



MAPES & SPROWL STEEL

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CLASSIFICATION OF INTERLAMINAR INSULATION COATINGS ASTM A976

INSULATION DESIGNATION	DESCRIPTION	TYPICAL APPLICATIONS
C-0	The natural oxide surface which occurs on flat-rolled silicon steel which gives a slight but effective insulation layer sufficient for most small cores and will withstand normal stress-relief anneal of finished cores by controlling the atmosphere to be more or less oxidizing to the surface.	Fractional horsepower motors, pole pieces and relays, small communication owner transformers and reactors.
C-1	A very thin layer of oxide formed during heat treatment by exposing steel to an oxidizing atmosphere at the exit end of heat treatment cycle. This oxide is typically known as "Steam Blue" or "Blue Oxide" and it is bluish to gray in color.	Small transformer, small or fractional horsepower motor, small magnetic devices with low compressive forces in the power frequency range applications.
C-2	An inorganic insulation which consists of a glass-like film which forms during high temperature hydrogen anneal of grain-oriented silicon steel as the result of the reaction of an applied coating of MgO and silicates in the surface of the steel. This insulation is intended for air-cooled oil-immersed distribution transformers. It is also called "Mill Glass" or "Glass Film."	Wound-core, power frequency devices, distribution transformers, saturable reactors and large magnetic amplifiers.
C-3	An enamel or varnish coating intended for stamped laminations or magnetic devices that do not require Stress Relief Annealing. It provides an interlamination resistance superior to the C-1 type with uniform coverage. C-3 coating will also enhance punchability; is resistant to normal operation temperatures, up to about 180°C or 350°F.	Air-cooled, medium-sized power and distribution transformers; medium-sized continuous duty, high efficiency rotating machinery.
C-4	A chemically treated or phosphate surface intended for air-cooled or oil-immersed cores requiring moderate levels of insulation resistance. It will withstand stress-relief annealing and serve to promote punchability.	Applications requiring insulation similar to C-3 and a stress-relief anneal. Used extensively for small stamped laminations that require higher resistance than provided by annealing oxides.
C-5	An inorganic or mostly inorganic insulation similar to C-4 but with ceramic fillers added to enhance the interlamination resistance. It is typically applied over the C-2 coating on grain-oriented silicon steel. Like C-2, it will withstand stress-relief annealing/atmosphere. It can also be offered as C5 over base metal.	Principally intended for air-cooled or oil-immersed cores which utilize sheared laminations and operate at high volts per turn. Also finds applications in apparatus requiring high levels of interlamination resistance.
C5-A	A thin layer of coating of C5. It was previously called C5-AS AS denoting "Anti-Stick". It can withstand heat treatment.	A superior surface treatment providing improved magnetic quality and protection against sticking of laminations during the quality annealing of semi-processed material offering lower interlamination resistivity than C5.
C-6	Organic-based coating to which inorganic fillers have been added to increase the insulating ability of the coating. The coating is applied to the steel surface and cured by heating. C-6 is typically used on fully processed non oriented electrical steel.	Intended for small to medium size magnetic devices. Provides an adequate interlamination resistance. With advancement in C6 coating this class of coating can withstand stress-relief annealing. †

Also see ASTM A876 for designation NF, F2, F5 and PQ.

Note: There are other insulation designation in the industry such as 0A, C6-A, and C9-A that are NOT part of ASTM.

† NOT recommended in ASTM A976.