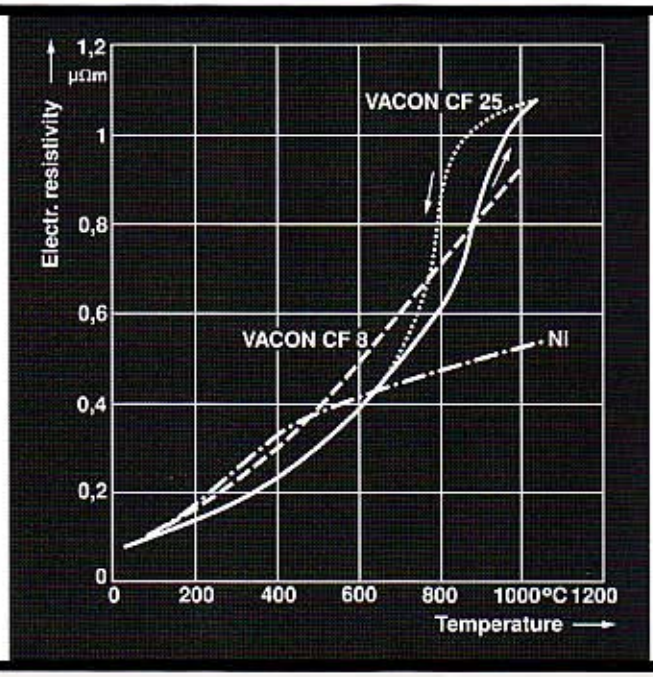
VACUUMSCHMELZE

VACON CF 25 · VACON CF 8

Expansion Alloys Featuring High Conductivity and Extreme Temperature Dependent Electrical Resistivity



Edition 2000

PP-005

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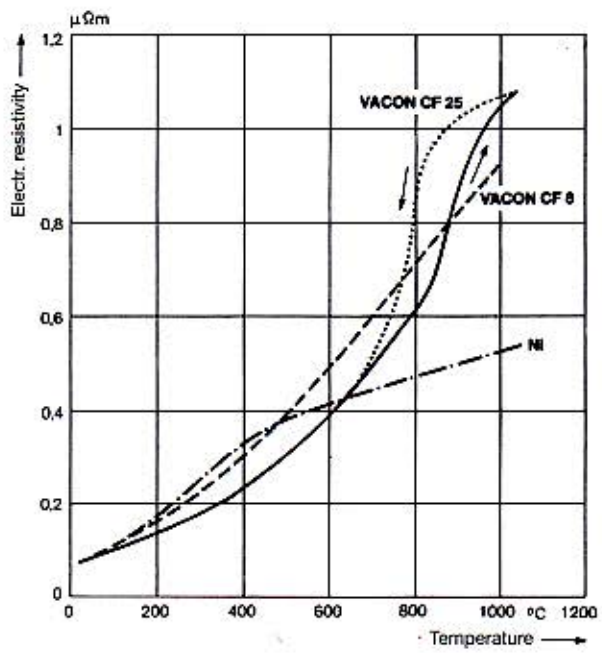

Fig. 1: Electrical resistivity of VACON CF 25, VACON CF 8 and Ni

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Characterization

The alloys VACON® and VACOVIT® have been used extremely successfully for many years to produce vacuum-proof, long lasting glass-to-metal seals. Just recently the VACON alloy group has been enlarged by two new alloys, VACON CF 25 and VACON CF 8. Their expansion behaviour matches that of soft glass and is coupled with high electrical and thermal conductivity. These attributes give access to a wide field of applications.

Alloy Description

VACON CF 25 (Co-25 Fe) is a ferritic alloy characterized by a sudden rise in electrical resistivity between 850 and 950°C. This is caused by the $\alpha \rightleftarrows \gamma$ transition which occurs in this range, see fig. 1. If the $\alpha \rightleftarrows \gamma$ phase transition cycle is run through very frequently dimensional changes may occur.

VACON CF 8 (Co-8 Fe) is an austenitic alloy without a $\alpha \rightleftarrows \gamma$ phase transition. It features an almost linear rise in electrical resistivity up to the Curie point (approx. 1050°C), see fig. 1.

