UL 1565

STANDARD FOR SAFETY

Positioning Devices

UL Standard for Safety for Positioning Devices, UL 1565

Sixth Edition, Dated July 29, 2022

SUMMARY OF TOPICS

This new edition of ANSI/UL 1565 dated July 29, 2022 is issued to incorporate changes from proposals dated November 26, 2021 and April 1, 2022.

The new requirements are substantially in accordance with Proposal(s) on this subject dated November 26, 2021 and April 1, 2022.

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CSA Group
CSA C22.2 No. 18.5:22
Third Edition

Underwriters Laboratories Inc.
UL 1565
Sixth Edition

Positioning Devices

July 29, 2022

Approved American National Standard

ANSI/UL 1565-2022

Commitment for Amendments

This standard is issued jointly by the Canadian Standards Association (operating as CSA Group) and Underwriters Laboratories Inc. (UL). Comments or proposals for revisions on any part of the standard may be submitted to CSA Group or UL at any time. Revisions to this standard will be made only after processing according to the standards development procedures of CSA Group and UL. CSA Group and UL will issue revisions to this standard by means of a new edition or revised or additional pages bearing their date of issue.

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This Standard is subject to review within five years from the date of publication, and suggestions for its improvement will be referred to the appropriate committee. To submit a proposal for change, please send the following information to inquiries@csagroup.org and include "Proposal for change" in the subject line: Standard designation (number); relevant clause, table, and/or figure number; wording of the proposed change; and rationale for the change.

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This ANSI/UL Standard for Safety consists of the Sixth Edition. The most recent designation of ANSI/UL 1565 as an American National Standard (ANSI) occurred on July 29, 2022. ANSI approval for a standard does not include the Cover Page, Transmittal Pages, Title Page (front and back), or the Preface.

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.

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Preface

This is the harmonized CSA Group and UL Standard for Positioning Devices. It is the third edition of CSA C22.2 No. 18.5, and the sixth edition of UL 1565. This edition of CSA C22.2 No. 18.5 supersedes the previous edition published in 2013. This edition of UL 1565 supersedes the previous edition published in 2013.

This harmonized Standard was prepared by CSA Group and Underwriters Laboratories Inc. (UL).. The efforts and support of the members of the Technical Harmonization Committee, which includes end product manufacturers and material suppliers, are gratefully acknowledged.

This Standard is considered suitable for use for conformity assessment within the stated scope of the Standard.

This Standard was reviewed by the CSA Subcommittee on Fittings, Hardware and Positioning Devices, under the jurisdiction of the CSA Technical Committee on Wiring Products and the CSA Strategic Steering Committee on requirements for Electrical Safety, and has been formally approved by the Technical Committee. This Standard has been developed in compliance with Standards Council of Canada requirements for National Standards of Canada. It has been published as a National Standard of Canada by CSA Group.

Application of Standard

Where reference is made to a specific number of samples to be tested, the specified number is considered a minimum quantity.

Note: Although the intended primary application of this standard is stated in its scope, it is important to note that it remains the responsibility of the users of the standard to judge its suitability for their particular purpose.

Level of harmonization

This Standard is published as an equivalent standard for CSA and UL.

An equivalent standard is a standard that is substantially the same in technical content, except as follows: Technical national differences are allowed for codes and governmental regulations as well as those recognized as being in accordance with NAFTA Article 905, for example, because of fundamental climatic, geographical, technological, or infrastructural factors, scientific justification, or the level of protection that the country considers appropriate. Presentation is word for word except for editorial changes.

Interpretations

The interpretation by the standards development organization of an equivalent standard is based on the literal text to determine compliance with the standard in accordance with the procedural rules of the standards development organization. If more than one interpretation of the literal text has been identified, a revision shall be proposed as soon as possible to each of the standards development organizations to more accurately reflect the intent.

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INTRODUCTION

1 Scope

1.1 This standard specifies the requirements for devices intended for positioning, which may include bundling, routing, locating, and securing of cable, wire, conduit, or tubing used in a wiring system in electrical installations in accordance with CSA C22.1, Canadian Electrical Code (CE Code), Part I, in Canada and the National Electrical Code (NEC), NFPA 70 in the United States of America.

1.2 These devices may be, but is not limited to, cable clamps, saddle clamp, cable and conduit clips, edge clips, mechanical mounts, screw mounts, push mounts, non-raceway wiring ducts., and devices including features such as magnets, adhesives etc.

1.3 These requirements do not apply to any mechanical protection or electrical insulation that is provided by these devices.

1.4 These requirements do not apply to hardware for the support of conduit, tubing, and cable from a building structure, such as hangers, staples, straps, and similar devices for installation in accordance with the National Electrical Code, NFPA 70, and the Canadian Electrical Code (CE Code), Part I.

Note: Hardware for the support of conduit, tubing, and cable from a building structure such as hangers, staples, straps, and similar devices for installation in accordance with the National Electrical Code, NFPA 70, and the Canadian Electrical Code (CE Code), Part I are covered in the Standard for Hardware for the Support of Conduit, Tubing, and Cable, CSA C22.2 No. 18.4 or UL 2239.

1.5 These requirements do not apply to cable ties or cable tie accessories (See Note 1), coated electrical sleeving (See Note 2), extruded insulating tubing (See Note 3), mechanical protection tubing (See Note 4), metallic or nonmetallic raceways, woven flexible (fiber loom) sleeving or nonmetallic tubing employed as mechanical protection for insulated wires or equipment covered by other standards or requirements.

Note 1: Cable ties and cable tie accessories are covered in the Standard for Cable Ties for Electrical Installations, CAN/CSA-C22.2 No. 62275 or UL 62275.

Note 2: Coated electrical sleeving is covered in the Standard for Coated Electrical Sleeving, CAN/CSA-C22.2 No. 198.3 or UL 1441.

Note 3: Extruded insulating tubing is covered in the Standard for Cable Ties for Extruded Insulating Tubing, CAN/CSA-C22.2 No. 198.1 or UL 224.

Note 4: Mechanical Protective Tubing (MPT) is covered in the Standard for Mechanical Protection Tubing (MPT) and Fittings, CSA C22.2 No. 227.3 or UL 1696.

