
Nespajkani spoji – 2. del: Nespajkani stisnjeni spoji – Splošne zahteve, preskusne metode in napotki za uporabo (IEC 60352-2:1990)

Solderless connections - Part 2: Solderless crimped connections - General requirements, test methods and practical guidance (IEC 60352- 2:1990)

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Annex ZA (normative)**Normative references to international publications with their corresponding European publications**

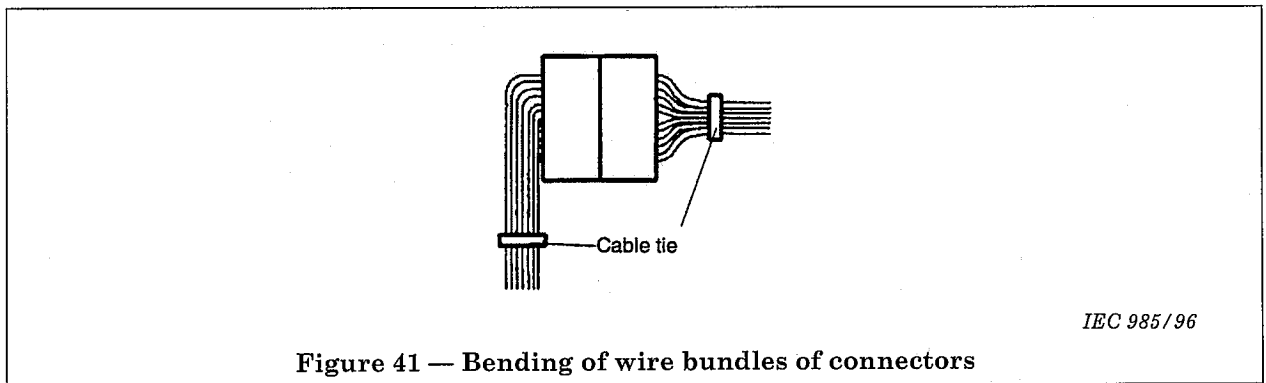
This European Standard incorporates by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

NOTE When the international publication has been modified by common modifications, indicated by (rood), the relevant EN/HD applies.

Publication	Year	Title	EN/HD	Year
IEC 60050-581	1978	<i>International Electrotechnical Vocabulary (IEV) — Chapter 581: Electromechanical components for electronic equipment</i>	—	—
A1	1998		—	—
IEC 60068-1	1988	<i>Environmental testing —</i>	—	—
+ corr. October	1998	<i>Part 1: General and guidance</i>	—	—
+ A1	1992		EN 60068-1	1994
IEC 60130-7	1971	<i>Connectors for frequencies below 3 MHz — Part 7: Circular multipole connectors with bayonet or push-pull coupling</i>	—	—
IEC 60189-3	1988	<i>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</i>	—	—
A1	1989	https://standards.iteh.ai/catalog/standards/sist/af2b3833-6596-4c5d-a77c-1d319b825d66/sist-en-60352-2-2005	—	—
IEC 60512	series	<i>Connectors for electronic equipment — Tests and measurements</i>	EN 60512	series
IEC 60512-1-100	2001	<i>Connectors for electronic equipment — Tests and measurements — Part 1-100: General — Applicable publications</i>	EN 60512-1-100	2001
IEC 60673	1980	<i>Low-frequency miniature equipment wires with solid or stranded conductor, fluorinated polyhydrocarbon type insulation, single</i>	—	—
A3	1989		—	—
ISO 60760	1989	<i>Flat, quick-connect terminations</i>	—	—
A1	1993		—	—
IEC 61210 (mod)	1993	<i>Connecting devices — Flat quick-connect terminations for electrical copper conductors — Safety requirements</i>	EN 61210	1995
IEC Guide 109	1995	<i>Environmental aspects — Inclusion in electrotechnical product standards</i>	—	—
ISO 6507-1	1997	<i>Metallic materials — Vickers hardness test — Part 1: Test method</i>	EN ISO 6507-1	1997

A2

If wire bundles/cables with crimped contacts have to be bent directly at the termination side of the connectors, no mechanical stress effects should take place in a direction transverse to the engaged contacts. Figure 41 shows a correct bending and fastening of wire bundles with crimp contacts.



21.4 Mating and unmating of multipole connectors with crimped contacts

To avoid stress on the inserted contacts, the connectors should be mated and unmated in an axial direction, without pushing or pulling the wire bundles/cables.



22 Final remarks

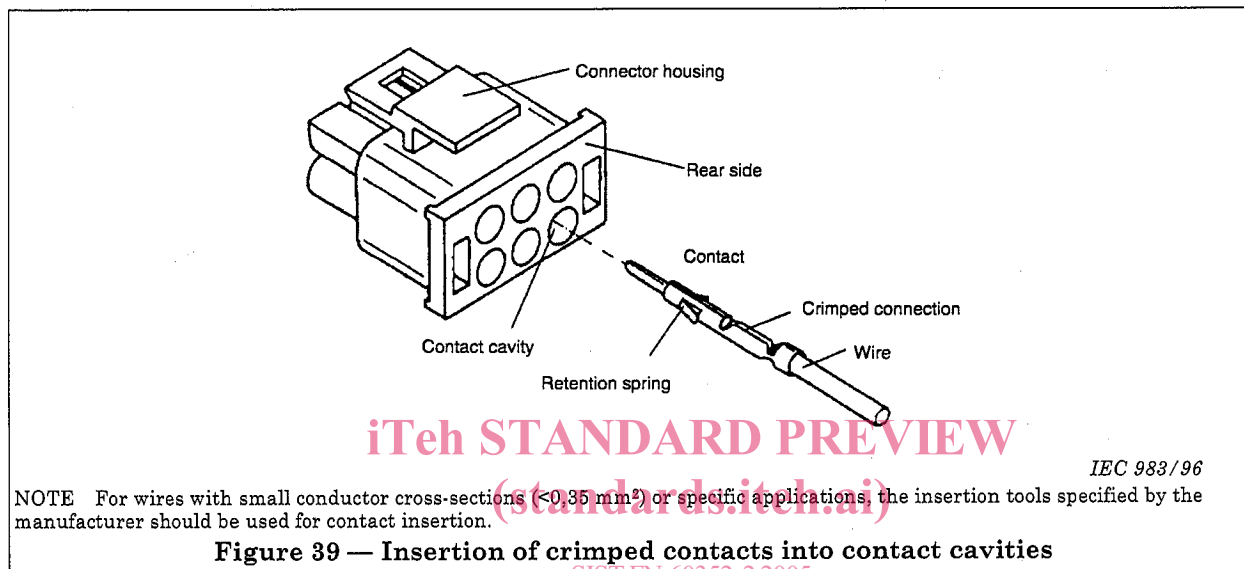
Attention should be paid to the manufacturer's documentation (detail, product, application specifications, instruction sheets, etc.), which should include information about the number of operations, contact retention, mating and unmating forces, current rating, maximum temperatures, instructions about the crimping tools, etc. Usually, this information is available on request from the contact/connector manufacturer. **A1**

