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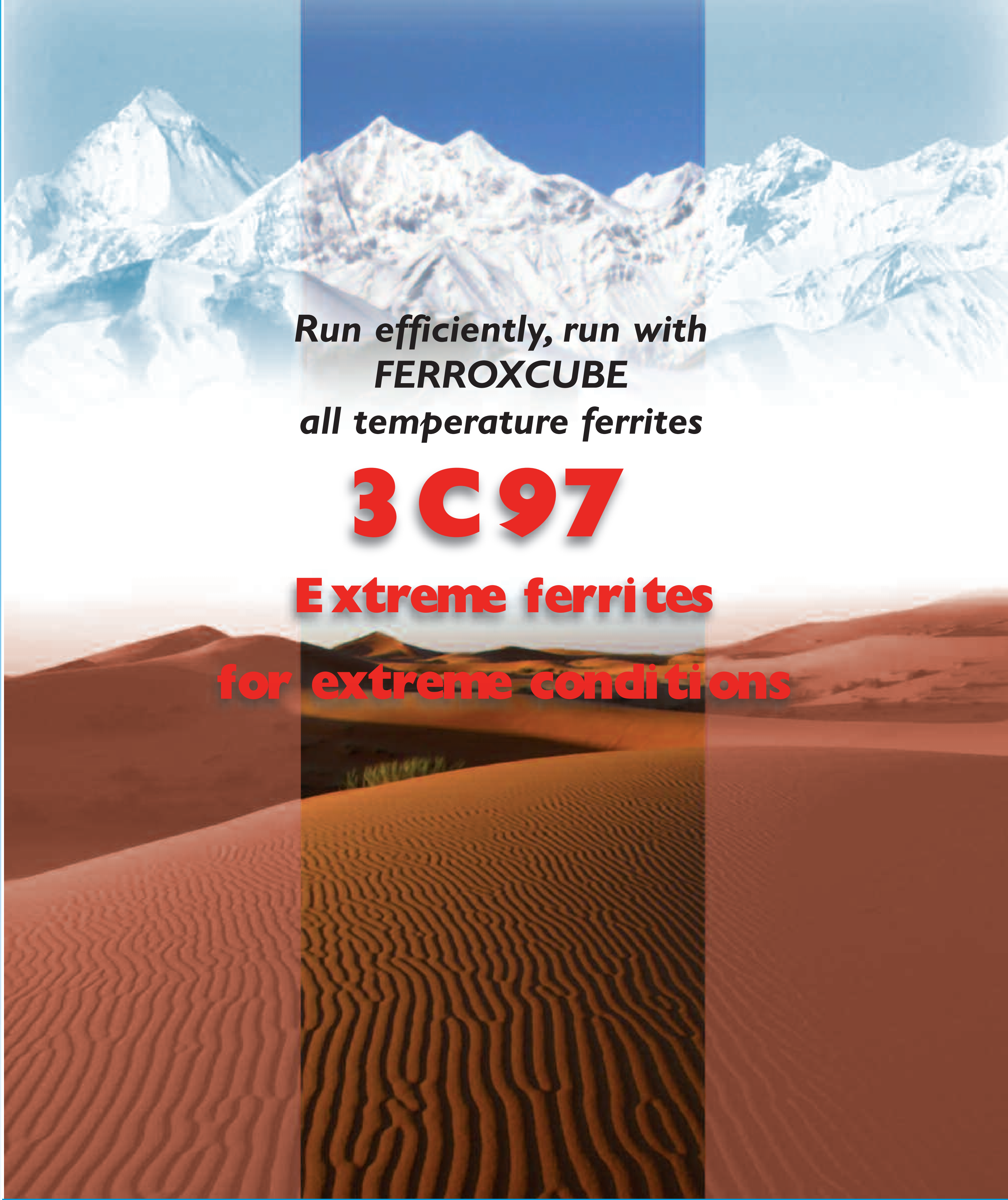

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3C97

FERROXCUBE´s new all temperature power ferrite. 3C97

FERROXCUBE extends its all temperature power ferrite range with a new power material: 3C97. This new grade complements our well known 3C95 in the search for high efficiency power conversion, especially in applications where large variations in operating temperatures occur.

Power conversion systems provided with FERROXCUBE 3C97 will not only offer high power density and reduced volume, but also increased efficiency when used in harsh environment applications with high ambient temperatures and wide temperature fluctuations.

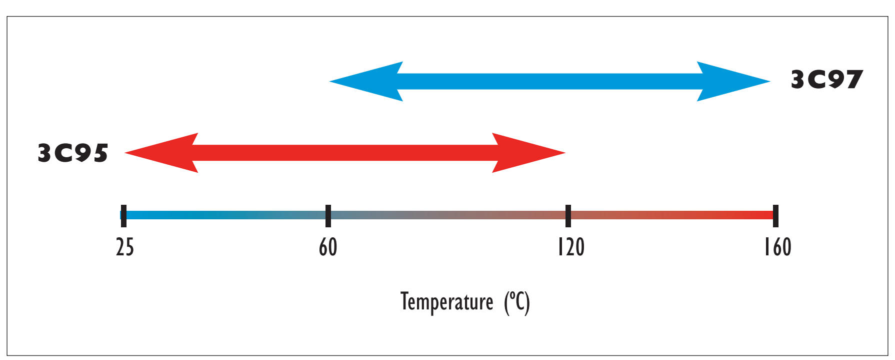

Figure 1. Recommended operating temperature for FERROXCUBE´s all temperature power ferrites.

