

## FURNACE ROLLERS GX48NiCrWSi48-28-5

### MATERIAL DATA SHEET



#### FEATURES

GX48NiCrWSi48-28-5 is a cast austenitic alloy with 48% nickel, 28% chromium and tungsten. A balanced composition provides excellent structural stability, high stress rupture strength and solid resistance to oxidation and carburization.

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

a) Intergranularly occurring primary carbides, nitrides or carbonitrides of the general form  $M_6[C,N]$  where M is tungsten. These greatly affect the generation of good high temperature properties. The phase is visible in unetched micro-specimen, its colour varying from the orange/yellow of the nitride to the gray/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 the properties due to decomposition and re-precipitation reactions in service, producing secondary carbides in a uniform dispersion. By this mechanism, dislocation movement is impeded which results in significant strengthening at elevated temperatures.

#### PRODUCT FORMS

GX48NiCrWSi48-28-5 was designed as centrispun tube material to match specific design criteria in terms of carburization and oxidation resistance, creep rupture strength and weldability. It is available as centrispun tubes, statically cast and investment cast product forms.

Other forms may be supplied on request. Additional information including maximum and minimum sizes is provided by our sales representatives in your region.

CHEMICAL COMPOSITION*	MASS, %
Carbon	0.45
Silicon	1.5
Manganese	1.5
Chromium	28
Iron	15
Tungsten	15
Nickel	Balance

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

## APPLICATIONS

The alloy is typically used for tubular systems that require resistance to carburization and oxidation, combined with high creep-rupture strength and creep-resistance. No heat treatment is required in most applications. Main high-temperature applications for the material are:

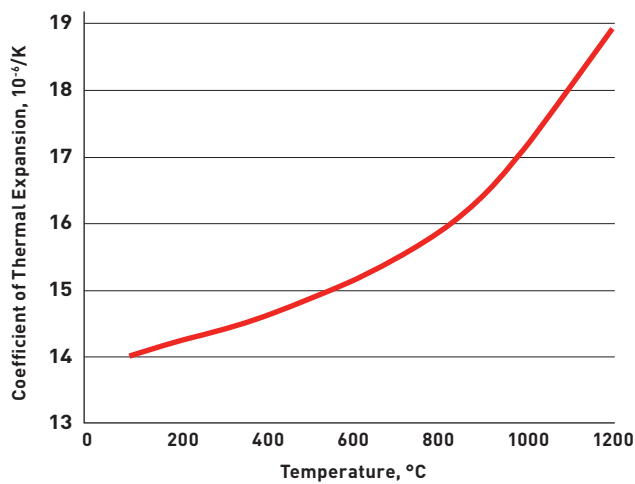
PROCESS	MAX. OPERATING TEMPERATURE, °C
Steam cracking	1150
Direct reduction of iron ore	1000
Furnace support component	1150

## PHYSICAL PROPERTIES

Density at 20°C: 8.2 g/cm<sup>3</sup>

Thermal Conductivity (20°C): 14.6 W/m

### MEAN COEFFICIENT OF LINEAR THERMAL EXPANSION



## MECHANICAL PROPERTIES

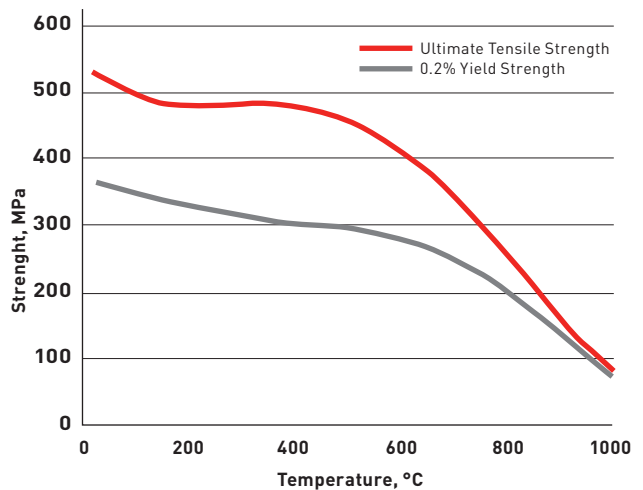
(only for wall thickness less than 25 mm, in the as-cast condition).

### TENSILE PROPERTIES

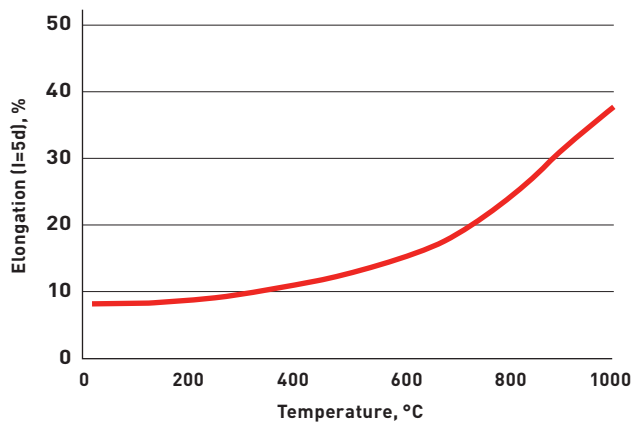
#### MINIMUM TENSILE PROPERTIES AT 20°C:

0.2% yield strength:	270 MPa
Ultimate tensile strength:	480 MPa
Elongation, (l = 5d):	4% for centricast tubes 3% for static castings

