

CONSTRUCTION DETAILS :

TABLE I

CLASS 130(B) TRANSFORMER MOTOR COIL INSULATION SYSTEM
DESIGNATED Z150N1

Insulation thicknesses indicated below are minimums.

The use of this insulation system is limited to the combination of materials specified below. Where more than one item is designated under Insulation Function, they may be used together, unless otherwise indicated, or they may be alternatives to one another. Functions designated "optional" are not necessarily required for every design.

<u>Insulation Function</u>	<u>Insulating Material</u>
1. Magnet Wire	Aluminum or copper, round or rectangular or sheet.
2. Magnet Wire Insulation	Recognized Component - Magnet wire (OBMW2), single build or greater. Magnet wire types listed below may be used in combination within a single product. A. Polyester basecoat with a polyamide topcoat, ANSI MW76 type, MW35 type various manufacturers. B. Polyurethane basecoat, with a polyamide topcoat, ANSI MW28 Type and MW80, various manufacturers. C. Solderable polyester coated ANSI MW26 type, various manufacturers. D. Polyurethane coated ANSI MW75 type, MW79 type, various manufacturers.
3. Ground and Interwinding Insulation	A. Recognized Component (QMFZ2) nylon, Grade Zytel FR-50, 101L, E101L, 101F, 132F, 103HSL, 103FHS, E101, E103HSL, 0.028 in min thickness; Grade Zytel 70G13L, 70G33L, 70G33HSIL, 70G30HSL, 0.15 in min thickness. E.I. DuPont. B. Nomex 410, 414, 418, 0.005 in min thickness by E.I. DuPont. C. Mylar, 0.005 in min thickness by E.I. DuPont. D. Recognized Component - Insulating Tape (QMFZ2), Tapes made from Polyethylene terephthalate film, 1 mil Minimum thickness, tapes Manufactured by P. Leo & Co., five layers minimum: 1. No. 1P801 2. No. 1P802

Insulation FunctionInsulating Material

4. Minor Sheet Insulation (Layer, Outer Wrap, etc.)
- A. The following sheets manufactured by Keene Corp. (Optional)
1. Extermat DM100
 2. PCMS-5 polyester film
 3. KMK 2-1-2
 4. Astromat NMN 5-10-5
 5. HS coated film -2 polyester film RM 7-2
 6. Permatherm Plus CVM5-2 Cequin V bonded to polyester film
 7. Epoxy "B" stage coated Nomex 5
 8. Astrotherm 200 XHX 3-3-3
 9. Estermat DM100 2-2-2
 10. Estermat DM70 2-2-2
 11. PSA coated Nomex 5 mil
 12. Astrotherm 180XMX 5-3-5
 13. Estermat HCMC 5-3-5
 14. Kraft/Mylar 7-3
 15. Permatherm Plus CM10-1
- B. The following sheets manufactured by Spaulding.
1. Flexlam RM 5-2
 2. Flexlam DMD10C 3-3-3
 3. Flexlam CMC 5-5-5
 4. Flexlam TMT 3-7, 5-3
 5. Flexlam QM 5-2
 6. Flexlam NMN 3-3-3
 7. Rag paper
- C. The following sheets manufactured by Riegel.
1. EB100 OR-C Kraft paper
 2. EB100 AZ-C Kraft paper
 3. EB100 AG-C Kraft paper - manufactured to G.E. Spec. A1A7D
 4. EB100 AE-C Kraft paper
 5. 65C Rise paper
- D. The following sheets manufactured by P. Leo.
1. NMN-***
 2. TP-****
 3. TK-****
 4. TPT-*****

* - Represents layer thickness in mils.

Insulation FunctionInsulating Material

4. Minor Sheet Insulation (Layer, Outer Wrap, etc.)
- E. The following sheets manufactured by Quin-T Corp. (Optional) (Cont'd)
1. TufQuin 110
 2. CeQuinBord Cel/Sat with epoxy
 3. CeQuin Ge Sat
 4. CeQuin IF
 5. CeQuin 3000
 6. AraQuin
 7. CeQuin 486C stage
 8. CeQuin Board T-3
 9. CeQuin IG
 10. CeQuin I
 11. CeQuin II
 12. CeQuin 30F
 13. CeQuin 500
 14. CeQuin Ge Sat G
- F. The following sheets manufactured by Cotrell.
1. Kraft
 2. Copaco
 3. Fish paper
- G. The following sheets manufactured by DuPont.
1. Nomex 410
 2. Mylar
- H. The following sheets manufactured by Bedford Materials.
1. Memco 100 DMD
 2. 5JF44 Varnish Cloth
 3. Pyroglas
 4. Pyrolam 100X
- I. The following sheets manufactured by Miki Tokusys Paper Mfg.
1. PB-2 Press Board Paper

