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NORME NATIONALE DU CANADA**

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(CEI/IEC 60832-2:2010, MOD)**

La norme internationale **CEI/IEC 60832-2:2010**, (édition 1.0, 2010-02) a été adoptée avec les exigences propres au Canada (MOD), et porte la désignation **CAN/ULC-60832-2-10**. Elle a été approuvée comme Norme nationale du Canada par le Conseil canadien des normes.

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**TRAVAUX SOUS TENSION
– PERCHES ISOLANTES
ET OUTILS ADAPTABLES –
PARTIE 2: OUTILS
ADAPTABLES**

ICS 13.260; 29.240.20; 29.260.99

**LIVE WORKING –
INSULATING STICKS
AND ATTACHABLE
DEVICES – PART 2:
ATTACHABLE DEVICES**

ICS 13.260; 29.240.20; 29.260.99



Numéro de référence
Reference Number
CEI/IEC 60832-2:2010

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International Electrotechnical Commission**

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NORME NATIONALE DU CANADA

NATIONAL STANDARD OF CANADA

CAN/ULC-60832-2-10
(CEI/IEC 60832-2:2010, MOD)

**Travaux sous tension – Perches
isolantes et outils adaptables – Partie
2: Outils adaptable**

ICS 13.260; 29.240.20; 29.260.99

CAN/ULC-60832-2-10
(CEI/IEC 60832-2:2010, MOD)

**Live working – Insulating sticks and
attachable devices – Part 2: Attachable
devices**

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Normes ULC**



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CAN/ULC-60832-2-10

(CEI/IEC 60832-2:2010, MOD)

Travaux sous tension – Perches isolantes et outils adaptables – Partie 2: Outils adaptable

PRÉFACE ULC

Ce document constitue la première édition de la norme, CAN/ULC-60832-2-10 (CEI/IEC 60832-2:2010, MOD), Travaux sous tension – Perches isolantes et outils adaptables – Partie 2: Outils adaptable, laquelle constitue une adoption, avec les exigences propres au Canada, de la norme internationale de la Commission Électrotechnique Internationale, CEI/IEC 60832-2 (édition 1.0, 2010-02)

Cette édition de la norme a été approuvée par le Comité ULC sur les travaux sous tension et a été approuvée en tant que Norme nationale du Canada par le Conseil canadien des normes.

Une grande partie du financement nécessaire au processus d'adoption de cette norme nationale du Canada a été assurée par l'association canadienne de l'électricité (ACE) que nous tenons à remercier.

Decembre 2010

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CAN/ULC-60832-2-10

(CEI/IEC 60832-2:2010, MOD)

Live working – Insulating sticks and attachable devices – Part 2: Attachable devices

ULC PREFACE

This is the First Edition of the Standard CAN/ULC-60832-2-10 (CEI/IEC 60832-2:2010, MOD), Live working – Insulating sticks and attachable devices – Part 2: Attachable devices, which is an adoption, with Canadian Deviations, of the international standard by International Electrotechnical Commission, CEI/IEC 60832-2 (Edition 1.0 2010-02).

This Edition of the Standard has been formally approved by the ULC Committee on Live Working and has been approved as a National Standard of Canada by the Standards Council of Canada.

Major funding in support of the adoption process of this National Standard of Canada was provided by the Canadian Electricity Association (CEA), whose assistance is acknowledged with thanks.

December 2010

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ULC 60832-2-10 2010

Exigences propres au Canada

2. Références normatives

[Corriger la référence CEI 61318 par]

« CAN/ULC-61318, Travaux sous tension – Évaluation de la conformité applicable a l'outillage, au matériel et aux dispositifs »

[Corriger la référence CEI 61477 par]

« CAN/ULC-61477, Travaux sous tension - Exigences minimales pour l'utilisation des outils, dispositifs et équipements »

4.5 Marquage

[Supprimer la quatrième item :

<<- le symbole IEC 60417-5216:2002-10 – Approprié aux travaux sous tension; double triangle (voir l'annexe A).>>

NOTE La proportion exacte de la hauteur de la figure à la base du triangle est de 1,43. Dans un souci pratique, la proportion peut se situer entre les valeurs de 1,4 et 1,5.

et réviser le cinquième item comme suit :]

<< - le numéro de la norme CAN/ULC applicable, avec l'année de publication, (CAN/ULC 60832-2-10).

Annexe B (normative) Approprié aux travaux sous tension; double triangle

[Supprimer tout Annexe B]



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2. Normative references

[Revise reference to IEC 61318 to read:]

“CAN/ULC-61318, Live Working – Conformity assessment applicable to tools, devices and equipment”

[Revise reference to IEC 61477 to read:]

“CAN/ULC-61477, Live Working – Minimum requirements for the utilization of tools, devices and equipment”

4.5 Marking

Delete the fourth item:

“- symbol IEC 60417-5216:2002-10 – Suitable for live working; double triangle (see Annex A)

NOTE The exact ratio of the height of the figure to the base of the triangle is 1,43. For the purpose of convenience, this ratio can be between the values of 1,4 and 1,5.”

and revise the fifth item to read:]

“number of the relevant CAN/ULC standard with the year of publication (CAN/ULC 60832-2-10).”

Annex B (normative) Suitable for live working; double triangle

[Delete all Annex B]

INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Live working – Insulating sticks and attachable devices –
Part 2: Attachable devices**

**Travaux sous tension – Perches isolantes et outils adaptables –
Partie 2: Outils adaptables**



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INTERNATIONAL STANDARD

NORME INTERNATIONALE

**Live working – Insulating sticks and attachable devices –
Part 2: Attachable devices**

**Travaux sous tension – Perches isolantes et outils adaptables –
Partie 2: Outils adaptables**

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LIVE WORKING – INSULATING STICKS
AND ATTACHABLE DEVICES –****Part 2: Attachable devices**

FOREWORD

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International Standard IEC 60832-2 has been prepared by IEC technical committee 78: Live working.

The first edition of IEC 60832-1 and that of IEC 60832-2 cancel and replace the first edition of IEC 60832 published in 1988. The two parts have been created to clearly separate the requirements and testing of insulating sticks from those of attachable universal devices.