Losses in power conversion systems based on ferrite transformers are mainly a consequence of copper windings and ferrite core losses themselves. Regarding the ferrite core losses, these are mainly determined by the magnetic flux density, frequency and by the operating temperature. Designers, by calculating such losses, predict transformer temperature rise at a determinate loading rate, then choosing the most appropriate conventional ferrite material minimize losses at the expected operating temperature.

FERROXCUBE, as the leading manufacturer in the ferrite industry, has been providing to the power conversion industry ferrite cores with the lowest power losses and highest saturation magnetic flux density over a wide range of operating frequencies (20KHz - 10MHz). This has allowed us to support today´s manufacturers of power conversion systems in their drive for greater miniaturization, lower weight and reduced power consumption in applications where the temperature rise and maximum achievable temperature can be estimated.

However, in the last years countless power conversion applications, for which a narrow operating temperature range cannot be assumed, are arising. Some examples are:

- Outdoors Solar inverters, Power-charging systems for electric vehicles.
- DC/DC converters for electric and hybrid cars, automotive electronics in general.
- Rugged systems suited to railway, heavy industry as well as others applications in adverse environments.

In the same way, since winding losses depend on the square of the current, power transformers efficiency varies depending on how much power is being given off. At reduced loads, the contribution of winding losses to the temperature rise of the transformer is minimum and since typical transformer designs are directed to minimize losses at steady state under full load, conventional ferrite materials will be out of their optimum loss point being the main cause for transformers reduced efficiency at low loads or stand-by states.

FERROXCUBE´s all temperature power ferrite range will make the design of true high energy-efficient products possible, since the transformer will keep the industry´s lowest loss levels independently of environmental temperature and loading.

New 3C97 power material is characterized by a flat Power density vs. Temperature curve between 60°C and 140°C achieving an improved efficiency over 3C95 in this temperature range.

