

VACODUR S PLUS

COMPOSITION (in wt%)

49 Co – 49 Fe – 2 V + Ta, Zr
IEC 60404-8-6 F1

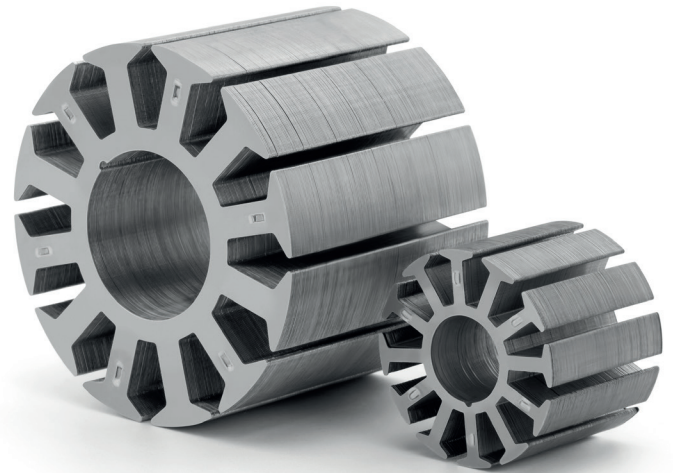
PRODUCT DESCRIPTION

The family of VACODUR® alloys has been developed for more demanding requirements with respect to high strength combined with high saturation. The yield strength can be adjusted by varying the heat treatment temperature.

VACODUR S Plus can achieve yield strengths of up to 800 MPa and is therefore ideally suited for high speed rotors. Even at such a high yield strength the iron losses of the material remain comparatively low.

MAIN PROPERTIES

- Saturation polarization of $J_s = 2.25$ T
- Electrical resistivity of $\rho_e = 0.42 \mu\Omega\text{m}$
- Very high yield strength $R_{p0.2}$ up to 800 MPa



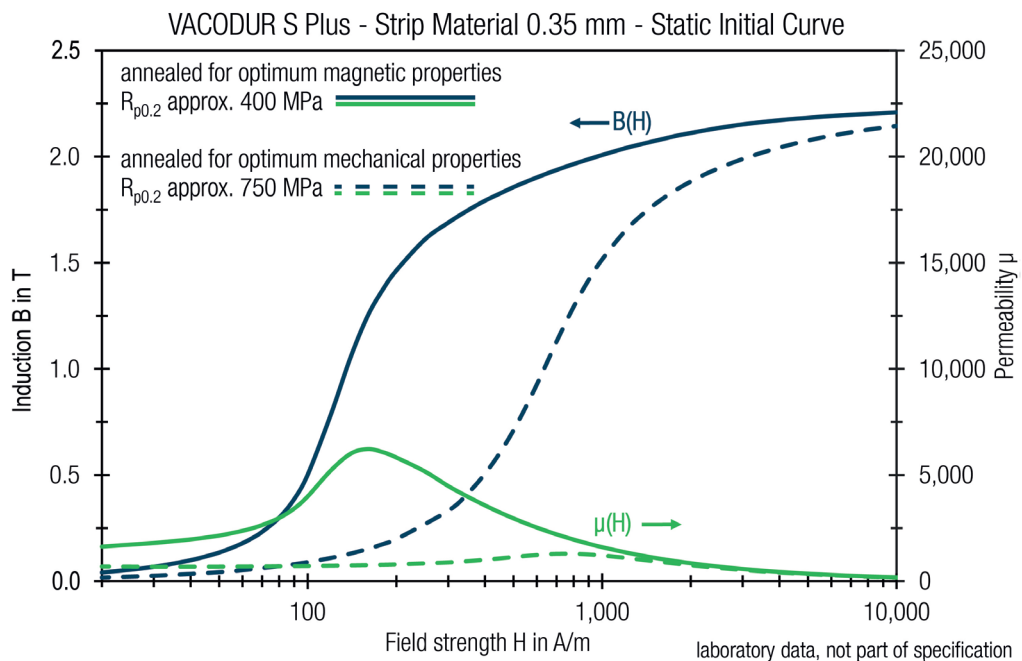
Rotor stacks produced from VACODUR S PLUS strip material

TYPICAL APPLICATIONS

Rotors of high speed rotating electrical motors and generators.

FORMS OF SUPPLY

- Strip material, thickness 0.05 – 1 mm, width 120 – 225 mm
 - Stamped parts, laminations and laminated assemblies
- Other dimensions and tolerances upon request.



STRIP MATERIAL 0.35 mm - TYPICAL VALUES

PHYSICAL PROPERTIES		Unit			
Mass density ρ		g/cm ³		8.12	
Thermal conductivity (25 °C) λ		W/(m · K)		32	
Thermal expansion coefficient (20 – 100 °C) α		10 ⁻⁶ /K		8.8	
Electrical resistivity ρ_e		$\mu\Omega\text{m}$		0.42	
STATIC MAGNETIC PROPERTIES				magnetically optimized	mechanically optimized
Coercivity H_c		A/m		120	600
Saturation polarization J_s		T		2.25	2.25
Saturation magnetization B_s at $H = 40$ kA/m		T		2.30	2.30
Maximum permeability μ_{max}				6,000	1,100
Magnetostriction constant λ_s		ppm		+70	+70
Curie temperature T_c		°C		950	950
SPECIFIC IRON LOSSES OF STRIP MATERIAL AFTER FINAL HEAT TREATMENT		Strip thickness		Strip thickness	
		0.15 mm	0.35 mm	0.15 mm	0.35 mm
p_{Fe} 1.5 T 50 Hz	W/kg	3.0	3.0	-	11.5
p_{Fe} 1.5 T 400 Hz	W/kg	28	43	89	109
p_{Fe} 1.5 T 1,000 Hz	W/kg	86	186	237	349
p_{Fe} 2.0 T 50 Hz	W/kg	5.0	5.0	19	22
p_{Fe} 2.0 T 400 Hz	W/kg	48	74	160	208
p_{Fe} 2.0 T 1,000 Hz	W/kg	143	352	428	660
MECHANICAL PROPERTIES (final annealed)				magnetically optimized	mechanically optimized
Young's modulus E	GPa			250	250
Yield strength $R_{p0.2}$	MPa			400	800
Tensile strength R_m	MPa			800	1,200
Elongation A	%			6	8
Hardness	HV			230	300
MECHANICAL PROPERTIES (cold rolled)					
Yield strength $R_{p0.2}$	MPa			1,120	
Tensile strength R_m	MPa			1,240	
Elongation A	%			1	
Hardness	HV			370	
RECOMMENDED PARAMETERS FOR THE FINAL HEAT TREATMENT				magnetically optimized	mechanically optimized
Atmosphere				hydrogen	hydrogen
Temperature	°C			840	720
Annealing time	h			4	1 – 2
Cooling rate	K/h			100 – 300	100 – 300

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