Schmidt + Clemens Group

Centralloy® H 101 Micro

MATERIAL DATA SHEET

Designation: GX13NiCrSiNbTi37-25

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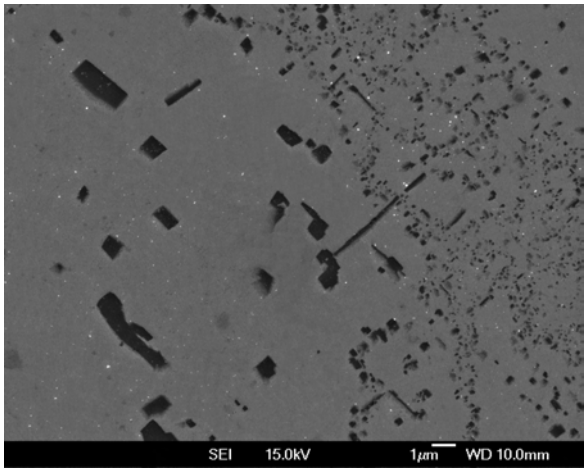
Contents:

Features

Centralloy® H 101 Micro is an air melted iron-base low carbon alloy consisting essentially of a Fe-Cr-Ni matrix. The composition has been optimised to combine adequate high temperature strength and structural stability. Centralloy® H 101 Micro has been developed using microalloying additions for an optimum performance in high temperature operation.

Due to the balance of niobium and carbon, the cast austenitic iron-chromium-nickel matrix is strengthened by formation of interdendritic $M_{23}C_6$ type carbides with M being mainly chromium and interdendritic precipitation of NbC. 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.

Mechanical properties have been improved for high temperature applications. The improvement of creep resistance is remarkable, without detrimental effect on the ductility, compared to non-microalloyed material. These results are explained by the microstructural changes promoted by the microalloying elements during aging. In contrast to the non-microalloyed steel, a much finer and more even distribution of secondary precipitates together with a higher stability of the microalloying containing primary carbides is reached in Centralloy® H 101 Micro.



SEM image of Centralloy® H 101 Micro after aging at 900ºC for 1000 hours

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 700ºC to 1050ºC. Also, room temperature ductility values are maintained after ageing at these service temperatures.

Product Forms

Centralloy® H 101 Micro 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 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	0.13
Silicon	0.50
Manganese	0.50
Chromium	25.00
Nickel	37.00
Niobium	0.50
Titanium	Additions
Zirconium	Additions
Iron	Balance

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

Applications

Tubular systems requiring superior thermal shock resistance combined with suitable stress rupture strength, creep resistance and ageing ductility. Main high temperature applications for the material are:

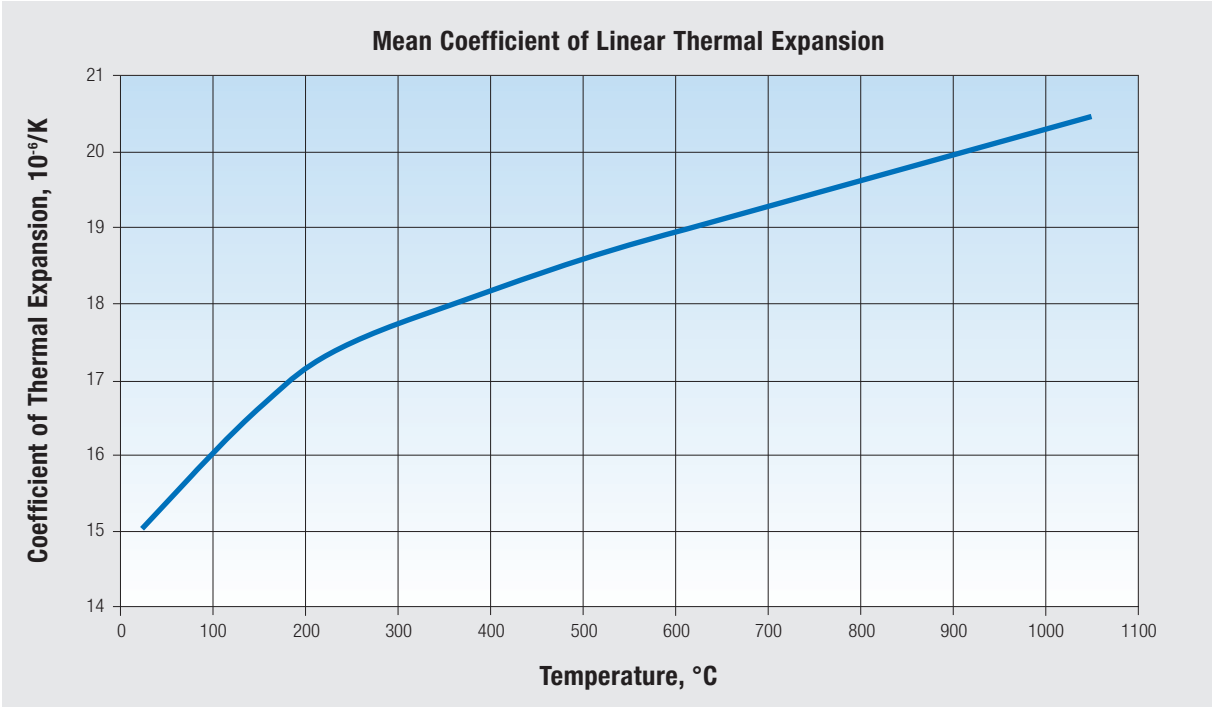
Process	max. operating temperature, °C
Steam cracking (transfer lines)	1050
Pyrolysis furnace outlet lines, collectors	1050
Steam reforming (outlet headers)	1050
Styrene, EDC	1050