21 General information about crimp type contacts as part of a multipole connector

21.1 Insertion of crimped contacts into the contact cavities of the connector housing

These crimped contacts should be absolutely straight and, without the use of extreme force, inserted in one operation into the contact cavities until a "click" is audible. The correct locking of the contact should be tested by a gentle pull on the wire. Misalignment of the crimped contacts should be avoided because of possible bending of the retention springs, and therefore impaired contact retention in the contact cavity.

Figure 39 shows the correct insertion of a crimped contact into the cavity of the connector housing.



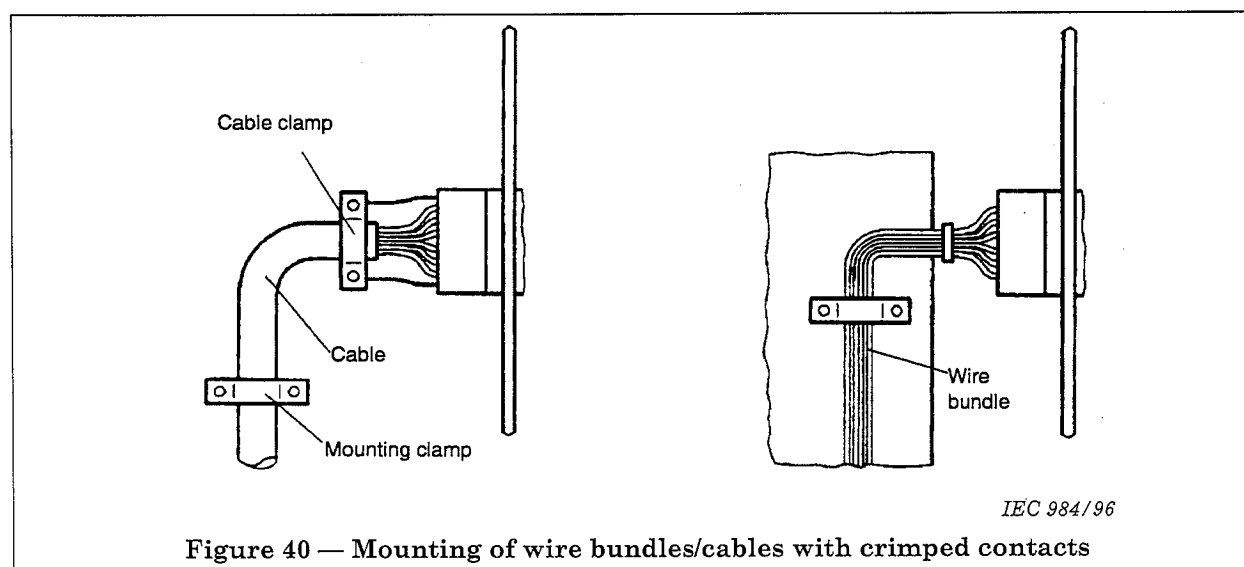
21.2 Removal of inserted contacts

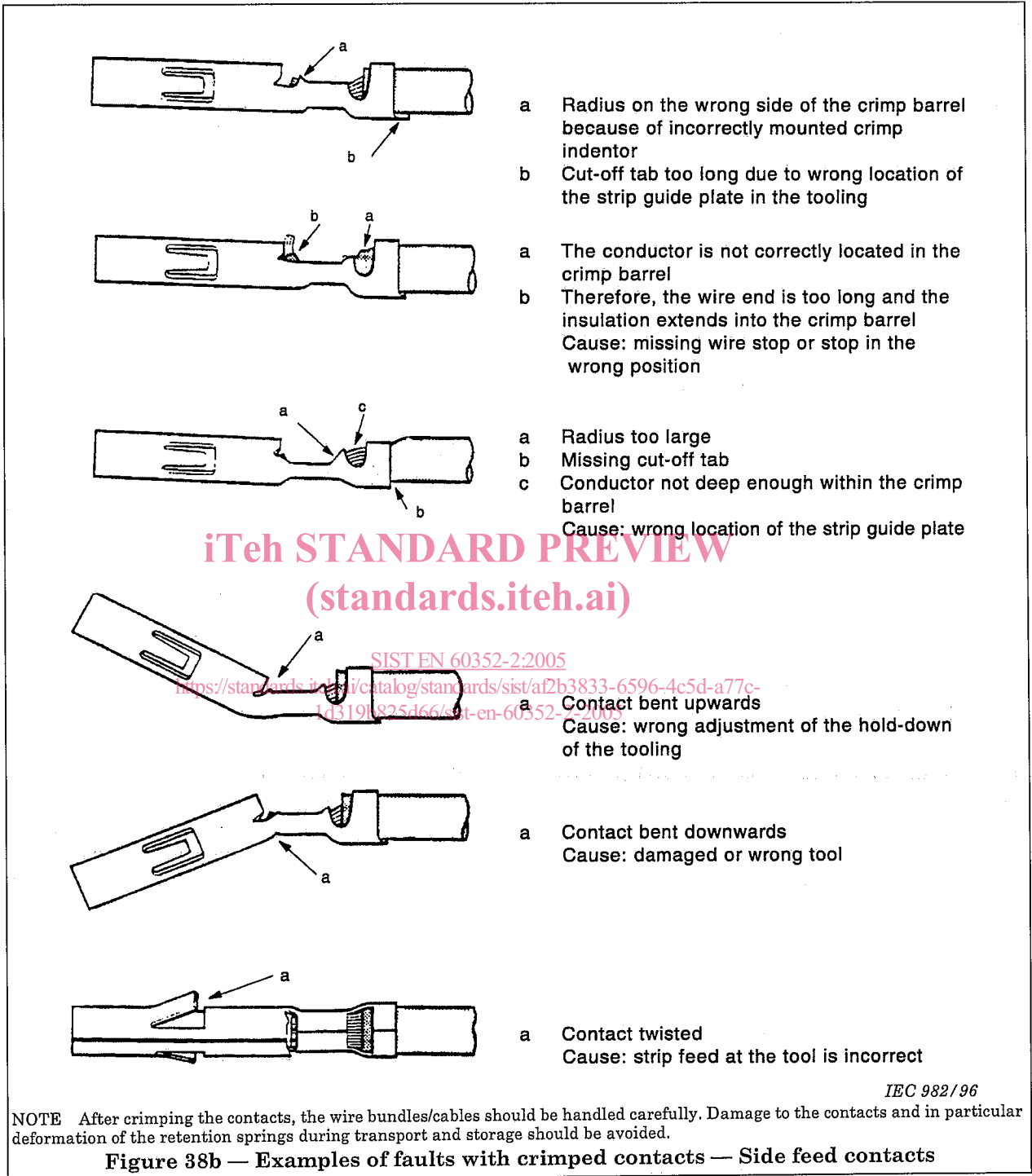
In the case of wrong loading or change of the wiring, inserted contacts can only be removed from the cavity with the contact removal tools specified by the manufacturer.

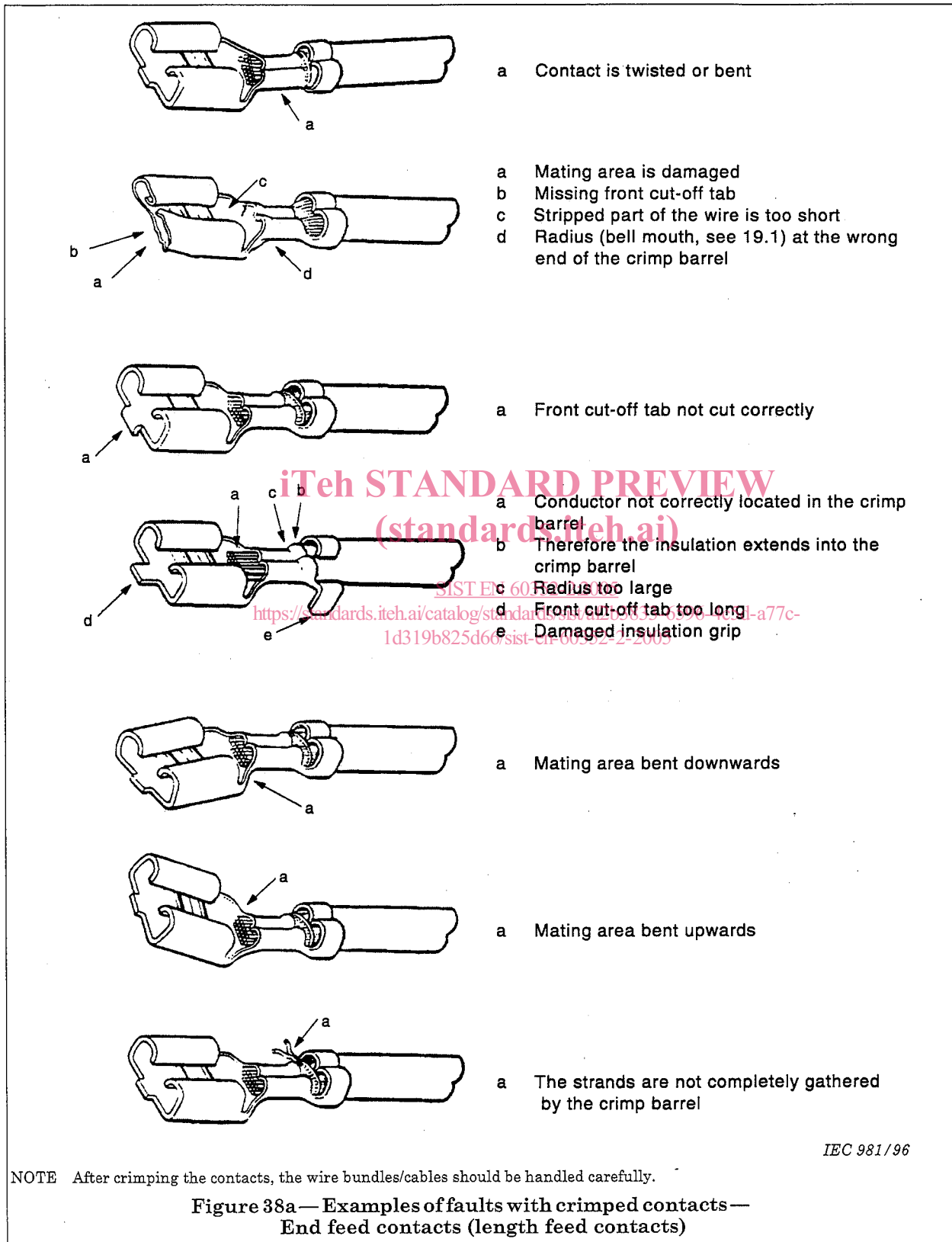
21.3 Mounting and bending of wire bundles/cables with crimped contacts

Wire bundles/cables with crimped contacts for multipole connectors should not stress the inserted contacts by their own weight, because of the existing danger of inclination of the contacts in the mating area of the connectors. This can be the reason for contact damage during the mating of both connector halves.

