

Ambient Curable Polyethylene Compound For Insulation Of Low Voltage Power Cable With High Line Speed

: KI – XL – 03 HS / KI – SC – 10 HS

DESCRIPTION:

KIL’s Polyethylene Compound XL – 03HS is a superior grade of silane pre-grafted low density Polyethylene Compound. It is designed to be used as insulation of low Voltage Power Cable. Keeping in mind the stringent quality requirements, special attentions are paid to maintain dust free environment during its manufacture. An enriched additive package makes it highly scorch retardant and protects it against heavy metal induced degradation.

KI-XL-03HS is to be used in conjunction with KI-SC-10HS, which contains a catalyst activator to enhance the process of cross-linking in open environment, (no needs of sauna, CV tube or steam bath) and special process aid to enhance the line speed without much of die drool.

These two components XL-03HS & KI-SC-10HS are inert, when stored in a cool & dry place. However when mixed, extruded and exposed to moisture cross-linking takes place rapidly. The components are therefore to be mixed just before consumption, usually in the ratio of 95 parts of Grafted Polymer (XL-03HS) to 5 part of Catalyst Master Batch (KI-SC-10HS).

Such system allows the compound to be extruded as normal thermoplastic in a conventional PE extrusion line. In each case time of curing is to be optimized as a function of thickness of insulation, concentration of catalyst and atmosphere humidity.

SPECIFICATIONS :

KI-XL-03 HS & XL-SC10 HS meets requirements as applicable under following standards, when processed using sound extrusion practice and testing procedure;

- IS 10810 , BS 5467, 5468, 6724, 7655 & IEC 60502

TYPICAL PROPERTIES :

A) XL-03HS

Property	Unit	Typical Value	Test Method
Density	gm / cm ³	0.922 – 0.925	ASTM-D-792
Melt Flow Index (190°C, 2.16 Kg)	gm / 10 Min	0.8 – 1.5	IS-10810 (Part-23) / ASTM-D-1238
Contamination (Visual)	No./Kg	< 5	KIIL

B) XL-03HS / KI-SC-10HS Combination

Mixed in proportion of 95:5 and extrude a tape of 1.0 mm thickness. Extruded tape kept in open environment (Relative humidity ≈ 60 – 70 & temperature 27 – 30°C) for 24 hrs where cross-linking takes place.

Property	Unit	Typical Value	Test Method
Tensile Strength	MPa	14 - 16	IS-10810 (Part-7) / ASTM-D-638
Elongation at break	%	400 – 600	IS-1081 (Part-7) / ASTM-D-638
Hot set at 200 °C			
a) Hot Elongation after 15 min.	%	80 – 100	IS-10810 Part-30 / IEC 60811-507
b) Permanent Set after 5 min	%	± 5	-- do --
Oven ageing at 135 °C, 168 hours			
a) Variation in Tensile Strength	%	± 15	IS-10810 Part-11 / IEC 60811-401
b) Variation in Elongation at Break	%	± 15	IS-10810 Part-11 / IEC 60811-401
Volume Resistivity	Ohm-cm	1 X 10 ¹⁶	ASTM-D-257
Dissipation factor @ 250V / 50 Hz, 25°C	-	0.0004	ASTM-D-150
Dielectric Constant @ 250V / 50Hz, 25°C	-	2.1 – 2.3	ASTM-D-150

CROSSLINKING WITH AMBIENT CURING CATALYST M. B. (KI-SC-10HS).

The time of cross-linking of the insulation usually dependent on the following factors:

- Catalyst concentration.
- Relative humidity.
- Temperature.
- Insulation thickness

Polyethylene absorbs water very slowly, that means insulation thickness has a relatively large influence on cross-linking speed.

Relative humidity %	Temperature °C	Insulation Thickness mm	Time to reach 100% hot elongation, days
50	27	0.7	2
50	27	1.0	5
50	27	1.2	7

It is evident from the above table, the grafted polymer and catalyst master batch makes it possible to crosslink with in a practical condition and acceptable time frame even at ambient temperature with radial thickness upto 1.2mm. In practice, the addition of water to the cable core drum by spraying further reduces curing time. For radial thickness above 1.2mm the actual time taken should be ascertain by actual trial before bulk production.

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PROCESSING GUIDELINES:

1. It is recommended to dry the Catalyst Master Batch and suitable colour Master Batch at 60°C in air oven in 4 – 6 cm Layers for 8 – 12 hours. The Grafted Polymer should never be pre-heated.
2. The Grafted Polymer and Catalyst Master batch should be manually mixed at a ration of 95:5 at room temperature without shearing, just before consumption. Mixing in large quantities should be avoided, since such leftover premix cannot be stored.
3. During extrusion, following temperature profile is suggested:

Position	Temperature (°C)
Barrel	150 - 170
Head	175 - 180
Die	190 - 195

To get maximum output (line speed), some adjustment in temperature profile and tooling size selection to be arrived by trial, depending on size and type of extruder and cable.

4. Recommended start-up procedure is given below:
 - a. Ensure that the screw, barrel and tools are thoroughly cleaned.
 - b. Start up slightly lower temperature profile. Allow the frictional heat to build-up to desired temperature and remain steady thereafter.
 - c. Flush with virgin LDPE (film grade). Adjust eccentricity and wall thickness inserting conductor.
 - d. Replace LDPE with XL-03HS / KI-SC-10HS premix. Increase line speed to optimum. Adjust temperature to obtain a smooth surface finish.
 - e. Avoid thermal shock by sudden cooling. Keep sufficient distance between die-head and water trough to allow air cooling. Avoid inlet water being too cold.
5. It is important that extruder should not be kept idle for more that 15 minutes when filled premix compound.
6. During tubing extrusion, build-up of stress should be avoided; size of the core point should be carefully selected to keep the Draw Down Ratio (DDR) below 2:1 in case of small sizes. For higher sizes of the core, DDR may be increased slightly. It is also recommended that land be in place, with its length approximately same as that of the finished diameter of the core.

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PACKAGING :

- Moisture Barrier Multilayer Bags of 25 kg.
- 20' FCL will take palletized 11 MT & 40' will take 24.75 MT.

STORAGE :

The shelf life of the product is 3 months from the date of production, subject of following conditions:

- Storage temperature not generally exceeding 25°C
- Away from direct sunlight and weathering.
- Closed and unbroken bags.
- Use of compound within 3-4 hours after bags are open.
- Bags should be kept on Wooden or Plastic pallets.

The information given in the document is believed to be reliable and is given in the good faith but without warranty. The user should test the product to ascertain the suitability for the intended use. Product specification or the whole document is subject to change without any prior notice.

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