Compared to IEC 60832, the major changes included in IEC 60832-2 are:

- updating of the list of devices;
- clarifying the applicability of the document to other attachment system than splined end-fitting;
- application of conformity assessment for products having completed the production phase, according to IEC 61318:2007 (Edition 3), focusing on the classification of defects and the introduction of alternative testing in case of production follow-up.

The text of this standard is based on the following document:

FDIS	Voting report
78/839/FDIS	78/845/RVD

Full information on the voting for the approval of this standard can be found in the report on voting indicated in the above table.

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

A list of all parts of the IEC 60832 series, published under the general title *Live working – Insulating sticks and attachable devices*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- 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.

INTRODUCTION

The purpose of this standard is to provide essential requirements. Each user of this standard may supplement it with their own requirements. For example, the user may add requirements regarding the use of attachable devices on d.c. electrical installations or the mechanical performance or compatibility and interchangeability with tools already in service. In such cases, caution should be taken to maintain or improve the performance of the products.

This publication has been prepared in accordance with the requirements of IEC 61477.

The products designed and manufactured according to this standard contribute to the safety of the users provided they are used by skilled persons, in accordance with safe methods of work and the instructions for use.

The product covered by this standard may have an impact on the environment during some or all stages of its life cycle. These impacts can range from slight to significant, be of short-term or long-term, and occur at the global, regional or local level.

Except for a disposal statement in the instructions for use, this standard does not include requirements and test provisions for the manufacturers of the product, or recommendations to the users of the product for environmental improvement. However, all parties intervening in its design, manufacture, packaging, distribution, use, maintenance, repair, reuse, recovery and disposal are invited to take account of environmental considerations.

LIVE WORKING – INSULATING STICKS AND ATTACHABLE DEVICES –

Part 2: Attachable devices

1 Scope

This part of IEC 60832 gives the essential requirements for devices that can be attached onto and removed from the fitting of the insulating sticks for live working, for use on a.c. electrical installations.

Part 1 of IEC 60832 covers insulating sticks.

In this part of the standard, the term “device” is used for “attachable device”, unless otherwise specified.

Products designed and manufactured according to this standard contribute to the safety of the users provided they are used by skilled persons, in accordance with safe methods of work and the instructions for use.

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this international standard. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60060-1, *High-voltage test techniques – Part 1: General definitions and test requirements*

IEC 60212:1971, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60417, *Graphical symbols for use on equipment*

IEC 61318:2007, *Live working – Conformity assessment applicable to tools, devices and equipment*

IEC 61477, *Live working – Minimum requirements for the utilization of tools, devices and equipment*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in IEC 61318 and the following apply.

3.1.1**rated value**

value of a quantity used for specification purposes, established for a specified set of operating conditions of a component, device, equipment or system

[IEV 151-16-08]

3.1.2**type of device**

family of devices which are of the same design and application and are of similar dimensions

3.2 Symbols

T_N	rated torque given by the manufacturer for a given device and for testing purposes
F_{TN}	rated tensile force given by the manufacturer for a given device and for testing purposes
F_{CN}	rated compression force given by the manufacturer for a given device and for testing purposes
F_{BN}	rated bending force given by the manufacturer for a given device and for testing purposes

4 Requirements**4.1 General**

The following requirements have been prepared in order that the products covered by this standard are designed and manufactured to contribute to the safety of the users, provided they are used by persons skilled for live working, in accordance with safe methods of work and the instructions for use.

All bolts used to join two parts together shall be of suitable and sufficient mechanical strength both in tension and shear for that purpose.

Devices subjected to tensile or compressive forces when in use shall be designed in such a way that the force shall be exerted along the axis of the stick.

The method for fixing the device shall ensure that it cannot become accidentally detached when in use.

The method for fixing the device shall be designed and constructed to allow the angle formed by the axis of the stick and the device fitted to it to be adjusted in steps of 30°. Two examples of such a system are shown in Annex A.

4.2 Dimensional and mechanical requirements**4.2.1 Dimensional requirements**

For each type of device complying with this part of the standard, the manufacturer shall provide in writing the rated dimensions and parameters relating directly to its specific functions.

NOTE Conducting devices should be designed to be as small as possible consistent with their proper functioning to reduce the risk of short-circuits.

4.2.2 Mechanical requirements

For each type of device complying with this part of the standard, the manufacturer shall provide in writing the rated values corresponding to the characteristics specified in Tables 1 and 2.

Conductor cleaning brushes shall resist uses under low and high temperature conditions.

NOTE 1 A cold crushing test and a hot crushing test of the brush are included in 5.6.4.3.

NOTE 2 In general, for other devices intended to be used in unusual atmospheric conditions (very high or very low temperature or relative humidity), the client should discuss with the manufacturer the interest of performing more restricting mechanical tests in appropriate conditions.

Only visual inspection (see 5.2), dimensional check (see 5.3) and compatibility check (see 5.4) are required for the following devices:

- Positive grip clamp stick head
- Shepherd's hook
- Ball-socket adjuster
- Fixed double-prong head
- Retaining device installer (cotter key installer)
- Insulator ball guide
- Hammer
- Self-aligning fuse puller
- Screw clamp
- Spiral disconnect
- Pruning saw
- Screwdriver
- Conductor polisher

Table 1 – Mechanical characteristics of splined end devices (to be supplied by the manufacturer)

Characteristics	Type of devices					
	Hook stick adaptor and universal adaptor	Formed-wire ring	Locating drift	Conductor cleaning brush	Holding fork	Spanner (wrench)
T_N	X					X
F_{TN}	X					
F_{BN}			X		X	
Specific characteristics		Tension strength of the spigot		Resistance to crushing F_{CN}		

Characteristics	Type of devices									
	Retaining pin remover			Retaining device installer or retaining device installer/remover			Rotary blade		Rotary prong	
	Spiral type	Fine point type	Cam type (pry type)	Snap-out type						
T_N	X	X								
F_{TN}				X			X		X	
F_{BN}			X		X				X	
Specific characteristics									Tightening capability	Strength of the articulation

Characteristics	Type of devices						
	All-angle pliers	Pin holder	Flexible spanner head (flexible wrench head)	Ammeter holder	Anti-interference braid applicator	Hack saw	Gap gauge
T_N			X	X			
F_{TN}							
F_{BN}	X	X			X	X	X
Specific characteristics	Tightening strength					Resistance to distortion	

**Table 2 – Mechanical characteristics of clevis and tongue stick devices
(to be supplied by the manufacturer)**

Characteristics	Type of devices					
	Clevis eye attachment	Tension link tongue attachment	Clevis-tongue adaptor	Clevis-tongue extension	Roller tongue attachment	Clevis screw adaptor
F_{TN}	X	X	X	X	X	X

4.3 Mechanical protection

When necessary, the ends of each device shall have adequate means for mechanical protection, such as an end-cap. Metal devices shall be carefully designed to ensure that all edges are rounded where this does not impair the function of the device.

