



UL 1097

STANDARD FOR SAFETY

Double Insulation Systems for Use in Electrical Equipment

*UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL*



Documents

Document Sharing Hub

UL Standard for Safety for Double Insulation Systems for Use in Electrical Equipment, UL 1097

Sixth Edition, Dated February 1, 2012

Summary of Topics

This sixth edition is being issued to adopt UL 1097 for the first time as an ANS approved standard, with an ANSI approval date of February 1, 2012.

The requirements are substantially in accordance with Proposal(s) on this subject dated December 12, 2011.

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted in any form by any means, electronic, mechanical photocopying, recording, or otherwise without prior permission of UL.

UL provides this Standard "as is" without warranty of any kind, either expressed or implied, including but not limited to, the implied warranties of merchantability or fitness for any purpose.

In no event will UL be liable for any special, incidental, consequential, indirect or similar damages, including loss of profits, lost savings, loss of data, or any other damages arising out of the use of or the inability to use this Standard, even if UL or an authorized UL representative has been advised of the possibility of such damage. In no event shall UL's liability for any damage ever exceed the price paid for this Standard, regardless of the form of the claim.

Users of the electronic versions of UL's Standards for Safety agree to defend, indemnify, and hold UL harmless from and against any loss, expense, liability, damage, claim, or judgment (including reasonable attorney's fees) resulting from any error or deviation introduced while purchaser is storing an electronic Standard on the purchaser's computer system.

The requirements in this Standard are now in effect, except for those paragraphs, sections, tables, figures, and/or other elements of the Standard having future effective dates as indicated in the note following the affected item. The prior text for requirements that have been revised and that have a future effective date are located after the Standard, and are preceded by a "SUPERSEDED REQUIREMENTS" notice.

No Text on This Page

*UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL*



Documents

Document Sharing Hub

FEBRUARY 1, 2012



ANSI/UL 1097-2012

1

UL 1097

Double Insulation Systems for Use in Electrical Equipment

First Edition – November, 1978

Second Edition – April, 1983

Third Edition – June, 1993

Fourth Edition – September, 1997

Fifth Edition – July, 2004

Sixth Edition

February 1, 2012

The most recent designation of ANSI/UL 1097 as an American National Standard (ANSI) occurred on February 1, 2012. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page, or effective date information.

Comments or proposals for revisions on any part of the Standard may be submitted to UL at any time. Proposals should be submitted via a Proposal Request in UL's On-Line Collaborative Standards Development System (CSDS) at <http://csds.ul.com>.

UL's Standards for Safety are copyrighted by UL. Neither a printed nor electronic copy of a Standard should be altered in any way. All of UL's Standards and all copyrights, ownerships, and rights regarding those Standards shall remain the sole and exclusive property of UL.

COPYRIGHT © 2012 UNDERWRITERS LABORATORIES INC.

**UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL**



Documents

Document Sharing Hub

No Text on This Page

*UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL*



Documents

Document Sharing Hub

CONTENTS

INTRODUCTION

1 Scope	4
2 General	4
2.1 Units of measurement	4
2.2 Undated references	4
3 Glossary	4

CONSTRUCTION

4 General	6
5 Reinforced Insulation	7
5.1 General	7
5.2 Brush caps and brush holders	7
5.3 Commutator and end turns of the armature winding	8
5.4 Switches	9
5.5 Power-supply cord	10
5.6 Internal wiring	10
5.7 Other locations	11
6 Flexible Cord	11
7 Strain Relief	11
8 Bushings	11
9 Capacitors	12
10 Transformers	12
11 Spacings	12
12 Internal Wiring	13

PERFORMANCE

13 Leakage Current Test	14
14 Dielectric Voltage-Withstand Tests	18
15 Insulation Resistance Test	18
16 Resistance to Impact Tests	19
17 Overload Tests on Isolating Transformers	20
18 Overload Test on Motors	22
19 Abnormal Operation Test	23
20 Investigation of Armature Employing Reinforced Insulation Test	23
21 Moisture Resistance Test	24

MANUFACTURING AND PRODUCTION TESTS

22 Production-Line Dielectric Voltage-Withstand Test	24
--	----

MARKINGS

23 General	25
------------------	----

INTRODUCTION

1 Scope

1.1 These requirements cover electrically operated equipment marked "Double Insulation" or "Double Insulated" to be used in accordance with the National Electrical Code, ANSI/NFPA 70.