1.6 In Canada, the requirements in this standard generally address class of workmanship in accordance with the Canadian Electrical Code (CE Code), Part I, and where applicable, minor combustible components in the National Building Code of Canada.

2 Units of Measurement

2.1 The values given in SI (metric) units shall be normative. Any other values are for information only.

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

3 Referenced Publications

3.1 For undated references to standards, such reference shall be considered to refer to the latest edition and all revisions to that edition up to the time when this Standard was approved. For dated references to

standards, such reference shall be considered to refer to the dated edition all revisions published to that edition up to the time the Standard was approved.

CSA Group Standards

C22.1
Canadian Electrical Code, Part I

C22.2 No. 0
General Requirements – Canadian Electrical Code, Part II

CAN/CSA-C22.2 No. 0.17
Evaluation of Properties of Polymeric Materials

C22.2 No. 18.4
Hardware for the Support of Conduit, Tubing, and Cable

CSA C22.2 No. 62275
Cable Management Systems – Cable Ties For Electrical Installations

UL Standards

UL 94
Flammability of Plastic Materials for Parts in Devices and Appliances

UL 224
Extruded Insulating Tubing

UL 746B
Polymeric Materials – Long Term Property Evaluations

UL 1441
Coated Electrical Sleeving

UL 1696
Mechanical Protection Tubing (MPT) and Fittings

UL 2239
Hardware for the Support of Conduit, Tubing, and Cable

UL 2043
Fire Test for Heat and Visible Smoke Release for Discrete Products and Their Accessories Installed in Air-Handling Spaces

UL 62275
Cable Management Systems – Cable Ties for Electrical Installations

ULC Standards

CAN/ULC-S142
Standard Method of Fire Test for Heat and Visible Smoke Release for Discrete Products

ASTM Standards

ASTM B117
Standard Practice for Operating Salt-Spray (Fog) Apparatus

ASTM G151
Standard Practice for Exposing Nonmetallic Materials in Accelerated Test Devices That Use Laboratory Light Sources

ASTM G155
Standard Practice for Operating Xenon Arc Light Apparatus for Exposure of Nonmetallic Materials

IEC Standards

IEC 60216-4-1:2006
Guide for the Determination of Thermal Endurance Properties of Electrical Insulating Materials – Part 4: Aging Ovens Section One: Single Chamber Ovens (Third Edition)

IEC 60695-11-10:2013
Fire Hazard Testing – Part 11-10: Test Flames – 50 W Horizontal and Vertical Flame Test Methods. (First Edition)

National Research Council of Canada Publication

National Building Code of Canada – 2015

NFPA Publication

ANSI/NFPA 70-2020
National Electrical Code (NEC®)

4 Glossary

4.1 For the purpose of this Standard, the following definitions apply.

4.2 AIR HANDLING SPACES – Equipment intended for use in spaces used for environmental air, such as the space above suspended ceilings or below floors. This does not include plenums used for the removal of dust, loose stock, or vapor, or for ventilation of commercial-type cooking equipment.

4.3 BUNDLE – Collection of things or quantity of material (such as wire and cables) tied or wrapped up together.

4.4 CLAMP – A device such as cable clamp and saddle clamp used for positioning wire, cable, conduit or tubing, or binding groups of wires or cables by gripping them together. A clamp can also secure or position the bound wires or cables to a surface or frame.

4.5 COMPOSITE COMPONENT – Comprising of both metallic and non-metallic materials where both contribute to the determination of the strength.

4.6 DUCT – A non-raceway device that typically consists of a main channel body and closure lid, that provides continuous positioning for wire or cable.

4.7 EDGE-MOUNTED DEVICE – A device that positions wires, cables, or tubing running perpendicular or parallel to the mounting surface.

4.8 ENVIRONMENTAL INFLUENCE – Effect of corrosive substances or solar radiation, etc.

4.9 EQUILIBRIUM MOISTURE CONTENT – State at which a polymer neither absorbs or releases moisture when exposed to a surrounding environment of 23 °C (73.4 °F) and 50 % relative humidity

4.10 FASTEN – Hold two or more components together securely using adhesive or a mechanical device, such as a screw, rivet, bolt, or pin.

4.11 LOCATING – Situate in a particular place or specific location.

4.12 LOW HYGROSCOPIC POLYMER – Polymer having the characteristic of not enabling attraction or holding water greater than 1.0 % by weight of the material from the surrounding environment at 23 °C (73.4 °F) and 50 % relative humidity.

Note: Examples of low hygroscopic polymers include: polypropylene, acetal, ethylene tetrafluoroethylene, ethylene chlorotrifluoroethylene, nylon 12, and polyetheretherketone.

4.13 MECHANICAL MOUNT – A device secured to a surface using a fastening device, such as a screw, rivet, bolt, or pin.

4.14 METALLIC COMPONENT – Consists of metal only.

Note: A metallic device having a thin non-metallic or organic coating where the coating does not contribute to the determination of the strength, is considered a metallic component.

4.15 NON-METALLIC COMPONENT – Consists of non-metallic material only.

4.16 POSITION – Put or arrange something in a particular place or way.

4.17 PUSH MOUNT – A device secured to a surface by inserting the device through a hole, onto an edge, or over a stud or bolt.

4.18 ROUTING – Direct along a specific course.

4.19 SECUREMENT – Fix or attach firmly.

4.20 SUPPORT – Bear all or part of the weight.

4.21 SURFACE – Base that is conducive to stabilizing (securing) an object.

CONSTRUCTION

5 Flammability

5.1 Non-metallic materials and the non-metallic components of composite devices shall have a minimum flammability classification of HB. Flammability classification of a pre-selected material shall be based on a nominal 1.5 mm (0.059 inches) thickness.

5.2 Compliance shall be checked by the test in IEC 60695-11-10.

5.3 Flame classifications determined in accordance with CAN/CSA-C22.2 No. 0.17 or UL 94 meet the intent of this requirement.

5.4 For a metallic device having a non-metallic coating, samples having a combination of the minimum coating thickness and minimum metal thickness, and samples having a combination of the maximum coating thickness and minimum metal thickness shall be tested. If the flame test has to be conducted, the bar type specimens with the coating applied to the metal shall be 127 mm (5 inches) long and 12.7 mm (0.5 inches) wide.