4.4 Protection against corrosion

Metal parts shall be protected against corrosion either by their composition or by the use of a suitable surface treatment.

4.5 Marking

Each device shall be marked with the following permanent items of marking:

- manufacturer's name or trademark;
- type reference;
- year and (if possible) month of manufacture;
- symbol IEC 60417-5216 (2002-10) – Suitable for live working; double triangle (see Annex B);

NOTE The exact ratio of the height of the figure to the base of the triangle is 1,43. For the purpose of convenience, this ratio can be between the values of 1,4 and 1,5.

- number of the relevant IEC standard immediately adjacent to the symbol (IEC 60832-2).

The marking shall be durable, clearly visible and legible to a person with normal or corrected vision without additional magnification.

Other characteristics or information not needed at the work location, like the year of publication of the standard, shall be associated to the product item by other means, such as coded information (bar codes, microchips, etc.), or shall be associated to its packaging.

4.6 Instructions for use

Each device shall be supplied with the manufacturer's written instructions for use and care.

These instructions shall be prepared in accordance with the general provisions given in IEC 61477.

These instructions shall include as a minimum, recommendations for maximum mechanical load (see 4.2.2), cleaning, storage and transportation, periodic testing, possible repair and disposal of the device.

5 Tests

5.1 General

The present standard provides testing provisions to demonstrate compliance of the product to the requirements of Clause 4. These testing provisions are primarily intended to be used as type tests for validation of the design input. Where relevant, alternative means (calculation, examination, tests, etc.), are specified within the test subclauses for the purpose of devices having completed the production phase.

To show compliance with this part of the standard, the manufacturer shall prove that the type tests referred to in Tables C.1 and C.2 have been successfully carried out on at least three devices of each type.

However, when differences between various types of devices are limited in number, tests that are unaffected by the differing characteristics of the device can be carried out on a single type of device and the results can be used for the other types of device.

The tests referred to in Tables C.1 and C.2 shall be performed in the specified numbered order.

The required values of mechanical forces specified in Clause 5 shall be reached using a rate of increase between 1 % and 10 % of the rated force per second. The forces shall be applied with an accuracy of ± 5 %.

NOTE For example, if the rated tensile force stated by the manufacturer for a given tool is $F_{TN} = 100$ N, the rate of increase will be between 1 N/s and 10 N/s and the applied force to the device will be between 95 N and 105 N.

The dimensions specified in mm in Clause 5 shall be verified with an accuracy of ± 2 %.

Unless otherwise specified, room temperature shall be (25 ± 10) °C.

When visual inspection is specified, it shall be understood to be visual inspection by a person with normal or corrected vision without additional magnification.

5.2 Visual inspection

Each device shall be visually inspected to detect manufacturing defaults and to check proper functioning and compliance with requirements included in 4.3, 4.4 and 4.5 where applicable.

5.3 Dimensional check

Each device shall be measured to ensure that its dimensions match the manufacturer's rated dimensions.

5.4 Compatibility check

It shall be verified by attaching each attachment system that each type fits properly and securely on the stick for which it has been designed for.

5.5 Durability of marking

The durability of the marking shall be verified by thoroughly cleaning the marking for at least 1 min with a piece of lint-free cloth dampened with water and then rubbing it vigorously for a further minimum of 1 min with a piece of lint-free cloth dampened with isopropanol ($\text{CH}_3\text{-CH(OH)-CH}_3$).

NOTE 1 It is the employer's duty to ensure that any relevant legislation and any specific safety instructions regarding the use of isopropanol are fully observed.

The test shall be considered as passed if the marking remains legible and the letters do not smear.

The surface of the tool may change. No signs of loosening shall be present for labels.

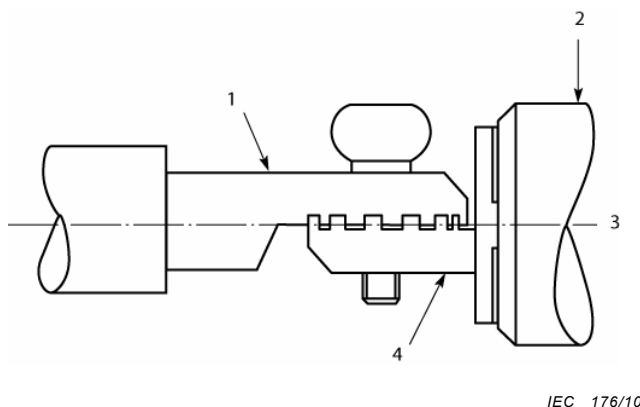
NOTE 2 Markings made by moulding or engraving need not be subjected to this test.

5.6 Mechanical tests and specific tests

5.6.1 Universal adaptor and hook stick adaptor

5.6.1.1 Torsion of the adaptor

The adaptor shall be fitted to a stick for which it is designed, and the assembly shall be fitted to the test part shown in Figure 1. The wing screw shall be tightened with a torque of 3 N·m.