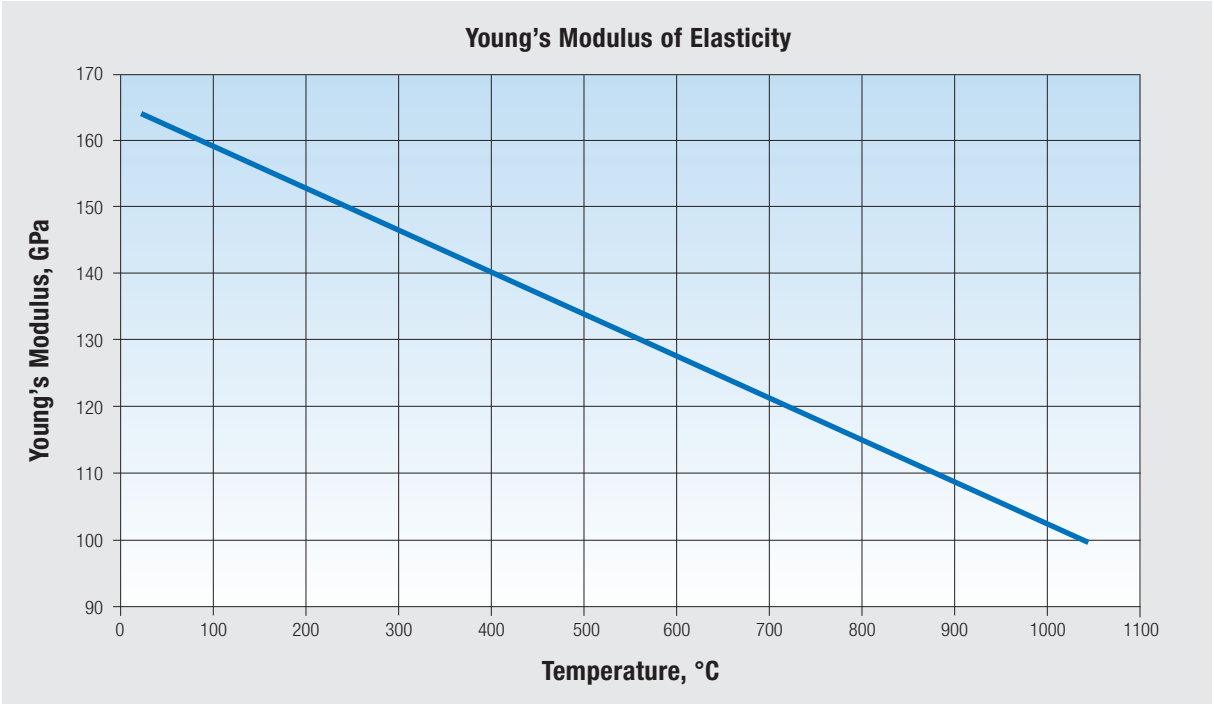
Physical Properties

Density: 8.0 g/cm³

Thermal conductivity at:

50°C	10.9 W/mK
200°C	13.1 W/mK
400°C	16.1 W/mK
600°C	19.1 W/mK
800°C	22.0 W/mK
900°C	23.5 W/mK



