

Polyethylene

Visico™ FR4450/LE4433

Silane Crosslinkable Halogen Free Flame Retardant Compound

Description

Visico FR4450/LE4433 is a black, halogen free, moisture-induced crosslinking polyethylene compound system designed for use as low voltage wire insulation and jacketing.

The combination of Visico FR4450 base resin and LE4433 catalyst, provides a highly scorch retardant compound system with excellent thermal stability and good flame retardant properties. Visico FR4450/LE4433 contains a patented scorch retardant additive that increases the processing window for a silane crosslinkable compound system and minimizes the tendency for premature crosslinking in the extruder, head or die.

A finished compound that is composed of 93 parts of Visico FR4450 and 7 parts of LE4433 is recognized by Underwriters Laboratories as "Visico FR4450/LE4433". Visico FR4450/LE4433 is designed to reduce normal PE flame spread characteristics and achieve an HB-1 flame rating on 14 AWG wires and larger. LE4433 also provides, in addition to catalyst, a stabilization package containing suitable antioxidants, a metal deactivator and fine particle size carbon black for UV weather resistance.

Cable insulation with a proper mixture of Visico FR4450 (93 parts) and LE4433 (7 parts) exhibits excellent thermo-oxidative stability in contact with aluminum or copper.

Typical characteristics

Visico™ FR4450/LE4433 can be described with following typical characteristics:

Applications

Visico™ FR4450/LE4433 is intended for following applications:

Insulation and jacket for low voltage control cables and power cables up to 6 kV.

Specifications

Visico™ FR4450/LE4433 is expected to meet the applicable requirements included in the below mentioned standards provided it is processed using sound material handling and processing practices as well as appropriate testing procedures.

UL 44

CSA 22.2

UL 854

Physical properties

Property	Typical value *	Unit	Test method
Density ¹	1100	kg/m ³	ASTM D792
Density ²	1100	kg/m ³	ASTM D792
Melt flow rate (190 °C/2.16 kg) ¹	0.7	g/10min	ASTM D1238
Elongation at Break ³	>300	%	ASTM D638
Tensile strength ³	15	MPa	ASTM D638
Tensile strength ³	2175	psi	ASTM D638
Hot Creep Test (150°C, 29 psi) Elongation under load ³	<100	%	ICEA T-28-562
Hot Creep Test (150°C, 29 psi) Permanent deformation ³	<5	%	ICEA T-28-562

* Data should not be used for specification work

¹ FR4450

² LE4433

³ Value refers to cured specimens, 7% catalyst added.

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Electrical properties

Property	Typical value *	Unit	Test method
DC volume resistivity ³	>0.5	PΩcm	IEC 62631-3-2
Dissipation factor (50 Hz) ³	0.1	-	IEC 62631
Relative permittivity (50 Hz) ³	3	-	ASTM D150

³ Value refers to cured specimens, 7% catalyst added.

* Data should not be used for specification work

Other properties

Property	Typical value *	Unit	Test method
Limiting Oxygen Index ³	32	%	ASTM D2863
Corrosivity of combustion fumes, Conductivity ³	<10	μS/mm	IEC 60754-2
Corrosivity of combustion fumes, pH ³	>4.3	-	IEC 60754-2
UL Horizontal flame test ⁴	Pass	-	UL 2556

³ Value refers to cured specimens, 7% catalyst added.

⁴ Value refers to cured specimens, 7% catalyst added - (14 AWG-30 mil)

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Processing techniques

The actual conditions will depend on the type of equipment used.

Visico FR4450/LE4433 are typically mixed directly in the extruder hopper using a volumetric or gravimetric masterbatch feeder. Most equipment designed for PVC or PE extrusion is equally suitable for Visico FR4450/LE4433.

A conductor pre-heater is recommended to ensure good mechanical properties and this should be at approximately 100°C.

Processing setting	Typical value/range
Barrel temperature	130 - 140 - 150 - 160 - 170 °C
Die temperature	170 °C
Barrel temperature	266 - 284 - 302 - 320 - 338 °F
Die temperature	338 °F

Crosslinking

These products can be crosslinked by immersion in hot water or exposed to low pressure steam with a typical temperature range of 60°C to 90°C. This time period may be varied due to the humidity, thickness of insulation, reel size and temperature.

Drying

Unopened packages of Visico FR4450 should not require drying. Once packages of Visico FR4450 have been opened, aluminum liner needs to be resealed as soon as possible to prevent moisture uptake. However, if the moisture level of opened packages rises to more than 400 ppm, then drying for 4 hours at 60 °C in a dehumidifying type dryer is recommended.

LE4433 should not be dried. It should always be used from a fresh package. Once the package of LE4433 has been opened, it needs to be resealed as soon as possible to prevent moisture uptake which can cause potential pre-crosslinking during the extrusion step.

Packaging and storage

Visico™ FR4450/LE4433 can be stored for 18 months after production, at 10-30°C (50-85°F) in unopened original packages, without significant deterioration in the quality of the material. Visico FR4450 and LE4433 should be stored in dry conditions and protected from direct sunlight. LE4433 is sensitive to moisture and is therefore delivered with low moisture content, ready to be used. Pre-drying is not recommended, as it will destroy the drying agent that has been added to prevent the material to take up moisture. Once a bag is opened, we recommend to fully use it; otherwise, the bag must be properly resealed between uses, as even short periods of storage in humid conditions may cause scorch during extrusion.

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Product compliance documents

Latest versions of product safety information sheets (PSIS), product safety data sheets (SDS) and other product liability documents are available in our website www.borealisgroup.com.

Sustainability aspects

Borealis is ever mindful of the impact of our products on the planet. We promote Design for Circularity (DfC) and Design for Recycling (DfR) to conserve natural resources and to reduce the environmental impact of products over their entire lifetime (including production, use phase and after phase). DfR helps ensure that material can be effectively recycled while maximizing the material performance efficiency.

Further information on sustainability and Design for Recycling (DfR) can be found from our websites www.borealisgroup.com and www.borealiseverminds.com.

Disclaimer

The product(s) mentioned herein are not intended to be used for medical, pharmaceutical or healthcare applications and we do not support their use for such applications.

To the best of our knowledge, the information contained herein is accurate and reliable as of the date of publication; however we do not assume any liability whatsoever for the accuracy and completeness of such information.

Borealis makes no warranties which extend beyond the description contained herein. Nothing herein shall constitute any warranty of merchantability or fitness for a particular purpose.

It is the customer's responsibility to inspect and test our products in order to satisfy itself as to the suitability of the products for the customer's particular purpose. The customer is responsible for the appropriate, safe and legal use, processing and handling of our products.

No liability can be accepted in respect of the use of any Borealis product in conjunction with any other products and/or materials. The information contained herein relates exclusively to our products when not used in conjunction with any other material unless as specifically provided for in the test methods stated above.