

Specification for

Insulating poles (insulating sticks) and universal tool attachments (fittings) for live working

The European Standard EN 60832:1996 has the status of a
British Standard

ICS 13.260

Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Power Electrical Engineering Standards Policy Committee (PEL/-) to Technical Committee PEL/88, upon which the following bodies were represented:

- Association of Manufacturers Allied to the Electrical and Electronic Industry (BEAMA Ltd.)
- BECCAMA (BEAMA Electrical Cable Connector and Accessories Manufacturer’s Association)
- British Railways Board
- Department of Trade and Industry
- Department of Trade and Industry (Consumer Safety Unit, CA Division)
- Electricity Association
- Federation of British Hand Tool Manufacturers
- GAMBICA (BEAMA Ltd.)
- Health and Safety Executive
- Industrial Safety (Protective Equipment) Manufacturers’ Association
- International Powered Access Federation
- Ministry of Defence
- National Association of Glove Manufacturers
- Coopted member

This British Standard, having been prepared under the direction of the Power Electrical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 October 1993

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The following BSI references relate to the work on this standard:
Committee reference PEL/88
Draft for comment 88/23761 DC

ISBN 0 580 22309 4

Amendments issued since publication

Amd. No.	Date	Comments
9358	March 1997	Indicated by a sideline
13560 Corrigendum No. 1	14 August 2002	Replacement of references in 2.1, 2.1.6, 2.1.7 and 2.1.8

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National foreword

This British Standard has been prepared by Technical Committee PEL/78 (formerly PEL/88) and is the English language version of EN 60832:1996, *Insulating poles (insulating sticks) and universal tool attachments (fittings) for live working*, published by the European Committee for Electrotechnical Standardization (CENELEC). It was derived from IEC 60832:1988, including its amendment 1 and Corrigendum May 2000, published by the International Electrotechnical Commission (IEC).

The common modifications to the text of IEC 60832 that have been introduced by CENELEC are indicated by a line in the margin.

The graphics signs, symbols and letters used may be found in the following documents.

BS 3939	<i>Graphical symbols for electrical power, telecommunications and electronics diagrams</i> Part 1:1986 <i>General information, general index</i> Part 2:1985 <i>Symbol elements, qualifying symbols and other symbols having general application</i> Part 3:1985 <i>Conductors and connecting devices</i>
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From 1 January 1997, all IEC publications have the number 60000 added to the old number. For instance, IEC 27-1 has been renumbered as IEC 60027-1. For a period of time during the changeover from one numbering system to another, publications may contain identifiers from both systems.

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled “International Standards Correspondence Index”, or by using the “Search” facility of the *BSI Electronic Catalogue* or of British Standards Online.

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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN title page, pages 2 to 61 and a back cover.

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Descriptors: Live working, electrical equipment, insulating tube, tool, characteristic, test, interchangeability

English version

Insulating poles (insulating sticks) and universal tool attachments (fittings) for live working

(IEC 60832:1988, modified)

Perches isolantes et outils adaptables pour travaux sous tension
(CEI 60832:1988, modifiée)

Isolierende Arbeitsstangen und zugehörige Arbeitsköpfe zum Arbeiten unter Spannung
(IEC 60832:1988, modifiziert)

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CENELEC

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

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The text of the International Standard IEC 832:1988, prepared by IEC TC 78, Tools for live working, was approved by CENELEC as HD 542 S1 on 1989-11-01.

This Harmonization Document, together with common modifications prepared by the Technical Committee CENELEC TC 78, was submitted to the formal vote and was approved by CENELEC as EN 60832 on 1996-03-05.

The following dates were fixed:

- latest date by which the EN has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 1997-03-01
- latest date by which national standards conflicting with the EN have to be withdrawn (dow) 1997-03-01

For products which have complied with HD 542 S1:1990 before 1997-03-01, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2002-03-01.

Annexes designated “normative” are part of the body of the standard.

Annexes designated “informative” are given only for information.

In this standard, Annex A is informative, Annex B to Annex E and Annex ZA are normative.

Annex ZA has been added by CENELEC.

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Introduction

This standard covers general matters. It should not be considered complete in itself and it leaves to each customer the task of establishing his own detailed requirements. These will cover, for example, required mechanical performance and conditions of interchangeability with equipment already in service.

1 Scope

This standard is applicable to insulating poles (insulating sticks) and tool attachments (fittings) and is divided into three chapters.

