SÜDWESTFALEN
Edelstahlwerke Südwestfalen GmbH

C: **max. 0,12**
Si: **0,7 – 1,4**
Cr: **17,0 – 19,0**
Al: **0,70 - 1,20**

FERROTHERM® 4742
X10CrAlSi18

Ferrotherm® 4742

Stainless heat resistant ferritic chromium steel with aluminium addition

Relevant current and obsolete standards:
- EN 10095 : 1.4742 X10CrAlSi18
- AISI : 442
- BS :
- JIS : SUH21
- AFNOR : Z10CAS18
- DIN : 1.4742
- SIS :
- SEW 470 : 1.4742 X10CrAl18

General properties
- corrosion resistance : average
- mechanical properties : average
- forgeability : good
- weldability : limited
- machinability : average

Special properties
- resistant to scaling in air up to 1000°C

Physical properties
- density (kg/dm^3) : 7,7
- electrical resistivity at 20°C (Ω mm^2/m) : 0,93
- magnetisable : yes
- thermal conductivity
  at 20°C (W/m K) : 19
  at 500°C (W/m K) : 25
- specific heat capacity at 20°C (J/kg K) : 500
- melting point (°C) : ≈ 1420
- thermal expansion (μm/mK) between:
  20 and 200°C : 10,5
  20 and 400°C : 11,5
  20 and 600°C : 12,0
  20 and 800°C : 12,5
  20 and 1000°C : 13,5

Typical applications
- high temperature nozzles and jets
- high temperature conveyor systems
- mechanical engineering
- furnace engineering, grills
- cement industry - chains

Processing properties
- automated machining : seldom
- machinable : seldom
- hammer and die forging : yes
- cold forming : yes
- cold heading : not common

Product forms and conditions
- wire rod ∅ 5,5 - 27
- bright wire h9, ∅ 4 - 20
- solution annealed
- pickled
- drawn
- straightened
- peeled
- ground

Demand tendency ↗

Ferrotherm® 4742 is a heat resistant, ferritic stainless steel which is characterised by its resistance sulphur bearing gasses. Due to its higher chromium content, **Ferrotherm® 4742** is more resistant to high temperature oxidation than **Ferrotherm® 4724**, but is less resistant than **Ferrotherm® 4762**, which contains even more chromium.

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Properties, applications and processing

High temperature corrosion resistance

Ferrotherm® 4742 is highly resistant to oxidising sulphur bearing gases and displays somewhat less, but still good, resistance to sulphur bearing gasses in reducing environments. **Ferrotherm® 4742** is moderately resistant to carburising gasses, but is not resistant to high temperature nitridíng or oxygen denuded gasses. This grade of steel is resistant to scaling in air up to temperatures of 1000°C.

Heat treatment / mechanical properties

Optimal material properties are realised after annealing by holding in the temperature range 800 - 860°C‡, followed by rapid cooling in air or water. In this condition the following mechanical properties can be expected when testing in the longitudinal direction at room temperature:

Property	Specification	Typical
- yield strength (N/mm^2)	$R_{p0,2}$: ≥ 270	370
- tensile strength (N/mm^2)	R_m : 500 – 700	580
- tensile elongation (%)	A_5 : ≥15	18
- hardness	HB : ≤ 212	

The high chromium content and fully ferritic microstructure of this steel makes it susceptible to 475 embrittlement when held at temperatures within the range 400 to 550°C. Slow heating or cooling through this temperature range should thus be avoided. The effects of 475 embrittlement can be reversed by briefly heating to within the temperature range 700 to 800°C. Due to the high chromium content of this steel, it is susceptible to embrittlement by sigma phase formation within the temperature range 600 to 800°C. The effects of sigma phase formation may be reversed by heating to above 1050°C to take all of the sigma phase into solution again.

A slight tendency for grain growth and embrittlement exists at above temperatures of 950°C. It must be noted that any properties that are adversely affected by grain coarsening occurs cannot be recovered by simple thermal treatments.

‡ When heat treatment is performed in a continuos furnace, the upper temperature must be aimed for and in some cases can even be exceeded.

Welding

Ferrotherm® 4742 is weldable using all usual welding processes with preheating to a temperature between 200 and 300°C, being recommended. Low heat inputs should be used when welding to reduce any possible grain coarsening. Although post weld heat treatment is not necessary, a stress relief treatment is sometimes performed in the temperature range 650 to 800°C when large differences in cross-section exist and/or when the components have been extensively cold worked.
If an austenitic filler metal is used and the component is destined for use in either a sulphur containing or carburising environment, then the austenitic weld bead must be over-laid with a ferritic weld run to ensure some resistance to the operational environment.

Novonit® 4820 is suitable for use as a filler material when welding **Ferrotherm® 4742**.

Elevated temperature properties

Due to the much poorer high temperature mechanical properties of **Ferrotherm® 4742**, compared to the heat resistant austenitic grades, this steel can only be used in applications where the high temperature mechanical requirements are not too great.

Forging

Forging is usually performed at 1150 - 800°C followed by rapid cooling in air or water. Generally, forging is followed by the heat treatment described previously.

Machining properties

Ferritic stainless steels such as **Ferrotherm® 4742** tend to smear during machining which results in the formation of longer swarf thereby making machining difficult. When machining this grade of steel with coated hard metal cutting/machining tools, the following machining parameters can be used as a guideline:

tensile strengths R_m in N/mm^2	Depth of cut (mm) Feed (mm/rev)		
	6 mm 0,5 mm/r	3 mm 0,4 mm/r	1 mm 0,2 mm/r
solution annealed (550 - 650)	100 m/min	130 m/min	150 m/min

General comments

Ferrotherm® 4742 is less formable than the austenitic grades and is best formed within the temperature range 600 to 800°C, especially when the cross section is greater than 3mm.

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