



UL 1581

STANDARD FOR SAFETY

Reference Standard for Electrical
Wires, Cables, and Flexible Cords

This is a preview. Click [here](#) to purchase the full publication.

This is a preview. Click [here](#) to purchase the full publication.

UL Standard for Safety for Reference Standard for Electrical Wires, Cables, and Flexible Cords, UL 1581

Fourth Edition, Dated October 31, 2001

Summary of Topics:

This revision to ANSI/UL 1581 dated June 30, 2021 includes editorial corrections to type designations and units in [Table 50.133](#), [Table 50.134](#) and [Table 50.136](#).

Text that has been changed in any manner or impacted by UL's electronic publishing system is marked with a vertical line in the margin.

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.

No Text on This Page

OCTOBER 31, 2001
(Title Page Reprinted: June 30, 2021)



1

UL 1581

Reference Standard for Electrical Wires, Cables, and Flexible Cords

First Edition – August, 1983
Second Edition – December, 1991
Third Edition – October, 1997

Fourth Edition

October 31, 2001

This ANSI/UL Standard for Safety consists of the Fourth Edition including revisions through June 30, 2021.

The most recent designation of ANSI/UL 1581 as an American National Standard (ANSI) occurred on May 7, 2020. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, and Title Page.

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 <https://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 © 2021 UNDERWRITERS LABORATORIES INC.

This is a preview. Click here to purchase the full publication.

No Text on This Page

CONTENTS

INTRODUCTION

1 Scope	9
2 Units of Measurement	9
3 References and Terms.....	9
4 thru 9 <i>Reserved for Future Use</i>	9

CONDUCTORS

10 Requirements for Aluminum Conductors of an 8000 Series Alloy	9
11 Requirements for Copper-Clad Aluminum Conductors.....	10
12 thru 19 <i>Reserved for Future Use</i>	10
20 Conductor Diameter and Cross-Sectional Area.....	10
21 thru 29 <i>Reserved for Future Use</i>	25
30 D-C Conductor Resistance	25
31 thru 39 <i>Reserved for Future Use</i>	45

INSULATION AND JACKET MATERIALS

40 General	45
41 thru 46 <i>Reserved for Future Use</i>	45
47 Index Table	45
48 thru 49 <i>Reserved for Future Use</i>	50
50 Specific Materials	50
51 thru 199 <i>Reserved for Future Use</i>	89

METHODS

CONDUCTOR DIMENSIONS AND RESISTANCE

200 Conductor Diameter	89
201 thru 209 <i>Reserved for Future Use</i>	90
210 Conductor Cross-Sectional Area by the Weight Method.....	90
211 thru 219 <i>Reserved for Future Use</i>	90
220 D-C Conductor Resistance.....	90
221 thru 227 <i>Reserved for Future Use</i>	91

WIRE BRAID AND SERVING COVERAGE

228 Measurements and Calculations	91
229 thru 239 <i>Reserved for Future Use</i>	91

THICKNESSES OF INSULATION AND JACKET

240 Thicknesses of Insulation on Thermoplastic- and Thermoset-Insulated Wires and Cable	91
241 thru 249 <i>Reserved for Future Use</i>	92
250 Thicknesses of Insulation on Flexible Cord and on Fixture Wire	92
251 thru 259 <i>Reserved for Future Use</i>	93
260 Thicknesses of Jacket on Thermoplastic- and Thermoset-Insulated Wires and Cables	93
261 thru 279 <i>Reserved for Future Use</i>	94
280 Thicknesses of Jacket on Flexible Cord, Fixture Wire, and Elevator Cable	94

This is a preview. Click here to purchase the full publication.