Applications

Due to the favourable combination of low thermal expansion and high thermal and electrical conductivity, the following fields of application have emerged:

Highly Conductive Glass-to-Metal Sealing Alloys

VACON CF 25 has proven itself as a highly conductive glass leadthrough and replaces the previously used compound wires with a Cu core. While offering almost identical expansion properties, the electrical and thermal conductivity is considerably improved. Particularly low stress seals are achieved with special glasses, e.g. Schott-Glass No. 8515/8421.

Utilizing the Temperature Coefficient of the Electrical Resistivity

Both VACON CF 25 and VACON CF 8 are characterized by an unusually high temperature coefficient of electrical resistivity (fig. 7). This effect can be utilized, e.g. to reduce the heating time in Diesel glow plugs and as an automatic current control on reaching the required temperature. It can, of course, also be used in other controls.

Forms of Supply

Wire	Diameter 0.1 to 6 mm
Rods	on request
Strip	on request

Tolerances

Our measurement tolerances are based on:

Wire DIN 59 781

Tolerances for physical and mechanical properties as agreed.

Physical Properties (nominal values)

		VACON CF 25	VACON CF 8
Composition		Co 25 Fe	Co 8 Fe
Density (g/cm)[3]		8.4	8.7
Mean coefficient of linear expansion ($10^{-6}K^{-1}$)			
20-100°C		10.2	11.7
20-200°C		10.8	12.3
20-400°C		11.5	12.9
20-600°C		12.2	13.6
20-800°C		12.9	14.3
Electrical resistivity at RT ($\mu\Omega$m)			
hard/soft		0.072[1]/0.066[2]	0.080[3]/0.071[4]
Tolerance		± 0.003	± 0.003
Thermal conductivity at RT (W/mK)		approx. 100	approx. 85
Ferromagnetism		yes	yes
Special features	Curie point:	approx. 850°C non magnetic	approx. 1050°C
	Transition:	$\alpha \rightarrow \gamma$ approx. 850°C	none

[1] KV approx. 80% c.w. [2] after cooling in furnace [3] KV approx. 30% c.w.

Mechanical Properties (nominal values at room temperature)

	VACON CF 25		VACON CF 8	
State	hard[1]	soft[2]	hard[3]	soft[4]
Tensile strength R_m (MPa)	850 ± 100	600 ± 100	950 ± 100	550 ± 100
Yield strength R_p 0.2 (MPa)	800 ± 100	400 ± 100	850 ± 100	250 ± 100
Elongation A_L[4] (%)	>2	>15	>1	>30
Vickers hardness	300	220	300	130
Young's modulus (GPa) approx.	220	220	220	220

[1] KV approx. 80% c.w. [2] after cooling in furnace [3] KV approx. 30% c.w. [4] 50mm for strip ($A_{L\ 50}$), 100mm for wire ($A_{L\ 100}$)

Guarantee

All values in this leaflet are characteristic and shall not be considered as guaranteed.
As a rule, we guarantee values for the electrical resistivity in the delivery state listed with the appropriate limiting deviations. The other properties and tolerances are usually met. They will be guaranteed only upon special request.

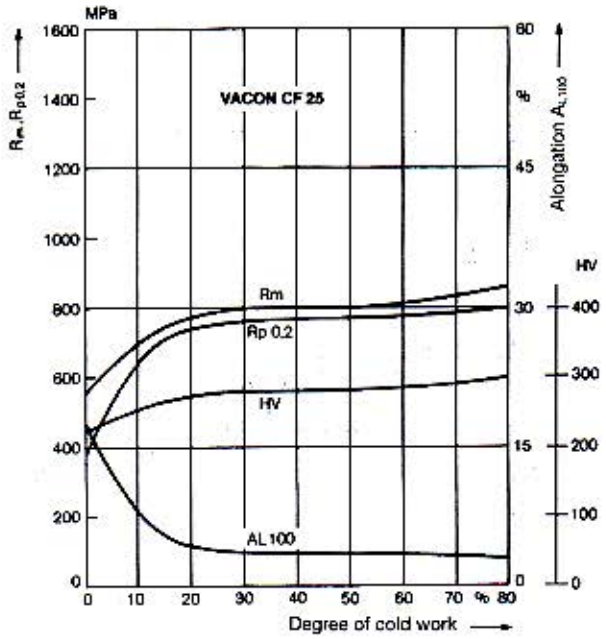

Fig. 2: Tensile strength R_m, yield strength $R_{p\,0.2}$, Vickers hardness HV und elongation $A_{L\,100}$ of wire of VACON CF 25