Key

- 1 test part
- 2 head of hook stick
- 3 direction of tension / axis of torque
- 4 adaptor

Figure 1 – Test set-up for a hook stick adaptor – Torsion and tension of the adaptor

A torque shall be applied around the axis of the universal hand stick or hook stick and progressively increased up to a value of $1,25 T_N$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

The torque shall be applied again in the same manner as above using a maximum value of torque of $2,5 T_N$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.1.2 Tension of the adaptor

The adaptor shall be fitted to a stick for which it is designed, and the assembly shall be attached to the test part shown in Figure 1. The wing screw shall be tightened with a torque of 3 N·m.

A tensile force shall be applied along the axis of the universal hand stick or retractable hook stick and progressively increased up to a value of $1,25 F_{TN}$ and then maintained at this value for a period of not less than 1 min.

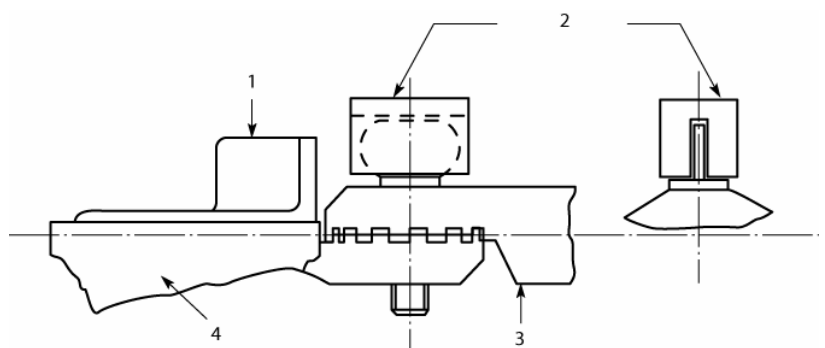
The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

A tensile force shall be applied again in the same manner as above using a maximum value of tensile force of $2,5 F_{TN}$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.1.3 Torsion of the wing screw

The adaptor shall be fitted to the test part (see Figure 2).



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Key

- 1 fixed adaptor
- 2 test cap piece on the head
- 3 universal end fitting to ensure the clamping
- 4 vice

**Figure 2 – Universal adaptor and hook stick adaptor –
Torsion of the wing screw**

A torque shall be applied to the wing screw up to a value of 1,25 times the rated torque of 3 N·m and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is observed after the test.

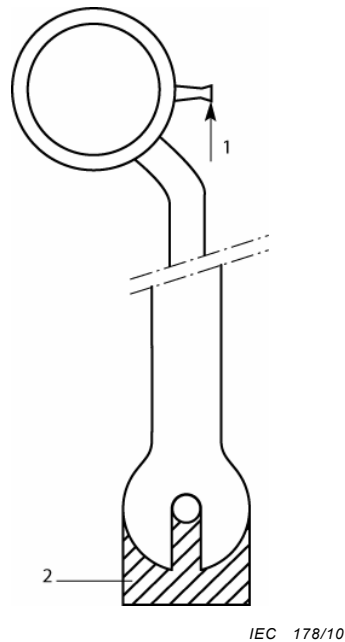
The torque shall be applied again in the same manner as above using a maximum value of torque of 2,5 times the rated torque of 3 N·m and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.2 Formed-wire ring – Tension of the spigot

A ring shall be fixed by means of its attachment system (on a universal hand stick for example).

A tensile force shall be applied to the spigot and progressively increased (see Figure 3) up to a value of 1,25 times the tension strength of the spigot supplied by the manufacturer, and then maintained at this value for a period of not less than 1 min.



Key

- 1 spigot
- 2 support

Figure 3 – Formed-wire ring – Tension of the spigot

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

A tensile force shall be again applied in the same manner as above using a maximum value of tensile force of 2,5 times the tension strength of the spigot supplied by the manufacturer, and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.3 Locating drift – Bending test

The locating drift shall be placed in the test device shown in Figure 4.

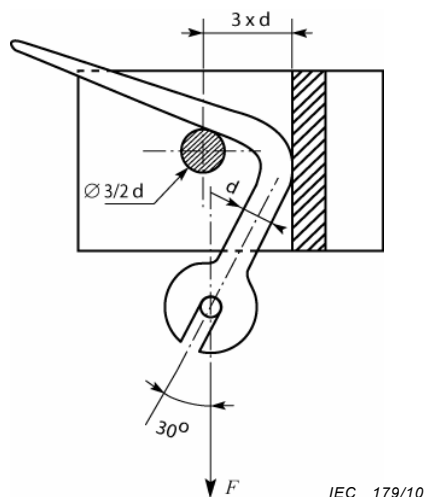


Figure 4 – Locating drift – Bending test

A bending force shall be applied and progressively increased along the axis of the attachment system up to a value of $1,25 F_{BN}$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

A bending force shall be applied again in the same manner as above using a maximum value of bending force of $2,5 F_{BN}$ and then maintained at this value for a period of not less than 1 min.

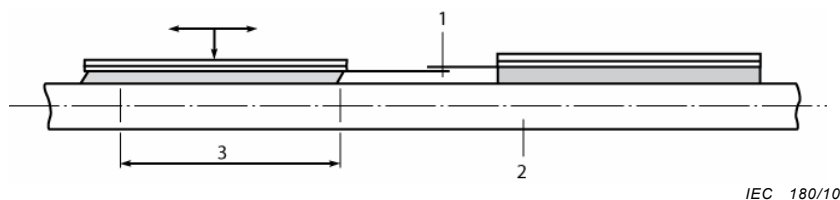
The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.4 Conductor cleaning brush – Semi-tubular type

5.6.4.1 Fatigue test

The brush shall be mounted on a device that allows a rectilinear movement to be applied to it under a specified pressure.

The pressure shall be chosen so that the crushing of the brush fibres on a 20 mm diameter bar is 10 % of their length (see Figure 5).



Key

- 1 crushing
- 2 metal bar
- 3 stroke 100 mm

Figure 5 – Conductor cleaning brush – Fatigue test on semi-tubular type

3 000 movement cycles shall be applied to the brush: each cycle shall be a complete movement to-and-fro.

Stroke: 100 mm $\pm$ 10 mm

Frequency: (50 $\pm$ 2) movement cycles/min.

The test shall be performed with a brass bar, then with a copper bar (3 000 cycles each time).

The test shall be considered as passed if the brush fibres and the brush keep their efficiency.

