

File E318161

Project 08CA17437

Issued: October 08, 2008

Revised: November 17, 2008

**REPORT
ON**

***SYSTEM COMPONENTS, ELECTRICAL INSULATION - COMPONENT**

Indian Electrical & Electronics Manufacturers Association (Ieema), Mumbai.

Copyright © 2008 Underwriters Laboratories Inc.

[X] Underwriters Laboratories Inc. authorizes the above named company to reproduce this Report provided it is in its entirety.

DESCRIPTION

PRODUCT COVERED:

Component - Systems Components, Electrical Insulation.

[X] Class 155 (F) insulation system designated IEIS-155-1.

GENERAL CHARACTER:

The insulation system covered by this Report is for use in motor, transformer or coil constructions.

RATINGS:

System Designation	Insulation Class	Maximum Hot Spot Temperature	Indoor	Outdoor (Enclosed)
IEIS-155-1	(F)	155°C hot spot	Yes	Yes

[X] The insulation system has been evaluated for connection to the low voltage side of the distribution network where the voltage is limited to 1000 V or less and where transient overvoltages and partial discharge are not likely to contribute to the degradation of the insulation system.

This use is consistent with systems extending from the service point or source of power operating at not more than 600 V nominal according to the National Electrical Code, NFPA 70. This application is also consistent with systems extending from the consumer's service in Low-Voltage or Extra-low voltage applications at not more than 750 V according to the Canadian Electrical Code, C22.1 and low-voltage mains of 1000 V ac or less in overvoltage category IV installations according to Electrical Installations of Buildings, IEC 60364.

TECHNICAL CONSIDERATIONS (NOT FOR UL FIELD REPRESENTATIVE'S USE):

Use — For use only in products where the acceptability of the combination is determined by Underwriters Laboratories Inc.

1. The use of this insulation system by a manufacturer of motors, coils and/or transformers requires an OBJY2 or OBJY3 report to be created for that company. The construction Details for that Report can either be a paper copy of, or electronic (Internet) reference to the Construction Details contained in this report.
2. The acceptability of construction features of the motors or coil or transformer, assemblies, such as spacings, insulation thicknesses (greater than those specified under "Construction Details"), thickness and voltage rating of lead insulation (if applicable), etc., shall be determined in the end-use application.
3. The suitability for use when exposed to oil, chemicals, refrigerant, soaps, x-rays, ultraviolet light and the like, has not been determined by this investigation.
4. The only materials listed in these insulation systems that have been evaluated for their long term electrical capabilities are those materials listed as Ground Insulation, Interwinding Insulation, Magnet Wire Insulation, Filament Wire Insulation, Winding Wire Insulation and Encapsulants. All other materials listed in these insulation systems have only been evaluated for chemical compatibility. As a result the long term reliability of these other materials, such as potting compounds, tapes, minor sheet insulation, etc., as electrical insulation or as a mean to reduce spacings has not been evaluated as part of this Recognition.
5. Ground insulation, in at least the minimum thickness specified, must always be used between the windings and grounded metal and/or the magnetic cores of devices. Ground insulation for motors may be referred to as slot insulation. Materials not listed under ground and interwinding insulation may not be used for these functions even if listed elsewhere in the system description.
6. Interwinding insulation, in the minimum thickness specified, must always be used between any two isolated windings in a transformer, with the exception that it is not required between the series-parallel winding of multivoltage devices. Materials not listed under ground and interwinding insulation may not be used for these functions even if listed elsewhere in the system description.
7. Core tubes or bobbins designated "Mechanical Support Only" are not to be substituted for ground insulation and must be covered with one of the specified ground insulation materials in the proper minimum thickness.
8. Window insulation in a transformer construction or major outer wrap for coil constructions is used to insulate the open end or outer surface of the windings from the grounded metal. This insulation is considered "Optional" if an air gap of at least 1/32 in. exists between the window insulation and grounded or dead metal. If no such air gap exists, the window insulation is serving in the capacity of ground insulation and a proper ground insulation material, in the proper thickness, must be used.
9. Magnet wire may be of aluminum and/or copper as specified in the Construction Details of each Report. When verifying the ANSI MW type, this type number may be followed by a Suffix -A or -C indicating aluminum or copper respectively.

10. If the insulation of the lead wire enters the confines of the winding or the outer wrap of the winding, the wire is considered part of the insulation system and should be specified in the construction details. If the insulation on these wires terminates prior to entering the winding or outer wrap, this wire is not considered part of the insulation system. Lead wires may not be used for filament winding applications unless specifically stated. See Item 9 below.

All lead wires must either be Recognized Component Appliance Wiring Materials (AWM) (AVLV2), Listed fixture wire (ZIPR) or Listed flexible cords (ZJCZ) with the insulation thickness and voltage ratings required in the end product application.

11. Filament windings may be made from the same type of wire used as lead wires except these wires are used to construct a winding. The material used as a filament winding must appear in the insulation system under the non-optional functions of "Magnet Wire Insulation" or "Filament Windings".

12. The use of any thermal protector such as thermal fuse or thermal cut-off is considered acceptable in any insulation system and need not be documented.