5.5 For a line of non-metallic or composite devices, or metallic devices having a non-metallic or organic coating that includes a range of colors, the test shall be conducted on the following samples. The results of tests conducted on these samples are considered representative of a full range of colors:

a) Samples containing no color pigment (natural); and

b) Samples of both the most heavily pigmented light color (often white) and dark color (often black/including carbon black) are to be considered representative of the color range, if the test results are essentially the same; and

c) Samples containing the heaviest organic pigment loading (not carbon black), unless the most heavily pigmented light and dark colors include the highest organic pigment level. When certain color pigments (for example, red, yellow, or the like) are known to affect flammability characteristics, they shall also be provided.

6 Relative Thermal Index (RTI)

6.1 The maximum operating temperature rating of the device, in accordance with 14.3, shall be based on the relative thermal index (RTI – Strength) properties of the material used in the device. This declared temperature shall not exceed the relative thermal index of a 1.5 mm (0.59 inches) thick material from which the product is molded.

6.2 The relative thermal index shall be determined as given in UL 746B or CAN/CSA-C22.2 No. 0.17.

Note: The relative thermal index of a material is an indication of the material's ability to retain a particular property (such as physical or electrical) when exposed to an elevated temperature for an extended period of time. For each material, a number of relative thermal indices are established, each related to a specific property, and specific thickness of the material.

6.3 For the purposes of this Standard, the relative thermal index of steel is 300 °C (572 °F), and the relative thermal index for aluminum is 150 °C (302 °F).

7 Polymer Variations

7.1 Except as specified in (a) and (b), polymeric materials used to mold or fabricate devices covered by this Standard shall be made from materials that are 100 % virgin and unmodified by the molder:

a) Devices made from thermoplastic materials shall be limited to 25 % regrind by weight of the same material, unless the results of a separate investigation indicate acceptable performance for the material or the specific device. Annex B, Polymeric Material Modifications, includes guidelines to be considered in such a separate investigation.

b) Devices covered by this Standard shall be allowed to employ colorants, flame retardants, fillers, mold-release lubricants, color concentrates, dyestuff, chemical blowing agents or reinforcements in conjunction with the polymeric material, when the additive or concentrate is tested and found not to adversely affect the critical properties of the material. An additive or concentrate of unknown performance shall not be used. Annex B, Polymeric Material Modifications, provides guidance for

the use of specific additives that may be used in the molding process without need for separate investigation.

7.2 Devices shall not employ materials that have been blended together unless one of the following conditions has been met:

a) When two materials have already been individually considered acceptable for an application, and are both found to be generically similar, are both produced by the same manufacturer, and are both classed HB according to 5.1, these materials may be dry blended in any proportion by the manufacturer without further testing.

b) When two materials have already been individually considered acceptable for an application and are both found to be generically similar, are both produced by the same manufacturer, are each is classed V-0, or V-1, or V-2 when tested in accordance with 5.1, and the results of a separate investigation indicate performance meeting the requirements for the material or the specific device, these materials may be dry blended in any proportion by the manufacturer without further testing. Annex B, Polymeric Material Modifications, includes guidelines for a separate investigation.

7.3 A device made from blended material as specified in 7.2 (a) or (b) shall be considered to have flammability, mechanical, and thermal properties that are no better than the performance of the weaker of the individual constituents on a property-to-property basis.

8 Substitution of Materials

8.1 Another polymeric material may be substituted in a device having met the requirements of this Standard only when the material meets the conditions in Annex A, Substitution of Materials, and compliance is determined through appropriate investigation.

9 Corrosion Resistance

9.1 Metallic and composite components of a positioning device classified according to 14.7(c) shall have adequate resistance to corrosion when deterioration or breakage of such parts will result in a risk of fire, electric shock, or injury to persons. Compliance is checked by conducting the appropriate mechanical strength test in accordance with Section 16, following each of the conditions as specified in 16.4.4 and 16.4.5.

9.2 Testing of products constructed of stainless steel having a chromium content of 16 % or more is not required to be exposed to the conditions as specified in 16.4.4 and 16.4.5.

10 Sharp Edges

10.1 Surface of the devices shall be free from burrs and similar inconsistencies, and edges shall be smooth so as not to damage wires, cables, or inflict injury to the installer or user. Samples shall be inspected by normal or corrected vision.

11 Adhesives

11.1 A positioning device that is mounted using an adhesive, that is of rubber generic type, shall be subjected to the appropriate mechanical strength test in accordance with Section 16 when mounted to bare (uncoated) stainless steel or aluminum panels and is suitable for installation on the following surfaces:

a) Any bare or uncoated metal; and

b) Enamel, epoxy, or polyester painted surface.

Additional surfaces, other than those listed above, require testing on those specific surfaces.

11.2 A positioning device that is mounted using an adhesive, that is of acrylic generic type, shall be subjected to the appropriate mechanical strength test in accordance with Section 16 when mounted to bare (uncoated) stainless steel or aluminum panels and is suitable only for installation on any bare or uncoated metal surface. Additional surfaces require testing on those specific surfaces.

11.3 An adhesive of any other generic type, mounted to a device, shall be subjected to the appropriate mechanical strength test in accordance with Section 16 to determine suitability of each specific surface.

11.4 Unless specified by the manufacturer, the samples shall be secured to the respective surface for a period of 5 seconds with a force of 50 ±5 newtons (11.2 ±1.12 lb/f) prior to each appropriate conditioning in accordance with 16.4.

11.5 As an alternate to the requirements specified in 11.1 through 11.4, an adhesive relied upon to maintain proper functioning of the device may be previously evaluated for bond strength properties when all of the following conditions are met and compliance is determined through the appropriate investigation:

a) An adhesive has been previously evaluated for bond strength properties determined in accordance for polymeric adhesive systems as specified in UL 746C, Adhesives – Specialized Applications, and UL 746A, Method A – shear strength by tension loading.

b) Bond strength has been established on each applicable surface and only requires testing for mechanical strength test in accordance with Section 16 when mounted on a single surface, having the lowest established adhesive bond strength.

c) An adhesive may be suitable for installation on additional surfaces when the established bond strength is greater than that of the adhesive evaluated in accordance with 11.5(b).

d) The adhesive evaluated in accordance with 11.5(a) shall be suitable for use with the material used to construct the device, for which it is being applied.

e) The maximum operating temperature of the adhesive in 11.5(a) shall be equal to or greater than the maximum operating temperature of the device.