5.6.4.2 Articulation test

The body of the brush shall be fixed. Force shall be applied and increased progressively on the attachment system until it rotates in relation to the body of the brush.

The test shall be considered as passed if this rotation occurs at a value of force between 0,1 N·m and 0,15 N·m.

5.6.4.3 Crushing tests

5.6.4.3.1 Cold crushing test

The conditioning details shall comply with IEC 60212. The brushes shall be placed in a conditioning chamber (code 6h/–10C).

Then a crushing test shall be performed for a period of 1 h at a temperature of 10 °C in the open position (see Figure 6), by applying a force of 2,5 F_{CN} on the body of the brush.

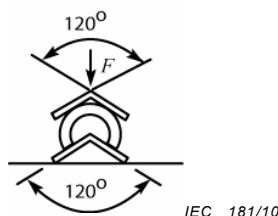


Figure 6 – Conductor cleaning brush – Semi-tubular type – Crushing test

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.4.3.2 Hot crushing test

The conditioning details shall comply with IEC 60212. The brushes shall be placed in a conditioning chamber (code 4h/55C/20 %).

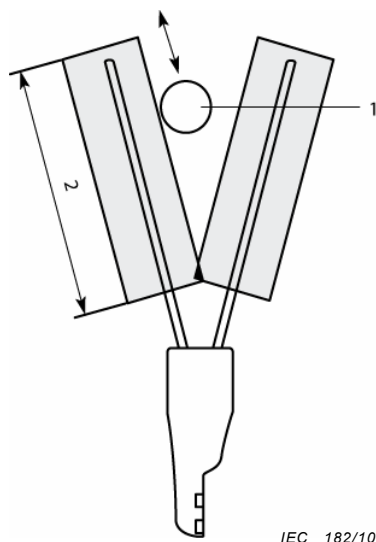
Then a crushing test shall be performed for a period of 1 h at 55 °C and 20 % relative humidity in the open position (see Figure 6), by applying a force of 2,5 F_{CN} on the body of the brush.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

The test shall be considered as passed if when the force is removed, the brush regains its initial size at room temperature (code M/23C/50 %).

5.6.5 Conductor cleaning brush – V-shaped type – Fatigue test

The test shall be identical to the fatigue test for the semi-tubular type brush but as shown in Figure 7.



Key

- 1 metal bar
- 2 stroke 100 mm

Figure 7 – Conductor cleaning brush – V-shaped type – Fatigue test

5.6.6 Oilcan – Functioning of the operating lever

The tank shall be filled with oil. The oilcan shall be kept vertical.

A steadily increasing force shall be applied to the end of the operating lever until a jet of oil comes out of the spout.

This shall occur at a value of applied force of between 15 N and 50 N.

A force of 150 N shall be then applied to the lever in the same way as above.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

Then the tank shall be emptied almost entirely using the operating lever, and the operating force shall be measured. The value of the force measured shall remain between 15 N and 50 N.

5.6.7 Ratchet spanner (ratchet wrench) – Friction

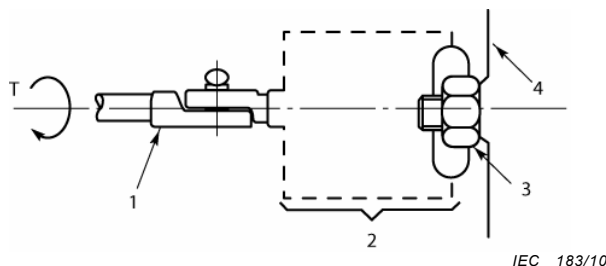
This test applies only to devices without external adjustment.

The body of the ratchet spanner shall be fixed. A force shall be applied to the attachment system and progressively increased until it rotates smoothly.

The test shall be considered as passed if this rotation occurs at a value of torque of between 2 N·m and 3 N·m.

5.6.8 Spanner (wrench) – Torsion test

The spanner shall engage a nut which cannot rotate (see Figure 8). The attachment system of the spanner shall be mounted on the attachment system of a universal hand stick, and the screw shall be tightened with a torque of 10 N·m.



Key

- 1 stick end fitting
- 2 spanner
- 3 nut
- 4 device for holding lock nut
- T torque

Figure 8 – Spanner (wrench) – Torsion test

A torque shall be applied to the attachment system and progressively increased up to a value of $1,25 T_N$, and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

A torque shall be applied again in the same manner as above using a maximum value of torque of $2,5 T_N$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.9 Retaining pin remover

The test provisions applicable to different types of pin removers are given below.

a) Spiral type

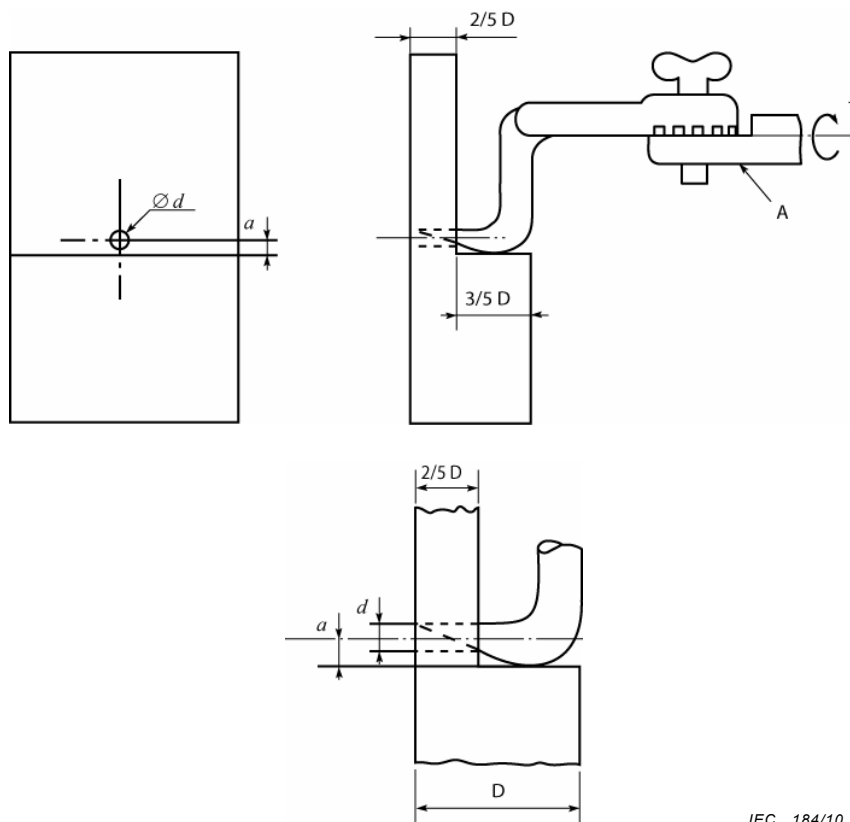
The point of the retaining pin remover shall be inserted into a hole d (mm) in diameter that has been drilled in a plate that has a hardness index greater than that of the device. A metal plate shall be fixed a mm underneath the centre line of the hole, and the device shall be brought into contact with this supporting plate (see Figure 9).

