KAWASAKI STEEL TECHNICAL REPORT
No.39 (October 1998)
Electrical Steel

Heat-Proof Domain-Refined Grain-Oriented Electrical Steel

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Synopsis :
Kawasaki Steel has recently developed a new type of heat-proof domain-refined grain-oriented electrical steel (RGHPD) whic h is characterized by deterioration-free properties even after stress relief annealing at high temperature. This steel is obtained by refining 180° magnetic domains through linear grooves introduced by applying localized electrolytic etching on the surface of the steel sheet after final cold rolling. The iron loss of this new material product is 10% less than that of steel which has not undergone domain refining. Iron loss in wound core transformers using this material is also about 10% less than that of conventional transformers. Moreover, this material can be used for stacked core tran sformers and is expected to contribute significantly to energy conservation and savings in the future as a result of improved transformer efficiency.

The body can be viewed from the next page.

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Heat-Proof Domain-Refined Grain-Oriented Electrical Steel*

Synopsis:

sists of introducing linear grooves onto the surface of the steel after final cold rolling through the application

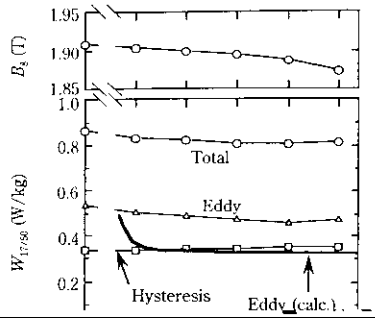
tends to increase somewhat when the magnetic flux increases beyond a certain limit. The reason for this is

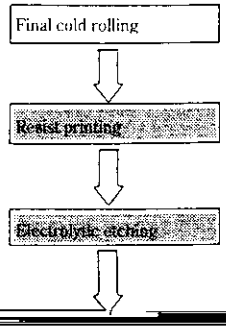
of localized electrolytic etching so as to refine magnetic

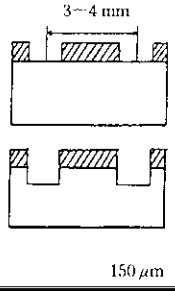
because crystal grain size tends to increase and the

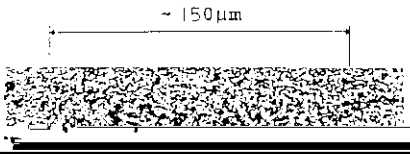
surface of the sheet.

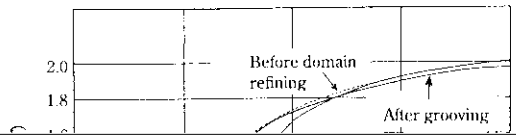
domain width d_0 tends to become smaller as the groove


1.95
1.90
1.85
B_8 (T)
1.0
0.8
0.6
0.4
0.2
$W_{17/50}$ (W/kg)
Total
Eddy
Hysteresis
Eddy (calc.)


Final cold rolling
Resist printing
Electrolytic etching


3~4 mm
150 μm


~ 150μm


2.0
1.8
Before domain refining
After grooving


50Hz
riction
$(\times 10^{-1})$
2
Without grooves

A B C D

Table 2 Magnetic properties of stacked-core model transformers

Magnetic properties	Magnetic properties of model