

Solderless connections

Part 4: Solderless non-accessible insulation displacement connections — General requirements, test methods and practical guidance

The European Standard EN 60352-4:1994, with the incorporation of amendment A1:2000, has the status of a British Standard

ICS 29.120.20

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National Foreword

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Cross-references

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Summary of pages

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English version

Solderless connections

Part 4: Solderless non-accessible insulation displacement connections — General requirements, test methods and practical guidance

(includes amendment A1:2000)
(IEC 60352-4:1994 + A1:2000)

Connexions sans soudure
Partie 4: Connexions autodénudantes, non accessibles sans soudure — Règles générales, méthodes d'essai et guide pratique
(inclut l'amendement A1:2000)
(CEI 60352-4:1994 + A1:2000)

Lötfreie elektrische Verbindungen
Teil 4: Lötfreie nichtzugängliche Schneidklemmverbindungen Allgemeine Anforderungen, Prüfverfahren und Anwendungshinweise
(enthält Änderung A1:2000)
(IEC 60352-4:1994 + A1:2000)

This European Standard was approved by CENELEC on 1994-10-04. Amendment A1 was approved by CENELEC on 2000-11-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

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CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

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Ref. No. EN 60352-4:1994+A1:2000 E

Foreword

The text of document 48B(CO)251, as prepared by Subcommittee 48B, Connectors, of IEC Technical Committee 48, Electromechanical components and mechanical structures for electronic equipment, was submitted to the IEC-CENELEC parallel vote in February 1994.

The reference document was approved by CENELEC as EN 60352-4 on 4 October 1994.

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1995-10-01
- latest date of withdrawal
of conflicting national
standards (dow) 1995-10-01

Annexes designated 'normative' are part of the body of the standard. In this standard, annex ZA is normative.

Foreword to amendment A1

The text of document 48B/908/FDIS, future amendment 1 to IEC 60352-4:1994, prepared by SC 48B, Connectors, of IEC TC 48, Electromechanical components and mechanical structures for electronic equipment, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 60352-4:1994 on 2000-11-01.

The following dates were fixed:

- latest date by which the
amendment has to be
implemented at national
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- latest date by which the
national standards
conflicting with the
amendment have to be
withdrawn (dow) 2003-11-01

Annexes designated 'normative' are part of the body of the standard. In this standard, annex ZA is normative.

Annex ZA has been added by CENELEC.

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INTRODUCTION

The two following parts of IEC 352 are available on solderless insulation displacement connections:

- Part 3: Solderless accessible insulation displacement connections – General requirements, test methods and practical guidance;
- Part 4: Solderless non-accessible insulation displacement connections – General requirements, test methods and practical guidance.

These parts include requirements, tests and practical guidance information.

Two test schedules are provided:

- the *basic test schedule* which applies to insulation displacement connections which *conform to all requirements* of section 2 of this standard;

These requirements are derived from experience with successful applications of such connections.

- the *full test schedule* which applies to insulation displacement connections which do *not fully conform to all requirements* of section 2, for example which are manufactured using materials or finishes not included in section 2.

This philosophy permits cost and time effective performance verification using a limited basic test schedule for established insulation displacement connections and an expanded full test schedule for connections requiring more extensive performance validation.

NOTE – In this standard the term "insulation displacement" is abbreviated to "ID", for example "ID connection", "ID termination".

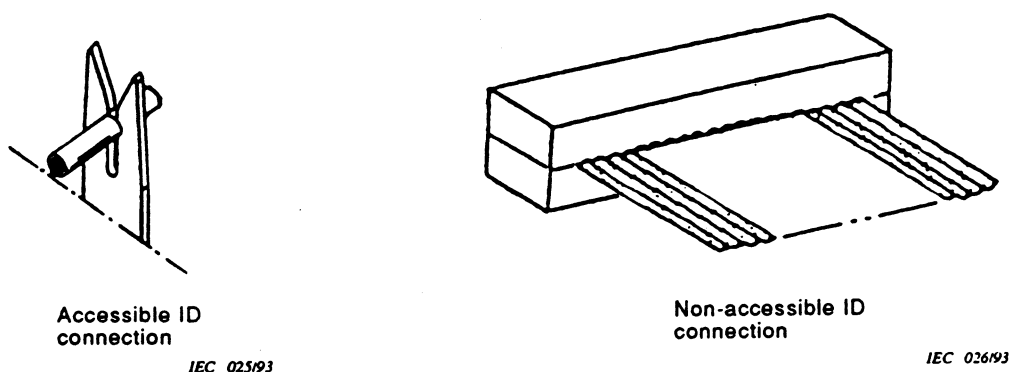


Figure 1 – Examples of accessible and non-accessible Insulation displacement connections

IEC Guide 109 advocates the need to minimize the impact of a product on the natural environment throughout the product life cycle.

