

**Ferritic Heat Resisting Steel**

**Material Data Sheet**

Steel Designation:	Name	Material-No.
	<b>X18CrN28</b>	<b>1.4749</b>

**Scope**

This data sheet applies for hot and cold rolled sheet and strip, semi-finished products, bars, rods and sections as well as for seamless steel tubes mechanical and general engineering purpose.

**Application**

For construction parts which should be resistant to scaling up to about 1100 °C and extensively inured to the effect of sulfurous gases. The inclination to carburization in reduced gases is very low.

**Chemical composition (heat analysis in %)**

Product form	C	Si	Mn	P	S	Cr	N
C, H, P, L	0,15-0,20	≤ 1,00	≤ 1,00	≤ 0,040	≤ 0,015	26,00-29,00	0,15-0,25
T <sub>S</sub> *	0,15-0,20	≤ 1,00	≤ 1,00	≤ 0,040	≤ 0,015	26,00-29,00	0,15-0,25

C = cold rolled strip; H = hot rolled strip; P = hot rolled sheet; L = semi-finished products, bars, rod and sections; T<sub>S</sub> = seamless tubes;

\*according to DIN EN 10297-2:2007-06

**Mechanical properties at room temperature in the usual delivery condition**

Product form	Thickness <i>a</i> or Diameter <i>d</i> mm	HB max. <sup>1)2)3)</sup>	Proof strength <sup>3)</sup>		Tensile strength <i>R<sub>m</sub></i> N/mm <sup>2</sup>	Elongation A % min.		
			<i>R<sub>eL1.0</sub></i> N/mm <sup>2</sup> <sub>min</sub>	<i>R<sub>p0.2</sub></i> N/mm <sup>2</sup>		Long products <sup>3)</sup>	Flat products	
					0,5 ≤ <i>a/d</i> < 3		3 ≤ <i>a/d</i>	
C,H,P	<i>a</i> ≤ 12	212		280	500 - 700	15	13 <sup>4)5)</sup>	15 <sup>4)5)</sup>
L	<i>d</i> ≤ 25	212		280	500 - 700	15		
T <sub>S</sub> *	<i>a</i> = 12	212		280	min. 500	15		

<sup>1)</sup> The maximum HB values may be raised by 100 units or the maximum tensile strength value may be raised by 200 N/mm<sup>2</sup> and the minimum elongation value be lowered to 20 % for cold worked sections and bars of ≤ 35 mm thickness.

<sup>2)</sup> For guidance only. <sup>3)</sup> For rod, only the tensile values apply.

<sup>4)</sup> Longitudinal test piece <sup>5)</sup> Transverse test piece

\* according to DIN EN 10297-2:2007-06

**Creep properties - estimated average values about the long-term behavior at elevated temperature\***

Temperature °C	1%-Elongation <sup>1)</sup> for		Rupture <sup>2)</sup> for		
	1000 h	10 000 h	1000 h	10 000 h	100 000 h
	N/mm <sup>2</sup>		N/mm <sup>2</sup>		
500	80	50	160	100	55
600	27,5	17,5	55	35	20
700	8,5	4,7	17	9,5	5
800	3,7	2,1	7,5	4,3	2,3
900	1,8	1,0	3,6	1,9	1,0

1) Stress related to the out put cross-section, which leads after 1000 or 10 000 h to a permanent elongation of 1%.

2) Stress related to the out put cross-section, which leads after 1000, 10 000 or 100 000 h to breakage.

\* for guidance only

**Reference data on some physical properties (for guidance only)**

Density at 20 °C kg/dm <sup>3</sup>	Thermal conductivity W/m K at		Specific heat capacity at 20 °C J/kg K	Electrical resistivity at 20 °C Ω mm <sup>2</sup> /m
	20 °C	500 °C		
7,7	17	23	500	0,70

Coefficient of linear thermal expansion 10<sup>-6</sup> K<sup>-1</sup> between 20 °C and

200 °C	400 °C	600 °C	800 °C	1000 °C
10,0	11,0	11,5	12,0	13,0

**Guidelines on the temperatures for hot forming and heat treatment**

Hot forming*		Heat treatment +A (annealed), Microstructure		
Temperature °C	Type of cooling	Temperature °C	Type of cooling	Microstructure
1100 - 900	Air	800 - 860 <sup>1)</sup>	Air, Water <sup>2)</sup>	Ferrite

<sup>1)</sup> If heat treatment is carried out in a continuous furnace, the upper part of the range specified is usually preferred or even exceeded.

<sup>2)</sup> In special cases, furnace cooling is also permitted.

\* according to SEW 470

**Processing / Welding**

Standard welding processes for this steel are:

TIG-welding

MAG-welding solid wire

Arc welding (E)

Submerged arc welding (SAW)

Process	Filler metal	
	similar	higher alloyed
TIG	-	Thermanit C 1.4842
MAG solid wire	-	Thermanit C 1.4842 Thermanit L 1.4820
Arc welding (E)	-	Thermanit C 1.4842 Thermanit L 1.4820
SAW	-	Thermanit L 1.4820

Ferritic chrome steels are heat sensitive. Therefore the steel 1.4749 should be welded with lowest possible heat input by using thin electrode diameter, low current intensity and stringer bead welding.

For wall thicknesses under 3 mm, it is not necessary to preheat 1.4749. For thicker construction parts (> 3 mm) the preheating and interpass temperatures 200 – 300 °C should not be under respectively over run.

1.4749 can be processed with similar or higher alloyed filler metals. With sulfurous atmospheres a ferritic top layer should be laid on the media side (Thermanit L 1.4820).

**Cold forming**

When cold forming 1.4749, certain preventive measures should be observed. Sheets up to 3 mm thickness can be cold bended if necessary preheating with 200 - 300 °C should be done.

Products with thicknesses > 3 mm must be preheated up to 600 - 800 °C; concerning machinability 1.4749 can be compared to low carbon steel.

## Embrittlement

While heating 1.4749 over about 950 °C embrittlement by grain growth occurs, which can be removed any more. A further embrittlement occurs in the temperature range between 400 and 550 °C (475 °C-embrittlement). A longer abidance within this temperature range should be avoided. This loss of ductility can be corrected by a short heating up to 700 and 800 °C.

In the temperature range of 600 to 900 °C 1.4749 has the affinity to sigma-phase-embrittlement, so that after longer application within this temperature range the ductile values are strongly reduced. The steel should not come into operation within this temperature range, if mechanical stress is existent.

## Remark

The material is magnetizable.

Heat resisting tubes are delivered regarding testing in accordance to DIN EN 10297-2.  
In Germany, SEW 470 still applies for heat resisting tubes.

## Editor

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## References

DIN EN 10095:1999-05	Beuth Verlag GmbH, Postfach, D-110772 Berlin
DIN EN 10297-2:2007-06	
Stahl-Eisen-material bulletin 470:1976-02	Verlag Stahleisen GmbH, Postfach 10 51 64, D-40042 Düsseldorf
MB 821 "Properties"	Informationsstelle Edelstahl Rostfrei, Postfach 10 22 05, D-40013 Düsseldorf
MB 822 "The converting of stainless steel"	
Böhler Schweißtechnik Deutschland GmbH, Hamm	

## Important note

Information given in this data sheet about property or applicability of materials respective products is no assurance of characteristics but serve for description.

Information, with which we like to advise you, relate to the experience of the producers and our own. Warranty for the results of the treatment and application of the products cannot be granted.