13. "Litz" wires are multiple magnet wires bundled together for use typically when winding high frequency transformers. If these wires are employed, care must be taken to ensure that they themselves are Recognized Component - Magnet Wires (OBMW2) or the wire used to make them are similarly Recognized. "Litz" wires using outer wraps or cores other than just another strand of wire (e.g. dacron, fiberglass, aramid fiber, etc.) are not to be used unless specifically called out under "Magnet Wire" in the construction details.

14. Any material or component mounted on the outside of the motor, coil or transformer such that the material or component does not touch the windings or enter the confines of the outer wrap, is not considered part of the insulation system and need not be tabulated in the system description.

15. Off-site molding of those bobbins to be used as ground or interwinding insulation shall be performed by molders Recognized under the Fabricated Parts (QMMY2) category; and, Bobbins to be used as ground or interwinding insulation that are molded at the winding facility shall comply with the requirements outlined in the Standard for Polymeric Materials - Fabricated Parts, UL 746D, with the exception of the marking requirements.

16. Tapes listed under the "Tape" insulation function may not be used as ground or interwinding insulation unless listed separately under the "Ground and Interwinding Insulation" function.

17. The use of metal foil or a metal foil tape in an insulation system additionally requires the use of a suitable ground insulation from that system between the metal foil and all windings.

18. Resistance to ignition, distortion and dielectric concerns resulting from abnormal operation must be addressed in the end application.

19. Direct support of uninsulated terminals or the suitability of the encapsulant to be relied upon as an enclosure, including the material's RTI, must be addressed in the end application.

20. Addition consideration shall be given to requiring a quality control program for those factories applying integral ground coatings.

[X] CONSTRUCTION DETAILS:

TABLE I

CLASS 155(F) TRANSFORMER, MOTOR, COIL INSULATION SYSTEM DESIGNATED IEIS-155-1.

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 used as alternates to one another. Functions designated "optional" are not necessarily required for every design.

Insulation Function	Insulating Material
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 not be used in combination within a single product.
	A. Polyester (imide) basecoat with a Polyamideimide topcoat rated 220°C or ANSI MW37C, MW38C type by: BHARAT INSULATION CO (INDIA) LTD (E250515) G K WINDING WIRES LTD (E205855) PRECISION WIRES INDIA LTD (E174288) RAM RATNA WIRES LTD (E238786) K PATEL METAL INDUSTRIES PVT LTD (E237164)

Insulation Function	Insulating Material
3. Ground and Interwinding Insulation	<p>Nomex® 410, 414, 416, 418, or 464 0.13 mm minimum thickness 0.12 mm minimum thickness Nomex® 411 0.25 mm minimum thickness 0.22 mm minimum thickness Manufactured by EI DUPONT DE NEMOURS & CO INC.</p> <p>A. FLEXITHERM NPN - with 0.13 mm minimum total Nomex thickness (Represents all the other composite combinations made from Nomex and polyester) manufactured by BEICO INDUSTRIES PVT LTD.</p> <p>B. FLEXILAM NPN: with 0.13 mm minimum total Nomex thickness, (Represents all the other composite combinations made from Nomex and polyester) manufactured by BEICO INDUSTRIES PVT LTD.</p> <p>C. GARTHERM NPN - with 0.13 mm minimum total Nomex thickness (Represents all the other composite combinations made from Nomex and polyester) manufactured by POLYCOM ASSOCIATES.</p>
4. Tape (Optional)	F250 (Adhetherm Polyimide Kapton Acrylic adhesive Tape) by Vidyut Impex.
5. Tubing and Sleeving (Optional)	VFVGS-F Videxflex varnished coated FG sleeve F class by Vidyut Impex.
6. Tie Cord (Optional)	<ul style="list-style-type: none"> ■ BRC - Videx Bracing cord by Vidyut Impex. ■ GFHC - Videx glass fibre hauser cord by Vidyut Impex. ■ GFPHC - Videx Glassfibre polyester Hauser cord by Vidyut Impex.

Insulation Function	Insulating Material
7. Spacers and Wedges (Optional)	<p>Any material described in this table regardless of thickness.</p> <ul style="list-style-type: none"> ■ GIO - Lamitherm fiberglass epoxy sheet by Vidyut Impex. ■ GFEHC - Lamitherm fiberglass epoxy sheet by Vidyut Impex.
8. Lead Wire (Optional)	<ul style="list-style-type: none"> ■ Cross Linked Polyethylene rated 150°C (+).
<p>+ - To be isolated from direct contact with windings (magnet wire) by any insulating material (tape, layer insulation, sleeving, etc.) listed in this table.</p>	
9. Varnish	<p>Recognized Component - Varnishes (OBOR2)</p> <ul style="list-style-type: none"> A. Isonel 31-J B. Isopoxy 800 C. Elmotherm FR 63 D. Dobeckan FT 1052/.... E. Dobeckan FT 1040/.... F. Dobeckan FT 1080/.... G. Dobeckan FT 2001/.... <p>Manufactured by Elantas Beck India Ltd.</p> <p>Note: Represents optional suffix denoting viscosity</p>
10. Overcoat Varnish (Optional)	<p>The following overcoat varnishes may be used only on assemblies already impregnated with an Item No. 9 Varnish.</p> <ul style="list-style-type: none"> A. Epoxy Gelcoat (Red)+ EH411 + Thinner 221 B. Becktol (Red or Grey) <p>By Elantas Beck India Pvt.</p>