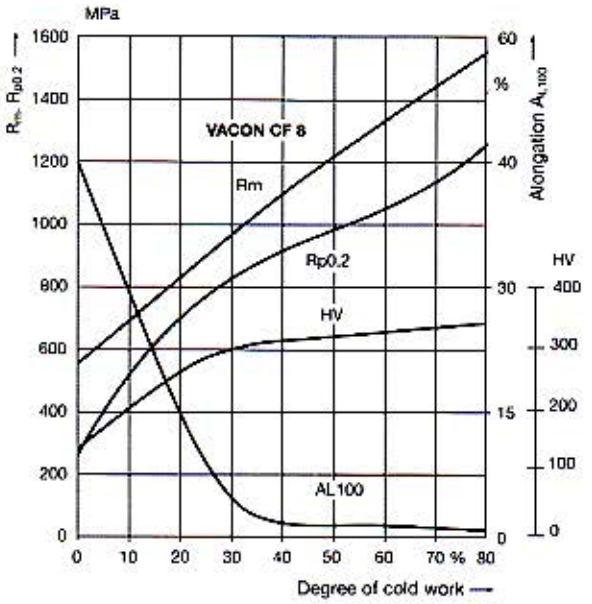

Fig. 3: Tensile strength R_m, yield strength $R_{p\,0.2}$, Vickers hardness HV und elongation $A_{L\,100}$ of wire of VACON CF 8