281 thru 399 <i>Reserved for Future Use</i>	94
---	----

PHYSICAL PROPERTIES TESTS OF INSULATION AND JACKET

400 General	94
401 thru 419 <i>Reserved for Future Use</i>	94
420 Apparatus	94
421 thru 439 <i>Reserved for Future Use</i>	94
440 Preparation of Specimens	94
441 thru 459 <i>Reserved for Future Use</i>	94
460 Recovery	94
461 thru 469 <i>Reserved for Future Use</i>	95
470 Ultimate Elongation and Tensile Strength	95
471 thru 479 <i>Reserved for Future Use</i>	95
480 Accelerated Aging	95
481 Long-Term Aging	96
482 thru 489 <i>Reserved for Future Use</i>	97

COMPOUND ANALYSIS

POLYVINYL CHLORIDE (PVC) COMPOUNDS

490 Infrared Spectroscopy	97
491 Determination of the Ash Content	98
492 Elemental Analysis	99
493 Gel Permeation Chromatography	101

OTHER COMPOUNDS

494 Infrared Spectroscopy	102
495 Pyrolytic Gas Chromatography	102
496 Thermogravimetry	102
497 Differential Scanning Calorimetry	102
498 thru 499 <i>Reserved for Future Use</i>	103

CONDUCTOR CORROSION

500 General	103
501 thru 519 <i>Reserved for Future Use</i>	103

INSULATION FALL-IN

520 Test	103
521 thru 539 <i>Reserved for Future Use</i>	103

HEAT SHOCK

540 Test	103
541 thru 559 <i>Reserved for Future Use</i>	103

DEFORMATION

560 Test	103
561 thru 579 <i>Reserved for Future Use</i>	105

This is a preview. Click here to purchase the full publication.

COLD BEND

580 Test	105
581 thru 582 <i>Reserved for Future Use</i>	105

FLEXIBILITY AT LOW TEMPERATURE

583 Test	105
584 thru 592 <i>Reserved for Future Use</i>	107

IMPACT AT ABNORMALLY LOW TEMPERATURE

593 Test	107
594 <i>Reserved for Future Use</i>	108

CRUSHING RESISTANCE

595 Test	108
596 thru 600 <i>Reserved for Future Use</i>	108
601 Crushing-Resistance Test of Round Type NM Cable	108
602 thru 619 <i>Reserved for Future Use</i>	108
620 Crushing-Resistance Test of Types XHHW-2, XHHW, and XHH	108
621 thru 699 <i>Reserved for Future Use</i>	109

DIELECTRIC TESTS

700 Dielectric Breakdown Test of Types XHHW-2, XHHW, and XHH after Glancing Impact	109
701 thru 719 <i>Reserved for Future Use</i>	110
720 Dielectric Breakdown Test of Types XHHW-2, XHHW, and XHH after Scoring	110
721 thru 759 <i>Reserved for Future Use</i>	112
760 Dielectric Voltage-Withstand Test of Straight Foil-Wrapped Specimens	112
761 thru 779 <i>Reserved for Future Use</i>	112
780 Dielectric Voltage-Withstand Test of Foil-Wrapped U-Bend Specimens	112
781 thru 799 <i>Reserved for Future Use</i>	112
800 Dielectric Voltage-Withstand Test for Cord Conductors	112
801 thru 819 <i>Reserved for Future Use</i>	113
820 Dielectric Voltage-Withstand Test of Coils and Reels in Water	113
821 thru 829 <i>Reserved for Future Use</i>	113
830 Dielectric Voltage-Withstand Tests for Power-Limited Circuit Cable and for Cable for Power-Limited Fire-Alarm Circuits	113
831 thru 899 <i>Reserved for Future Use</i>	114

SPARK TEST

900 Method	114
901 thru 909 <i>Reserved for Future Use</i>	115
910 Spark Tests for Power-Limited Circuit Cable and for Cable for Power-Limited Fire-Alarm Circuits	115
911 thru 918 <i>Reserved for Future Use</i>	117

INSULATION RESISTANCE

919 Test Procedure for Determining the Multiplying-Factor Column for Adjusting Insulation Resistance	117
920 Insulation-Resistance Test in Water	119

This is a preview. Click here to purchase the full publication.