PERFORMANCE

12 General

12.1 A device shall withstand the stresses likely to occur during recommended installation practice and perform under the conditions of classifications as specified in Section 14 as declared by the manufacturer. Compliance is checked by carrying out all the appropriate tests.

12.2 A positioning device that is self-locking or self-holding shall operate so that it will not be inadvertently released in normal use.

13 General Notes on Tests

13.1 Devices produced in a range of sizes, wall thicknesses, number density, or a construction feature having a range of dimensional characteristics, shall be conducted on samples having both extremes of the range, and the minimum performance level obtained for either extreme shall be representative of the entire range. A range of sizes that is a subset of the wider range may be used for testing when a different performance level is specified for the smaller range. A range of number density refers to the number of slots or holes per unit length.

NOTE For guidance in determining product types and sample sets, a family of devices having material, construction characteristics, and classifications specified in Section 14, in common, are considered of the same product type. Examples for consideration are identical generic material description, material colors, or variable lengths of a device of otherwise similar construction. The sample sets selected for testing from each product type is representative of the extremes of the range (example: shortest and longest), and the minimum performance level obtained for either extreme is determined to be representative of the entire range.

Consideration is given to minor construction variations that can be determined by inspection to have no effect on performance, when determining product types.

13.2 Unless otherwise noted, tests on non-metallic and composite components shall commence when the samples have been removed from their packaging and then stabilized at a temperature of 23 ±5 °C (73.4 ±9 °F) and a relative humidity of 50 ±5 % for a period as specified in Table 13.1, as referred to the as-received condition

NOTE This stabilization intends to achieve equilibrium of moisture content for all samples before and after further conditioning and testing.

Table 13.1
Stabilization Time for Samples

Critical thickness of device		Stabilization time days
mm	(inch)	
1.2 or less	(0.047) or less	7 ±1
1.2 to 1.4	(0.047) to (0.055)	7 but not more than 21
1.4 or more	(0.055) or more	7 but not more than 35
All thicknesses of materials known to have low hygroscopic characteristics[a]		2 ±3

[a] Examples of materials which are known not to be hygroscopic include (but are not limited to) polyethylene, polypropylene, acetal, ethylene tetrafluoroethylene, Polyamide 12, and polyetherkeytone.

13.3 The critical thickness of a device shall be the smallest cross section in the area that interfaces with the locking mechanism or as declared by the manufacturer.

13.4 When the equilibrium moisture content for a material at 23 ±5 °C (73.4 ±9 °F) and 50 ±5 % relative humidity is determined through a method agreed to by the manufacturer and the testing laboratory, the stabilization time specified in Table 13.1 may be reduced under the following conditions:

a) The product's moisture content in the as-received condition and after each appropriate conditioning is measured using a calibrated moisture analyzer device;

b) The samples are subjected to exposure to a constant temperature not exceeding 50 ±2 °C (122 ±3.6 °F) and relative humidity not exceeding 80 ±5 %; and

c) The product's equilibrium moisture content at 23 ±5 °C (73.4 ±9 °F) and 50 ±5 % relative humidity is verified using a calibrated moisture analyzer device. This verification process is repeated until equilibrium is determined.

13.5 Unless otherwise specified, the tests shall be carried out at an ambient temperature of 23 ±5 °C (73.4 ±9 °F) and at a relative humidity between 40 and 60 %.

13.6 Unless otherwise specified, three new samples are submitted to the tests and the requirements are satisfied if all the tests are met. If only one of the samples does not satisfy a test owing to an assembly or manufacturing fault, that test and any preceding one which may have influenced the results of the test shall be repeated. The tests that follow shall be carried out in the required sequence on another full set of samples, all of which shall comply with the requirements.

NOTE The applicant, when submitting the first set of samples, can also submit an additional set of samples which may be necessary if one sample fails. The test station will then without further request test the additional set of samples and will reject only if a further failure occurs. If the additional set of samples is not submitted at the same time, a failure of one sample will entail a rejection.

13.7 When toxic or hazardous processes are used, due regard shall be taken of the safety of persons within the test area.

13.8 Unless otherwise specified, the cross-head speed of a tensile machine used during the tests shall be 25 ±2.5 mm/min (0.984 ±0.098 inch/min). Dead weights may be used for conducting mechanical strength tests for devices classified according to 14.6(a), provided that no sudden application of force occurs.

13.9 Where required for heat aging, a full draft circulating-air oven as in accordance with IEC 60216-4-1 shall be used. A portion of the air shall be allowed to re-circulate and a substantial amount of air shall be admitted continuously to maintain the normal air content surrounding the samples. The oven shall be adjusted to achieve more than five complete fresh-air changes per hour.

13.10 A positioning device and its integral or separate component, the purpose of which is to secure the device to a mounting surface (such as a beam flange, drop wire, rod, or the surface of a panel), shall comply with the requirements for that device and its component.

13.11 An integral or separate component of a positioning device, the performance of which is dependent on the mounting surface or the mounting orientation, shall comply with all applicable tests when the device is assembled on the surfaces for which it is intended and in each intended mounting orientation declared by the manufacturer. When it can be determined that a particular mounting orientation represents the most onerous condition, the results of the tests in that orientation may represent all mounting orientations.

14 Classification

14.1 Material according to:

a) Metallic component; or

b) Non-metallic component, or

c) Composite component.

14.2 Maximum mechanical strength for positioning devices, other than a wiring duct, as specified in Table 14.1.

Table 14.1
Mechanical strength

Mechanical strength	
N	**(lb/f)**
No Mechanical Strength	No Mechanical Strength
30	(6.74)
50	(11.2)
67	(15.0)
80	(17.9)

Table 14.1 Continued on Next Page

Table 14.1 Continued

Mechanical strength	
N	**(lb/f)**
90	(20.2)
112	(25.1)
222	(49.9)
334	(75.0)
359	(80.7)
Notes: 1 Other values may be declared at the manufacturer's discretion. 2 Mechanical strength does not provide an indication of long-term static load bearing capabilities.	

