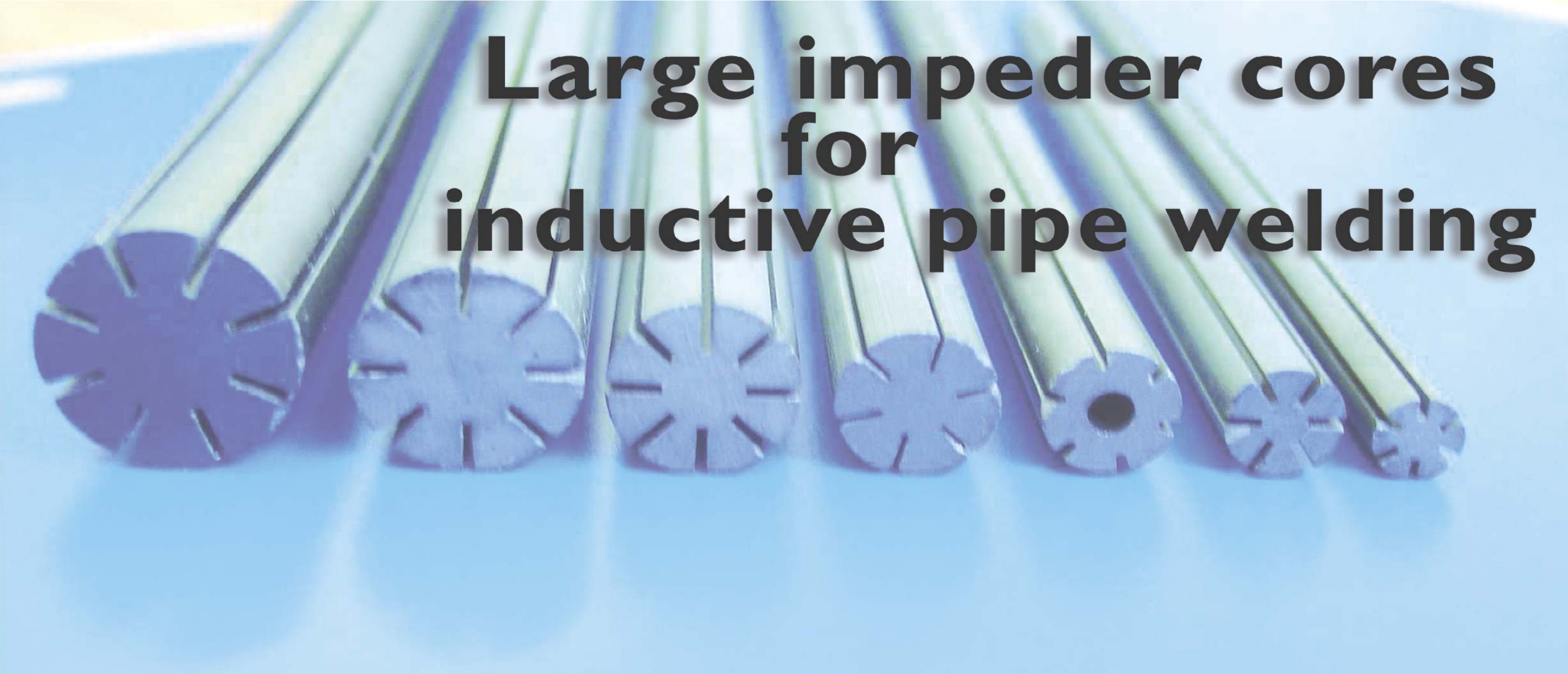
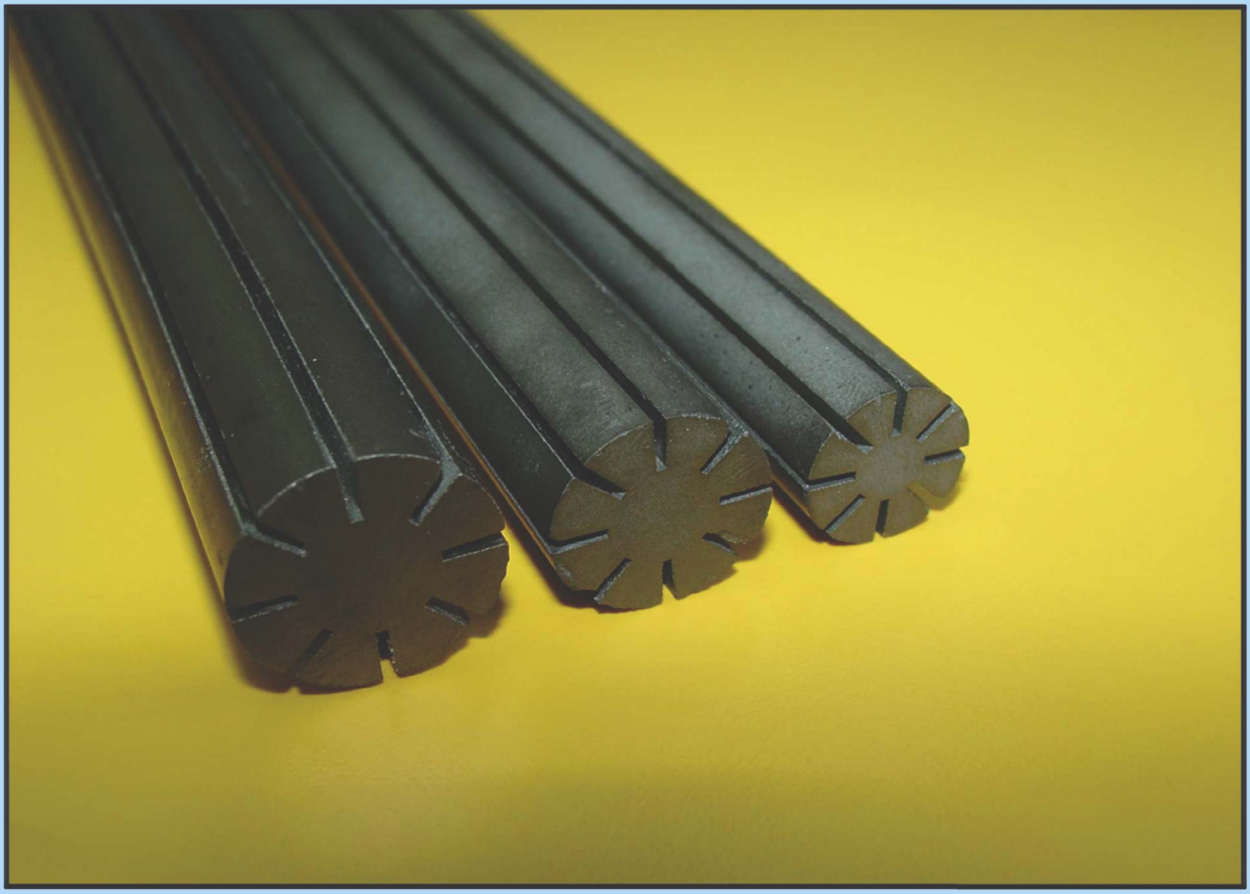
Large impeder cores for inductive pipe welding





