



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 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, 467, 468, 1169, 1205, 1318, 1339, 1554, MR98
- Avery Dennison: 1122
- Daeil 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
- Nitto-Permacel: P21, P212, P213, P221, P222, P223, P224, P243, P245, P246, P247, P252, P262, P421, P422, P423, P424, P440, P59713
- 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 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
- 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
- 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 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
- 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
- Western Filament: DHS-1CL, NFB-2CL, NRT-CL, 20HOF9A, 30HOF13W, 40HOF17W-NAT, 50DOF17W, 70HOF25S, 130HOF25W

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 TEFLON® 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, 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

Core Tubes and Bobbins

- DuPont: RYNITE® 415HP, 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, 51578(415SA), 51579(6161), 51580(40), 51587(49), 51588(50), 51589(64), 51594(6106), 51596, 51597(15), 51599(17), 54562, 56228FR
- Nitto-Denko: 188, 360UL, 380, 903
- Nitto-Permacel: P21, P212, P213, P221, P222, P223, P224, P243, P245, P246, P247, P249, P252, P256, P262, P421, P422, P423, P424, P440, P59713
- P Leo: 1G006, 1G130, 1G155, 1G180, 1H015, 1H86A, 1H801, 1H802, 1H803, 1H850, 1H860, 1K063, 1K7170, 1K7177, 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 TEFLON® 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
- 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
- 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
- Western Filament: DHS-1CL, NFB-2CL, NRT-CL, 20HOF9A, 30HOF13W, 40HOF17W-NAT, 50DOF17W, 70HOF25S, 130HOF25W

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: HKSU-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 °C
- Silicone Rubber with glass braid, rated 200 °C

Tie Cord

- Unimpregnated fiberglass, various manufacturers

For Information about alternatives or additions to this new UL System, contact Roger Wicks - DuPont:

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