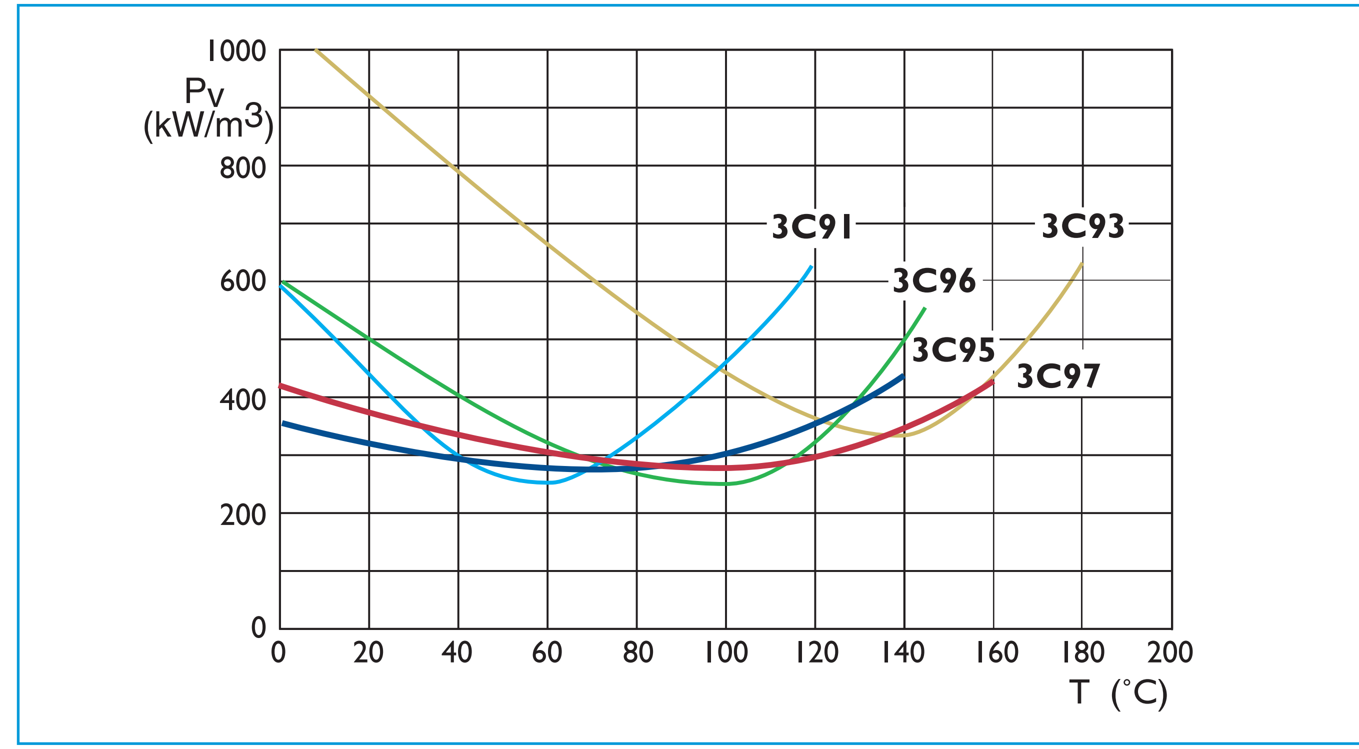

Figure 2. Loss density (100 kHz, 200mT) versus temperature for FXC's conventional power materials and new all temperature power ferrites (3C95, 3C97).

SYMBOL	CONDITIONS	VALUE	UNIT
μ_i	25 °C; ≤10 kHz; 0.25 mT	3000 ± 20 %	
μ_a	100 °C; 25 kHz; 200 mT	≈ 5000	
B	25 °C; 10 kHz; 1200 A/m	≈ 530	mT
	100 °C; 10 kHz; 1200 A/m	≈ 410	
P_V	60 °C; 100 kHz; 200 mT	≈ 320	kW/m³
	120 °C; 100 kHz; 200 mT	≈ 320	
	140 °C; 100 kHz; 200 mT	≈ 380	
ρ	DC, 25 °C	≈ 5	Ωm
T_C		≥ 215	°C
density		≈ 4800	kg/m³

Figure 3. Material Characteristics.

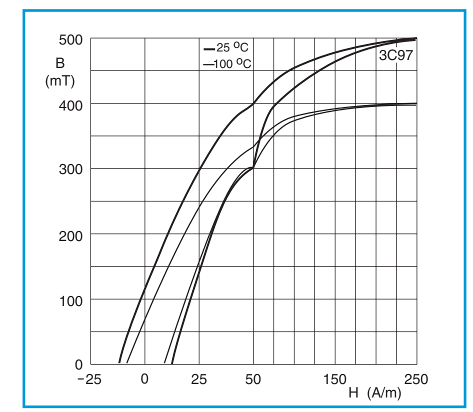

Figure 4. Typical B-H loops

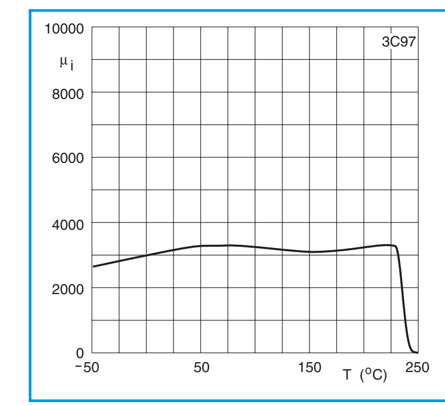

Figure 5. Initial permeability as function of temperature

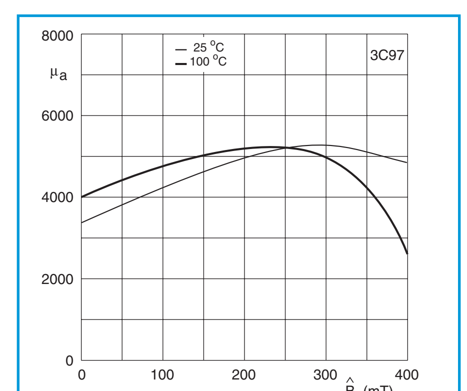

Figure 6. Amplitude permeability as function of peak flux density

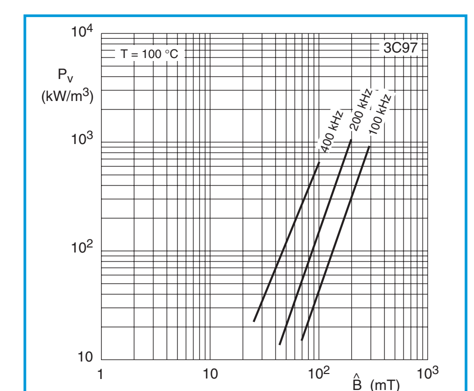

Figure 7. Specific power loss as function of peak flux density with frequency as a parameter

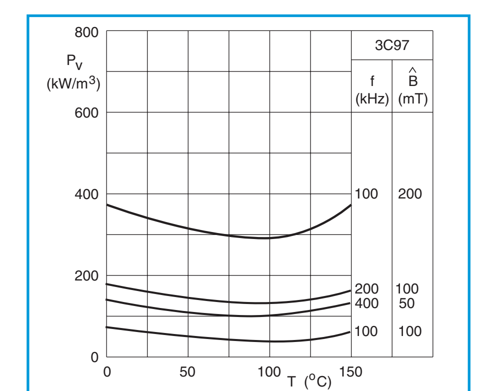

Figure 8. Specific power losses for several frequency/flux density combinations as a function of temperature