# UNIGARD™ RE DFDC-1638 BK

Non-Halogen, Flame Retardant, Thermoplastic Jacket Compound

The Dow Chemical Company

## Message:

No halogen, flame retardant, thermoplastic sheath material
UNIGARD™RE DFDC-1638 Black is a halogen-free, high flame retardant grade, thermoplastic, low smoke, low corrosion and low toxicity material. This material is used in the field of universal electric sheath. The sheath made with this product can easily pass the IEEE-383/UL-1685 (limited smoke production test) vertical bracket cable combustion test. Of course, the structure of the cable plays an important role in the flame retardant performance. The maximum operating temperature of cables using this material as a sheath can be as high as 90°C.
This product can replace PVC, low-smoke PVC and halogen-containing rubber as sheath materials. It has excellent fire safety (low smoke, low corrosion and low toxicity) and good performance balance. This product can meet or exceed the specifications of many industries for sheath materials: UL-1277 bracket cables, general-purpose communication cables required by UL Subject 444, rail transit applications and various international application fields.
As a halogen-free flame retardant sheath material, DFDC-1638 Black can also be used to replace ordinary non-halogen sheath products. Compared with the existing non-halogen sheath products, the extrusion temperature of this product is higher (up to 392 °F [200°C]), and the common single spiral metering PE screw can be used for extrusion processing.
Features
UNIGARD RE DFDC-1638 Black has the following characteristics:
High flame retardancy (IEEE 383 combustion test grade)
Environmental protection (lead-free, halogen-free, sulfur-free/antimony-free)
low smoke, low corrosiveness and low toxicity
Easy extrusion without special screw
Excellent cutting resistance, extrusion resistance and wear resistance
Good UV resistance, moisture resistance and waterproof performance
Has a good balance between toughness and flexibility
electrical mark resistance and corrosion resistance

| General Information | |
|---|---|
| Uses | Flame Retardant Jacketing<br>Industrial Cable Jacketing<br>LSZH Jacketing<br>Wire and cable applications<br>Communication wire sheath |
| Agency Ratings | IEEE 383<br>UL 1277<br>UL 1685<br>UL 444 |
| Forms | Particle |
| Processing Method | Extrusion |

| Physical | Nominal Value | Unit | Test Method |
|---|---|---|---|
| Density | 1.50 | g/cm³ | ASTM D1505 |
| Mechanical Water Absorption - 7 days (70°C) | 14.3 | mg/in² | UL 1581 |
| Taber Abrasion Resistance [1] | 1 | % | ASTM D1044 |
| Shrinkback - 4 hrs (100°C) | 5.3 | % | REA 89 |
| Tensile strength retention rate | | | ASTM D638 |

| | | | |
|---|---|---|---|
| 100°C [2] | 95 | % | ASTM D638 |
| 7 days : 121°C | 110 | % | ASTM D638 |
| Elongation retention rate | | | ASTM D638 |
| 100°C [3] | 70 | % | ASTM D638 |
| 7 days : 121°C | 63 | % | ASTM D638 |
| Thermal deformation | | | UL 1581 |
| 100°C | 5.2 | % | UL 1581 |
| 121°C | 49 | % | UL 1581 |
| Acid Gas Test | | | MIL C-24643 |
| Acid by Weight | 0.43 | % | MIL C-24643 |
| US Navy pH | 3.30 | | MIL C-24643 |
| Toxicity | 0.820 | | NES 713 |
| Acid gas emission pH-International Electrotechnical Comm. | 5.20 | ppg | IEC 754-2 |
| Acid gas emission conductivity-Conductivity Change | | µS/mm | IEC 754-2 |
| Temperature index (combustion)-Critical | > 375 | °C | NES 715 |
| Smoke (2.54mm) | 12.0 | | NES 711 |
| Smoke Density | | | ASTM E662 |
| Flaming Mode - D1.5 : 2.54 mm | 0.40 | | ASTM E662 |
| Flaming Mode - D4.0 : 2.54 mm | 2.7 | | ASTM E662 |
| Flaming Mode - Dm, (corr.) : 2.54 mm | 59 | | ASTM E662 |
| Non-flaming Mode - D1.5 : 2.54 mm | 0.70 | | ASTM E662 |
| Non-flaming Mode - D4.0 : 2.54 mm | 21 | | ASTM E662 |
| Non-flaming Mode - Dm, (corr.) : 2.54 mm | 280 | | ASTM E662 |
| Track and Erosion Resistance | Pass @ 240 hrs | | ASTM D2132 |
| Sunlight Resistance | Pass | | UL 1581 |
| Environmental Stress-Cracking Resistance (10% Igepal) | 720 | hr | ASTM D1693 |
| **Hardness** | **Nominal Value** | **Unit** | **Test Method** |
| Durometer Hardness (Shore A) | 88 | | ASTM D2240 |
| **Mechanical** | **Nominal Value** | **Unit** | **Test Method** |
| Tensile Strength | 13.8 | MPa | ASTM D638 |
| Tensile Elongation (Break) | 160 | % | ASTM D638 |
| Flexural Modulus - 1% Secant | 207 | MPa | ASTM D790 |
| **Elastomers** | **Nominal Value** | **Unit** | **Test Method** |
| Tear Strength (Split) | 6.1 | kN/m | ASTM D470 |
| **Thermal** | **Nominal Value** | **Unit** | **Test Method** |
| Brittleness Temperature | -20.0 | °C | ASTM D746 |
| **Electrical** | **Nominal Value** | **Unit** | **Test Method** |
| Volume Resistivity | 3.9E+14 | ohms·cm | ASTM D257 |
| Dielectric Constant | | | ASTM D150 |