It is understood that some of the materials permitted in this standard may have a negative environmental impact.

As technological advances lead to acceptable alternatives for these materials, they will be eliminated from the standard.

SOLDERLESS CONNECTIONS –

Part 4: Solderless non-accessible insulation displacement connections – General requirements, test methods and practical guidance

Section 1: General

1 Scope

This part of IEC 352 is applicable to non-accessible ID connections for which the tests and measurements of section 3 are suitable and which are made with:

- appropriately designed ID terminations;
- wires having solid round conductors of 0,25 mm to 3,6 mm nominal diameter;
- wires having stranded conductors of 0,05 mm² to 10 mm² cross-section;

for use in telecommunication equipment and in electronic devices employing similar techniques.

Information on materials and data from industrial experience is included in addition to the test procedures to provide electrically stable connections under prescribed environmental conditions.

2 Object

The object of this part of IEC 352 is to:

- determine the suitability of non-accessible ID connections under specified mechanical, electrical and atmospheric conditions;
- provide a means of comparing test results when the tools used to make the connections are of different designs or manufacture.

There are different designs and materials for ID terminations in use. For this reason only fundamental parameters of the termination are specified while the performance requirements of the wire and the complete connection are specified in full detail.

3 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 352. At the time of publication, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 352 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 60050 (581): 1978, *International Electrotechnical Vocabulary (IEV) — Chapter 581: Electro-mechanical components for electronic equipment*

IEC 60068-1: 1988, *Environmental testing — Part 1: General and guidance*

IEC 60068-2-60 TTD: 1990, *Environmental testing — Part 2: Tests — Test Ke: Corrosion tests in artificial atmosphere at very low concentration of polluting gas(es)*

IEC 60189-3: 1988, *Low-frequency cables and wires with PVC insulation and PVC sheath — Part 3: Equipment wires with solid or stranded conductor, PVC insulated, in singles, pairs and triples*
Amendment 1 (1989)

IEC 60326-2: 1990, *Printed boards — Part 2: Test methods*
Amendment 1 (1992)

IEC 60352-3: 1993, *Solderless connections — Part 3: Solderless accessible insulation displacement connections — General requirements, tests methods and practical guidance*

IEC 60512-1: 1984, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods — Part 1: General*
Amendment 1 (1988)

IEC 60512-2: 1985, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods — Part 2: General examination, electrical continuity and contact resistance tests, insulation tests and voltage stress tests*

IEC 60512-4: 1976, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods — Part 4: Dynamic stress tests*

IEC 60512-5: 1992, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods — Part 5: Impact tests (free components), static load tests (fixed components), endurance tests and overload tests*

IEC 60512-6: 1984, *Electromechanical components for electronic equipment; basic testing procedures and measuring methods — Part 6: Climatic tests and soldering tests*

IEC 60512-11-7: 1996, *Electromechanical components for electronic equipment — Basic testing procedures and measuring methods — Part 11: Climatic tests — Section 7: Test 11g: Flowing mixed gas corrosion test*

IEC 60673: 1980, *Low-frequency miniature equipment wires with solid or stranded conductor, fluorinated polyhydrocarbon type insulation, single*
Amendment 3 (1989)

IEC 60918: 1987, *PVC insulated ribbon cable with a pitch of 1,27 mm suitable for insulation displacement termination*

ISO 61463: 1982, *Metallic and oxide coatings — Measurement of coating thickness — Microscopical method*

IEC Guide 109: 1995, *Environmental aspects — Inclusion in electrotechnical product standards*

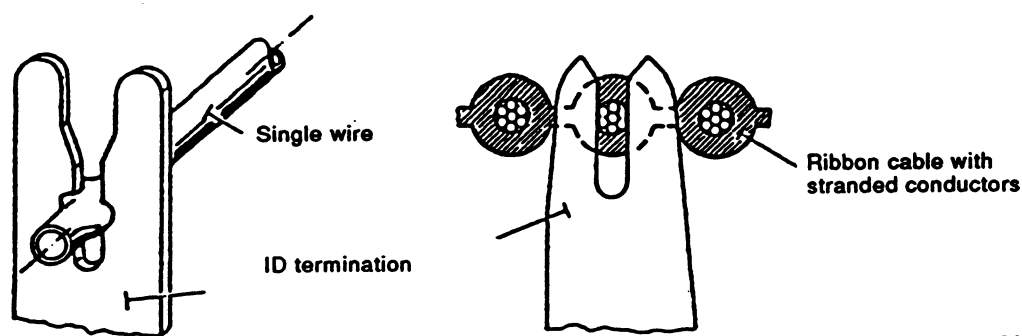
4 Definitions

Terms and definitions used in and applicable to this part of IEC 352 are included in IEC 50(581). IEC 512-1 also contains some applicable terms and definitions.

