HSM Wire International Inc
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HSM Wire International, Inc

Ph: 330-244-8501 Fax: 330-244-8561

www.hsmwire.com

CELANESE INSULATED WIRE

Celanese was the first synthetic yarn adopted for wire insulating. A product of the Celanese Corporation of America, it was introduced in about 1934 as a substitute for silk; the only high grade insulating yarn then available. As a replacement, it was only partially effective; the yarn builds proved to be greater, and its poor abrasion resistance precluded its use in severe winding operations. However, it won immediate and continued acceptance in electronic coil applications because of its excellent radio frequency characteristics.

The yarn is acetate which is defined by the Federal Trade Commission as “man-made textile fibers and filaments composed of cellulose acetate, yarn, thread, or other textile fabric made of such fibers and filaments”. Chemically it is an acetic acid ester of cellulose and as such differs in physical, chemical and electrical properties from regenerated cellulose and cotton.

In its manufacture, cotton linters or wood pulp are treated with acetic anhydride in the presence of a catalyst to form the tricetate of cellulose. This tricetate is hydrolyzed to the acetone soluble ester which, after precipitation and drying, is dissolved in acetone. The highly viscous spinning solution so prepared is extruded through spinnerets into warm air and the acetone evaporates, leaving solid filaments which are gathered together and wound onto bobbins in the form of yarn.

Unlike nylon, Celanese is not highly elastic. Accordingly, objectionable springiness is not obtained when fine gauge Celanese insulated wire is stretched. In common with other thermoplastic yarns, Celanese will exhibit sticking, softening and melting at elevated temperatures. Softening and sticking occurs in the range of 375° to 400°F, and it melts at about 500°F, well above the soldering temperature of polyurethane film insulated wire.

Celanese is soluble in acetone, methyl and ethyl acetate, dioxane, methyl cellosolve acetate, dichloroethylene, cresol, phenol, etc. Celanese is partially Soluble in methylene chloride and ethylene chloride at 60°C, and is swollen by some alcohols. It is not soluble in gasoline, petroleum, ether or ethyl ether, benzene, toluene, perchloroethylene. Trichloroethylene, carbon tetrachloride, cyclohaxanol, and xylene. The solvents of coil cements and lacquers should be tested for their effect on Celanese servings before using.

Since Celanese yarn dissolves and fuses when wet to acetone, this property may be used advantageously in routine coil fabrication and also to facilitate automatic winding

operations. In the latter, a controlled amount of acetone is applied to the wire as it is being wound and, upon completion of the coil, the volatile acetone is evaporated in seconds by a blast of hot air, leaving the winding firmly cemented.

The layer to layer dielectric strength of Celanese insulation is 100 volts per mil, minimum. Tests made at radio frequencies on Celanese insulated wire would coils show them to have outstanding Q values.

Most textile fibers absorb moisture from the surrounding atmosphere. The amount present, referred to as moisture regain, is expressed as a percentage of its oven-dry weight. The standard regain of Celanese at 70°F and 65% RH is generally accepted as 6.5%.

Celanese yarn servings have only fair abrasion resistance and. With the tensile strength of Celanese only ¼ to 1/5 that of nylon, they add little to the strength of the insulated conductors. These considerations impose no great hardship on the coil winder. He need only maintain his wire and winding guides in good condition and avoid excessive wire tensions.

Varying with the wire size, the yarn builds of Celanese insulated wire range from about 50 to 100% greater than those on nylon insulated. This inherent difference is due to the relative coarseness of Celanese yarn. Its filaments are about 3 times larger than those of nylon. Also, for this reason, Celanese servings are rougher in appearance.

Magnet Wire Celanese Yarn Builds

AWG Wire Sizes	Single Served		Double Served	
	Max.	Min.	Max.	Min.
#18 through #23	.0045”	.0036”	.0090”	.0072”
#24 through #29	.0040”	.0032”	.0080”	.0064”
#30 through #44	.0035”	.0028”	.0070”	.0056”
This information is to be used as a guide only.				