# SI-LINK™ AC Crosslinkable Polyethylene

Dow Electrical & Telecommunications (Dow E&T), a world leader in power cable compounds for almost 60 years, offers SI-LINK™ AC, a unique crosslinkable insulation system that brings faster cure rates, improved scorch resistance and an enhanced crosslinking rate to the wire and cable industry.

**Advanced performance**

SI-LINK AC is a scorch-resistant, fast-curing moisture-crosslinkable insulation system designed for low voltage (1 kV or less) power applications. In addition to improved scorch resistance, SI-LINK AC achieves significantly faster cure rates in all conditions, including ambient, such as in a warehouse environment of 23 °C and 70 percent relative humidity (RH). This new product also minimizes the potential for "pre-cure" in the extruder, improves insulation surface quality and appearance, and reduces scrap, providing improved value and handling characteristics. To enhance the rate of crosslinking, most cable manufacturers use a water bath or sauna to crosslink their cable at high temperatures and high humidity. Under these cure conditions, SI-LINK AC provides an accelerated cure rate compared to that of traditional materials. Because of its ability to cure under ambient conditions, SI-LINK™ AC is the ideal choice for customers who do not plan to operate, maintain or install traditional water baths or saunas.

SI-LINK AC provides the same cleanliness, ease of addition, processibility and performance that cable manufacturers worldwide achieve with Dow E&T's conventional SI-LINK™ crosslinkable silane-ethylene copolymer system.

When utilizing SI-LINK AC, customers should expect:

- Smaller cable constructions to cure faster than larger constructions
- Faster cure rates at higher ambient temperatures and relative humidity
- Faster cure rates if a conventional hot water bath or sauna is used

**Meeting industry specifications**

When DFDB-5451 NT is melt-mixed with DFDA-5488 NT, and optionally, DFDB-5410 BK, the insulation meets typical low voltage specifications such as those in:

- IEC 60502-1
- ICEA S-66-524
- UL 854
- CSA RW 90

This includes tensile and elongation, shrinkback, and electrical performance requirements.

| Application | Natural | Colorable | Black (UV) | Black FR/Horizontal Burn | Natural FR/Horizontal Burn |
|---|---|---|---|---|---|
| Product | | | | | |
| DFDB-5451 NT | 95% | 94-95% | 88.7% | 60% | 68-70% |
| DFDA-5488 NT | 5% | 5% | 5% | 5% | 5% |
| DFDB-5410 BK | | | 6.3% | | |
| DFDB-5445 BK | | | | 35% | |
| DFDB-5400 NT (*) | | | | | 25% |
| Color Concentrate | | 0-1% | | | 0-2% |

(*Or comparable FR masterbatch)

Like conventional SI-LINK, the SI-LINK AC system includes several products that are combined to suit the intended application. Recommended use ratios are shown at right.

Scorch-resistant technology in SI-LINK AC (as shown in the upper cable) improves the insulation surface quality and appearance and reduces scrap.

**Handling and use recommendations**

Product storage - Products perform best when preserved in original, unopened packaging. Because of the fast-curing nature of the SI-LINK AC system, exposure to moisture or humidity must be avoided during storage and conveyance.

Drying - DFDB-5451 NT and DFDA-5488 NT products are shipped dry. No further drying is needed. However, if desired or needed, the DFDA-5488 NT may be dried for four to six hours at 60 - 70 °C in a dehumidified air dryer to reduce moisture further. Drying of the DFDB-5410 BK masterbatch and colorants is recommended using these same drying conditions.

Blending - Homogenous blending and melt mixing of the SI-LINK AC products are necessary to achieve optimal processing, cure and insulation performance. Blending should occur immediately prior to feeding the products to the extruder. If the products are blended too far in advance of extrusion, then the contact of the base compound with the catalyst masterbatch may result in premature crosslinks leading to gels in the screen pack or insulation.

