



SLOVENSKI STANDARD
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Solderless connections - Part 2: Crimped connections - General requirements, test methods and practical guidance

Lötfreie Verbindungen - Teil 2: Crimpverbindungen - Allgemeine Anforderungen, Prüfverfahren und Anwendungshinweise

Connexions sans soudure - Partie 2: Connexions serties - Exigences générales, méthodes d'essai et guide pratique

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SECRETARY:

Mr Jeffrey Toran

OF INTEREST TO THE FOLLOWING COMMITTEES:

PROPOSED HORIZONTAL STANDARD:

Other TC/SCs are requested to indicate their interest, if any, in this CDV to the secretary.

FUNCTIONS CONCERNED:

EMC

ENVIRONMENT

QUALITY ASSURANCE

SAFETY

SUBMITTED FOR CENELEC PARALLEL VOTING

NOT SUBMITTED FOR CENELEC PARALLEL VOTING

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TITLE:

Solderless connections - Part 2: Crimped connections - General requirements, test methods and practical guidance

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

SOLDERLESS CONNECTIONS –

Part 2: Crimped connections –
General requirements, test methods and practical guidance

FOREWORD

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International Standard IEC 60352-2 has been prepared by subcommittee 48B: Electrical connectors, of IEC technical committee 48: Electrical connectors and mechanical structures for electrical and electronic equipment.

This third edition cancels and replaces the second edition published in 2006 and Amendment 1:2013. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) the “Practical guidance” section (former clauses 6 through 15) has been moved into new Annex A (informative);
- b) several definitions have been added (wire, cable, crimping, crimped connection, crimp contact, terminal, terminal end, pre-insulated terminal end, termination, connecting device, splice, insulation support, insulation grip, pre-insulated crimped connection, crimping tool, locator, positioner, full cycle crimp mechanism, crimp anvil, crimp indenter, crimp height, crimp inspection hole, crimp barrel wire range, nominal cross-sectional area);
- c) a three-level classification by end-product level has been introduced in the *workmanship* clause, based on the expected level of reliability of the end-use application for which the

- 401 crimped connections under subject are suitable, similar to what done in 4.3 of IEC 61191-
402 1:2018 for soldered electrical and electronic assemblies;
- 403 d) for better clarification, former subclause 4.5 Crimped connections, now renumbered and
404 renamed 5.5 Prerequisites for crimped connections, has been split in several third level
405 subclauses with assigned title;
- 406 e) allowable strand damage has been introduced with reference to the classification in three
407 levels by end-use application, for the production of test specimens;
- 408 f) based on industry experience, in 5.3.1 the minimum copper content of a copper alloy suitable
409 for making crimp barrels has been lowered to 57 % from original 60 %;
- 410 g) the elongation at break of annealed copper suitable for conductors to be crimped has been
411 increased to 15 % from original 10 %;
- 412 h) the cross-sectional area of conductors for testing purposes is allowed to be the nominal
413 (commercial) one, instead of the geometric (actual) one for wires with nominal cross-
414 sectional area larger than 2,5 mm² (see 5.4.3), the geometric (actual) one being the
415 reference in case of dispute on test results;
- 416 i) consideration about wire insulation concentricity has been added in 5.4.5;
- 417 j) former subclause 5.2.1 General examination is now renumbered and renamed as 7.1
418 General examination of crimp barrels and wires (examination of parts as called later) and a
419 new subclause 7.2 Examination of crimp dimensions has been added, to cover examination
420 of dimensions after crimping, with several new third level subclauses: 7.2.1 Crimp height
421 C_h, crimp width C_w and measurable crimp width C_{wm}, 7.2.2 Contact deformation after
422 crimping, 7.2.3 Visual examination of insulation distance and conductor overhang, 7.2.4
423 Visual examination of splice crimped connections, 7.2.5 Visual examination of crimped
424 connections on closed (machined crimp barrels, 7.2.6 Visual examination of crimped
425 connections on B-crimp open crimp barrels, 7.2.7 Visual examination of crimped
426 connections with open crimp barrel with insulation grip;
- 427 k) the pull-out force (tensile strength) requirements covering safety requirements of crimped
428 connections have been kept in 7.3.1 from Ed. 2.1 Table 1, here renumbered Table 5;
429 interpolated values for most used cross-sectional areas 0,34 mm² and 0,37 mm² have been
430 added. Reference to IEC 61210 as source for these safety values has been removed, as
431 partially inaccurate. Optional specification of higher pull-out force requirements, based on
432 classification by end-use product per 5.1, and more representative of what can be achieved
433 based on the type of crimp barrel, the form of the crimping, the material and plating of barrel
434 and wire, has been introduced in A.7.3;
- 435 l) a microsection test (optional) has been added in 7.3.2;
- 436 m) vibration test (optional) has been added in subclause 7.3.7;
- 437 n) current-carrying capacity test (optional) has been added in subclause 7.4.3;
- 438 o) alternative current loading, cyclic test method added in 7.5.5;
- 439 p) flowing mixed gas corrosion test (optional) has been added in subclause 7.6.2;
- 440 q) crimping at low temperature (former subclause 5.4.2.5) has been completed in 7.5.6 by re-
441 entering the test method already present in Edition 1 subclause 11.4.5;
- 442 r) types of test specimens have been expanded: a new type A specimen is added, type B is
443 former type A, type C is former type B, type D is former type C, type E is former type D
444 modified with addition of reference wires, type F is former type E, and new specimens types
445 G and H were added to perform tests on splices;
- 446 s) normative references, as well as Bibliography have been updated and expanded as
447 required;
- 448