- Chapter I: Specifies the required characteristics for insulating poles with permanently attached fittings and the tests (electrical and mechanical) which shall be satisfied by these tools.
- Chapter II: Specifies the required characteristics for parts which may be attached to and detached from the ends of poles described in Chapter I, and the tests which shall be satisfied by these tools.
- Chapter III: Specifies the special clauses applicable to insulating poles and universal tool attachments.

The insulating poles mentioned in this standard shall be built with insulating tubes and rods in accordance with IEC Publication 855.

2 Definitions

2.1 IEV definitions

The following terms are defined in accordance with IEC Publication 50 (151) and IEC 61318.

2.1.1

type test

a test of one or more devices made to a certain design to show that the design meets certain specifications (IEV 151-04-15)

2.1.2

routine test

a test to which each individual device is subjected during or after manufacture to ascertain whether it complies with certain criteria (IEV 151-04-16)

2.1.3

sampling test

a test on a number of devices taken at random from a batch (IEV 151-04-17)

2.1.4

acceptance test

a contractual test to prove to the customer that the device meets certain conditions of its specification (IEV 151-04-20)

2.1.5

rated value

a quantity value assigned, generally by a manufacturer, for a specified operating condition of a component, device or equipment (IEV 151-04-03)

2.1.6

minor defect

a minor defect is a defect that is not likely to reduce materially the usability of the unit of product for its intended purpose, or is a departure from established standards having little bearing on the effective use or operation of the unit (see 2.6 of IEC 61318)

2.1.7

major defect

a major defect is a defect, other than critical, that is likely to result in failure, or to reduce materially the usability of the unit of product for its intended purpose (see 2.5 of IEC 61318)

2.1.8

critical defect

a critical defect is a defect that judgment and experience indicate is likely to result in hazardous or unsafe conditions for individuals using, maintaining or depending upon the product, or a defect that judgment and experience indicate is likely to prevent performance of the function of a major end item (see 2.4 of IEC 61318)

2.2 Definitions of special terms used in this standard

2.2.1

end fitting

part (generally metallic) permanently fitted to the ends of insulating tube or rod (IEC Publication 743, Sub-clause 1.2.1)

2.2.2

type of tool

tools which have the same design and equal dimensions

2.2.3

family of tools

it includes all the types of tools which have the same function (utilization, use, etc.)

2.2.4

MIDCT

“minor defect control test”. It consists of applying a certain force or torque (specified in this standard) to a tool and verifying whether any minor defect has occurred.

2.2.5

MADCT

“major defect control test”. It consists of applying a certain force or torque (specified in this standard) to a tool and verifying whether any major or critical defect has occurred

T_N : Rated torque given by the manufacturer for a tool and testing purposes.

F_{TN} : Rated tensile force given by the manufacturer for a tool and testing purposes.

F_{CN} : Rated compression force given by the manufacturer for a tool and testing purposes.

F_{BN} : Rated bending force given by the manufacturer for a tool and testing purposes.

Section 1. Technical characteristics

3 General

Care shall be taken to ensure that adequate attention is given to minimize the weight and size to optimize the handling of the equipment.

4 Insulation

Insulation shall be obtained by a length of tube or rod in accordance with IEC Publication 60855.

5 Dimensional and mechanical characteristics

Dimensional characteristics:

For each type of tool the manufacturer shall indicate the dimensions or operating ranges relating to the specific functions of the tool.

Mechanical characteristics:

For each type of tool the manufacturer shall give rated values corresponding with the characteristics specified in Table I and Table II.

Table I — Hand poles (hand sticks)

Mechanical tests are not required but only visual inspection (Clause 9) and dimensional checks (Clause 10) on:

Insulated oiler pole (stick),

Clip-on ammeter pole (amertong).

Characteristics	Family of tools						
	Tie pole (tie stick)	Safety hook pole (retractable hook stick)	Hook pole extension (retractable hook stick)	Universal hand pole (universal hand stick)	Wire holding pole (wire holding stick)	Cotter-key plier pole	Wire-cutter
F_{BN}		X	X			X	
F_{TN}		X		X	X	X	
T_N		X	X	X	X	X	
Other special characteristics	Tensile strength of the rotary blade and prong		Tensile strength of the connecting clamp	Torsion strength of the wing screws	Holding capability	Holding capability	Cutting capability
						Torsion strength of the support-handle	
						Torsion strength of the operating handle	