Insulation FunctionInsulating Material

5. Core Tube or Bobbin (Mechanical Support Only) (Optional)
- A. The following tubes manufactured by Precision Tube.
 - 1. HS Mylar
 - 2. Resinite
 - 3. Vulcanized fiber
 - 4. Acetate
 - 5. Thermoform 700 Nomex
 - 6. Resinite FR 9120
 - 7. Polyester glass
 - 8. Thinwall P1000
 - 9. Pyro 310
 - 10. Kapton
 - 11. Dielectric Kraft
 - 12. Mylar
 - B. The following tubes manufactured by Stone Industries.
 - 1. Mylar
 - C. The following tubes manufactured by E.I. DuPont.
 - 1. Rynite FR530
 - 2. Rynite FR945
 - 3. 935
6. Tape (Optional)
- A. The following tapes manufactured by P. Leo.
 - 1. No. 1A025
 - 2. No. 1C821
 - 3. No. 1G006
 - 4. No. 1G015
 - 5. No. 1G027
 - 6. No. 1G130
 - 7. No. 1G830
 - 8. No. 1H850
 - 9. No. 1H860
 - 10. No. 1H86A
 - 11. No. 1H861
 - 12. No. 1H862
 - 13. No. 1H863
 - 14. No. 1K063
 - 15. No. 1K7177
 - 16. No. 1M868
 - 17. No. 1N008
 - 18. No. 1N012
 - 19. No. 1P130
 - 20. No. 1P350
 - 21. No. 1P700
 - 22. No. 1P701
 - 23. No. 1P702
 - 24. No. 1P717
 - 25. No. 1P800
 - 26. No. 1P801
 - 27. No. 1P802
 - 28. No. 1P808
 - 29. No. 1P830
 - 30. No. 1P833
 - 31. No. 1P9FR
 - 32. No. 1PK825
 - 33. No. 1PN820
 - 34. No. 1PN828
 - 35. No. 1PEN2

Insulation FunctionInsulating Material6. Tapes (Optional)
(Cont'd.)

B. The following tapes manufactured by Permacel.

1. No. P21
2. No. P224
3. No. P234
4. No. P245
5. No. P248
6. No. P256
7. No. P262
8. No. P277
9. No. P286
10. No. P422

C. The following types manufactured by Ideal Tape Inc.

1. No. 720
2. No. 725
3. No. 750
4. No. 7017
5. No. 7177
6. No. 7300
7. No. 7807

D. The following tapes manufactured by Minnesota Mining & Mfg. Co.,
3M Co.

- | | |
|-----------------|---------------|
| 1. No. 3 | 8. No. 60 |
| 2. No. 11 | 9. No. 69 |
| 3. No. Super 20 | 10. No. 90 |
| 4. No. 27 | 11. No. 92 |
| 5. No. 44 | 12. No. 1312 |
| 6. No. 46 | 13. No. 1350 |
| 7. No. 56 | 14. No. 1350F |

Insulation Function

Insulating Material

6. Tapes (Optional)
(Cont'd.)

E. The following tapes manufactured by Nitto Denko Corp.

- | | |
|---------------|----------------|
| 1. No. 5 | 5. No. 354E |
| 2. No. 31B | 6. No. 360N UL |
| 3. No. 156 | 7. No. 380 |
| 4. No. 188 UL | 8. No. 903 |

F. The following tapes manufactured by Electro Tape Specialties.

- | | |
|-------------------|-----------------|
| 1. No. ETS-149-21 | 7. No. ETS-451 |
| 2. No. ETS-21FR | 8. No. ETS-92 |
| 3. No. ETS-418 | 9. No. ETS-29 |
| 4. No. ETS-23 | 10. No. ETS-97 |
| 5. No. ETS-94 | 11. No. ETS-269 |
| 6. No. ETS-95 | |

