



# UL-RECOGNIZED 600 VOLT CLASS ELECTRICAL 220 °C INSULATION SYSTEMS BASED ON NOMEX®

## System 10-1 System for 220 °C Operation

### Magnet Wire (Copper or Aluminum)

MW16, MW60, MW61 or Bare Conductor insulated with any NOMEX® Paper type listed below as ground and phase insulation, with a minimum thickness of 2 mils

### Ground and Phase Insulation

NOMEX® Brand Papers and Pressboards, as follows:

- Type 410, 5 mils
- Type 411, 10 mils
- Type 414, 5 mils
- Type 418, 5 mils
- Type 419, 7 mils
- Type E56, 7 mils
- Type 992, 63 mils (thinnest available)
- Type 993, 40 mils (thinnest available)
- Type 994, 40 mils (thinnest available)
- Laminates containing 5 mils of Type 416 and/or Type 464

### Additional Materials which can be included, as required by design:

#### Minor Sheet Insulation

Any Ground Insulation Material listed above or any listed below, with no minimum thickness

- DuPont: NOMEX® Type 410, 411, 414, 418, 419, 992, 993, 994, E56

#### Varnish

- Dow Corning: DC-997

#### Tapes

- 3M Company: 27
- Intertape Polymer Group (Tesa/Tuck): 4616-00 (51)
- Nitto-Permacel: P21, P262

### Spacers and Wedges

Any minor insulation, with no minimum thickness requirement.

- DuPont: NOMEX®
- Glastic: SG-200
- Resolute Polyglas: Supersil

### Spiral Tubing

- D&B Products (Formerly Plastic Tubes): NOMEX®
- Niemand Bros.: NOMEX®
- Precision Paper Tube Corp (Buckeye Bobbin Div.): NOMEX®
- Precision Paper Tube Corp (Resinite Div.): NOMEX®
- Stone Industrial: NOMEX®

### Sleeving and Tie Cord

- DuPont: NOMEX® Yarn

## System 10-2 System for 220 °C Operation

### Magnet Wire (Copper or Aluminum)

MW16, MW60, MW61 or Bare Conductor insulated with any NOMEX® Paper type listed below as ground and phase insulation, with a minimum thickness of 2 mils.

### Ground and Phase Insulation

NOMEX® Brand Papers and Pressboards, as follows:

- Type 410, 5 mils
- Type 411, 10 mils
- Type 414, 5 mils
- Type 418, 5 mils
- Type 419, 7 mils

- Type E56, 7 mils
- Type 992, 63 mils (thinnest available)
- Type 993, 40 mils (thinnest available)
- Type 994, 40 mils (thinnest available)
- Laminates containing 5 mils of Type 416 and/or Type 464

**Additional Materials which can be included, as required by design:**

**Minor Sheet Insulation**

- Any Ground Insulation Material listed above or any listed below, with no minimum thickness.
- DuPont: NOMEX® Type 410, 411, 414, 418, 419, 992, 993, 994, E56
- DuPont (Formerly VRI-USA, Inc.): NMN, NKN
- Arlon: Astrotherm 200XHX, Astrotherm 180XHX, Astrotherm 200XMX, Astrotherm 180XMX, B-Staged Epoxy-Coated NOMEX®
- Bedford Materials: Pyromid, Pyrolam, NMN, 5JF44-Varnished Glass, 5JF47-Varnished Glass
- EIS/Fabrico: NOMEX® Type 411/copper

**Core Tubes and Bobbins**

- DuPont: RYNITE® 415HP, RYNITE® FR515, RYNITE® 530, RYNITE® 530L, RYNITE® FR530, RYNITE® FR530L, RYNITE® FR543, RYNITE® 935, RYNITE® FR945
- Paramount: NOMEX®
- Precision Paper Tube Corp: Thermoform 700
- Stone Industrial: NOMEX®, KAPTON®, Polyester/Glass

**Tapes**

- 3M Company: 1, 27, 38, 46, 60, 61, 62, 69, 79, 90, 92, 1339, 1554, MR98
- Carolina Narrow Fabric: 16412-2
- Hesgon: Fiberglass yarn
- Ideal: 750, 780, 7170, 7177, 7270, 7300, 7307, 7807
- Intertape Polymer Group (Tesa/Tuck): 4238(16), 4426(41), 4427(415), 4428(23), 4429(24), 4564, 4616-00(51), 4616-04(56), 4617(58), 4618(59), 51560, 51578(415SA), 51579(6161), 51580(40), 51587(49), 51588(50), 51589(64), 51594(6106), 51597(15), 51599(17), 54562, 56228FR
- Mutual Industries: C150WS
- Nitto-Denko: 188, 360UL, 380, 903
- Nitto-Permacel: P21, P212, P213, P222, P224, P262, P421, P422, P440
- P Leo: 1G155, 1G180, 1H850, 1K7170, 1K7177, 1K7270, 1PG880, 1PG887
- Saint-Gobain Performance Plastics (CHR Div.): G540, G551, G561, G564, G565, G569, K100, K102, K103, K104, K250, K250X, K350

**Lead Wire**

All to be isolated from direct contact with windings by minor insulation:

- Silicone Rubber, rated 200 °C
- Silicone Rubber with glass braid, rated 200 °C
- Extruded TEFLON® TFE, rated 200°C

**Spacers and Wedges**

Any minor insulation, with no minimum thickness requirement.