14.3 Maximum operating temperature as specified in Table 14.2.

Table 14.2
Maximum operating temperature for application

Temperature	
°C	**(°F)**
50	(122)
60	(140)
65	(149)
75	(167)
85	(185)
105	(221)
120	(248)
150 (aluminum)	(302) (aluminum)
250	(482)
300 (steel)	(572) (steel)
Note: Use of these ratings are recommended. Additional ratings in 5° increments may be declared.	

14.4 The maximum operating temperature declared by the manufacturer shall be applied for testing according to this Standard. For required markings specified in Section 21, lower temperatures may be marked at the manufacturer's discretion.

NOTE: When declaring maximum operating temperatures, be certain laboratory conditioning ovens are capable of maintaining the parameters required in accordance with 13.9.

14.5 The maximum operating temperature declared for a device that includes an adhesive for fixing to a surface shall not exceed that of the adhesive in accordance with Section 11.

14.6 Intended use according to:

a) Product intended for use as a complete system – Indoor use; or

b) Component intended for use in a complete product or system – Indoor use.

14.7 Environmental influences according to:

a) Not declared; or

b) Resistant to ultraviolet light - for non-metallic components – (Outdoor use); or

c) Resistant to ultraviolet light and resistant to corrosion - for metallic and composite components – (Outdoor use).

14.8 Smoke and heat generation according to:

a) Not declared; or

b) AH-1: Suitable for use in air-handling spaces (plenums) for devices according to 14.1(a); or

c) AH-2: Suitable for use in air-handling spaces (plenums) for devices according to 14.1 (b) or (c).

POSITIONING DEVICES

15 Installation Test

15.1 Three samples of a positioning device shall be installed on a rigid, smooth circular mandrel representing the minimum and maximum specified diameter or size that is able to be installed in the intended manner, as declared by the manufacturer. The diameter test mandrel shall have a tolerance of ±10 %.

15.2 Samples of an integral or separately supplied mounting means for a positioning device, the function of which is dependent upon panel thickness, hole size, or other mounting surface characteristic, shall be installed on the minimum and maximum size panel thickness, hole size or other characteristic as declared by the manufacturer.

15.3 Assembly shall not result in damage or visible cracking to the device, mounting means, or integral positioning device.

15.4 Moisture stabilization specified in 13.2 is not applicable for this test.

16 Mechanical Strength

16.1 General

16.1.1 This test method applies to positioning devices, other than a duct, with a means for mounting to a structural support or panel surface.

16.1.2 A device having an integral mounting means shall be tested as a system.

16.1.3 A device having a separable or separately supplied mounting means may be tested in combination as a system or separately.

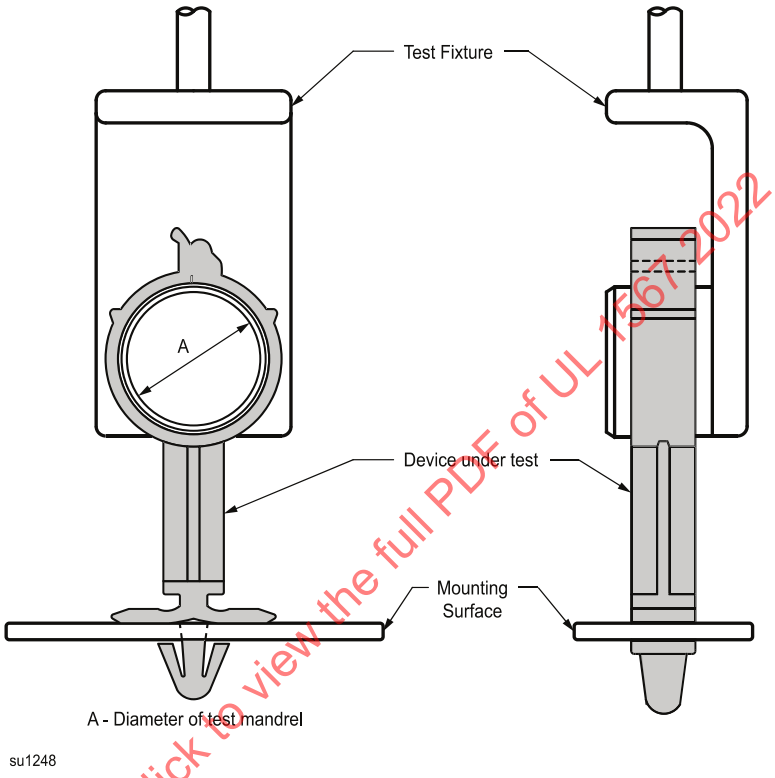
16.1.4 A device comprised of a combination of separable components, which have been separately tested, shall not be required to be tested in combination. The declared mechanical strength for the combination of devices shall not exceed the mechanical strength of either separate component of the combination, if determined by separate evaluation. The individual components shall be rated the same as the combination without further test.

16.1.5 Unless otherwise specified by the manufacturer, the test shall be conducted by applying the test force to the functional portion of the device perpendicular to the mounting surface. The functional portion is

the portion of the device that will secure or position the cable, conduit, tube, etc. A typical arrangement of the test assembly is shown in Figure 16.1.

Figure 16.1

Typical Arrangement of Test Assembly for Push Mount Using Mandrel



16.1.6 Each sample set shall consist of a minimum of 10 specimens of the device to be tested. One set shall be tested after being subjected to the appropriate conditionings in accordance with 16.3.