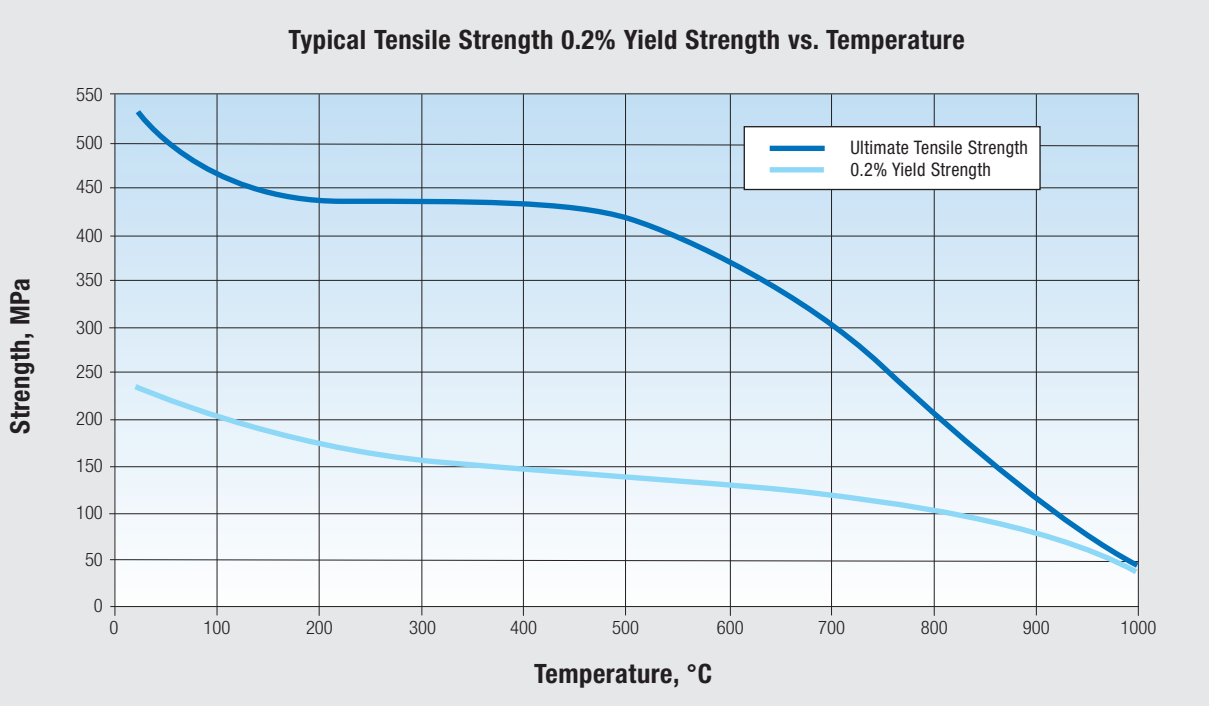


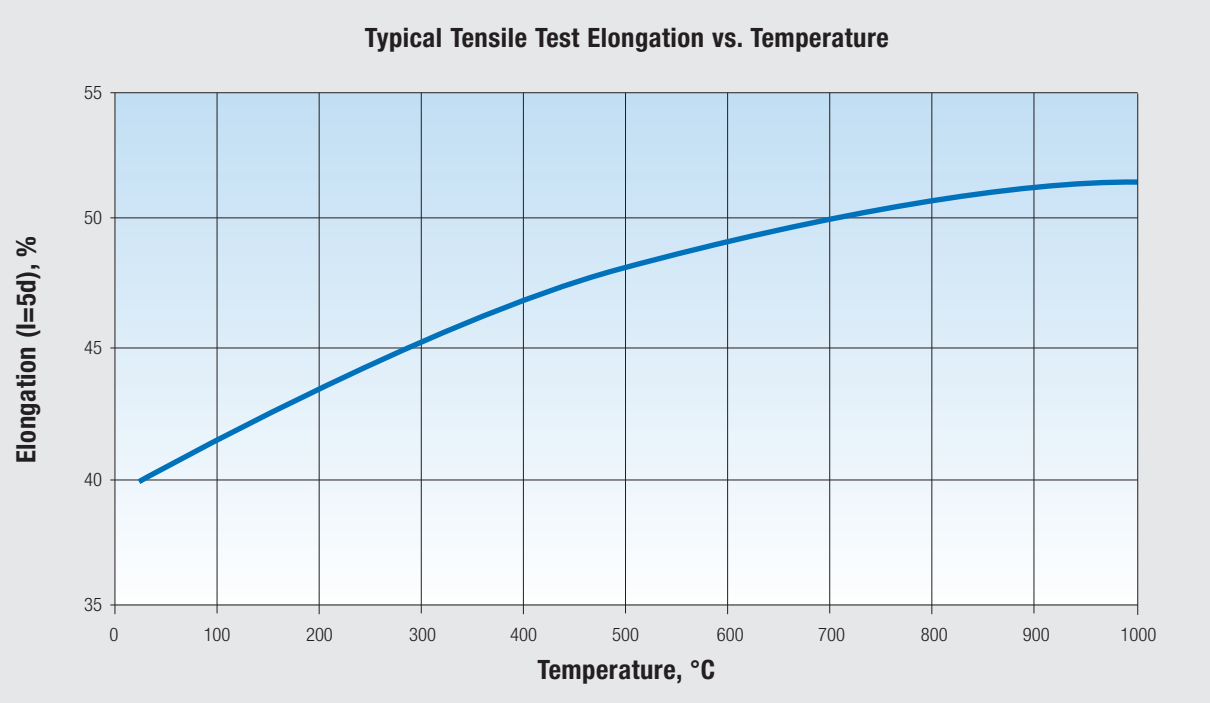
Mechanical Properties

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

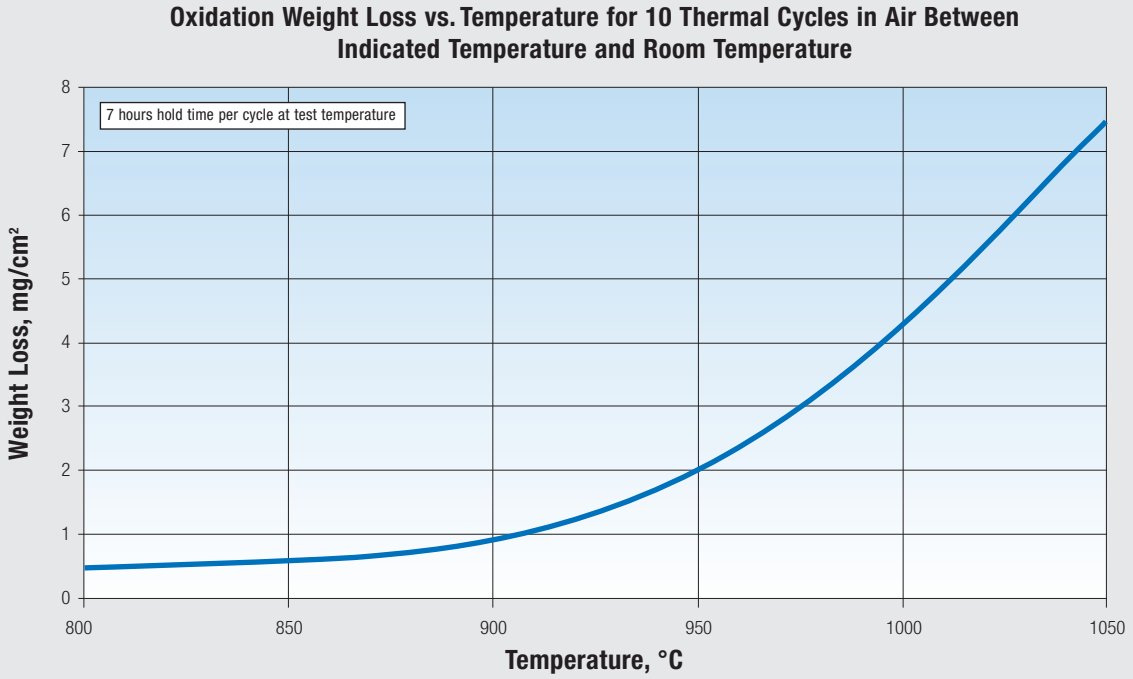
Tensile properties

Minimum tensile properties at 20ºC:	0.2% Yield strength:	190 MPa
	Ultimate tensile strength:	445 MPa
	Elongation, (l = 5d):	25% for centricast tubes
		20% for static castings