Thus, the connectors should have a cable clamp, or the wire bundles/cables should be mounted as shown in Figure 40.

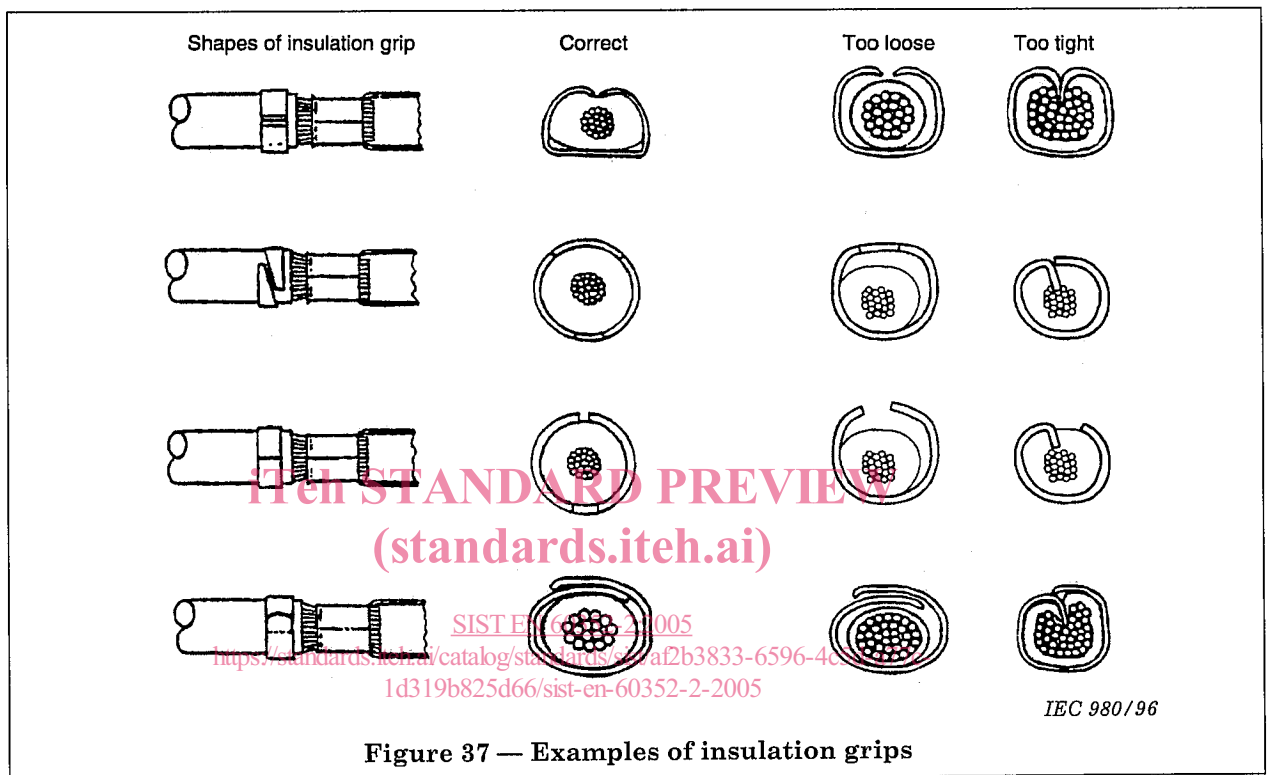






Contacts with open crimp barrels with insulation grip are usually designed for one wire; the crimping of more than one wire, insulation grip included, requires special care which should be agreed with the manufacturer (see 17.2).

Figure 37 shows examples of insulation grip shapes of contacts having open crimp barrels; furthermore, correct, too loose, and too tight insulation grips are shown.



20 Faults with crimped contacts having open barrels

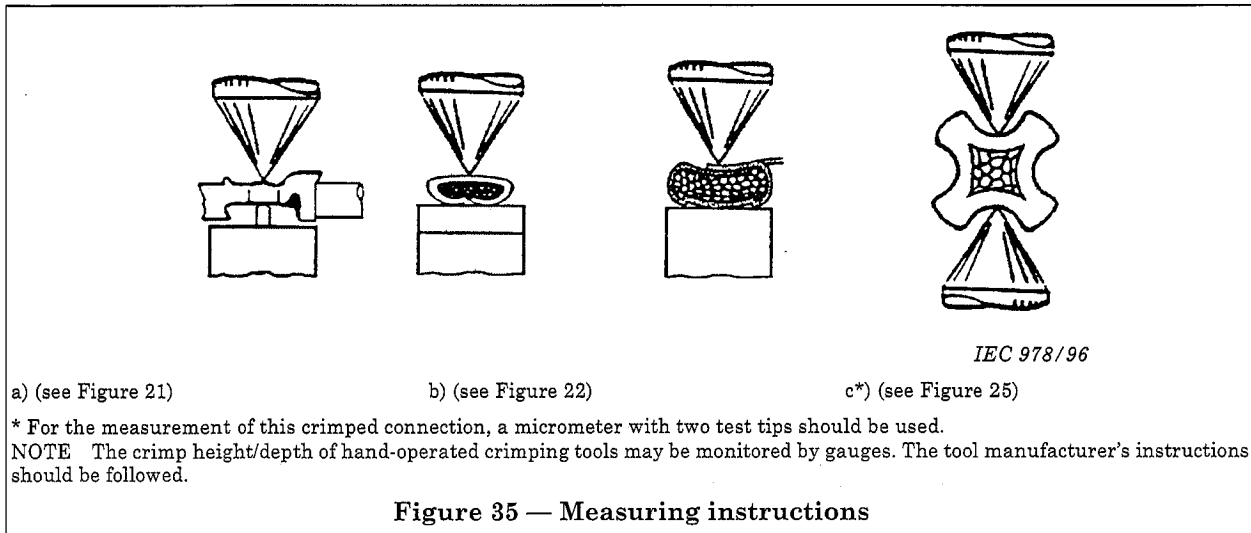
Faults with crimped contacts are shown in Figure 38; these faults are often caused by:

- inappropriate handling;
- incorrect adjustment of the crimping tool/machine;
- incorrect crimping tool/machine;
- incorrect storage before and after crimping, etc.