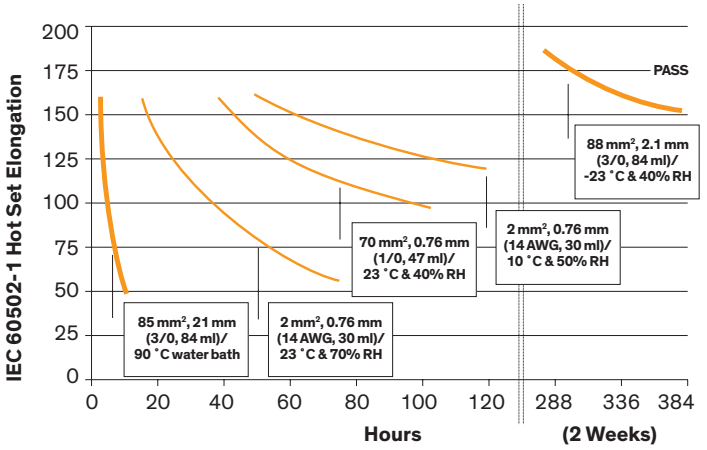
## Processing recommendations

Extruder - SI-LINK™ AC has been successfully processed in conventional polyethylene thermoplastic extrusion equipment having length-to-diameter ratios of 18:1 to 24:1 (preferred). Dead zones in the extruder, breaker plate, head and die must be avoided to prevent build-up and premature crosslinking. Avoid no-flow situations and minimize non-essential shutdowns.

Screw - A polyethylene metering screw with Maddock mixing section and 3:1 compression ratio is recommended. A traditional polyethylene screw can also be used. Screw cooling is not required. Excellent results are achieved with a screw speed of 40 RPM or greater.

Screen pak - A 20/40/60 screen pack combination is suggested.

Die - For smaller constructions (such as circuit size), an on-size pressure die is preferred. For larger sizes, tube-on tooling is acceptable. Draw-down ratios of 2:1 to 3:1 have been used.




Typical SI-LINK AC performance on different cable constructions and under different cure conditions meets the IEC 60502-1 hot set requirement.

| | | Time to Achieve IEC 60502-1 Hot Set of 100% | |
|---|---|---|---|
| Cable Construction | Cure Conditions | SI-LINK | SI-LINK AC |
| 0.76 mm (30 ml) Wall on 2 mm² (14 AWG) Conductor | 90 °C Sauna | > 60 Min | @ 15 Min |
| (Same) | 23 °C 70% RH Warehouse | > 10 Days | @ 1.5 Days |

The cure rate comparison shows why new SI-LINK™ AC is an ideal choice for cable manufacturers who do not wish to install or operate traditional water baths or saunas.

Conductor preheat for thin-wall constructions
Use of conductor preheat (approximately 95 - 105 °C) is critical for small, thin-wall constructions. Otherwise, when tube samples are tested for IEC Hot Set or ICEA Hot Creep, test specimens may fail prematurely (brittle break) and give a false negative degree of cure. This phenomenon is attributed to the presence of frozen-in stresses at the conductor-insulation interface of the test specimen, which are formed when the molten polymer contacts an unheated conductor surface.

Extruder temperature profile - SI-LINK AC has been processed successfully at melt temperatures ranging from 150 - 210 °C. To account for differences in extruder heat uniformity and thermocouple functioning, Dow E&T recommends that customers target a melt temperature of 170 - 180 °C. Adjust the melt temperature upward or downward to optimize the melt mixing, surface smoothness and line speed.

Cooling water trough - A cooling gradient is recommended. In general, maximize the air gap between the extruder die and water trough to improve tensile properties. The water temperature in the initial sections of the cooling trough (those closest to the extruder) should be set to 60 - 90 °C. The remaining sections should ramp down to room temperature.

Start up and shut down - Follow good cable manufacturing practices.

## About Dow Electrical & Telecommunications

Dow E&T, a business unit of The Dow Chemical Company ("Dow"), is a leading global provider of products, technology, solutions and knowledge that sets standards for reliability, longevity, efficiency, ease of installation and protection that the power and telecommunications industries can count on in the transmission, distribution and consumption of power, voice and data. Understanding that collaboration is essential to success, Dow E&T works together with cable makers, other industry suppliers, utilities, municipalities, testing institutes and other organizations around the world to help develop solutions and create mutual value that will sustain these industries for years to come. For more information, visit www.dow.com/electrical.

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