A torque shall be applied to the attachment system using a lever attached to it (an universal hand stick for example) and progressively increased up to a value of $1,25 T_N$, and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

A torque shall be applied again in the same manner as above using a maximum value of torque of $2,5 T_N$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.



IEC 184/10

Key

A test part

T torque

Figure 9 – Spiral type retaining pin remover – Torsion test**b) Fine point type**

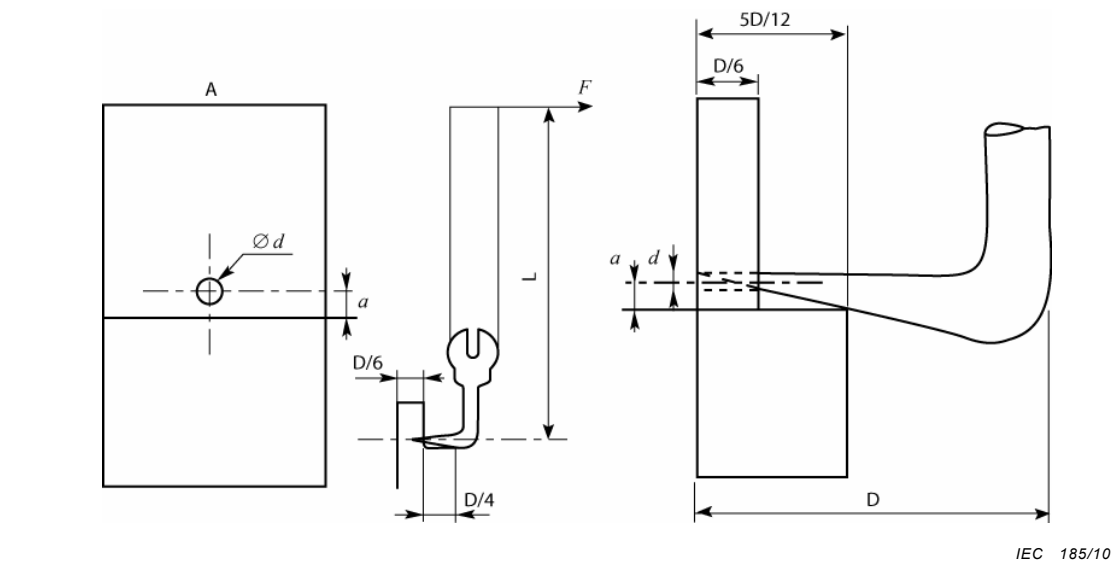
The point of the retaining pin remover shall be inserted into a hole d (mm) in diameter that has been drilled in a plate that has a hardness index greater than that of the device. A metal plate shall be fixed a mm underneath the centre line of the hole; the device shall be brought into contact with this supporting plate (see Figure 10).

A torque shall be applied to the attachment system using a lever attached to it (an universal hand stick for example) and progressively increased up to a value of $1,25 T_N$, and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

A torque shall be applied again in the same manner as above using a maximum value of torque of $2,5 T_N$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.



Key

- A test part
- L lever arm 1 m

Figure 10 – Fine-point type retaining pin remover – Torsion test

c) Cam type (pry type)

Friction

One complete turn of the attachment system shall be used to determine the lowest torque value causing the system to rotate and the maximum value required to maintain this rotation.

The test shall be considered as passed if rotation occurs at a value of torque of between 0,5 N·m and 1,5 N·m.

Bending

Let “a” be the manufacturer’s distance rating (see Figure 11). The point of the retaining pin remover shall be inserted into a hole d (mm) in diameter that has been drilled in a plate with a hardness index greater than that of the device. A supporting plate shall be fixed to this plate so that the cams are put in contact with the supporting plate (see Figure 11).