FERROXCUBE
A YAGEO COMPANY

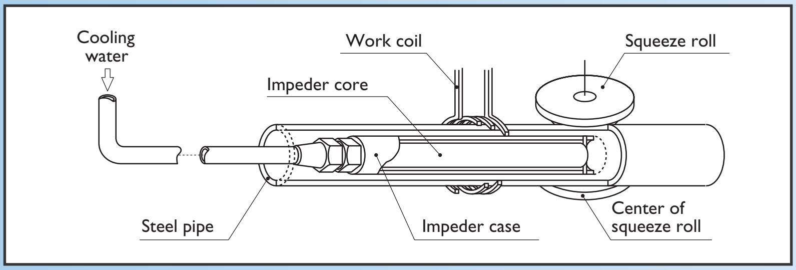
Impeder cores - designed for welding applications

FERROXCUBE introduces a new product : large impeder cores for high-frequency inductive pipe welding. Steel pipes are manufactured by pulling a strip of the material through sets of steel rolls, thus folding the strip to an open seam tubular shape. The open seam passes through a high-frequency induction coil, where eddy currents heat up the steel, especially the edges. During the passage through the steel rolls afterwards, the seams are pressed together and joined by welding.
Eddy currents along the outer surface can return along the inner surface or along and around the vee. The ferrite impeder core inside the tube suppresses with its alternating magnetic field the return current on the inner surface and increases the return current along the vee, resulting in a much higher welding eficiency.