### TYPICAL TENSILE STRENGTH AND 0.2% YIELD STRENGTH VS. TEMPERATURE

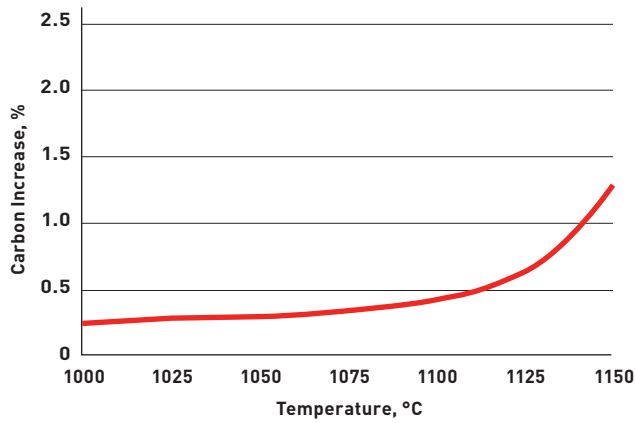


### TYPICAL TENSILE STRENGTH TEST ELONGATION VS. TEMPERATURE



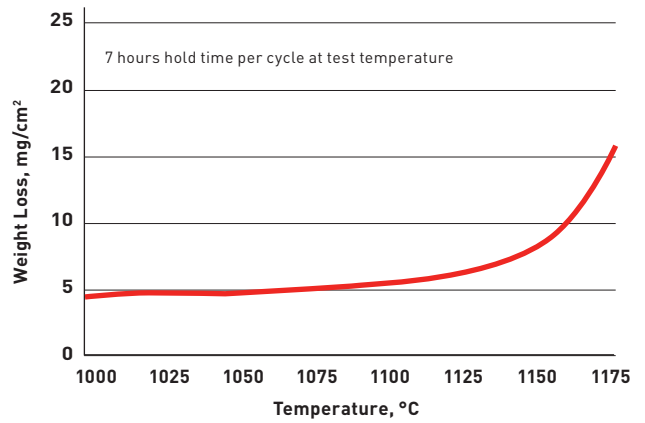
## CARBURIZATION RESISTANCE

INCREASE IN CARBON CONTENT VS. TEMPERATURE AFTER PACKED CARBURIZATION FOR 260 HOURS AT INDICATED TEST TEMPERATURE



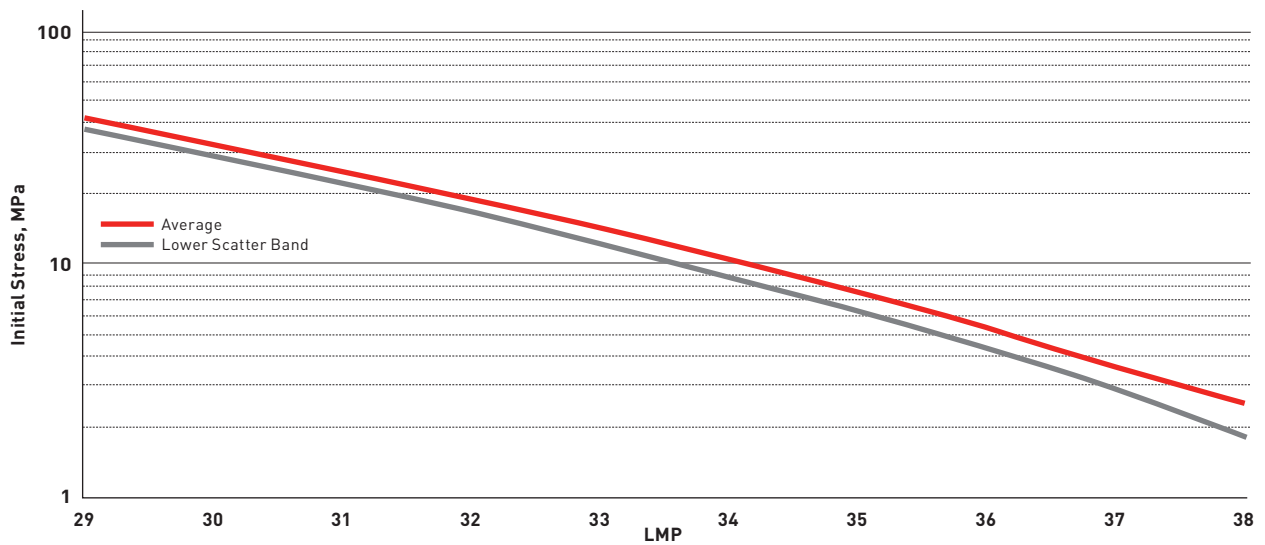
## OXIDATION RESISTANCE

OXIDATION WEIGHT LOSS VS. TEMPERATURE FOR 10 THERMAL CYCLES IN AIR BETWEEN INDICATED TEMPERATURE AND ROOM TEMPERATURE



## PARAMETRIC STRESS RUPTURE STRENGTH

PARAMETRIC STRESS RUPTURE



LMP = Larson Miller Parameter.  $LMP = T (21.5 + \log t_r) / 1000$ . Where T: temperature [K] and  $t_r$ : rupture time [h]. Lower Scatter Band represents 95% confidence level

## MANUFACTURING CHARACTERISTICS

### MACHINING

In general terms the machinability of GX48NiCrW-Si48-28-5 is similar to that of other heat-resistant alloys.

### WELDING

For critical, highly-stressed and corrosion-resistant joints and coated electrodes, flux-cored wire and bare filler materials are commercially available. These welding consumables have high-strength properties at elevated temperatures with well-retained ductilities.

In addition to fillerless PAW, TIG and MAW have been used satisfactorily for component fabrication or repair welding. Preheating and postweld heat treatment of joint is not necessary.

For weld joints dissimilar to austenitic materials the same filler materials are recommended. Further information is available on request.

## 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. Inhalation of metal dust from welding, grinding, melting and gross handling of these alloy systems may cause adverse health effects.