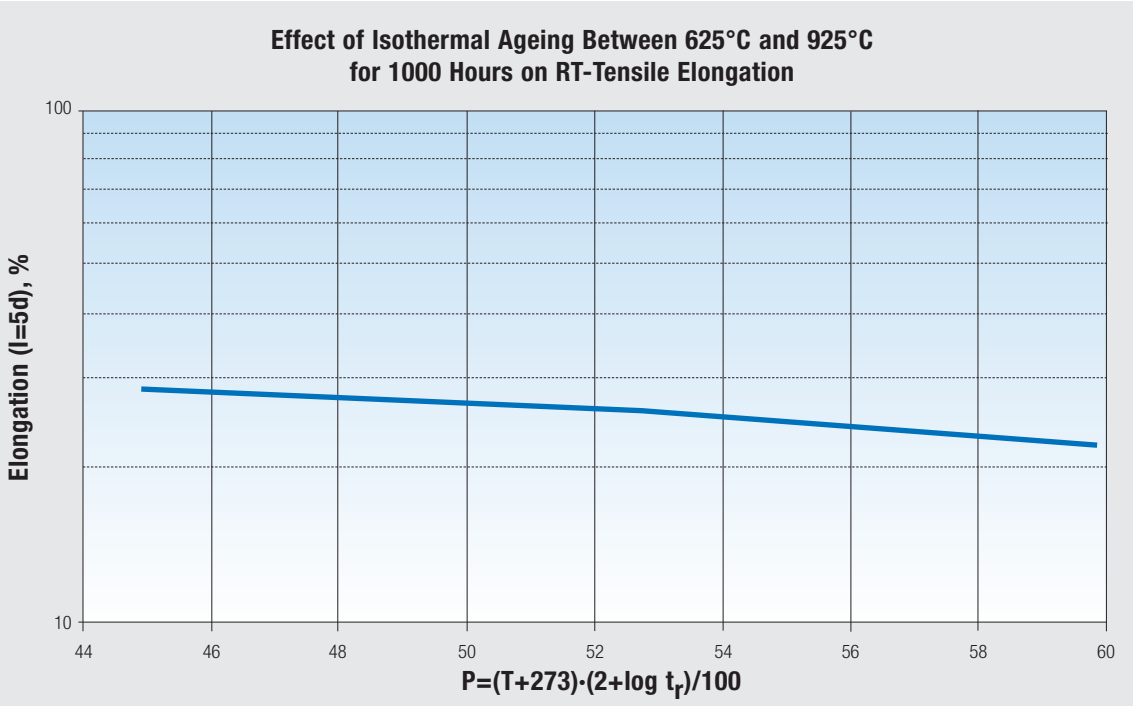




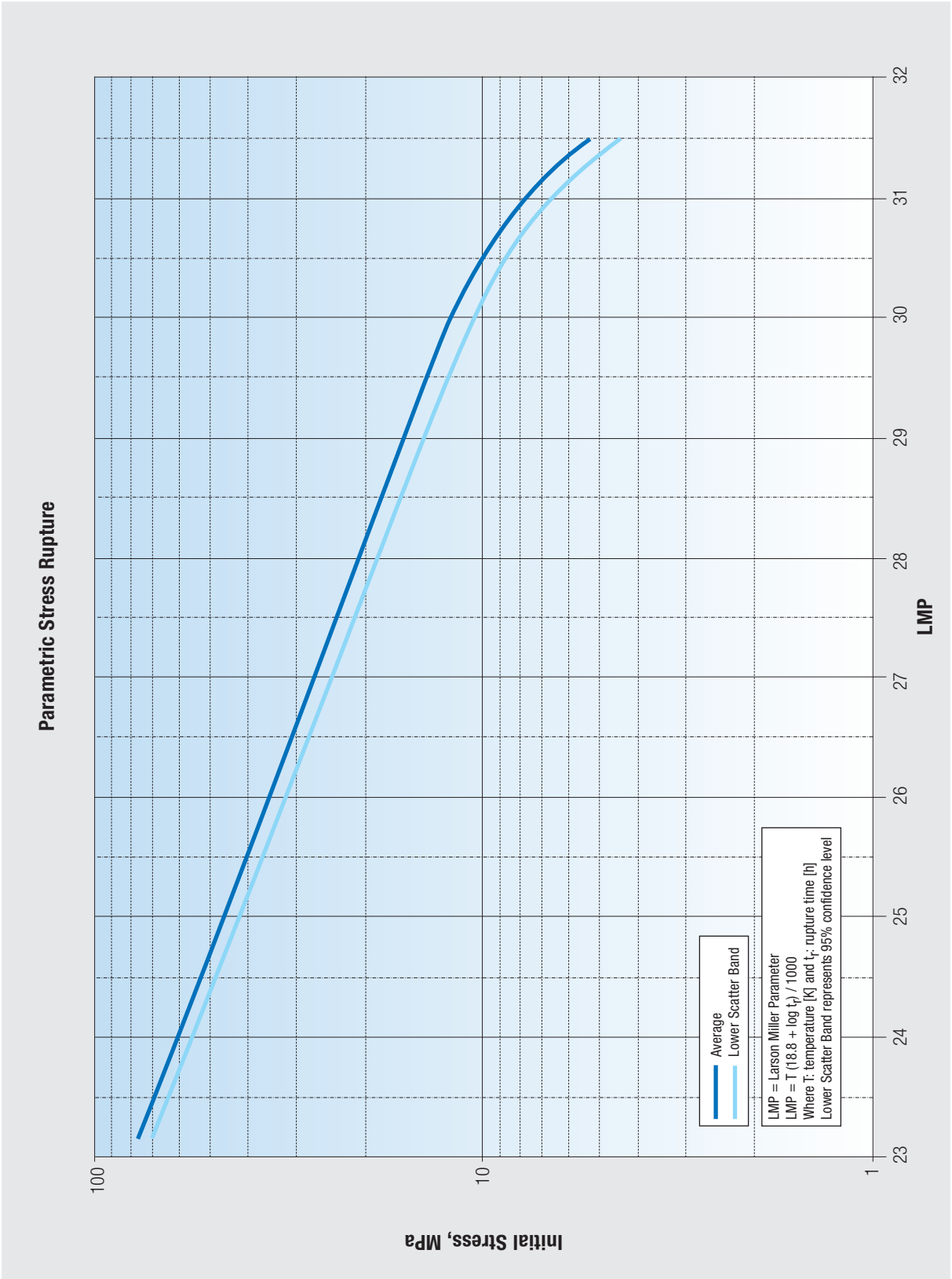
Oxidation Resistance



Ageing Behaviour



Parametric Stress Rupture Strength



Manufacturing Characteristics

Machining

In general terms the machinability of Centralloy® H 101 Micro is similar to that of other heat resistant alloys with low carbon content.