| | | | |
|---|---|---|---|
| 60 Hz | 3.72 | | ASTM D150 |
| 100 kHz | 3.63 | | ASTM D150 |
| 1 MHz | 3.56 | | ASTM D150 |
| Dissipation Factor | | | ASTM D150 |
| 60 Hz | 5.0E-3 | | ASTM D150 |
| 100 kHz | 7.2E-3 | | ASTM D150 |
| 1 MHz | 0.013 | | ASTM D150 |

| Flammability | Nominal Value | Unit | Test Method |
|---|---|---|---|
| Oxygen Index | 40 | % | ASTM D2863 |

| Additional Information | Nominal Value | Test Method |
|---|---|---|

Fluid Resistance:Diesel Fuel, MIL-F-16884, 24 hrs, 35°C
Extruded tapes (25 mil) or compression-molded plaques, except for these items based on 45 mil/14 AWG (1.63 mm dia.) wires.
Tensile Strength Retention: 76%
Elongation Retention: 112%
Hydraulic Fuel, MIL-H-5606, 24 hrs, 49°C
Extruded tapes (25 mil) or compression-molded plaques, except for these items based on 45 mil/14 AWG (1.63 mm dia.) wires.
Tensile Strength Retention: 66%
Elongation Retention: 98%
Hydraulic Fuel, MIL-H-17672, 24 hrs, 49°C
Tensile Strength Retention: 72%
Elongation Retention: 105%
Lubricating Oil, MIL-L-23699, 24 hrs, 49°C
Tensile Strength Retention: 80%
Elongation Retention: 116%
ASTM #2 Oil, 4 hrs, 70°C
Tensile Strength Retention: 65%
Elongation Retention: 87%

## Extrusion instructions

DFDC-1638 Black can be processed on a wide range of commercially available cable fabrication equipment. Generally, it is recommended that a low compression, shallow metering PE screw be used for processing this product. A very low compression (1.1:1 type) screw can be used successfully; however, breakerplate and 20/40 mesh screen pack should be used to generate adequate back-pressure.Based on tests completed on 2.5 inch, 24:1 Davis Standard extruder, the following typical conditions are recommended as a starting point. However, it may be necessary to optimize conditions for a given set of construction, extruder-screw configuration and tooling.Extruder
Extruder L/D 20:1 to 24:1
Screw Metering Depths:
2.5 in: 110-130 mil
3.5 in: 140-170 mil
4.5 in: 200-240 mil
Compression Ratio 3:1
Temperature Profile
Feed Zone: 300°F-325°F (149°C-162°C)
Barrel Zone: 380°F-400°F (193°C-204°C)
Head/Die Zone: 350°F-360°F (175°C-180°C)
Flat temperature profile: 360°F-400°F (180°C-204°C)
Draw-Down Ratio (DDR)
Core Diameter less than 0.5 in (13 mm) 1:1 to 1.25:1
Core Diameter greater than 0.5 in (13 mm) 2:1
Tooling
Semi-pressure tooling improves surface finish. Tube-on tooling: Retract guider-tip slightly into die.
Die
Short-land tapered die is preferred.
Vacuum
Though not usually necessary, on occasion, may help obtain a tight jacket and offset any low DDR effect.
Air-Gap/Cooling Water
Short air gap (such as 6 inches or 150 mm) and ambient water.
Pre-Drying
Pre-drying at approximately 158°F (70°C) for 4 hours is recommended in commercially available dehumidifying dryers. Do not heat over 195°F (90°C).

| NOTE | |
|---|---|
| 1. | 1000 cycles |
| 2. | 10 days. Based on 0.045 in./14 AWG (1.63 mm dia.) wires. |
| 3. | 10 days. Based on 0.045 in./14 AWG (1.63 mm dia.) wires. |



## Recommended distributors for this material

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