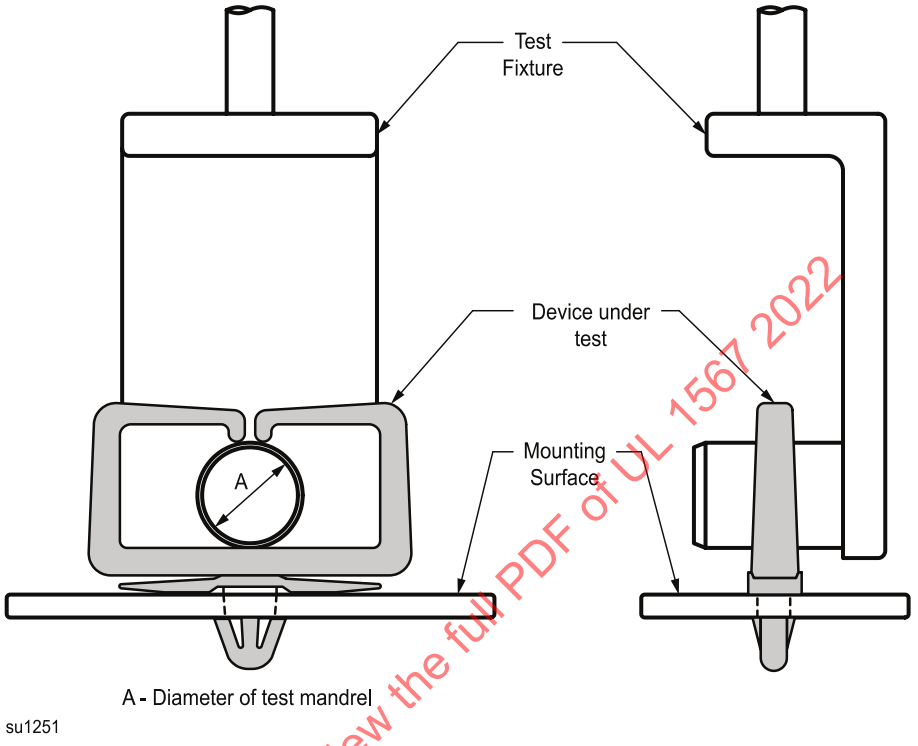
16.2 Assembly

16.2.1 Samples of a positioning device, intended to position or support round cross sectional area products, shall be installed around a rigid, smooth circular mandrel equal to the maximum diameter recommended by the manufacturer with a tolerance of +0,-10 %. A typical arrangement of the test assembly is shown in Figure 16.1.

16.2.2 Devices having a functional area with a rectangular or otherwise oblong cross section which are intended to secure a number of smaller cables might not be able to accommodate a mandrel having the diameter of the maximum bundle diameter, since the device is designed to distribute the cables/wires along its width. In such cases, a mandrel having a diameter no larger than the minimum dimension of the functional area (area intended to support or position), but no smaller than the minimum dimension of the functional area minus 10 %, shall be used. The mandrel shall be centered in the device during testing. A typical arrangement of such a test assembly is shown in Figure 16.2.

Figure 16.2

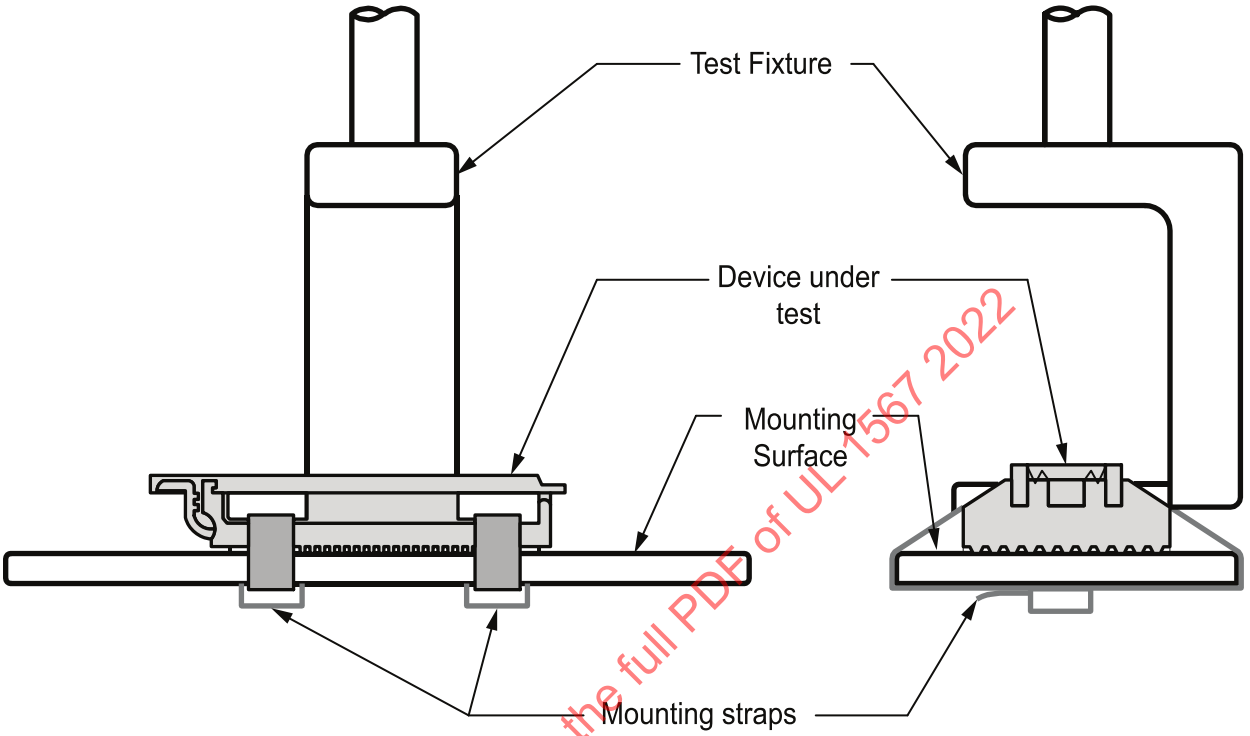
Typical Arrangement of Test Assembly for Mechanical Strength Test of Oblong, Push-Mount Positioning Device



16.2.3 Devices having a flat construction intended to secure ribbon cables or conductors having a flat profile shall have the mechanical strength test conducted using a rigid “L” bracket having a width no greater than one half of the functional width of the clamp and a thickness no greater than the maximum thickness of cable the clamp is intended to accommodate. The fixture shall be centered in the device during testing. A typical arrangement installed according to the manufacturer’s instructions of such a test assembly is shown in Figure 16.3.

Figure 16.3

Typical Arrangement of Test Assembly for Flat, Mechanically Fastened Clamp



16.2.4 Screws or bolts provided as part of a positioning device, other than for securing a positioning device directly to a structural support or panel surface, shall be tightened in accordance with the manufacturer's recommended torque. In the absence of any specific recommendation, the screw or bolt shall be assembled hand tight plus an additional quarter turn. If a specific torque value is specified by the manufacturer, the specific torque shall be marked in accordance with 20.3.