Characteristics	Family of tools			
	All-angle cog spanner (wrench)	Flexible insulated spanner (wrench)	Extendable universal hand pole (stick)	Measuring pole or rod (stick)
F_{BN}			X	
F_{TN}			X	
T_N	X	X	X	
Other special characteristics			Torsion strength of the wing screws	Torsion strength of the wing screws

Table II — Conductor support poles (wire support sticks)

Characteristics	Family of tools		
	Conductor (wire) support pole (support stick)	Tension pole (strain stick)	Tension puller (dead-end tool)
F_{TN}	X	X	X
F_{CN}	X		

6 Ends of insulating poles (sticks)

The ends of every pole shall be constructed to prevent the ingress of water or other contaminant into the fitting or the end of the tool or equipment.

6.1 Mechanical protection

When necessary the ends of each pole shall have adequate means provided for mechanical protection such as an end-fitting or cap. When metallic fittings are used care shall be taken in their design to ensure that all edges are rounded where this does not impair the function of the tool.

6.2 Corrosion protection

Metallic parts shall be incorrodible either by their inherent composition or by a suitable treatment.

6.3 Conducting parts

It shall be made apparent that conductive parts fixed to the tube or to the rod are conducting.

Where this is not technically possible the outside of the tube or rod shall be clearly marked to indicate that a conducting item is included.

There shall be no external marking on the pole other than a band indicating the extent of the internal metallic parts and arrows.

All conducting parts fixed to the tube or to the rod shall be designed and manufactured so as to reduce the danger of short-circuits.

7 Multiple tube or rod tools

For maintenance purposes all tools which consist of several tubes or rods shall be able to be dismantled.

Section 2. Type tests

8 General

In order to show compliance with this standard the manufacturer shall provide evidence that the following tests have been carried out successfully on a minimum of three specimens of each type of construction assembly. Compression and bending tests shall be carried out on complete tools.

However, when the differences between several types of tools are limited to a few characteristics, the tests which are not influenced by these characteristics may be made on only one type and the result applied to the other types.

Tensile tests need not be repeated when the types of tools differ only by the length of the insulating tube.

The tests in Table III and Table IV shall be carried out in the sequence specified.

NOTE In Table III and Table IV the "Type test" column includes a reference to the clause or sub-clause in which the test is explained. Some columns relating to certain types of tool are divided into a certain number of sub-columns equal to the number of destructive mechanical tests to be applied to the tool. These sub-columns show the sequence of tests to be applied. Any additional test that the customer may require should be specified as an acceptance test.

Table III — Type tests of hand poles (hand sticks)

The first test is the visual inspection test (9)¹⁾ made on each tool.

Type test	Family of tools													
	Tie pole (tie stick)	Safety hook pole (retractable hook sick)			Hook pole extension (retractable hook stick extension)		Universal hand pole (universal hand stick)		Wire holding pole (wire holding stick)		Cotter-key plier pole			Insulated oiler pole (stick)
Dimensional (10)	2	2			2		2		2		2			2
Torsion MIDCT MADCT (11.1)			2 3				2 4 4 6		4 6					
BendingMIDCT MADCT (11.4)		4 5			3 4									2 3
Tension MIDCT MADCT (11.2)				2 4					2 3		2 3			
Dye penetration (12)	5	6	4	5	5	4	5	7	4	7	7		4	5
Electrical (13)	4			3			3	5		5	5			3
Other special type tests	Tension of the rotary blade and prong 3 (14)	Operation of the control rod 3 (15)			Strength test MIDCT 2 MADCT 3 Tensile test 3 (16)		Torsion of wing screws 3 (17)		Tightening test 3 (18)		Tightening test 3 (19)	Torsion of the operating handle MIDCT 2 MADCT 3 (19)		Operation of the control rod 4 (20)
											Torsion of the support handle MIDCT 4 MADCT 6 (19)			

1) See note to Clause 8

¹⁾ See note to Clause 8

Table III — Type tests of hand poles (hand sticks) (*concluded*)

Type tests	Family of tools					
	Wire-cutters	All-angle cog spanner (wrench)	Flexible insulated spanner (wrench)	Clip-on ammeter pole (amertong)	Extendable universal hand pole (stick)	Measuring pole or rod (stick)
Dimensional (10)	2	2	2	2	2	2
Torsion MIDCT MADCT (11.1)		3 5	3 5			2 3
Bending MIDCT MADCT (11.4)					4 6	
Tension MIDCT MADCT (11.2)						2 3
Dye penetration (12)	5	6	6		7	4 5
Electrical (13)	4	4	4		5	4
Other special type tests	Cutting tests 3 (21)				Torsion of wing screws 3 (17)	Torsion of wing screws 3 (17) Solvent and abrasion resistance 6 (22) Electrical test after abrasion 7 (22)

Table IV — Type tests of conductor support poles (wire support sticks)

The first test is the visual test (9)¹⁾ made on each tool.