For the purpose of this part of IEC 352, the following additional terms and definitions apply.

4.1 *Insulation displacement connection (ID connection)*

A solderless electrical connection made by inserting a single wire into a precisely controlled slot in a termination such that the sides of the slot displace the insulation and deform the conductor of a solid wire or strands of stranded wire to produce a gas-tight connection.



IEC 027/93

Figure 2 – Insulation displacement connections

4.1.1 *Accessible insulation displacement connection (accessible ID connection)*

(See IEC 352-3).

An ID connection in which it is possible to access test points for carrying out mechanical tests (for example transverse extraction force) and electrical measurements (for example contact resistance) without deactivation of any design feature intended to establish and/or maintain the ID connection.

4.1.2 *Non-accessible insulation displacement connection (non-accessible ID connection)*

An ID connection in which it is not possible to access test points for carrying out mechanical tests such as transverse extraction force and some electrical measurements (for example contact resistance) without deactivation of any design feature intended to establish and/or maintain the ID connection, mainly where the ID connection is enclosed in a component.

4.2 *Insulation displacement termination (ID termination)*

A termination designed to accept a wire for the purpose of establishing an ID connection.

4.2.1 *Reusable insulation displacement termination (reusable ID termination)*

An ID termination that can be used more than once.

4.2.2 Non-reusable insulation displacement termination (non-reusable ID termination)

An ID termination that can only be used once.

4.3 Slot

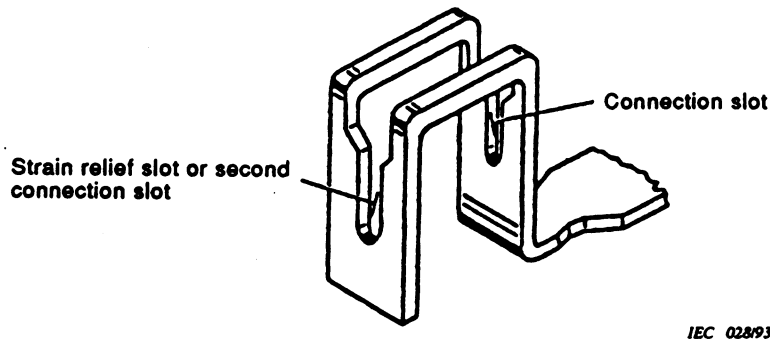


Figure 3 – Slot

4.3.1 Connection slot

The specially shaped opening in an ID termination suitable to displace the insulation of a wire and to ensure a gas-tight connection between the termination and the conductor(s) of the wire.

In certain cases, a second connection slot is used to provide for a double connection.

4.3.2 Strain relief slot

The specially shaped opening in an ID termination suitable to grip the wire.

4.4 Beam

The specially shaped metallic part of an ID termination on each side of the slot.

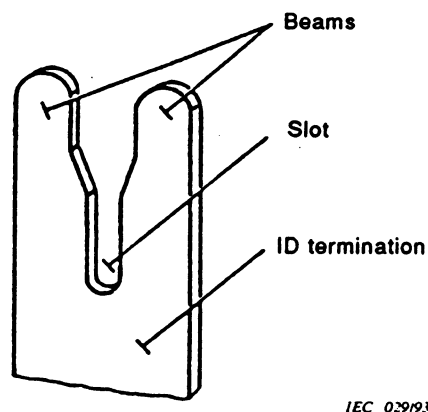


Figure 4 – Beam

4.5 Apparent diameter (of a stranded conductor)

The diameter of the circumscribing circle of the bundle of strands.

4.6 Guiding block

A specially shaped part of a component, e.g. a connector, which guides/inserts the wire(s) into the slot(s). Additionally it may provide for other mechanical features, for example fixing the wire(s) in correct position(s), strain relief of the ID connection(s), secondary loading on the ID termination(s) or beams.