16.2.5 Straps or similar devices intended to be mounted directly to a structural support or panel surface shall be mounted to the test fixture as intended using the minimum size and quantity of the hardware provided with the device according to the manufacturer's instructions. If mounting hardware is not provided for mounting the device, the device shall be rigidly mounted to the test fixture in a manner representing actual use such that the measured stress is indicative of the strength of the device being tested rather than the secureness of the mounting means.

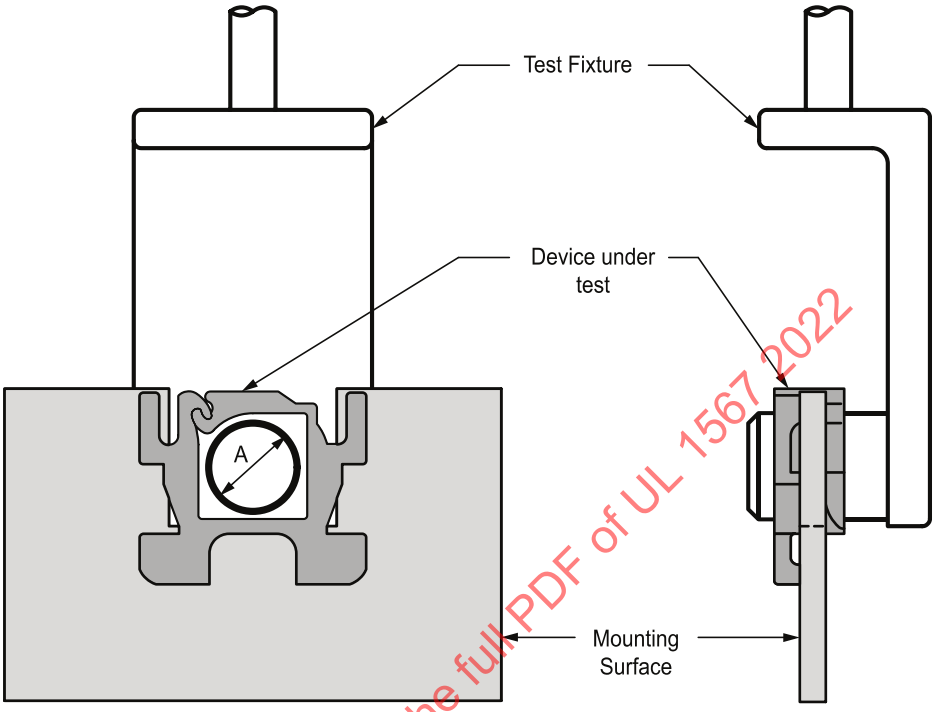
16.2.6 Devices intended to be mounted to wood shall be secured to stud-grade pine or spruce wood, unless another wood is recommended. Installation shall be in accordance with the manufacturer's instructions.

16.2.7 A drop wire, threaded or unthreaded rod, or stud, where required for the test assembly, shall be standard grade, unless a hardened grade is specified by the manufacturer. The test apparatus for positioning devices attached to a drop wire shall ensure that both ends of the wire are secured and under tension.

16.2.8 Edge-mounted devices shall be tested by applying the test load to the functional portion (area intended to position or support) of the device parallel or perpendicular to the mounting surface. A typical arrangement of such a test assembly is shown in Figure 16.4.

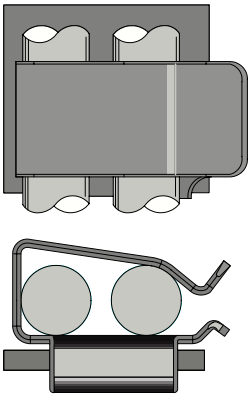
Figure 16.4

Typical Arrangement of Test Assembly Edge Mount Device



A - Diameter of test mandrel

su1249

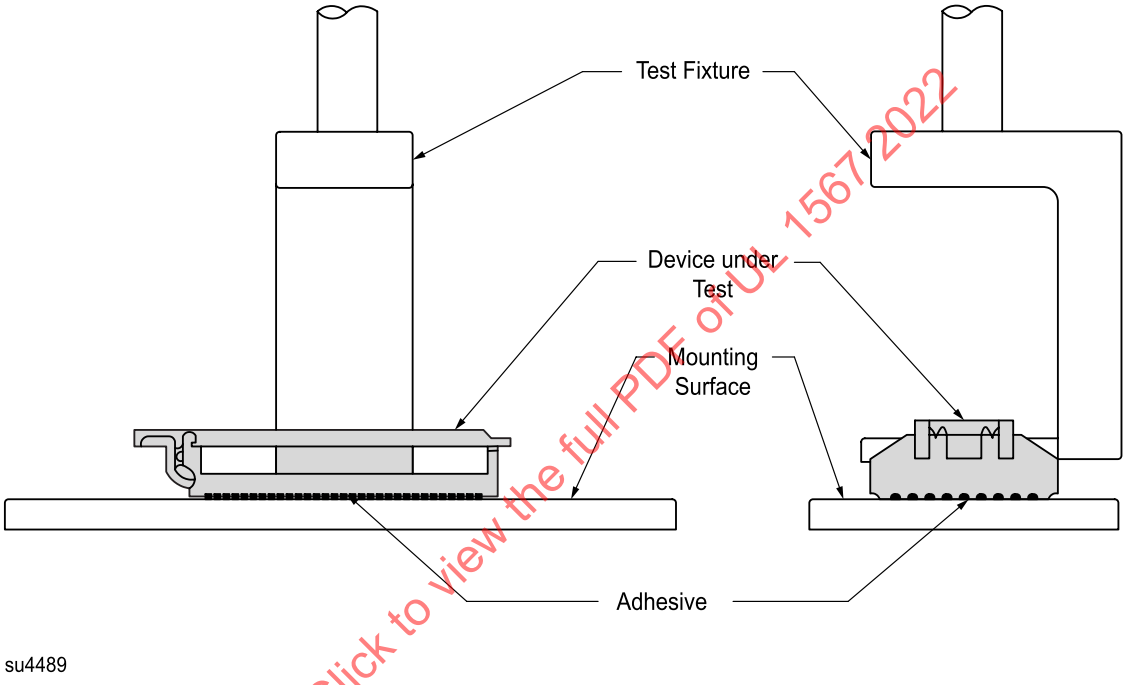


su4888

16.2.9 Positioning devices relying on adhesive as the sole means of securement to the structural support or panel surface shall have the test surface cleaned and prepared as directed by the manufacturer. Refer to Section 11 for additional details. A typical arrangement installed according to the manufacturer's instructions for an adhesive backed assembly is shown in Figure 16.5.