1.2 Equipment marked "Double Insulation" or "Double Insulated" shall comply with the applicable requirements in this standard and the standard covering the particular type of equipment – the end-product standard. In cases where the end-product standard contains requirements for double insulation, that standard takes precedence.

2 General

2.1 Units of measurement

2.1.1 Values stated without parentheses are the requirement. Values in parentheses are explanatory or approximate information.

2.2 Undated references

2.2.1 Any undated reference to a code or standard appearing in the requirements of this standard shall be interpreted as referring to the latest edition of that code or standard.

3 Glossary

3.1 For the purpose of this standard the following definitions apply.

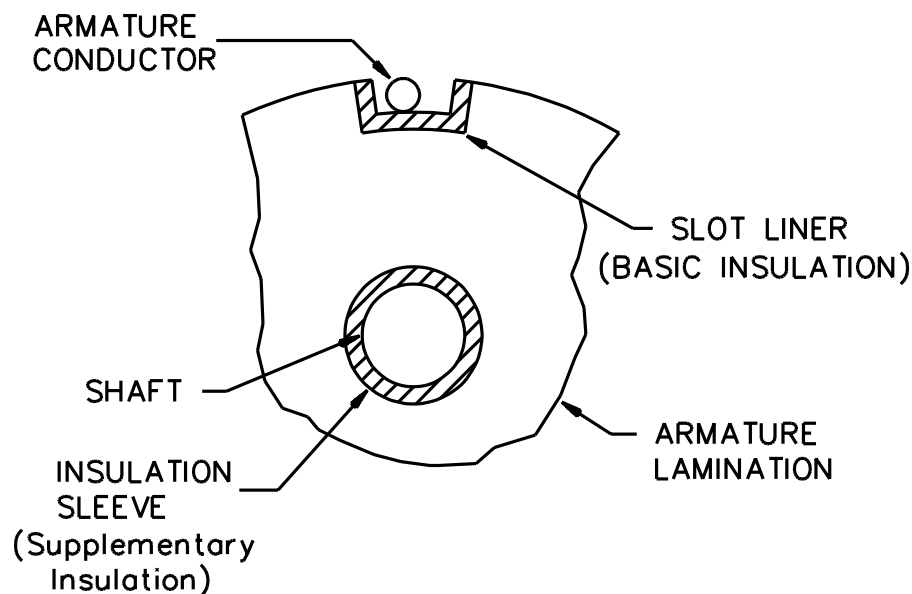
3.2 ACCESSIBLE PART or SURFACE – A part or surface subject to contact by persons under any condition of operation or user function. In a determination of whether a live or dead part or surface is accessible to such contact, the criteria specified in the product standard are to be applied.

3.3 BASIC INSULATION (formerly FUNCTIONAL INSULATION) – The insulation applied to live parts to provide basic protection against electric shock. Basic insulation does not necessarily include insulation used exclusively for functional purposes.