G. The following tapes manufactured by Tesa.

- | | |
|----------------|-----------------|
| 1. No. 51597 | 5. No. 51582 |
| 2. No. 4428 | 6. No. 4616-00 |
| 3. No. 4426-04 | 7. No. 51589-00 |
| 4. No. 51596 | 8. No. 4353 |

H. The following tapes manufactured by CHR.

1. G551
2. G565
3. K103
4. K250
5. M54
6. M97

Insulation FunctionInsulating Material

7. Lead Wire (Optional)

- A. Chemically crosslinked polyethylene, rated 125°C
- B. Chemically crosslinked polyethylene, rated 150°C
- C. Chlorosulfonated polyethylene, rated 105°C+
- D. Polyvinyl chloride, rated 105°C+
- E. Silicone rubber with glass braid, rated 150°C
- F. Silicone rubber with glass braid, rated 200°C
- G. Silicone rubber without glass braid, rated 150°C
- H. Silicone rubber without glass braid, rated 200°C
- I. Ethylene propylene diene monomer, rated 125°C
- J. Ethylene propylene diene monomer, rated 150°C
- K. Irradiated crosslinked PE, rated 125°C
- L. Irradiated crosslinked PE, rated 150°C
- M. Irradiated crosslinked polymeric, rated 125°C
- N. Irradiated crosslinked polymeric, rated 150°C
- O. ETFE-extruded Tefzel, rated 150°C
- P. TFE-extruded Teflon, rated 200°C
- Q. Tefzel 750, rated 200°C

+ - To be isolated from direct contact with windings (magnet wire) by any insulating material (tape, layer insulation, sleeving, etc.) listed in this table.

8. Spacers and Wedges (Optional)

- A. The following spacers and wedges manufactured by NVF.
 - 1. Lamikor GP-9107, GP-9206, GP-9306, GP-200HP
 - 2. G-7-838
 - 3. G-11-861
 - 4. XX-324
 - 5. LE-675
 - 6. EG873
 - 7. G-9-818
 - 8. Peerless 110
 - 9. G-5-813
- B. The following spacers and wedges manufactured by Haysite.
 - 1. No. HST-II
 - 2. No. EHC
 - 3. No. ETR-FR-C
 - 4. No. EFM
 - 5. FHT
 - 6. H755
 - 7. ETS
- C. The following spacers and wedges manufactured
 - 1. Poly (Dog Bone)
 - 2. SG-200
 - 3. FHT
 - 4. UTR (GPO-3)
 - 5. UTS (GPO-2)
 - 6. 1412

Insulation FunctionInsulating Material

8. Spacers and wedges (Optional) (Cont'd)

D. The following spacers and wedges manufactured by Dupont.

1. Rynite FR530
2. Rynite FR945
3. Rynite 935
4. Zytel, Grades 70G13L, 70G33L, 70G33HSIL, 10IL, 103HSL, FR50 or 70G30HSL
5. Nomex 410

E. The following spacers and wedges manufactured by Liberty Polyglas.

1. Supersil for 200 systems
2. Polyester for 130 systems
3. Supersil for 180 systems
4. Polyester for 105 systems
5. Polyester for 155 systems
6. Polyester for 180 systems

F. The following spacers and wedges (barrier tape) by P. Leo :

- | | |
|---------------|----------------|
| 1. No. 1P801 | 12. No. 1G006 |
| 2. No. 1P802 | 13. No. 1G015 |
| 3. No. 1P130 | 14. No. 1G027 |
| 4. No. 1P830 | 15. No. 1H860 |
| 5. No. 1P833 | 16. No. 1H86A |
| 6. No. 1P700 | 17. No. 1H861 |
| 7. No. 1P701 | 18. No. 1H862 |
| 8. No. 1P702 | 19. No. 1H863 |
| 9. No. 1P717 | 20. No. 1PK825 |
| 10. No. 1P350 | 21. No. 1PN820 |
| 11. No. 1A025 | 22. No. 1PN828 |

9. Sleeving (Optional)

A. The following sleeveings manufactured by Essex.

1. Suflex silicone rubber
2. Suflex silicone resin
3. Suflex silver Flex T & D
4. Suflex Flexicone 200
5. Suflex Acrylflex F
6. Suflex Acryflex VPI-NF

Insulation FunctionInsulating Material

9. Sleeving (Optional) (Cont'd)

B. The following sleeveings manufactured by Bentley Harris.

1. Ben-Har Acryl
2. Ex-Flex 1500
3. 1062
4. Ben-Har 1151-FR
5. Ben-Har 1151-XL-FR-1
6. Ben-Har 1151-XL-200
7. Ben-Har 1151-XL-240

C. The following sleeveings manufactured by Brand-Rex.

1. Turbo 117E-C1
2. Turbo 117F-A
3. Tubrocryl-C1
4. Heat treated-saturated-Std.
5. Turbo 117E-A, B
6. Turbo 117F-B, C
7. Heat treated-Std.
8. Heat treated-sat.

