UL-RECOGNIZED 600 VOLT CLASS ELECTRICAL
200 °C INSULATION SYSTEMS BASED ON NOMEX®

System 12-1 System for 200 °C Operation

Magnet Wire (Copper or Aluminum)
MW35, MW36, MW60, MW61, MW73, MW74 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, 7 mils
- Type 414, 5 mils
- Type 418, 3 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

Varnish
- PD George Co.: Pedigree 60-60, Ripley Resin 468-2

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 200HX, Astrotherm 180XHX, Astrotherm 200XMX, 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, 467, 468, 1169, 1205, 1318, 1339, 1554, MR98
- Avery Dennison: 1122
- Daedel Chemical: 127, 350A
- Electro Tape Specialties: 3-S, 49Y, 51, 95, 605
- Hyupsung Chemicals: 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
- 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: ST101, NOMEX® Tape
- Sung-Won Electric: ANT-155
- Tae Hwa Industrial: TH-GC012, H-2715
Lead Wire
- Silicone Rubber, rated 200 °C
- Silicone Rubber with glass braid, rated 200 °C
- Extruded TEFLOW® 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
- P Leo: SM61
- Resolute Polyglas: Supersil, Polyglass polyester, FM, FR
- Sung-Won Electric: Mica SK661

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

Tie Cord
- Atkins and Pearce: 17-200-NX
- Breyden: G100, G150, G350, 5070, 5100, 5200, 5311, 5312, 5313
- Varflex: No. 48

System 12-2 System for 200 °C Operation

Magnet Wire (Copper or Aluminum)
MW35, MW36, MW60, MW61, MW73, MW74 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, 7 mils
- Type 414, 5 mils
- Type 418, 3 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

Varnish
- Daihan Paint: DVB-2152

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

Tapes
- 3M Company: 10, 27, 44, 46, 55, 56, 69, 75, 79, 92, 1205, 1318, 1339
- Daeil Chemical: 127, 350A
- Ideal: 724, 725, 730, 7017, 7307
- Intertape Polymer Group (Tesa/Tuck): 4118, 4564, 54562
- Nitto-Permacel: P21, P212, P213, P224, P243, P245, P246, P247, P255, P256, P257, P262
- Saint-Gobain Performance Plastics (CHR Div.): G551, G565, G569, K103, K250, M52, M54, M56, M64, M99
- Sung-Won Electric: ANT-155
- Tae Hwa Industrial: TH-GC012, H-2715

Lead Wire
- Silicone Rubber, rated 200 °C
- Extruded TEFLOW® TFE, rated 200°C
Below to be isolated from direct contact with windings by minor insulation:

- Silicone Rubber with or without glass braid, rated 150 °C
- Crosslinked Polyethylene, rated 150 °C

**Spacers and Wedges**

Any minor insulation, with no minimum thickness requirement.

- DuPont: NOMEX®
- Glastic: SG-200, FHT, MTS
- Sung-Won Electric: Mica SK661

**Sleeving**

- Federal Mogul (Bentley Harris): Ben-Har 1151-XL-200, Ben-Har 1151-XL-240, Ben-Har Ex-Flex, Ben-Har ST
- Hilec: Hilec 200C Series, Hilec 700C Series
- Suflex Inc. (Formerly Essex): Suflex Acryflex F, Suflex Flexicone 200, Suflex Silicone Resin, Suflex Silicone Rubber
- Unimpregnated fiberglass by various manufacturers
- Varflex: Varglas ES-4400 Silicone Rubber, Varglas Non-Fray Type H, Varglas Non-Fray Type HO, Varglas Silicone Resin 500, Varglas Silicone Rubber, Varglas 343 Acrylic

**System 12-3 System for 200 °C Operation**

**Magnet Wire (Copper or Aluminum)**

MW35, MW36, MW60, MW61, MW73, MW74 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, 7 mils
- Type 414, 5 mils
- Type 418, 3 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

**Varnish**

- PD George Co.: Pedigree 50

**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, 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, MNM, 8929 Silicone Glass

**Core Tubes and Bobbins**

- DuPont: RYNITE® 451HP, RYNITE® FR515, RYNITE® 530, RYNITE® 530L

**Tapes**

- 3M Company: 1, 10, 11, 12, Super 20, 27, 38, 44, 46, 55, 56, 57, 60, 61, 62, 69, 75, 79, 90, 92, 467, 468, 1157R, 1169, 1205, 1276, 1312, 1318, 1339, 1350, 1554, MR94B, MR98
- Avery Dennison: 1122
- Electro Tape Specialties: 3-S, 49Y, 51, 95, 605
- Ideal: 724, 725, 730, 750, 780, 7017, 7170, 7270, 7300, 7307, 7807
- Intertape Polymer Group (Tesa/Tuck): 4118, 4238(16), 4426(41), 4427(415), 4428(23), 4429(24), 4564, 4616-00(51), 4616-04(56), 4617(58), 4618(59), 51560, 51579(415SA), 51579(6161), 51580(40), 51587(49), 51588(50), 51589(64), 51594(6106), 51596, 51597(15), 51599(17), 54562, 56228FR
- Nitto-Donko: 188, 360UL, 380, 903
- P Leo: 1G006, 1G130, 1G155, 1G180, 1H015, 1H86A, 1H801,1H802, 1H803, 1H850, 1H860, 1K063, 1K7170, 1K7270, 1N008, 1N012, 1P717, 1P801, 1P802, 1PEN2, 1PEN3, 1PG880, 1PG887, 1PK825, 1PN828, 1PNR2, 1PNR3
- 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
- Specialty Tapes: 198, 694, 2210
- Spec Tape: ST101, NOMEX® Tape

**Lead Wire**

- Silicone Rubber, rated 200 °C
- Silicone Rubber with glass braid, rated 200 °C
- Extruded TEFLOW® TFE, rated 200°C
- Extruded TFE, rated 200 °C
Spacers and Wedges

Any minor insulation with no minimum thickness requirement.

