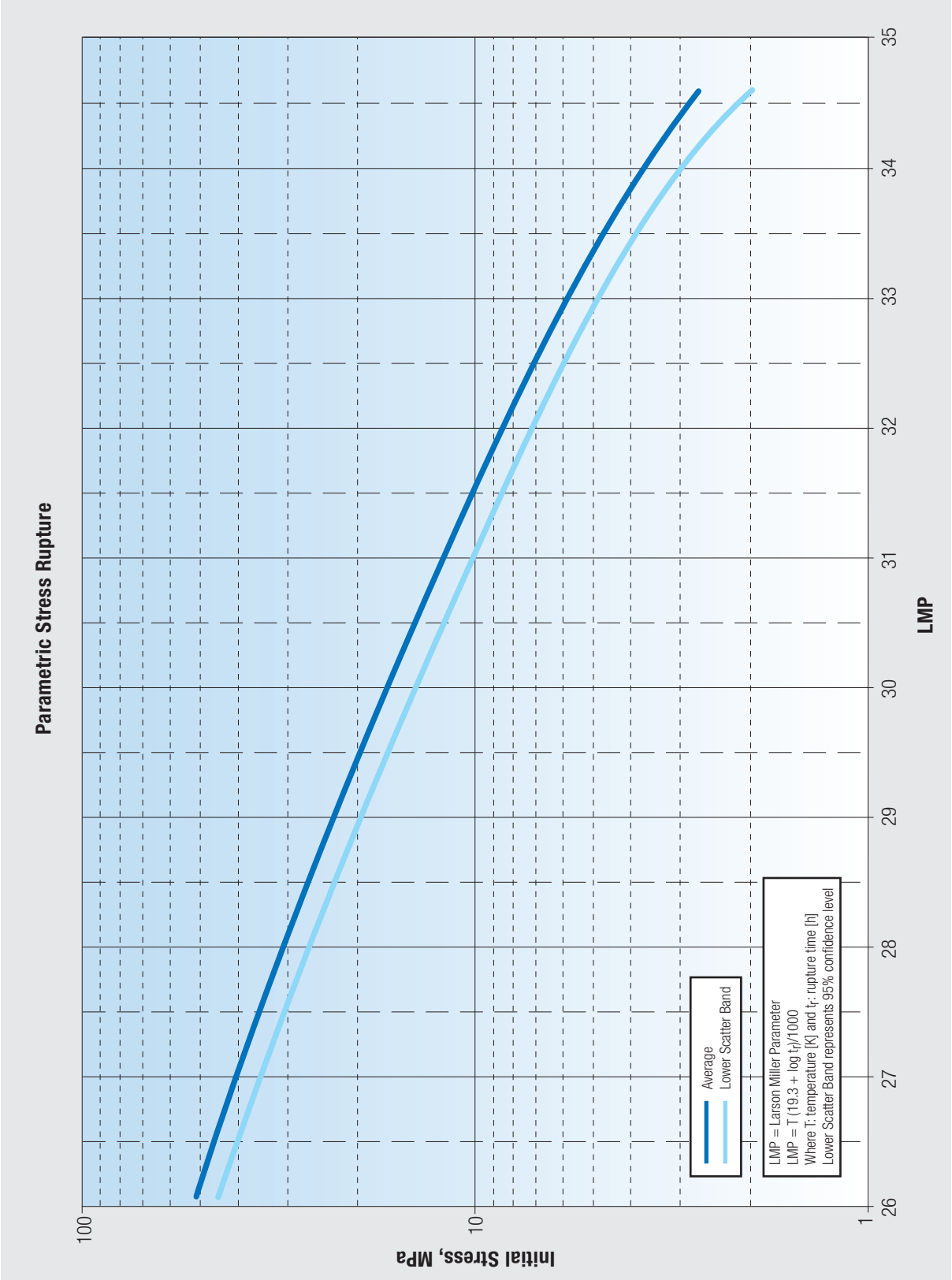
Carburisation Resistance



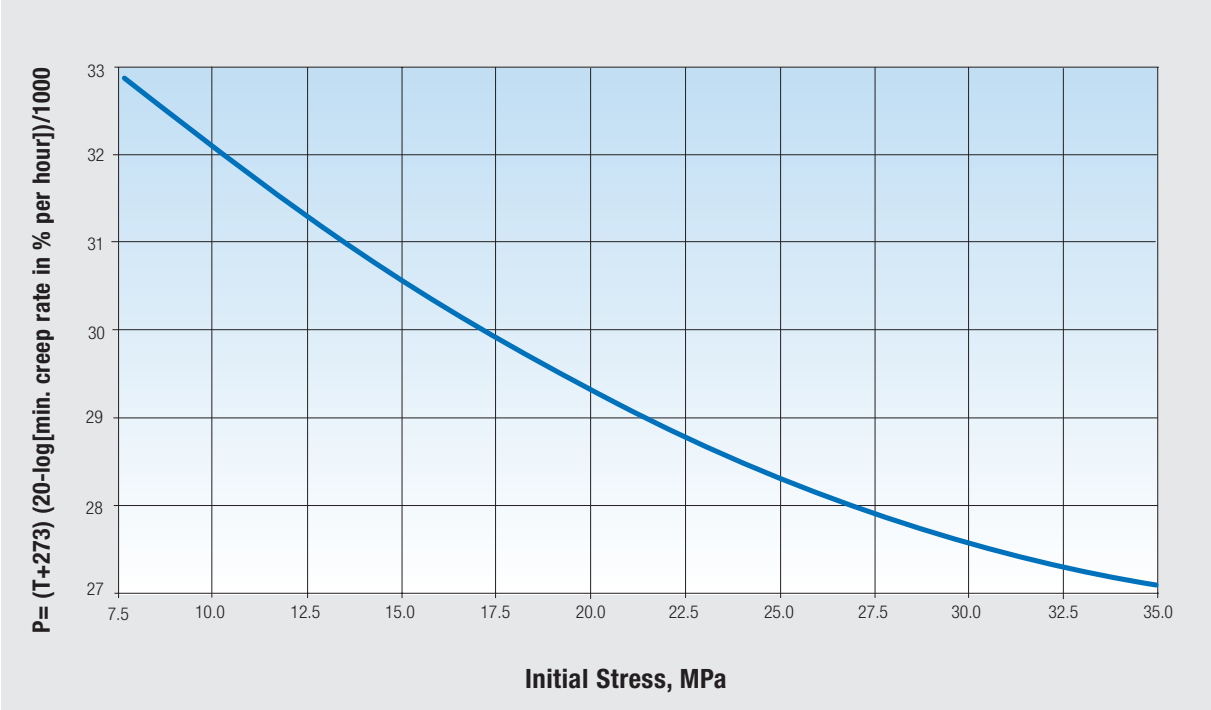
Oxidation Resistance



Parametric Stress Rupture Strength



Parametric Minimum Creep Rate



Manufacturing Characteristics

Machining

In general terms the machinability of Centralloy® ET 45 Micro is similar to that of other heat resistant alloys.

Welding

For critical, highly stressed and corrosion resistant joints coated electrodes, flux cored wire and bare filler material are commercially available. These welding consumables have high strength properties at elevated temperatures with good retained ductilities. Besides fillerless PAW, TIG and MAW have been used satisfactorily for component fabrication or repair welding. Preheating and postweld heat treatment of the joint is not necessary. For dissimilar weld joints to austenitic materials the same filler materials are recommended. Further information will be supplied upon request.

Health and Safety Information

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

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

Nickel- and iron-base materials may contain, in varying concentrations, elemental constitutions of chromium, iron, manganese, molybdenum, cobalt, nickel, tungsten and aluminium. Inhalation of metal dust from welding, grinding, melting and dross handling of these alloy systems may cause adverse health effects.

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Spun Casting – Petrochemical Industry

Industries
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- Iron-ore direct reduction

Services
- Business consulting
- Analysis of operational data
- Training of customer personnel
- Welding supervision

Germany
Schmidt + Clemens GmbH + Co. KG
Edelstahlwerk Kaiserau
Kaiserau 2, 51789 Lindlar
Phone: +49 2266 920
Fax: +49 2266 92370
E-Mail: info@schmidt-clemens.com

Spain
Schmidt - Clemens Spain S.A.U.
Ctra. Estella-Vitoria, Km. 12
31280 Murieta, Navarra
Phone: +34 948 53 46 00
Fax: +34 948 53 46 01
E-Mail: centracero@schmidt-clemens.com