Crimped contacts having these faults should be rejected by the quality control.

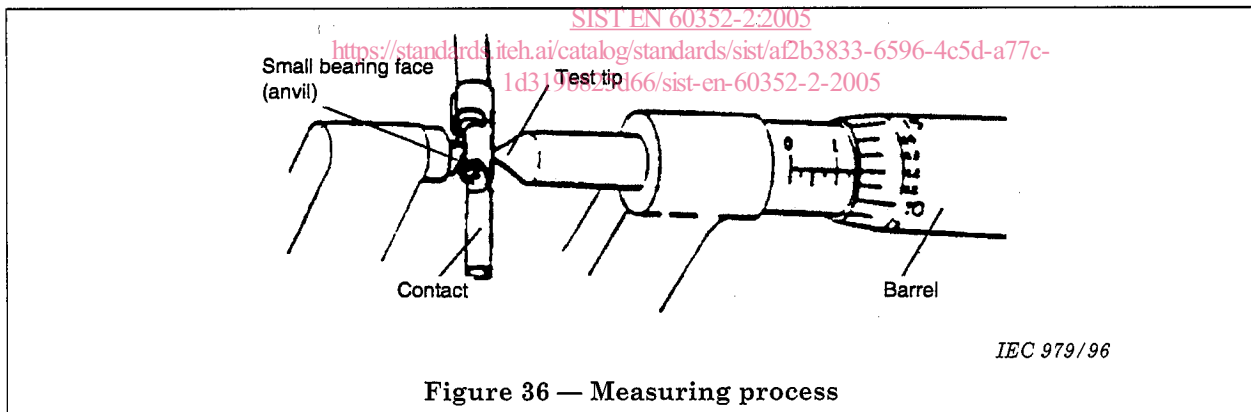
19.2.1 Measuring instructions

For examples of the measurement of crimp height/depth, see Figure 35.



19.2.2 Measuring process

Figure 36 shows how to measure the crimp height of a type a) crimped connection shown in Figure 35.



The formed area of the crimped connection should be placed on the anvil of the micrometer. After that, the scale barrel is turned until the test tip nearly touches the base of the crimped barrel. By turning the ratchet, the test tip will be put in contact with the base of the crimped barrel until the ratchet overwinds. This procedure guarantees that the crimping height is always measured with the same pressure. The value is then read from the scale.

19.3 Insulation grip

In addition to the conductor crimp barrel, most contacts have claws for the insulation grip. The object of these claws is to absorb mechanical stress effects which can come from the direction of the wire bundle/cable. This is particularly valid for vibration and bending stress.

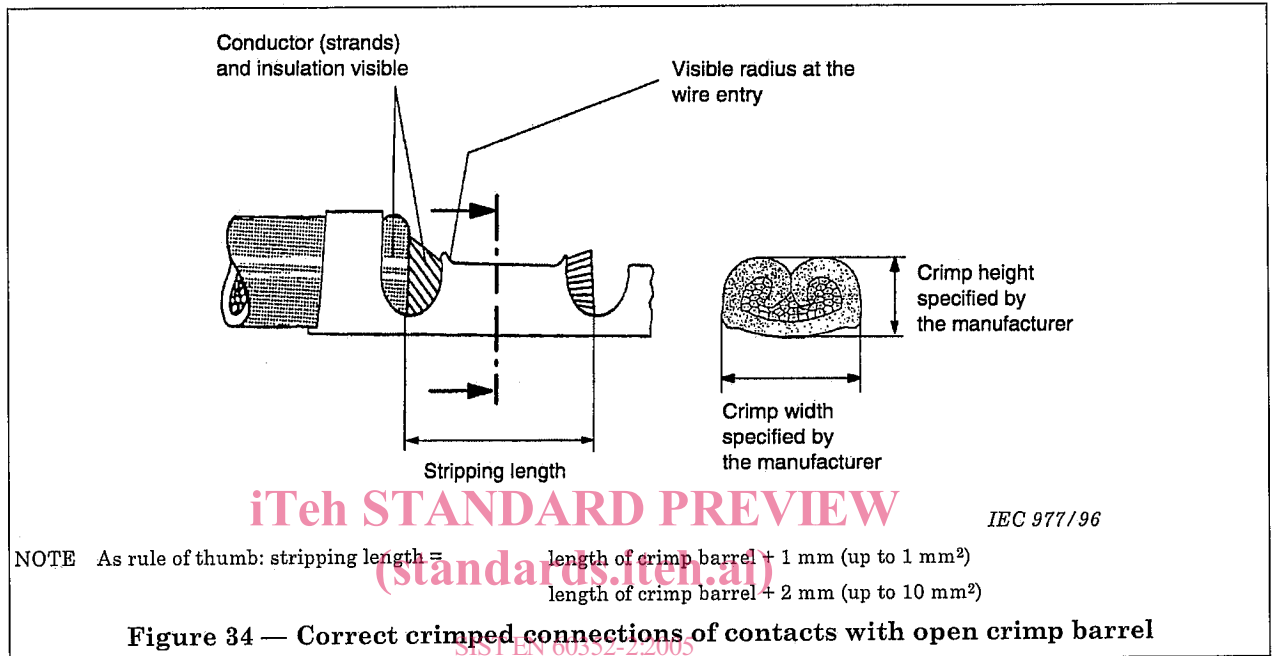
The insulation grip never functions as a cable clamp. The insulation grip should tightly clamp but not pierce through the insulation (see Figure 37).