FERROXCUBE now also introduces a new material grade, optimized for this application : 3C21.
Most important features are

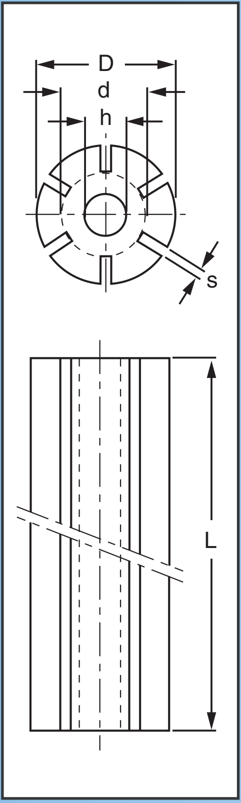
• High flux density in combination with high Curie temperature allows for the most demanding (highest power) welding applications.
• Low core loss density at high frequency reduces heating up of the core, which increases the saturation flux density at the working point.
• High bulk resistivity also reduces eddy currents in large cores, which would again lead to heating up and lower saturation.
• As a cost-effective alternative, we have a second grade 3C85 available.

In these grades, we offer a complete range of impeder cores, for various diameters. Every size is available with and without center hole.



High-frequency inductive pipe welding

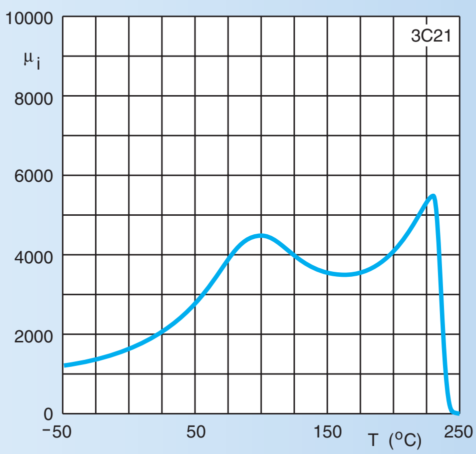
Impeder core product range



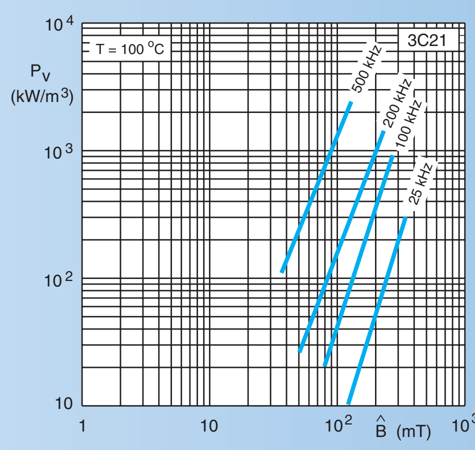
GRADE	NR OF SLOTS	DIMENSIONS (mm)		TYPE NUMBER	
		D	L	SOLID	HOLE
3C21 3C85	6	7 ± 0.3	200 ± 4	IMP7/200	IMPH7/200
	6	8 ± 0.3	200 ± 4	IMP8/200	IMPH8/3/200
	6	9 ± 0.3	200 ± 4	IMP9/200	IMPH9/3/200
	6	10 ± 0.35	200 ± 4	IMP10/200	IMPH10/3/200
	6	11 ± 0.35	200 ± 4	IMP11/200	IMPH11/4/200
	8	12 ± 0.35	200 ± 4	IMP12/200	IMPH12/4/200
	8	13 ± 0.4	200 ± 4	IMP13/200	IMPH13/4/200
	8	14 ± 0.4	200 ± 4	IMP14/200	IMPH14/5/200
	8	15 ± 0.45	200 ± 4	IMP15/200	IMPH15/5/200
	8	16 ± 0.5	200 ± 4	IMP16/200	IMPH16/5/200
	8	17 ± 0.5	200 ± 4	IMP17/200	IMPH17/6/200
	8	18 ± 0.55	200 ± 4	IMP18/200	IMPH18/6/200
	8	19 ± 0.55	200 ± 4	IMP19/200	IMPH19/6/200
	8	20 ± 0.6	200 ± 4	IMP20/200	IMPH20/6/200
	8	21 ± 0.6	200 ± 4	IMP21/200	IMPH21/6/200
	8	22 ± 0.65	200 ± 4	IMP22/200	IMPH22/6/200
	8	23 ± 0.7	200 ± 4	IMP23/200	IMPH23/6/200
	8	24 ± 0.75	200 ± 4	IMP24/200	IMPH24/6/200
	8	25 ± 0.85	200 ± 4	IMP25/200	IMPH25/6/200
	8	27 ± 0.85	200 ± 4	IMP27/200	IMPH27/6/200