Type test	Family of tools		
	Conductor wire support pole (support stick)	Tension pole (strain stick)	Tension puller (dead-end tool)
Dimensional (10)	2	2	2
Tension (11.2) MIDCT	3	3	3
MADCT	5	5	5
Compression (11.3) MIDCT		2	
MADCT		3	
Dye penetration (12)	6	4	6
Electrical	4 (13)	4 (13)	4 (13) and (23)

¹⁾ See note to Clause 8.

Example of a test sequence: safety hook pole (retractable hook stick)

Three samples

Test:

- first: visual
- second: dimensional
- third: operation of the control rod
- fourth: bending: $1.25 F_{BN}$
- fifth: bending: $2.5 F_{BN}$; destructive
- sixth: dye penetration (if necessary)

Three other samples

Test:

- first: visual
- second: torsion: $1.25 T_N$
- third: torsion: $2.5 T_N$; destructive
- fourth: dye penetration (if necessary)

Three other samples

Test:

- first: visual
- second: tension: $1.25 F_{TN}$
- third: electrical (if necessary)
- fourth: tension: $2.5 F_{TN}$; destructive
- fifth: dye penetration (if necessary)

9 Visual inspection

Each sample shall be visually inspected to check for manufacturing defects and correct functioning.

10 Dimensional check

Each sample shall be measured to ensure that it complies with the dimensions stated by the manufacturer.

11 Mechanical tests

11.1 Torsion

The torques given in Table V shall be reached with a rate of rise of $5 \pm 2 \text{ N} \cdot \text{m/s}$. These shall be maintained for 1 min before observing the results.

Table V

Test	Test torque	Result
MIDCT	$1.25 T_N$	No minor, major or critical defect shall occur
MADCT	$2.5 T_N$	No major or critical defect shall occur

This torque shall be applied at the ends of the sample.

11.2 Tension

The tensile forces given in Table VI shall be reached with a rate of rise of $200 \pm 50 \text{ N/s}$. These shall be maintained for 1 min before observing the results.

Table VI

Test	Tensile test force	Result
MIDCT	$1.25 F_{TN}$	No minor, major or critical defect shall occur
MADCT	$2.5 F_{TN}$	No major or critical defect shall occur

This force shall be applied at the ends of the sample.

11.3 Compression

The compression forces given in Table VII shall be reached with a rate of rise of $200 \pm 50 \text{ N/s}$. These shall be maintained for 1 min before observing the results.

Table VII

Test	Compression test force	Result
MIDCT	$1.25 F_{CN}$	No minor, major or critical defect shall occur
MADCT	$2.5 F_{CN}$	No major or critical defect shall occur

This force shall be applied at the ends of the sample.

11.4 Bending

The bending forces given in Table VIII shall be reached with a rate of rise of 20 ± 5 N/s. These shall be maintained for 1 min before observing the results.

Table VIII

Test	Bending test force	Result
MIDCT	$1.25 F_{BN}$	No minor, major or critical defect shall occur
MADCT	$2.5 F_{BN}$	No major or critical defect shall occur

The tool shall be placed horizontally between two supports separated by 500 mm. The force shall be applied on the head of the sample. The two supports shall be placed at 500 mm and 1 000 mm from the other end of the sample. See Figure B.1 of Annex B.

When the tool is a pole extension or one element of an extendable pole, the force shall be applied on the head of the tool and the other end shall be connected to a fixed base of the same configuration as the tool used in service.

12 Dye penetration test

The dye penetration test shall be made only when holes for inserts (metallic or not) are made in the insulating tube. Five samples, each 100 mm long, containing the holes, shall be completely immersed in a container of 0.1 % by volume fuchsine/distilled water solution. The container shall be placed in a vacuum chamber and evacuated to less than 6 500 Pa. The sample shall remain for 1 h in the dye solution and then the vacuum released and the sample removed.

In order to avoid fuchsine spreading from the sample ends during cutting, it is necessary to dry the samples for 24 h in ambient air (IEC Publication 60212): conditioning 24 h/18 °C to 28 °C/45 % to 75 % r.h.