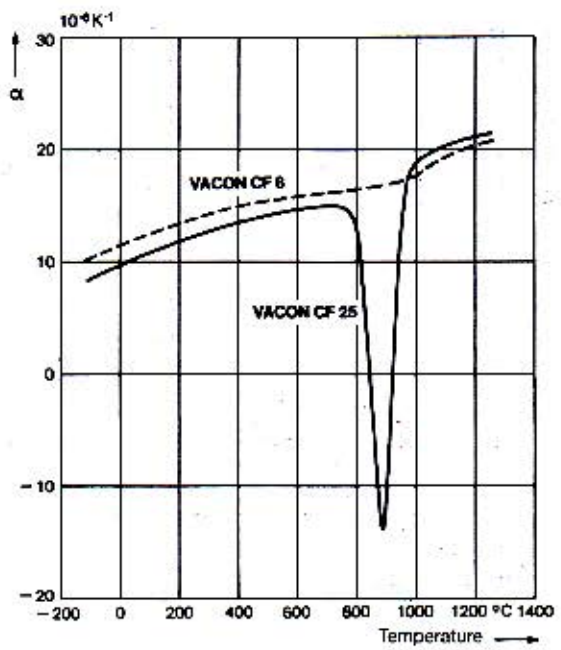

Fig 4: Coefficient of thermal expansion α of VACON CF 25 and VACON CF 8

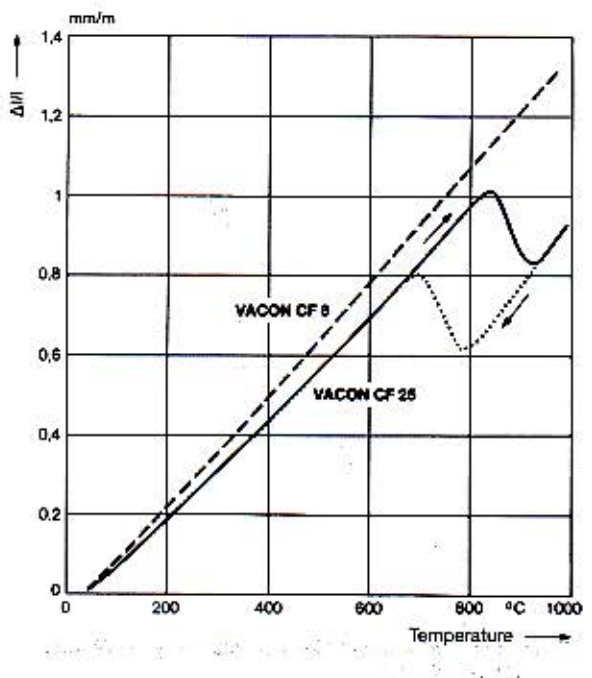

Fig 5: Thermal expansion $\Delta l/l$ of VACON CF 25 and VACON CF 8

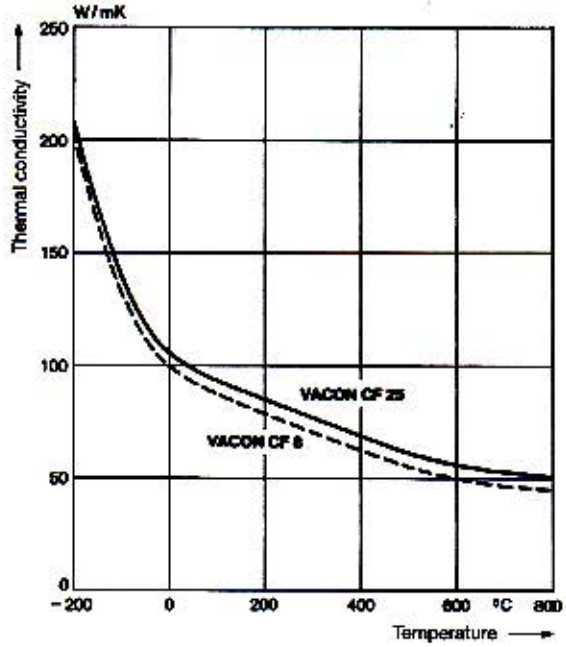

Fig. 6: Thermal conductivity of VACON CF 25 und VACON CF 8

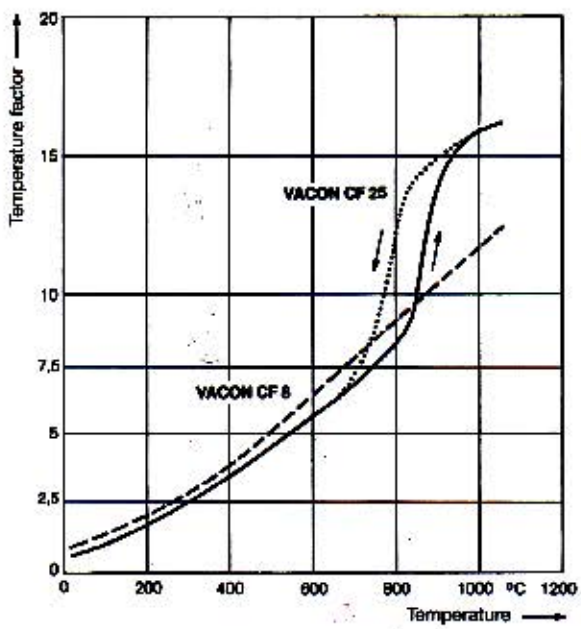

Fig. 7: Temperature factor of electrical resistivity of VACON CF 25 and VACON CF 8

Product Survey

Semi Finished Products and Parts

Semi Finished Products
Soft magnetic materials
Ductile permanent magnets
Thermobimetals
Spring alloys
Glass/ceramic-to-metal sealing alloys

Parts
Stamped/bent parts
Laminations
Magnetic shieldings

Superconductors

Cores and Components

Magnetic Cores
Tape-wound cores made of crystalline, amorphous and nanocrystalline alloys

Inductive Components
for ISDN, xDSL and switched mode power supplies, for current monitoring and for driving power semiconductors

Rare-Earth Permanent Magnets

Magnets on Sm-Co and Nd-Fe-B Base

Magnet Assemblies

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Published by VACUUMSCHMELZE GMBH, Hanau

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