- DuPont: NOMEX®
- Cogebi: Cogemica AP80, Cogemica AP120, Cogemica AP160
- Franklin Fibre: NOMEX® Window Block
- Glastic: SG-200, FHT
- Haysite: HST-II, EHC, HTF, H755, Ultratrac H950, ETR-FR-C
- NVF: GP200HT
- P Leo: SM61
- Resolute Polyglas: Supersil, Polyglass polyester, FM, FR

Sleeving

- DuPont-Teijin Films: PEN Film (TEONEX®)
- D&B Products: NOMEX®, NOMEX®/Polyester
- Federal Mogul (Bentley Harris): 1062, 1151-HW, Ben-Har 1151-FR, Ben-Har 1151-XL-200, Ben-Har 1151-XL-240, Ben-Har 1151-XL-FR-1, Ben-Har Ex-Flex, Ben-Har Ex-Flex 1500, Ben-Har ST, Ben-Har ST-1250
- P Leo: BC Mica RP65, BC Mica SM61, DPD 02/P2/02, NMN 222, N/PEN/N, PB-2, TK-5008, TP-5013, 2T-PTFE
- 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 Acryflex VPI-NF, Suflex Flexicone 200, Suflex Flexicone VPI, Suflex Silicone Resin, Suflex Silicone Rubber, Suflex Silicone Tying Cord, Suflex Silverflex T&D, Suflex Silverflex Unsaturated, Astra 703/105
- Varflex: Varglas ES-4400 Silicone Rubber, Varglas Hermetic, Varglas Non-Fray Type H, Varglas Non-Fray Type HO, Varglas Non-Fray Type HP, Varglas Silicone Resin 500, Varglas Silicone Rubber, VITON® 231
- Unimpregnated fiberglass by various manufacturers

Tie Cord

- Atkins and Pearce: 17-200-NX
- Breyden: G100, G150, G350, 5070, 5100, 5200, 5311, 5312, 5313, BPCCT155, BPCCT180
- Varflex: No. 48

System 12-5 System for 200 °C Operation

Magnet Wire (Copper or Aluminum)

MW35, MW36, MW73, MW74, 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.

Appliance Wire

- Han Kyung: HKSW-1 insulated with 0.70 mm thick silicone rubber and 0.15 mm thick polyester fiber braiding impregnated with varnish DC6-2230 by Dow Corning
- Nikkan Industries: WP-60-10S insulated with 0.60 mm thick silicone rubber and 0.15 mm thick silicone impregnated polyester fiber or glass braiding
- Nissei: RSU-T insulated with 0.70 mm thick silicone rubber and 0.15 mm thick silicone impregnated polyester fiber braiding
- Young Chang: Y-SRPW insulated with 0.65 mm thick silicone rubber and 0.20 mm thick silicone impregnated polyester fiber braiding

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, 3 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

Varnish

- Daihan Paint: DVB-2152
- Dow Corning: DC-997
- Hanval: TSHP, TSHP-F

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
Spacers and Wedges
Any minor insulation with no minimum thickness requirement.

- DuPont: NOMEX®
- K.E.T.: MG-630823
- Sung Won Electric: SK 641, SK 661

Sleeving
- Sung Won Electric: 2MR, 3MR, 5MR

Tapes
- Daeil: 127
- Ducksung: DTS-204A
- Hyupsung: Korta 210
- Sung Won Electric: NOMEX® Adhesive Tape ANT-155

Lead Wire
- Silicone Rubber, rated 200 ºC
- Silicone Rubber with glass braid, rated 200 ºC

Tie Cord
- Unimpregnated fiberglass, various manufacturers

For Information about alternatives or additions to this new UL System, contact Roger Wicks - DuPont:
- Tel: (804) 383-3300
- Fax: (804) 383-2009
- E-mail: Roger.C.Wicks@usa.dupont.com
These insulation systems conform to DuPont’s UL File E-57692 as of the date of preparation of this brochure, and are subject to change with material availability. Product safety information is available upon request. This information corresponds to our current knowledge on the subject. It is offered solely to provide possible suggestions for your own experiments. It is not intended, however, to substitute for any testing you may need to conduct to determine for yourself the suitability of our products for your particular purposes. This information may be subject to revision as new knowledge and experience becomes available. Since we cannot anticipate all variations in actual end-use conditions, DUPONT MAKES NO WARRANTIES AND ASSUMES NO LIABILITY IN CONNECTION WITH ANY USE OF THIS INFORMATION. Nothing in this publication is to be considered as a license to operate under or a recommendation to infringe any patent right.

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