Brazil
Schmidt + Clemens Brasil Ltda.
Avenida Beta, 351
13213-070, Jundiaí, Sao Paulo
Phone: +55 11 3378 3901
Fax: +55 11 4582 9888
E-Mail: scbrasil@schmidt-clemens.com.br

Malaysia
Schmidt + Clemens (Asia) Sdn. Bhd.
No. 15, Jalan Pemaju U1/15, Section U1
Hicom Glenmarie Industrial Park
40150 Shah Alam, Selangor Darul Ehsan
Phone: +60 3 5569 1945
Fax: +60 3 5569 1425
E-Mail: sc-asia@schmidt-clemens.com

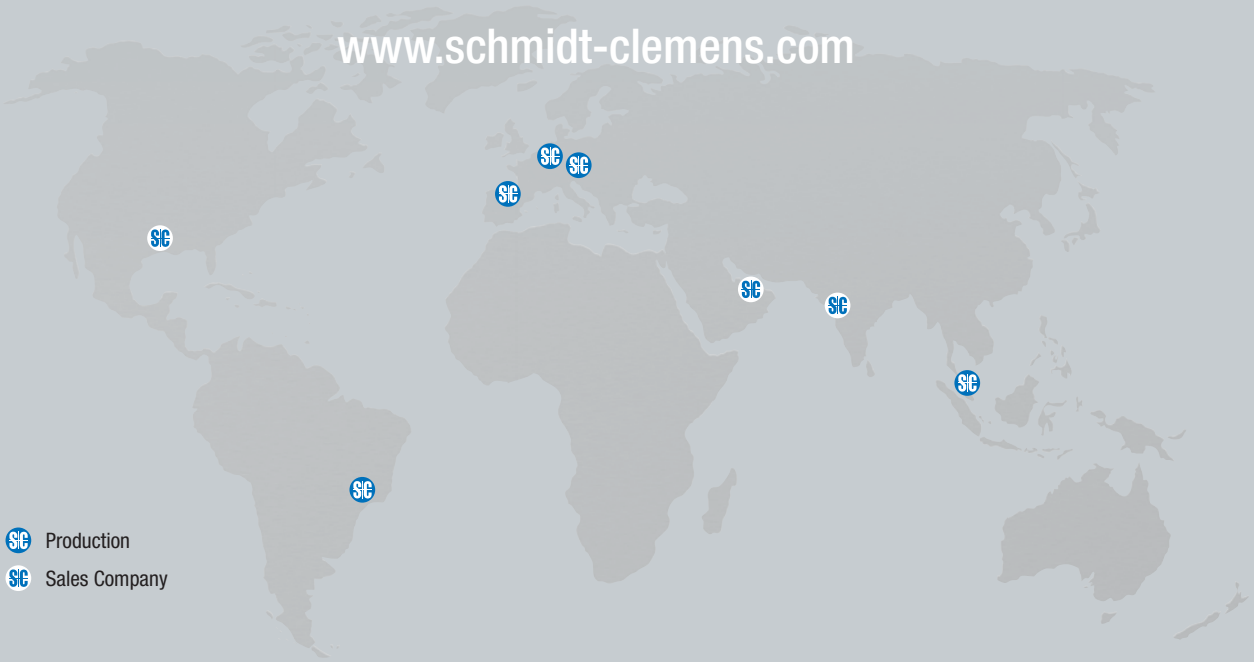
Czech Republic
S+C Alfanametal s.r.o koncern
783 57 Tršice c. 126
Phone: +420 58 59 57 428
Fax: +420 58 59 57 430
E-Mail: alfa@alfanametal.cz

USA
Schmidt & Clemens Inc.
24 Greenway Plaza Suite 1840
Houston, Texas 77046
Phone: +1 713 629 7770
Fax: +1 713 629 7373
E-Mail: sales-us@schmidt-clemens.com

United Arab Emirates
Schmidt + Clemens Middle East DMCC
10 E, 10th Floor, Silver (AG) Tower
Jumeirah Lake Tower, Dubai
Phone: +971 4 4328385
Fax: +971 4 4328384
E-Mail: dubai@schmidt-clemens.com

India
Schmidt + Clemens GmbH + Co. KG
India Liaison Office
A 214 Mahindra Gardens, S.V. Road
Goregaon (W), Mumbai 400 062
Phone: +91 22 8748 445
Fax: +91 22 8791 226
E-Mail: scindia@vsnl.net

www.schmidt-clemens.com



Production
Sales Company