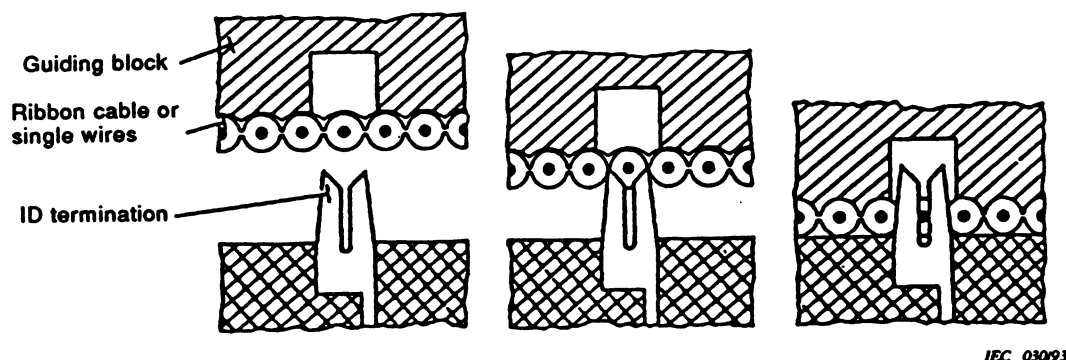


Figure 5 – Guiding block

4.7 Wire insertion tool

A hand or power operated tool for producing an ID connection by inserting the wire(s) in a controlled manner to a predetermined position into the slot(s).

4.8 Wire extraction tool

A device for extracting the wire(s) from the ID termination.

5 IEC type designation

Not applicable.

Section 2: Requirements

6 Workmanship

The connections shall be processed in a careful and workmanlike manner in accordance with good current practice.

7 Tools

Tools shall be used and inspected according to the instructions given by the manufacturer.

A tool shall be able to make uniformly reliable connections during its useful life.

A tool shall be designed and shall operate in such a manner that any damage to the ID termination and/or to the wire is avoided.

A tool shall provide for a correct location of the wire in the slot.

Tools are evaluated by testing ID connections made with the tools to be evaluated.

A guiding block, which may be a part of a component, e.g. a connector, may be used in combination with insertion tooling to insert the wire(s) or cable in the connection slot(s). The insertion tool shall apply a suitable force to the guiding block. The design of the guiding block should aid in alignment of the wire(s) or cable with the connection slot(s) so as to provide for reliable ID connections.

8 Insulation displacement termination (ID termination)

8.1 Materials

Suitable grades of copper alloy, such as copper-tin (bronze), copper-zinc (brass) or beryllium copper shall be used.

NOTE – If copper-zinc is used, care should be taken regarding corrosion effects caused by stress.

8.2 Dimensions

The quality of an ID connection depends on the dimensions of the ID termination, particularly of its slot and beams, together with the characteristics of the materials used.

The dimensions shall be chosen so as to be suitable for the wire or range of wires for which the ID termination is designed. The suitability is verified by applying the test schedule given in section 3.

8.3 Surface finishes

The contact area of the termination shall be plated with tin or tin-lead or with silver, gold, palladium or their alloys. The surface shall be free of detrimental contamination or corrosion.

8.4 *Design features*

ID terminations may be distinguished according to reusability conditions and according to the range of wire sizes that can be accommodated. This results in the following types:

- reusable terminations, designed to be connected more than once and designed for one specified nominal conductor diameter or cross-section;
- reusable terminations, designed to be connected more than once and designed for a specified range of conductor diameters or cross-sections;
- non-reusable terminations, designed to be connected once and designed for one specified nominal conductor diameter or cross-section;
- non-reusable terminations, designed to be connected once and designed for a specified range of conductor diameters or cross-sections.

The edges of the beams shall be smooth and free of burrs to avoid unintentional damage to the conductor(s) or insulation.

9 *Wires*

Ribbon cables or single wires with solid round conductors or stranded conductors with seven single strands shall be used.

NOTE – For further information on wires, see IEC 189-3 and IEC 673.
For information on PVC insulated ribbon cables, see IEC 918.

9.1 *Materials*

The conductor material shall be annealed copper. It shall have an elongation at break of not less than 10 %.

9.2 *Dimensions*

Different ranges of wires shall be used:

- single solid round wires of 0,25 mm to 0,8 mm diameter (converted 0,049 mm² to 0,5 mm²); or
- stranded wires of 0,075 mm² to 0,5 mm² cross-section.

9.3 *Surface finishes*

Solid round conductors shall be unplated or plated with tin, tin-lead or silver. Stranded conductors shall have strands plated with tin, tin-lead or silver.

The conductor surface shall be free of contamination and corrosion.

9.4 *Wire insulation*

The detail specification of the ID termination shall specify the outside diameter of the wire insulation that can be accommodated.

The insulation material shall be PVC or another material with properties compatible with the insulation displacement process, i.e. the insulation material shall be capable of being