449 The text of this International Standard is based on the following documents:

Draft	Report on voting
48B/XX/FDIS	48B/XX/RVD

450 Full information on the voting for its approval can be found in the report on voting indicated in
451 the above table.

452 The language used for the development of this International Standard is English.

453 This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in
454 accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available
455 at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are
456 described in greater detail at www.iec.ch/standardsdev/publications.

457 This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

458 IEC 60352 consists of the following parts, under the general title *Solderless connections*:

- 459 Part 1: Wrapped connections – General requirements, test methods and practical guidance
460 Part 2: Crimped connections – General requirements, test methods and practical guidance
461 Part 2-1: Crimped connections – General requirements, test methods and practical guidance
462 for connections with wires of cross-sectional area above 10 mm² up to 300 mm²
463 (included)¹
464 Part 3: Solderless accessible insulation displacement connections – General requirements,
465 test methods and practical guidance
466 Part 4: Solderless non-accessible insulation displacement connections – General
467 requirements, test methods and practical guidance
468 Part 5: Press-in connections – General requirements, test methods and practical guidance
469 Part 6: Insulation piercing connections – General requirements, test methods and practical
470 guidance
471 Part 7: Spring clamp connections – General requirements, test methods and practical guidance
472 Part 8: Compression mount connections – General requirements, test methods and practical
473 guidance
474 Part 9: Ultrasonic welded connections – General requirements, test methods and practical
475 guidance²

476 The committee has decided that the contents of this document will remain unchanged until the stability
477 date indicated on the IEC web site under “<https://webstore.iec.ch>” in the data related to the
478 specific document. At this date, the publication will be

- 479 • reconfirmed;
- 480 • withdrawn;
- 481 • replaced by a revised edition, or
- 482 • amended.

IMPORTANT – The “colour inside” logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this publication using a colour printer.

483

¹ In preparation.

² In preparation.

484

INTRODUCTION

485 IEC 60352-2 includes requirements and relevant tests (normative) as well as a practical
486 guidance in Annex A (informative) for crimped connections.

487 Two test schedules are provided:

488 – the basic test schedule which applies to solderless crimped connections which conform to
489 all of the prerequisites of Clause 5. It is derived from experience with successful applications
490 of such connections;

491 – the full test schedule which applies to solderless crimped connections which do not fully
492 conform to all prerequisites of Clause 5, for example which are made with solid wires, using
493 materials or finishes not included in Clause 4.

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

497 A detail product specification or the manufacturer's specification for crimped connections and/or
498 associated cable assemblies, as well as for crimp contacts, terminal ends or splices, can include
499 additional tests, to verify enhanced performance and/or compliance with specified product
500 classes. It can also reference this document with test severities and acceptance criteria other
501 than those provided by either one of the two test schedules, as well as foresee an intermediate
502 test schedule. The requirements of the detail product specification or the manufacturer's
503 specification prevail, once the deviations from what specified by this document are provided in
504 the technical documentation of the product.

505 The suitability of the crimped connection implies that the specified requirements and tests apply
506 to all factors involved in producing a suitable crimped connection, namely:

507 – the crimp barrel, which may be part of a crimp contact or terminal end, the contact deemed
508 to be used in a single-pole or multipole connector;

509 – the wire (or range of wires) for which the termination is suitable;

510 – the tools required to produce that type of solderless connection.

511 The practical guidance (informative Annex A) serves as a guideline for the required
512 workmanship. Attention is drawn to the fact that some industries (e.g., automotive, aerospace,
513 nuclear, military) may have specific workmanship standards and/or quality requirements, which
514 are outside the scope of this document.

515 IEC Guide 109 advocates the need to minimise the impact of a product on the natural environ-
516 ment throughout the product life cycle.

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

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

521