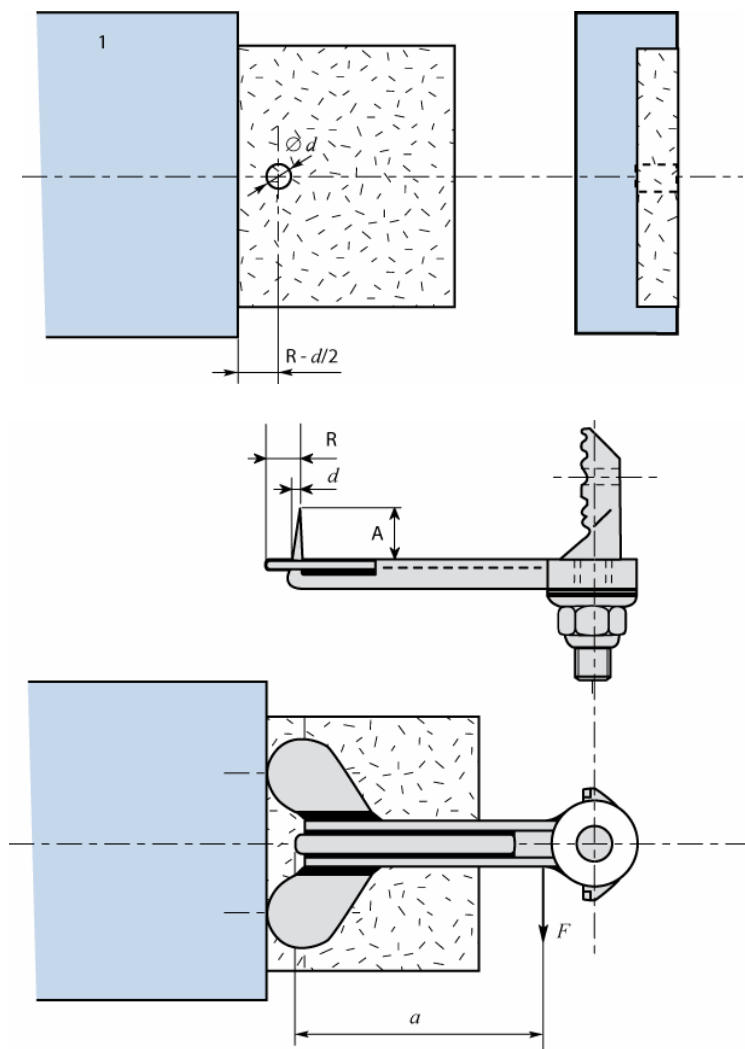
A bending force shall be applied at the rated distance a mm from the point of the device and progressively increased up to a value of $1,25 F_{BN}$ and then maintained at this value for a period of not less than 1 min.

The point of the device shall not come out of the hole.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

A bending force shall be applied again from a distance of a mm in the same manner as above using a maximum value of bending force of $2,5 F_{BN}$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.



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Key

- 1 supporting plate

Figure 11 – Cam type (pry type) retaining pin remover – Bending test

d) Snap-out type

Measuring the return force:

Let F_R be the rated return force value for the spring specified by the manufacturer. The minimum force required to bring the device to the end of its travel shall be measured.

The test shall be considered as passed if the measured value is within the values of $F_R \pm 20\%$.

Tension:

The snap-out type retaining pin remover shall be attached to a test part made with an attachment system.

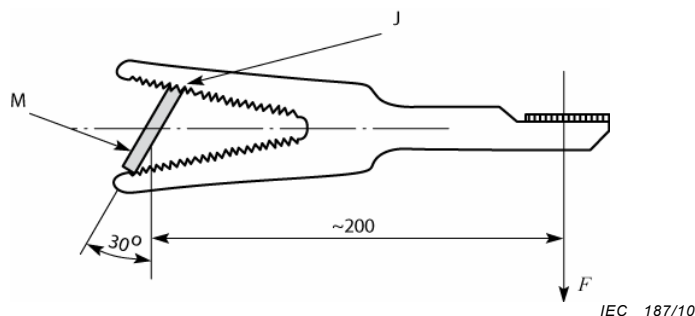
A force of $2,5 F_{TN}$ shall be applied to the conical point of the device using an axis 8 mm in diameter.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.10 Holding fork – Bending test

A flat metal plate shall be held firmly in place. The flat metal plate is jammed between the jaws of the holding fork, as show in Figure 12.

Dimensions in millimetres



Key

- M flat metal plate measuring 39 mm × 5 mm held firmly in place
- J jammed between the jaws

Figure 12 – Holding fork – Bending test

A bending force shall be applied and progressively increased in the axis of the attachment system up to a value of $1,25 F_{BN}$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test. The fork shall neither open nor slip.

A bending force shall be applied again in the same manner as above using a maximum bending force of $2,5 F_{BN}$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage is seen during a visual inspection after the test.

5.6.11 Retaining device installer/remover – Bending test

5.6.11.1 Test on the removing part

The device shall be mounted on an attachment system which shall be securely fixed in place. The wing screw shall be tightened with a torque of 3 N·m. The device shall be positioned as shown in Figure 13a.

A bending force shall be applied 200 mm from the axis of the attachment system and progressively increased up to a value of $1,25 F_{BN}$, and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

5.6.11.2 Test on the installing part

Another device shall be attached as shown in Figure 13b.

Dimensions in millimetres

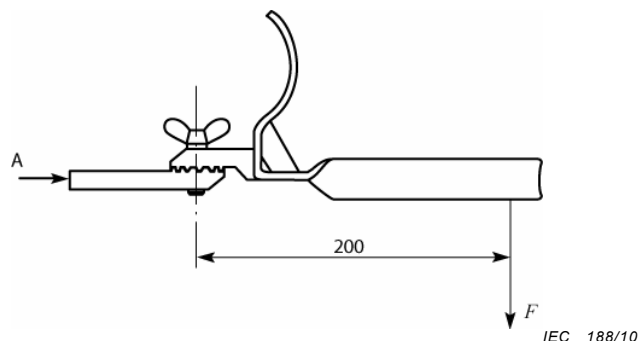


Figure 13a – Bending test for removing part

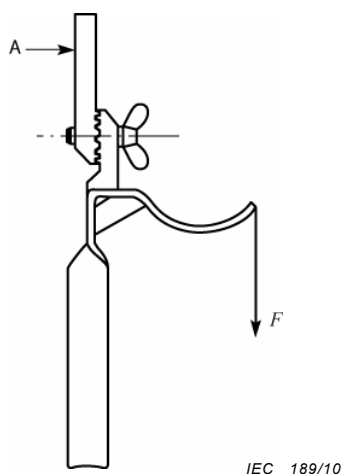


Figure 13b – Bending test for installing part

Key

A attachment system

Figure 13 – Retaining device installer/remover – Bending test

A bending force shall be applied to the end of the “installing” part of the device and progressively increased up to a value of $1,25 F_{BN}$, and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