NOTE Stating a crimp height for the insulation grip is not usual. For requirements and tests, see 11.2.2 and Test 16 h of IEC 60512-8.

19 Correct crimped connections (additional information)

19.1 Correct crimped connections of contacts with an open crimp barrel

Figure 34 shows the side view and cross-section of the crimp area of a correctly crimped connection.



NOTE As rule of thumb: stripping length = $\begin{cases} \text{length of crimp barrel} + 1 \text{ mm (up to } 1 \text{ mm}^2) \\ \text{length of crimp barrel} + 2 \text{ mm (up to } 10 \text{ mm}^2) \end{cases}$

To achieve the result shown in Figure 34, attention should be paid to the following:

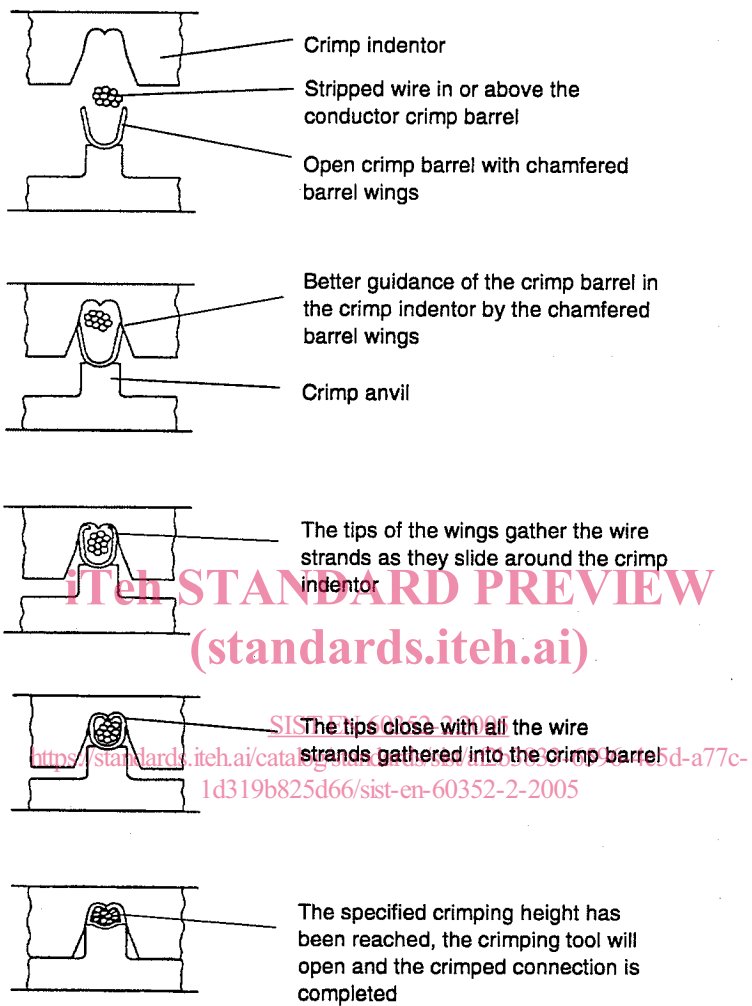
- the relation between the conductor cross-section and the wire range of the contact used is correct;
- the specified crimping height is held;
- the conductor strands and wire insulation are visible between the crimped barrel and the insulation grip;
- there is a radius visible at the wire entry side of the crimped barrel (bell mouth), to prevent damaging of the conductor strands; a radius at the opposite side is possible;
- the end of the crimped conductor protrudes from the end of the crimp barrel. The mating or termination area shall not be hindered;
- the wire insulation grip is correct;
- crimped contacts without insulation grip have a sufficient, but not too large distance, between the end of the wire insulation and the crimp barrel.

19.2 Measuring of crimp height/depth

For a non-destructive test of crimped connections, the specified crimp height should be monitored by a micrometer during the course of production. The crimp height is directly associated with the quality and the long-term stability of a crimped connection; consequently, the electrical characteristics and the mechanical strength of the crimped connection are directly affected.

The replacement of worn parts within the crimping tool requires new adjustment of the crimp height.

The values for crimp heights or depths shall be provided by the manufacturer.



IEC 976/96

Figure 33 — Crimping process of an open crimp barrel

Crimped connections made with more than one wire in a crimp barrel shall be tested to, and meet the requirements of, the full test schedule of 12.3.

NOTE If sealed connectors (sealing at the wire entry side) are used, only one wire in the wire barrel is recommended.

17.3 Dimensions after crimping

The workmanship of the crimped connection should be good. The crimp barrel should not be bent, twisted or deformed by the crimping operation in a way likely to give rise to doubts about the quality of the connection.

17.4 Materials

Care should be taken when selecting the materials and finishes for conductors and crimp barrels to ensure that they are as close as practicable in the electrogalvanic series of metals.

The quality of a crimped connection depends to a high degree on the condition of the surface materials and the quality of both the barrel and the conductor.

In general practice, it is desirable to have comparable deformation in both the conductor and the crimp barrel. This may be facilitated by avoiding combinations of very hard and very soft base materials.

18 Crimping process

18.1 Crimping of contacts with open crimp barrel

Contacts in strip form (side or length feed products) are usually delivered on reels. These contacts should be processed by fully or semi-automatic crimping machines.

18.2 Crimping of contacts with open crimp barrel, loose piece contacts

For small production rates or repair, loose piece contacts can be ordered. These contacts are produced from strip form types and the cut-off tabs have the correct length. The open crimp barrel, as well as the barrel for the insulation grip, are often preformed for better crimping with hand-operated tools.

Attention — It is not recommended to make loose piece contacts by cutting with pliers from strip form products; usually contacts in strip form and loose piece types have different part numbers.