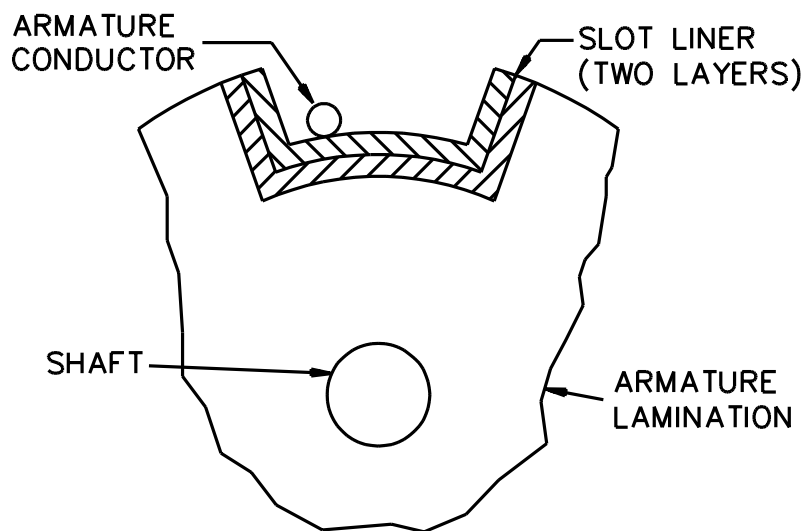
3.4 DEAD METAL PART – A metal or other electrically conductive part, accessible or inaccessible, that is not conductively connected to a live part.

3.5 DOUBLE INSULATION – An insulation system comprised of basic (formerly functional) insulation and supplementary insulation, with the two insulations physically separated and arranged so that they are not simultaneously subjected to the same deteriorating influences (temperature, contaminants, and the like) to the same degree. See Figure 3.1.

Figure 3.1
Examples illustrating 3.5



A -- CONSIDERED TO CONSTITUTE DOUBLE INSULATION



B -- NOT CONSIDERED TO CONSTITUTE DOUBLE INSULATION.
CONSTRUCTION TO BE INVESTIGATED AS REINFORCED INSULATION.

S0723B

UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM UL



Documents

Document Sharing Hub

3.6 LIVE PART – A part that is conductively connected either to the power-supply circuit, or a secondary circuit that operates at more than 42.4 V peak with reference to ground or accessible metal, and in which the available current measured through a 1500-ohm resistor shunted with a 0.15-μF capacitor connected from the part to ground or to any other accessible part exceeds 0.25 mA.

3.7 REINFORCED INSULATION – An improved basic (formerly functional) insulation with such mechanical and electrical qualities that it, in itself, provides the same degree of protection against electric shock as double insulation. It may consist of one or more layers of insulating material. Its acceptance in place of double insulation is described in 4.1 and Reinforced Insulation, Section 5.

3.8 SUPPLEMENTARY (PROTECTING) INSULATION – An independent insulation provided in addition to the basic (formerly functional) insulation to protect against electric shock in case of mechanical rupture or electrical breakdown of the basic insulation. An enclosure of insulating material may form a part or the whole of the supplementary insulation.

CONSTRUCTION

4 General

4.1 The equipment shall be constructed so that double insulation is interposed between all live parts and each of the following:

- a) All accessible surfaces of the equipment;
- b) All inaccessible dead parts and surfaces that are conductively connected to accessible dead parts or surfaces or both.

Exception No. 1: A construction that provides increased through-air and over-surface spacings between live parts and accessible dead parts and surfaces specified in the end-product standard (refer to Table 11.1) is acceptable in place of double insulation. This construction may be used only where it is impractical to provide double insulation.

Exception No. 2: A construction using Reinforced Insulation, Section 5, is acceptable in place of double insulation. This construction may be used only where it is impractical to provide double insulation.

4.2 The thickness and the resistance to deterioration with aging of insulation employed as supplementary insulation shall not be less than that required for the same material employed as basic insulation. A greater thickness of supplementary insulation is required if severe environmental or use conditions are likely.

4.3 The insulation qualities and resistance to deterioration with aging of materials employed as reinforced insulation shall not be less than the combination of basic and supplementary insulation.

4.4 The equipment shall be constructed so that the added protection provided by the supplementary or reinforced insulation is not reduced by the normal use and reasonable abuse (see Resistance to Impact Tests, Section 16, and Abnormal Operation Test, Section 19) to which the equipment is likely to be subjected.

UL COPYRIGHTED MATERIAL –
NOT AUTHORIZED FOR FURTHER REPRODUCTION OR
DISTRIBUTION WITHOUT PERMISSION FROM



Documents
Document Sharing Hub