3C21 & 3C85 - Material Characteristics

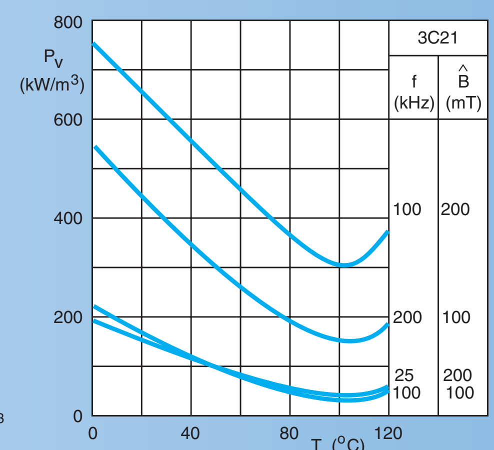
	CONDITIONS	VALUE		UNIT
		3C21	3C85	
μ_i	25 °C, ≤ 10 kHz, 0.25 mT	2000 ± 20 %	2000 ± 20 %	
μ_a	100 °C, 25 kHz, 200 mT	≈ 5500	≈ 5500	
B	25 °C, 10 kHz, 1200 A/m 100 °C, 10 kHz, 1200 A/m	≈ 500 ≈ 440	≈ 430 ≈ 360	mT
P_v	100 °C, 25 kHz, 200 mT 100 °C, 100 kHz, 100 mT 100 °C, 100 kHz, 200 mT 100 °C, 500 kHz, 50 mT	 ≈ 40 ≈ 300 ≈ 250	≤ 140 ≤ 165 	kW/m^3
ρ	DC, 25 °C	≈ 5	≈ 2	Ωm
T_c		≥ 240	≥ 200	°C
density		≈ 4800	≈ 4800	kg/m^3



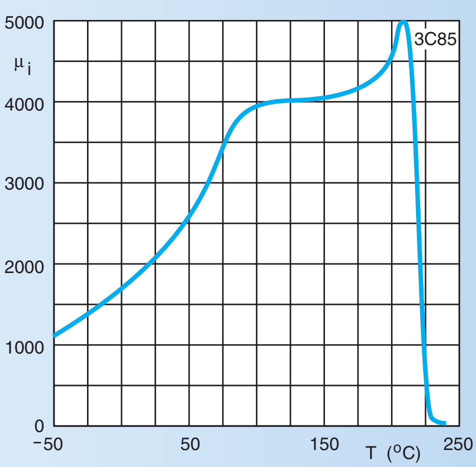
Initial permeability as a function of temperature



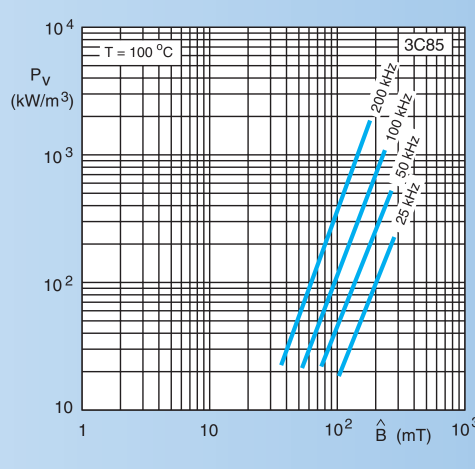
Specific power loss as a function of peak flux density with frequency as a parameter



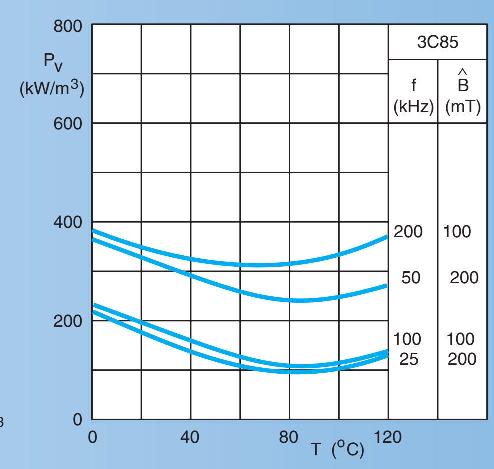
Specific power losses for several frequency/ flux density combinations as a function of temperature



Initial permeability as a function of temperature



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



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