18.3 Processing instruction

For the processing of crimp contacts, attention should be paid to the manufacturer's instructions. These should include the following information:

- workmanship;
- allocation of contacts to the crimp profile of the hand-operated crimping tool (with more than one crimp profile);
- allocation of contacts in strip form to the tool of the crimping machine;
- wire range for which the contact can be used;
- range of wire insulation diameters appropriate for the contact;
- positioning of the contact into the crimping profile of the hand-operated tool;
- stripping length of the wire;
- positioning of the stripped wire into the crimp barrel;
- information about crimp height or depth for 4 or 8 indent crimps used for screw-machined contacts;
- inspection procedure for the crimping tool;
- maintenance of the crimping tool.

The following figure shows the crimping process of an open crimp barrel.

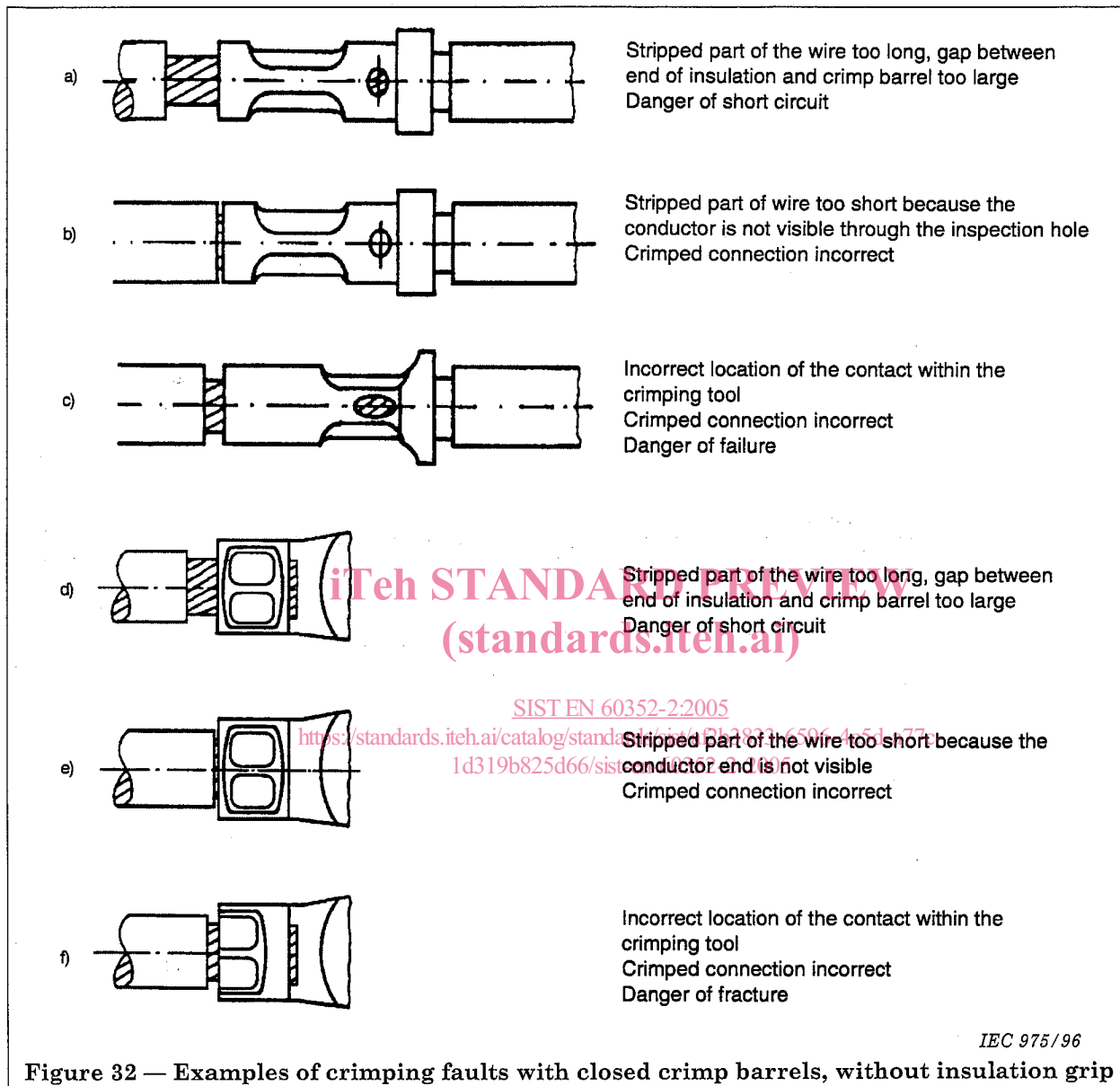


Figure 32 — Examples of crimping faults with closed crimp barrels, without insulation grip

