GENERAL INFORMATION

Cold-drawn wire from alloy Fechroma® is applied for resistance elements and heaters. For example, in alloy **Fechroma®**23 a high electric resistance and low temperature coefficient of electric resistance (TCER) are balanced.

Alloys Fechroma®23H, Fechroma®23, Fechroma®15**,** Fechroma®13 possess high resistance to oxidation and corrosion in the most widespread industrial hostile environments, that is caused by the nature of chemically inert, dense superficial field oxide layer on the surface of AL_2O_3. Unlike fechral, nickel-containing alloys, for example, can't be used not only in sulfur-containing environments, but also in protective CO-containing atmosphere at 800-950°C, cause at simultaneous oxidation and carburizing, on their surface there is a destruction of protective oxide with formation of so-called "green rot"

FECHRAL ADVANTAGES

The cost is 6-8 times lower than cost of Nichrome;

High operating temperature – up to 1350°C;

Higher melting point - 1500 °C, in comparison with 1400 °C for Cr20Ni80-N;

Low density – 7,28 g/cm^3 it allows to save up to 30% of weight during production of heating elements;

The best corrosion resistance in air atmosphere, vacuum, argon, sulfur containing and carbon-bearing environments, water vapor.

FECHRAL DISADVANTAGES

Despite the available advantages, fechral has a number of disadvantages, which limit its technological application and possibility of replacement with nichrome alloys:

- has the increased fragility and the lowered durability that complicates production of heating elements;
- gain irreversible fragility as a result of formation of coarse-grained structure after heating above 1000°C;
- as fechral contain iron, this alloy is magnetic and can rust in the damp atmosphere at a normal temperature;
- has the low resistance of creep;
- interacts with fireclay lining and oxides of iron;
- during operation fechral heaters are significantly extended that can lead to their sagging.

FEATURES OF OPERATION OF HEATERS FROM FECHRAL

Alloys like fechral are inclined to chemical interaction with oxides and metals. For fechral, unlike nichrome, the ceramics from chamotte containing a significant amount of iron oxides isn't suitable. At operation temperatures of fechral above 1100°C the fire-resistant weight has to contain not less than 75% of alumina and the minimum quantity of iron oxides (less than 1%), up to 1100°C the fire-resistant weight can contain not less than 60% of alumina and less than 1% of iron oxides. In practice, ceramics coating in places of contact with heating elements made of fechral with high-alumina weight has proved itself well (mix of 30% of corundum fraction ≈25mkm, 45% of corundum fraction ≈ 5mkm, 25% of kaolin and water).

The destroying effect on oxide scale of fechral is caused by couples and splashes of some metals – copper, zinc. Aluminum. Lead. The contact of a surface of heater made from fechral with table salt, slags, enamels, asbestos and iron scale is inadmissible. Production of heaters from a rusty fechral wire or strip is inadmissible. For the purpose of prevention of premature failure of heaters from fechral alloys it is necessary to avoid sharp change of thermal power, especially in the course of a furnace warming up. For increase of service life of fechral heaters it is recommended to cool as seldom as possible heaters of high-temperature furnaces lower than 700-800 °C.

For increase of service life in a vacuum. also in carbon-bearing and nitrogen-containing environments it is recommended preliminary oxidation of fechral wire at 1100°C during 10-20h. The oxides of aluminum which are formed at the same time slow down metal distillation and interfere to penetration of carbon and nitrogen in it.

It is necessary to consider that heaters from fechral have long service life on condition of the high culture of their operation.

Classification	
DIN	1.4725 (CrAl 14 4)
UNS	K 91670

Chemical composition, %			
Cr	**Fe**	**Al**	**C**
14.0-15.0	rest	3.0-4.8	≤0.005
Mn	**Si**	**S**	
≤0.50	≤0.50	≤0.015	

Mechanical properties at 20°C		
Diameter, mm	Elongation, %, not less	Tensile strength, MPa
0,12 – 0,5	18	588-735
0,5 – 1,00	18	
1,0 – 12,0	25	

CREEP CHARACTERISTICS	
Temperature, °C	Creep resistance, 10^{-6}/K
600	16
800	4
1000	0.8
1200	-

PHYSICAL PROPERTIES		
Temperature, °C	Resistance μΩm	Exten. 10^{-6}/K
20	1,25	-
200	1,27	11,0
400	1,30	12,0
500	1,32	-
600	1,34	13,0
800	1,39	14,0
1000	1,42	15,0
1200	-	-

PROCESSING PROPERTIES	
Melting point	1500°C
Density	7.1 g/cm^3
Heat conductivity	52.7 W/m·K
Elastic modulus	200 KN/mm^2
Maximal work temperature	1070°C
Operating time	3500 hours

DESCRIPTION AND APPLICATION

Mostly alloy is used for production of resistance elements.