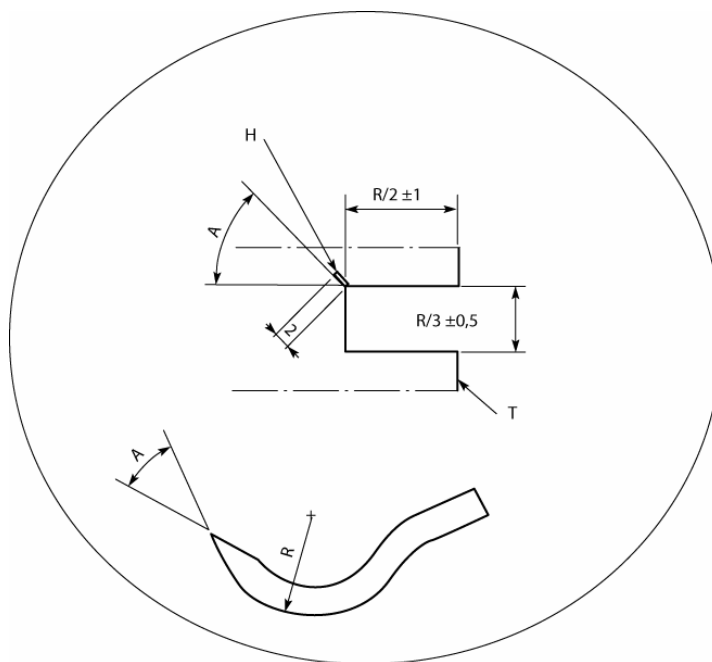
A bending force shall be applied again in the same manner as above using a maximum value of bending force of $2,5 F_{BN}$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage occurs or is seen during a visual inspection after the test.

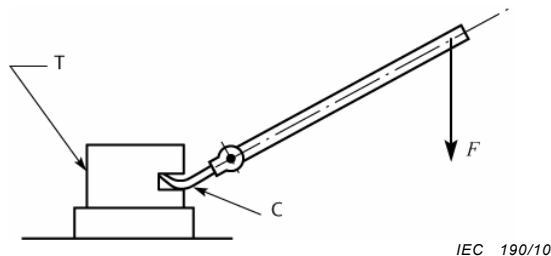
5.6.12 Binding wire cutter blade (tie wire cutter) – Bending test

The device shall be fitted to a stick for which it is designed and the tie wire cutter blade shall be inserted into the notch of the test device (see Figure 14).

A bending force shall be applied to it (see Figure 14) and progressively increased up to a value of $1,25 F_{BN}$ and then maintained at this value for a period of not less than 1 min.



Details of the test device



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Key

- T test device (R/2 mm thick) tightly clamped
- H hack saw mark
- C tie wire cutter inserted in the notch

Figure 14 – Binding wire cutter blade (tie wire cutter) – Bending test

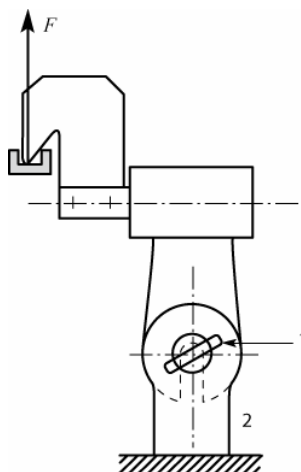
The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.

A bending force shall be applied again in the same manner as above using a maximum value of bending force of $2,5 F_{BN}$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage occurs or is seen during a visual inspection after the test.

5.6.13 Rotary blade – Tension test

With the attachment system of the rotary blade attached to the attachment system of the test device, tensile force shall be applied to the blade (see Figure 15), and progressively increased up to a value of $1,25 F_{TN}$, and then maintained at this value for a period of not less than 1 min.



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Key

- 1 tightening screw
- 2 attachment system of the test device

Figure 15 – Rotary blade – Tension test

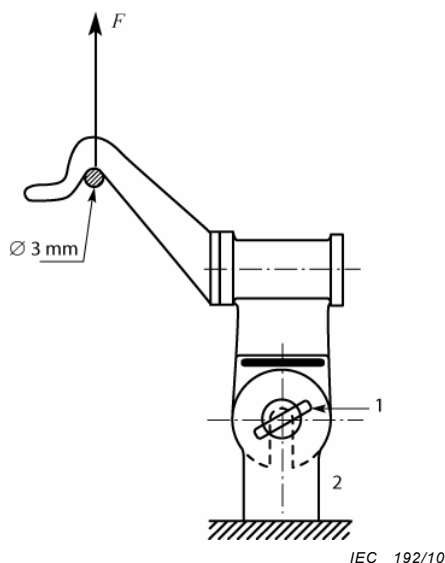
The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test. The rotary blade shall rotate without difficulty.

A tensile force shall be applied again in the same manner as above using a maximum value of tensile force of $2,5 F_{TN}$ and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no permanent deformation or breakage occurs or is seen during a visual inspection after the test.

5.6.14 Rotary prong – Tension test

The same test shall be used as for the rotary blade, but applied as shown in Figure 16.



Key

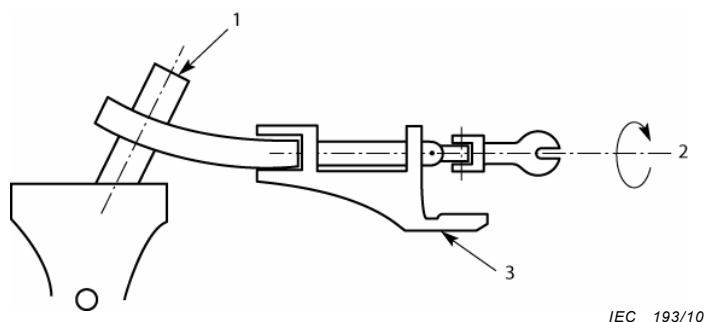
- 1 tightening screw
- 2 attachment system of the test device

Figure 16 – Rotary prong – Tension test

5.6.15 Adjustable pliers

5.6.15.1 Tightening capability

A metal rod 20 mm in diameter shall be placed between the jaws of the pliers under test as shown in Figure 17.



Key

- 1 tightly clamped rod 20 mm diameter
- 2 coupling force exerted horizontally
- 3 horizontal part

Figure 17 – Adjustable pliers – Tightening capability

A torque shall be applied to the attachment system that is interdependent with the gear in the longitudinal axis of the pliers and progressively increased up to a value of $1,25 T_N$, and then maintained at this value for a period of not less than 1 min.

The test shall be considered as passed if no visible sign of damage is seen during a visual inspection after the test.