921 thru 999 <i>Reserved for Future Use</i>	120
---	-----

STABILITY FACTOR

1000 Test	120
1001 thru 1019 <i>Reserved for Future Use</i>	120

CAPACITANCE AND RELATIVE PERMITTIVITY

1020 Test	120
1021 thru 1039 <i>Reserved for Future Use</i>	120

MECHANICAL WATER ABSORPTION

1040 Test	120
1041 thru 1042 <i>Reserved for Future Use</i>	122

SWELLING AND BLISTERING IN WATER

1043 Test	122
1044 thru 1059 <i>Reserved for Future Use</i>	122

FLAME TESTS

1060 Vertical Flame and FT1 Tests.....	122
1061 Cable Flame Test.....	123
1062 thru 1079 <i>Reserved for Future Use</i>	125
1080 VW-1 (Vertical-Specimen) Flame Test.....	125
1081 thru 1089 <i>Reserved for Future Use</i>	127
1090 Horizontal-Specimen Appliance-Wire Flame Test.....	127
1091 thru 1099 <i>Reserved for Future Use</i>	130
1100 Horizontal-Specimen / FT2 Flame Test.....	130
1101 thru 1159 <i>Reserved for Future Use</i>	131
1160 UL Vertical-Tray Flame Test.....	131
1161 thru 1163 <i>Reserved for Future Use</i>	131
1164 FT4/IEEE 1202 Vertical-Tray Flame Test	131
1165 thru 1199 <i>Reserved for Future Use</i>	131

SUNLIGHT RESISTANCE

1200 Xenon-Arc Tests	131
1201 thru 1249 <i>Reserved for Future Use</i>	132

GLASS CONTENT

1250 Test	132
1251 thru 1269 <i>Reserved for Future Use</i>	132

TIGHTNESS OF INSULATION

1270 Test for Tightness of Conductor Insulation in Decorative-Lighting Cords and Wire.....	132
1271 thru 1279 <i>Reserved for Future Use</i>	133
1280 Test for Tightness of Circuit-Conductor Insulation in Integral Parallel Cord Other Than Tinsel Cord	133

1281 thru 1299 <i>Reserved for Future Use</i>	133
---	-----

LEAKAGE

1300 Test of Type TBS for Surface Leakage Resistance	133
1301 thru 1319 <i>Reserved for Future Use</i>	133
1320 A-C Leakage-Current Tests of Low-Leakage-Current Service Cords	133
1321 thru 1339 <i>Reserved for Future Use</i>	135
1340 Test for D-C Resistance of Nonintegral Cord Jacket	135
1341 thru 1399 <i>Reserved for Future Use</i>	135

IMPACT RESISTANCE

1400 Test	135
1401 thru 1499 <i>Reserved for Future Use</i>	135

ABRASION OF 22 AWG TYPE XTW AND CXTW WIRE AND CORD

1500 Test	135
1501 thru 1509 <i>Reserved for Future Use</i>	135

ABRASION

1510 Test	135
1511 thru 1519 <i>Reserved for Future Use</i>	136

FLEXING OF 22 AWG TYPE XTW AND CXTW WIRE AND CORD

1520 Test	136
1521 thru 1539 <i>Reserved for Future Use</i>	137

**CRACKING OF NYLON COVERING ON COAXIAL-CABLE MEMBERS OF ELEVATOR CABLES OR
OF NYLON JACKET ON TYPES TFN, TFFN, AND SPT-1 AND OF INSULATED
CONDUCTORS IN SERVICE CORDS**

1540 Test	137
1541 thru 1559 <i>Reserved for Future Use</i>	137

FLEXING OF TYPE SF-1, SF-2, SFF-1, AND SFF-2 FIXTURE WIRES

1560 Test	137
1561 thru 1581 <i>Reserved for Future Use</i>	137

FLEXING OF SHIELDED CORDS

1582 Test	137
1583 thru 1589 <i>Reserved for Future Use</i>	138

MANDREL TEST OF NYLON JACKET ON TYPE THWN-2, THWN, AND THHN WIRES

1590 Test	138
1591 thru 1599 <i>Reserved for Future Use</i>	138
1600 Comparison of Metal Sheaths	138
1601 thru 1609 <i>Reserved for Future Use</i>	140