- DuPont: NOMEX®
- Franklin Fibre: NOMEX® Window Block
- Glastic: SG-200, FHT
- Haysite: HST-II, EHC, HTF, H755, Ultratrac H950, ETR-FR-C
- Resolute Polyglas: Supersil

**Sleeving**

- D&B Products: NOMEX®, NOMEX®/Polyester
- Euclid: NOMEX®
- Federal Mogul (Bentley Harris): 1062, 1151-HW, Ben-Har 1151-FR, Ben-Har 1151-XL-200, Ben-Har 1151-XL-240, Ben-Har Ex-Flex, Ben-Har Ex-Flex 1500, Ben-Har 1151-XL-FR-1, Ben-Har ST, Ben-Har ST-1250
- Hilec: Hilec 200C Series, Hilec 500R Series, Hilec 700C Series, Turbo 117E, Turbo 117F, Turbo 117G, Turbo 117U, Hilec Vol-glas, Hilec Vol-sil, Hilec Vol-glas P, HTS
- Stone Industrial: NOMEX®, NOMEX®/KAPTON®, NOMEX®/MYLAR®
- Suflex, Inc. (Formerly Essex): Suflex Flat Braid Type RF (6B-150 or 8A-150), Suflex Acryflex VPI-NF, Suflex Flexicone VPI, Suflex Flexicone 200, Suflex Silicone Resin, Suflex Silicone Rubber, Suflex Silicone Tying Cord, Suflex Silverflex T&D, Suflex Silverflex Unsaturated
- Varflex: Varglas ES-4400 Silicone Rubber, Varglas SR-9400 Silicone Rubber, Varglas Silicone Rubber, Varglas 240 Silicone Rubber, Varglas Hermetic, Varglas Non-Fray Type H, Varglas Silicone Resin 500, VITON® 231, Silflex

**Tie Cord**

- Atkins and Pearce: 17-200-NX, C81104SG
- Varflex: No. 48
- Western Filament: DHS-1CL, 50DOF17W

**Varnish**

- Ranbar Electrical Materials: B185-4

## System 10-3 System for 220 °C Operation

### Magnet Wire (Copper or Aluminum)

MW16, MW60, MW61 or Bare Conductor insulated with any NOMEX® Paper type listed below as ground and phase insulation, with a minimum thickness of 2 mils

### Ground and Phase Insulation

NOMEX® Brand Papers and Pressboards, as follows:

- Type 410, 5 mils
- Type 411, 10 mils
- Type 414, 5 mils
- Type 418, 5 mils
- Type 419, 7 mils
- Type E56, 7 mils
- Type 992, 63 mils (thinnest available)
- Type 993, 40 mils (thinnest available)
- Type 994, 40 mils (thinnest available)
- Laminates containing 5 mils of Type 416 and/or Type 464

### Additional Materials which can be included, as required by design:

#### Minor Sheet Insulation

Any Ground Insulation Material listed above or any listed below, with no minimum thickness

- DuPont: NOMEX® Type 410, 411, 414, 418, 419, 992, 993, 994, E56, KAPTON® HN, KAPTON® CR
- DuPont (Formerly VRI-USA, Inc.): NMN, NKN
- Arlon: Astrotherm 200XHX, Astrotherm 180XHX, Astrotherm 200XMX, Astrotherm 180XMX, B-Staged Epoxy-Coated NOMEX®
- Bedford Materials: Pyrolam, NMN, 8929 Silicone Glass
- EIS/Fabrico: NOMEX® Type 411/copper, Revval T-411

#### Core Tubes and Bobbins

- DuPont: RYNITE® 415HP, RYNITE® FR515, RYNITE® 530, RYNITE® 530L, RYNITE® FR530, RYNITE® FR530L RYNITE® FR543, RYNITE® 935, RYNITE® FR945, ZYTEL® 70G33L
- Paramount: NOMEX®
- Precision Paper Tube Corp: Thermoform 700
- Stone Industrial: NOMEX®, KAPTON®

#### Tapes

- 3M Company: 1, 10, 27, 38, 44, 46, 55, 56, 57, 60, 61, 62, 69, 75, 79, 90, 92, 1169, 1205, 1318, 1339,, 1554, MR98, Transfer Adhesive 467, Transfer Adhesive 468

