

## Fe-based nanocrystalline

### Main ingredients:(1K107)

Nanocrystalline material consists of Iron: 73.5%、 Silicon: 13.5%、 Boron: 9% and copper 1%、 Niobium 3% in which copper and niobium are necessary ingredients to form the nanocrystalline structure. It has low price, excellent magnetic performance which almost same as cobalt-based material. It widely used for industrial and civic medium to high frequency transformer and current transformer, inductor...etc. It's been called the further generation of permalloy and ferrite.

### Characteristics:

High saturation flux density、 high permeability、 low coercive force、 low core loss、 good temperature stability.

### Applications:

- ✧ Switch、 pulse power transformer; driver transformer;
- ✧ Lan transformer;
- ✧ Common mode choke;
- ✧ Power、 AC/DC current transformer; Voltage transformer.
- ✧ Circuit breaker、 precise current transformer;
- ✧ Saturated reactor;
- ✧ Magnetic amplifier;
- ✧ Spike killer

#### 1) Physical property of nanocrystalline:

Bs	1.25 T	Saturation magnetostriction coefficient	$< 2 \times 10^{-6}$
Tc	560 °C	density	7.2 g/cm <sup>3</sup>
Tx	510 °C	Specific resistance	130μOhm-cm
Hv	880kg/mm <sup>2</sup>	Working temperature	-55°C -130°C

#### 2) Magnetic property of nanocrystalline:

	No magnetic field annealing	Transverse magnetic field annealing	Longitudinal magnetic field annealing
Initial permeability	$> 8 \times 10^4$	$> 2 \times 10^4$	$> 1 \times 10^4$
Max permeability	/	/	/
Residual magnetic flux density	$< 0.6T$	$< 0.2T$	$< 0.85T$
Coercive force	$< 0.8A/m$	$< 1.8A/m$	$< 1.8A/m$
Core loss ( 20KHz 0.5T )	$< 25w/Kg$	$< 50w/Kg$	$< 90w/Kg$
Core loss(100KHz 0.3T )	$< 150w/Kg$	$< 150w/Kg$	$< 300w/Kg$
Core loss rate per temperature -55°C -125°C	$< 15\%$	$< 15\%$	$< 15\%$

### 3) Property comparison between nanocrystalline and other magnetic material

	Nanocrystalline	Permalloy 1j85	Ferrite
Saturation flux density	1.25T	0.75T	0.5
Saturation magnetostriction coefficient	< 2	< 2	4
Specific resistance	130	56	106
Tc	560	400	< 200
Residual magnetic flux density	0.2-1.0	/	0.2
Initial permeability (Gs/Oe)	> 80000	> 80000	
Max permeability (Gs/Oe)	> 200000	> 150000	< 20000
Coercive force	< 2	< 1	6
Core loss ( 20KHz 0.5T )	< 25w/Kg	/	NA
Core loss ( 50KHz 0.3T )	< 60w/Kg	/	NA