Figure 16.5

Typical Arrangement of Test Assembly for Flat, Adhesive Mounted Clamp



16.3 Mechanical strength test

16.3.1 The mechanical strength of a positioning device shall be determined through tests under static or increasing loads depending on the classification.

16.3.2 A positioning device classified in accordance with 14.6(a) and a declared mechanical strength of "No Mechanical Strength" in accordance with 14.2, is not required to be subjected to the tensile pull test in accordance with 16.1. The temperature rating is based on the relative thermal index – strength (RTI) at 1.5 mm (0.984 inches) thickness.

16.3.3 A positioning device classified in accordance with 14.6(a) shall be subjected to a tensile pull test in accordance with 16.1 until the load equivalent to the mechanical strength declared by the manufacturer is reached and maintained for 60 +5/-0 seconds. The test shall be conducted on specimens after the appropriate conditionings in accordance with 16.4.

16.3.4 A positioning device classified in accordance with 14.6(b), other than a wiring duct, shall be subjected to a tensile pull test in accordance with 16.1. No individual value, of the measured maximum force, shall be less than the mechanical strength, as specified in 14.2, in the as-received condition, and no individual value shall be less than 50 % of the mechanical strength after the appropriate conditionings in accordance with 16.4.

16.4 Conditioning

16.4.1 As-received condition

16.4.1.1 The test shall be carried out on a new set of 10 samples. Samples shall be conditioned in accordance with 13.2.

16.4.1.2 Each sample shall be subjected to the appropriate mechanical strength test as specified in 16.3.

16.4.2 After heat ageing

16.4.2.1 The test shall be carried out on a new set of 10 non-metallic or composite samples. Metallic devices are not required to be subjected to this test.

16.4.2.2 Moisture stabilization as specified in 13.2 before heat aging is not applicable for this test.

16.4.2.3 The samples shall be aged in a full-draft circulating-air oven with forced air at the maximum declared temperature as specified in 14.3 increased by 15 ±1 °C (59 ±2 °F) for 1,000 +48/-0 hours. Then samples shall be conditioned as specified in 13.2.

16.4.2.4 Each sample shall be subjected to the appropriate mechanical strength test as specified in 16.3. After the test, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.

16.4.3 After temperature cycling

16.4.3.1 The test shall be carried out on a new set of 10 samples.

Samples shall be stabilized by being exposed to a temperature of 23 ±2 °C (73.4 ±9 °F) and 50 ± 5 % relative humidity between each phase of conditioning for 30 min. Moisture stabilization as specified in 13.2 before temperature cycling is not applicable for this test.

16.4.3.2 The samples are subjected to the following cycling:

a) The samples shall be placed in a full-draft circulating-air oven at the declared maximum operating temperature of the device for 48 hours.

b) The samples then shall be placed in a chamber at 90 ±5 % relative humidity and 40 ±2 °C (104 ±3.6 °F) for 48 hours.

c) The samples shall be placed in a cold chamber at minus 35 ±2 °C (minus 31 ±3.6 °F) for 8 hours.

d) The samples shall be placed in a full-draft circulating-air oven at the declared maximum operating temperature for 64 hours.

e) Devices consisting of non-metallic and composite components shall be moisture stabilized as specified in 13.2.

16.4.3.3 Each sample shall be subjected to the appropriate mechanical strength test as specified in 16.3. After the test, there shall be no sign of disintegration nor shall there be any crack visible to normal or corrected vision.

16.4.4 Resistance to corrosion

16.4.4.1 Devices classified in accordance with 14.7(c) shall have adequate resistance corrosion.

16.4.4.2 The test is carried out on a new set of 10 samples.

16.4.4.3 Moisture stabilization as specified in 13.2 before salt spray is not applicable for this test.

16.4.4.4 Samples shall be exposed to a salt spray in accordance with ASTM B117 for 30 hours followed by 12 hours at 40 ±2 °C (104 ±3.6 °F). Samples of non-metallic coated devices shall be subjected to heat age conditioning as specified in 16.4.2 before exposure to the salt spray.

16.4.4.5 The samples shall then be rinsed in demineralized water. Metallic devices shall be dried. Composite devices shall be moisture stabilized as specified in 13.2.

16.4.4.6 Each sample shall be subjected to the appropriate mechanical strength test as specified in 16.3. After the test, there shall be no sign of disintegration of a fixing device or any crack visible to normal or corrected vision.

16.4.4.7 Resistance to corrosion conditioning is not required for a metallic cable tie with a non-metallic coating when the uncoated version has been determined to meet the requirements as specified in 16.4.4.

16.4.5 Resistance to ultraviolet light

16.4.5.1 Devices classified in accordance with 14.7 (b) or (c) shall have adequate resistance to ultraviolet light.

16.4.5.2 The test shall be carried out on a new set of 10 new samples.

16.4.5.3 Moisture stabilization as specified in 13.2 before ultraviolet light exposure is not applicable for this test.

16.4.5.4 When the product is provided in more than one color, the color having the heaviest organic pigment loading shall be subjected to this testing. All sets tested are considered representative of the material's entire color range.

NOTE In determining the product types and sample set for testing, consideration is given to products colored red or yellow which are known to have particular critical effects.

16.4.5.5 Samples shall be mounted on the inside of the ultraviolet light apparatus so that the samples do not touch each other. Samples shall be positioned in such a way that the locking portion is facing the light and water source.

16.4.5.6 The samples shall be exposed for 1,000 hour to xenon-arc, cycle 1, in accordance with ASTM G 151 and ASTM G155. There shall be continuous exposure to light and intermittent exposure to water spray. The cycle shall consist of 102 minutes without water spray and 18 minutes with water spray. The apparatus shall operate with a water-cooled or air-cooled xenon-arc lamp, borosilicate glass inner and outer optical filters, a spectral irradiance of 0.35 W/(m2·nm) at 340 nm and a black-panel temperature of 63 ±3 °C (145.4 ±5.4 °F).

16.4.5.7 Then samples shall be moisture stabilized as specified in 13.2.