D. The following sleeveings manufactured by Varflex Corp.

1. Varglas silicone rubber
2. Viton 231
3. Varglas Silicone Resin 500
4. Varglas Non-Fray Type HM
5. Varglas Non-Fray Type HO
6. Varglas A397 Acrylic
7. Siflex
8. Varglas Silicone Rubber ES 4400

E. The following sleeveings manufactured by Hilec.

1. Hilec 210
2. Hilec 410
3. Hilec 540
4. Hilec 710
5. Hilec 117F

F. The following sleeveings manufactured by Vol Tube.

1. Vol-glas, Vol-glas heavy-wall
2. Vol-flex, Vol-cryl
3. Vol-sil, Vol-glas P

Insulation FunctionInsulating Material

9. Sleeving (Optional) (Cont'd)

G. The following sleeveings manufactured by Markel.

1. Flexite spiral cut nylon
2. Hygrade VFA
3. Hygrade SR 398 HA-1
4. Thermoflex 1200
5. Thermoflex 500
6. Flexite TFE
7. Flexite PO-135 shrinkdown
8. Hygrade VFB
9. HB-1, HC-1
10. BH-1, C-1, C-2, C-3
11. Flexite Spiral Cut TFE
12. shrinkdown

H. The following sleeveings manufactured by Zeus Industrial Products, Inc.

1. TFE-SW-600

I. The following sleeveings manufactured by Sumitomo :

1. Sumitube F2

J. The following sleeveings manufactured by Goldstar Cable :

1. GSHS-1625
2. GSHS-1605

K. The following sleeveings manufactured by P. Leo :

1. 2P600
2. 2P300
3. 2T-TFL.xx (PTFE Teflon Tube)
4. 2T-TFT.xx (PTFE Teflon Tube)
5. 2T-TFS.xx (PTFE Teflon Tube)

L. The following sleeveings manufactured by Jenisco :

- | | |
|-----------------|---------------|
| 1. HT 210 | 7. HT 220 |
| 2. VC 325-4-3 | 8. SR 555-4-3 |
| 3. AC 435-4-3-2 | 9. ER 565-4-3 |
| 4. SE 545-4-3-2 | 10. WV 652 |
| 5. WV 651 | 11. AW 752 |
| 6. AW 751 | |

M. The following sleeveings manufactured by various companies.

1. Seasoned maple wood wedges
2. Untreated Fiberglass
3. Sumitube F2 Sumitomo

Insulation Function

Insulating Material

10. Tie Core (Optional)

A. The following tie cords manufactured by Atkins and Pearce.

1. MS 9023-T4 1100 den. 4 ply polyester
2. MS 9044-T4 1600 den. 4 ply polyester
3. 13-220 polyester
4. 29-210 nylon waxed
5. C-81104SG Nomex
6. AP-3100-T
7. 17-200 Nomex
8. 16-2HT
9. A4C1B1-S12, A4C1B1-S12C
10. 16-1, 25-250
11. MS 9023HSUN-4
12. A4C1B1-T6CON
13. N884 LN346

B. The following tie cords manufactured by Western Filament.

1. 50DOF17W
2. 50NOF17W
3. DHS-1CL

C. The following tie cords manufactured by Ludlow.

1. LP1126 PET
2. LP1556 PET
3. M1491A Kelvar Aramid
4. LP1552 PET
5. N884
6. LP1008 PET
7. LP1012 PET

D. The following tie cords by Varflex.

1. Fiberglass
2. Silicone coated fiberglass
3. Tying Cord No. 48

E. The following tie cords by Breyden.

1. BPCCT-155
2. BPCCT-180

11. Varnish (Optional)

Recognized Component - Varnishes (OBOR2)
"None"