- Avery Dennison: Transfer Adhesive 1122
- Daeil Chemical: 127, 350A
- Electro Tape Specialties: 3-S, 95, 149-Y, 451, 605
- Hyupsung Chemical: Korta 210, Korta 230
- Ideal: 724, 725, 730, 750, 780, 7017, 7170, 7270, 7300, 7307, 7807
- Intertape Polymer Group (Tesa/Tuck): 4118, 4238(16), 4426(41), 4426-04(39), 4427(415), 4428(23), 4429(24), 4564, 4616-00(51), 4616-04(56), 4617(58), 4618(59), 51560, 51578(415SA), 51579(6161), 51580(40), 51587(49), 51588(50), 51589(64), 51594(6106), 51596, 51597(15), 51599(17), 54562, 56228FR
- Nitto-Denko: 188, 360, 380, 903
- Nitto-Permacel: P21, P212, P213, P221, P222, P223, P224, P243, P245, P246, P247, P252, P262, P421, P422, P423, P424, P440, P597B (transfer adhesive)
- P Leo: 1G130, 1G155, 1G180, 1H850, 1K7170, 1K7270, 1P717, 1PG880, 1PG887, 1PK825, 1PN828
- Saint-Gobain Performance Plastics (CHR Div.): G540, G551, G561, G564, G565, G569, K100, K102, K103, K104, K250, K250X, K350, M52, M54, M56, M64, M97, M99
- Spec Tape: ST-101, NOMEX® Tape
- Sung-Won Electric: ANT-155
- Tae Hwa Industrial: TH-GC012, H-2715

#### Lead Wire

All to be isolated from direct contact with windings by minor insulation:

- Silicone Rubber, rated 200 °C
- Silicone Rubber with glass braid, rated 200 °C
- Extruded TEFLON® TFE, rated 200 °C
- Extruded TFE rated, 200 °C

#### Spacers and Wedges

Any minor insulation, with no minimum thickness requirement.

- DuPont: NOMEX®
- Cogebi: Mica Paper 0.25t, 0.35t
- Franklin Fibre: NOMEX® Window Block
- Glastic: SG-200, FHT
- Haysite: HST-II, EHC, HTF, H755, Ultratrac H950, ETR-FR-C
- Iten Industries: HT200
- NVF: GP200HT
- Resolute Polyglas: Supersil, Polyglass polyester, FM, FR
- Sung-Won Electric: Mica SK661

## Sleeving

- D&B Products: NOMEX®, NOMEX®/Polyester
- Federal Mogul (Bentley Harris): 1062, Ben-Har 1151-FR, Ben-Har 1151-XL-FR-1, 1151-HW, Ben-Har 1151-XL-200, Ben-Har 1151-XL-240, Ben-Har Ex-Flex, Ben-Har Ex-Flex 1500, Ben-Har ST, Ben-Har ST-1250, GR-2
- Hilec: Hilec 200C Series, Hilec 500R Series, Hilec 700C Series, Hilec 800C Series, Turbo 117E, Turbo 117F, HTS, NOMEX® Sleeving, Natglas, Natglas T&D, Silicone Rubber Coated Fiberglass
- Stone Industrial: NOMEX®, NOMEX®/KAPTON®, NOMEX®/MYLAR®
- Suflex, Inc. (Formerly Essex): Suflex Flat Braid Type RF (6B-150 or 8A-150), Suflex Acryflex, Suflex Acryflex F, Suflex Flexicone VPI, Suflex Acryflex VPI-NF, Suflex Flexicone 200, Suflex Silicone Resin, Suflex Silicone Rubber, Suflex Silicone Tying Cord, Suflex Silverflex T&D, Suflex Silverflex Unsaturated
- Varflex: Varglas ES-4400 Silicone Rubber, Varglas Silicone Rubber, Varglas Hermetic, Varglas Non-Fray Type H, Varglas Non-Fray Type HO, Varglas Non-Fray Type HP, Varglas Silicone Resin 500, VITON® 231

## Tie Cord

- Atkins and Pearce: 17-200-NX
- Breyden: G100, G150, G350, 5070, 5100, 5200, 5311, 5312, 5313
- Varflex: No. 48
- Western Filament: DHS-1CL, NFB-2CL, NRT-CL, 20HOF9A, 30HOF13W, 40HOF17W-NAT, 50DOF17W, 70HOF25S, 130HOF25W

## Adhesive

- D&K: Polyethylene adhesive/PET
- EIS/Fabrico: 809C AM/PET

## Varnish

- P. D. George Company: Pedigree 70, Pedigree 1000
- Ranbar Electrical Materials: B185, B535, B7-373
- Schenectady Chemicals: Isonel 51

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