Welding

Centralloy® H 101 Micro is readily welded by manual metal arc (SMAW), inert gas shielded arc (GTAW and GMAW) and plasma arc (PAW) processes using filler materials.

Approved filler materials are non-coated welding rods and electrodes. Preheating and postweld heat treatment is not required. Service exposed hardware from a temperature range of 750°C to 1050°C indicates that repair-weldability remains fair and repairs can be made to high quality standards.

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-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.

The information in this publication is as complete and accurate as possible at the time of publication. Variations in properties can occur to production and process routes. However, no warranty or any legal liability for its accuracy, completeness and results to be obtained for any particular use of the information herein contained is given. Where possible the test conditions are fully described. Where reference, is made to the balance of the alloy's composition it is not guaranteed that this balance is composed exclusively of the element mentioned, but that it predominates and others are present only in minimal quantities. The creep rupture data are frequently insufficient to be directly translatable to specific design or performance applications without examination and verification of their applicability and suitability by professionally qualified personnel. The primary units for property data are based on those of the SI-system.

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- Analysis of operational data
- Training of customer personnel
- Welding supervision

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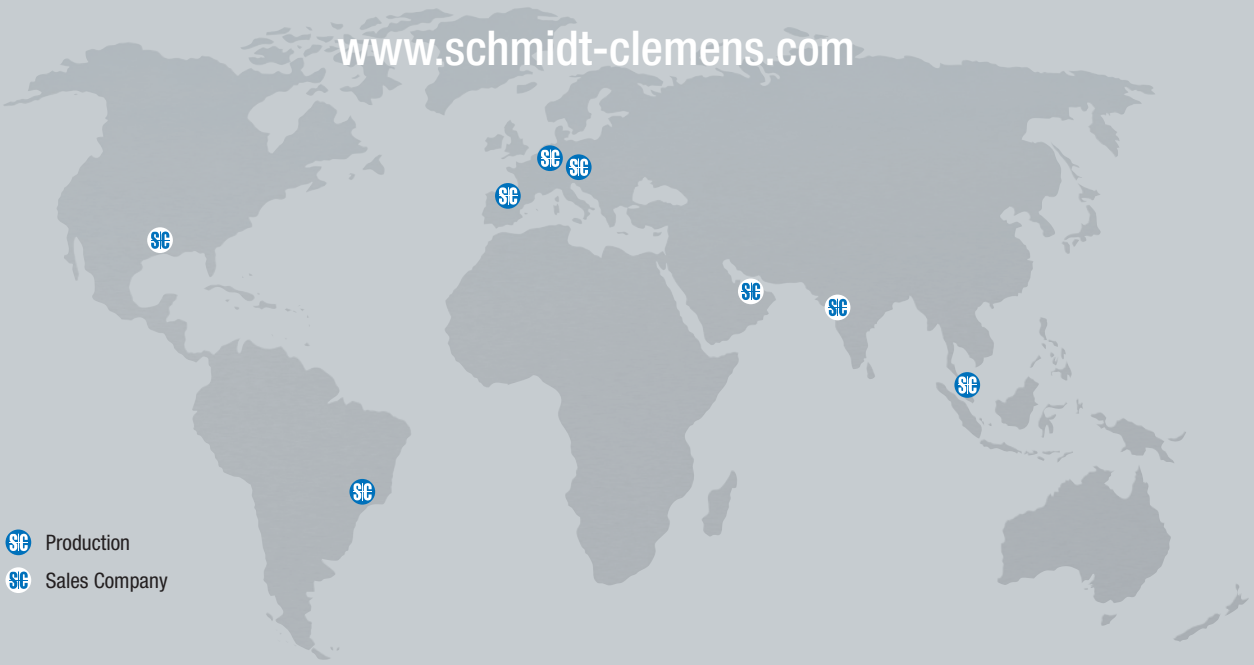

Production
Sales Company