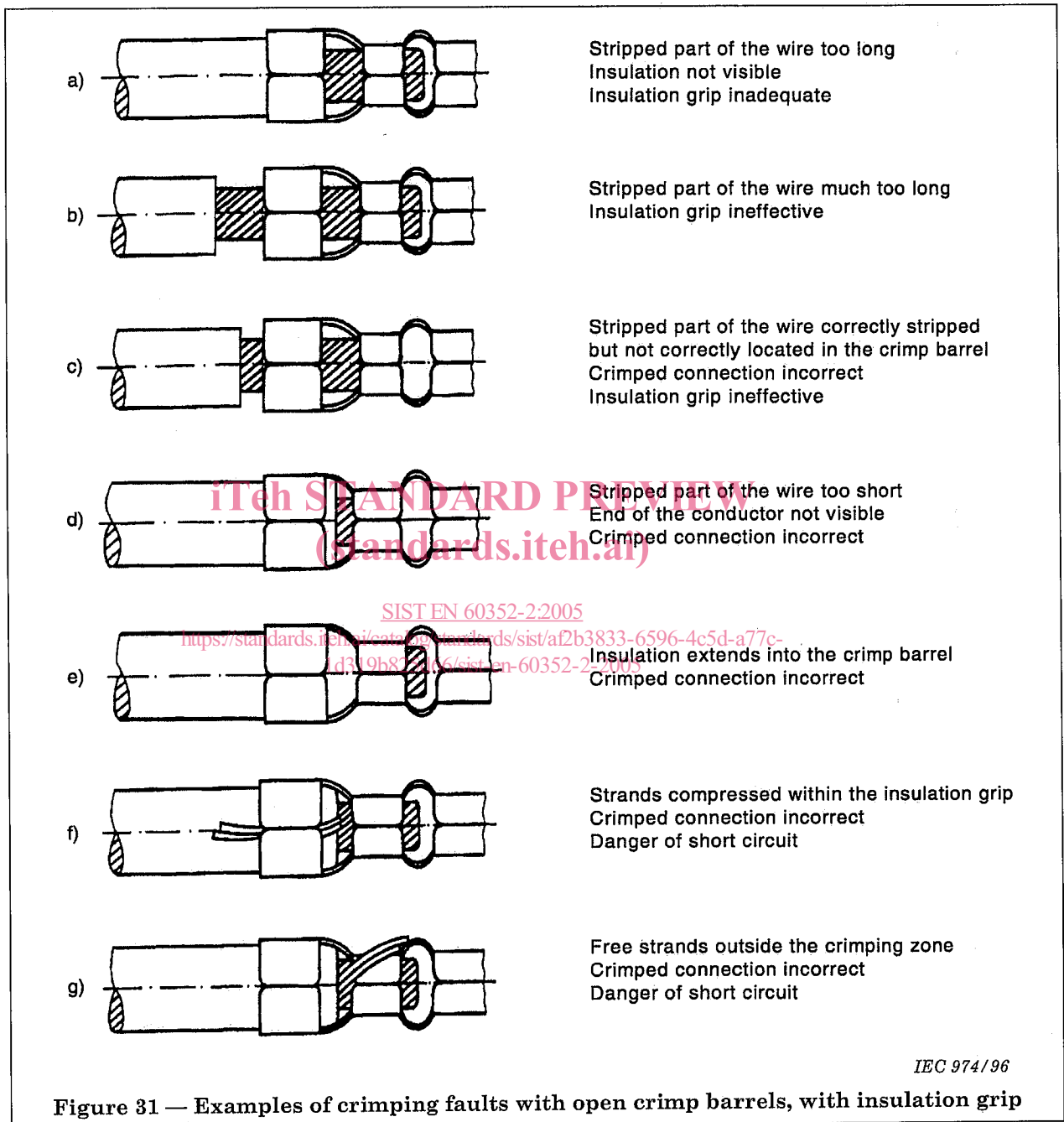
17.2 Crimped connections made with more than one wire in a crimp barrel

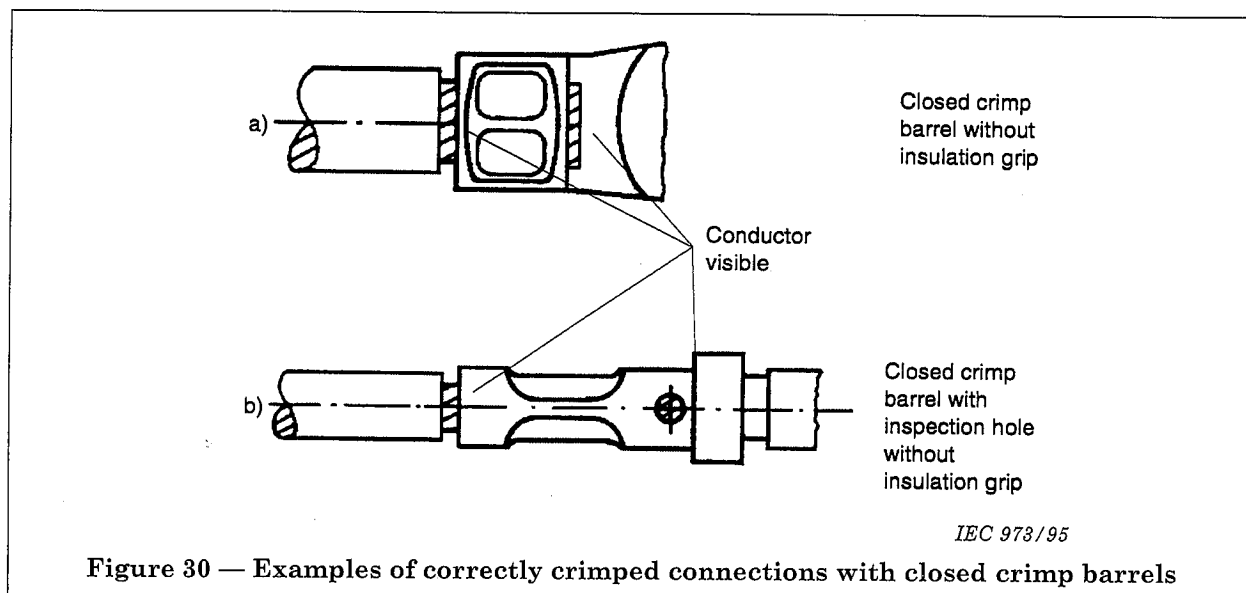
Normally, crimped connections are made with one wire in a crimp barrel; in some industries, the use of more than one wire is deprecated. Where crimped connections are made with more than one wire in a crimp barrel, attention should be paid to:

- the suitability of the wire combinations;
- the compatibility of the crimping part of the crimp barrel, the conductors to be crimped, and the crimping tool;
- the compatibility of the insulation grip, the wires to be secured, and that part of the crimping tool which forms the insulation grip, if applicable;
- the tensile strength requirements of the crimped connection.

Where two or more wires are crimped, the mechanical and electrical tests should be performed on each wire in accordance with its requirements.

The crimped connections made with open crimp barrels shown in Figure 31 should be avoided and they shall not be used.





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