After drying, a 10 mm section shall be cut from each end.

The centre section of each sample (80 mm long) thus obtained shall then be slit lengthways. They shall be free from any fuchsine dye penetration.

13 Electrical test after water conditioning

This test shall be made only on the portion of the tool considered as a part of the insulation, when holes for inserts (metallic or not) are made in the insulating tube.

13.1 General test conditions

The test location shall be at standard atmospheric conditions (IEC Publication 60212): M/18 °C to 28 °C/45 % to 75 % r.h. and the water temperature shall be within the same limits as the ambient temperature: 18 °C to 28 °C. A voltage of 100 kV r.m.s. at power frequency shall be applied between electrodes 300 mm apart for 1 min, in accordance with IEC Publication 60060. The test arrangement may be as shown in Figure B.2 of Annex B. By agreement between manufacturer and customer, an equivalent test arrangement, test voltage, electrode width and distance and testing duration may be used. In case of dispute, the test arrangement described in Figure B.2 of Annex B shall be used.

NOTE Spacing between samples should be at least twice the spacing of the electrodes.

13.2 Water conditioning

The samples shall be immersed in water whose resistivity shall be $100 \pm 5 \Omega\text{m}$ (IEC Publication 60060) and shall be subjected to conditioning during 24 h/23 °C/water (IEC Publication 60212). The samples shall be taken from the water and the surface liquid shall be removed by wiping with a clean absorbent cloth.

The test voltage shall be applied within 5 min.

13.3 Test results

The test shall be considered as having been satisfactory if, during and after the test for 1 min, the following conditions are satisfied:

- no flashover, no sparkover, no puncture;
- no visual trace of tracking or erosion on the surface;
- no perceptible temperature rise.

14 Tie pole (tie stick)

Tension of the rotary blade and rotary prong

The tie pole shall be fixed. An increasing tensile force of 100 N/s shall be applied on the rotary blade, in a parallel direction to the pole axis (see Figure B.3 of Annex B), until it reaches $1.25 F_{TN}$. After 1 min at this value the force shall be removed. The blade shall turn easily without any stiffness. No deformation of the blade, or cracking in the resin joint visible to the naked eye shall occur. An increasing tensile force shall then be applied, in the same direction, until it reaches $2.5 F_{TN}$. No major or critical defect shall occur. The same test shall be applied to the rotary prong under the same conditions (see Figure B.4 of Annex B).

These tests may be simultaneously applied to the pole.

15 Safety hook pole (retractable hook stick)

Operation of the control rod

The safety hook pole shall be positioned vertically. The hook shall be opened. An increasing force shall be applied on the sliding hand grip until it latches. It shall occur between 15 N and 50 N (see Figure B.5 of Annex B).

The same test with the same conditions shall be made with the hook in mid-position (closed but not fully retracted).

16 Hook pole extension (retractable hook stick extension)

Tensile test

The opening hook shall be closed on a steel rod of 10 mm diameter. The hook pole extension shall be fixed on a testing piece representing the head of a safety hook pole. Screws shall be tightened with a 5 N·m torque (see Figure B.6 of Annex B).

A tensile force shall be increased at a rate of 50 N/s and shall be applied to the link ring through the testing piece, until it reaches $1.25 F_{TN}$ and shall be maintained constant for 1 min.

No minor, major or critical defect shall occur. The force being removed, no part of the hook pole extension shall have permanent deformation. The tensile force shall be increased at a rate of 50 N/s until it reaches $2.5 F_{TN}$. No major or critical defect shall occur.

17 Universal hand pole (universal hand stick) and extendable universal hand pole (stick)

Torsion of wing screws

An increasing torque of 1 N·m/s shall be applied on the wing screw until it reaches $1.25 T_N$.

No minor, major or critical defect, or permanent deformation of the screw or the splined end shall occur.

The torque shall be increased by the same value until it reaches $2.5 T_N$.

No major, or critical defect shall occur.

18 Wire holding pole (wire holding stick)

Tightening test

A 20 mm diameter smooth metallic rod shall be tightened in the jaws. With the locking lever making a 50° angle with the tube (see Figure B.7 of Annex B), the adjustable jaw shall be brought into contact with the testing rod, with the aid of the fine control milled-nut. The lever shall then be locked and the head of the pole shall be fixed. A force increasing at a rate of 20 N/s shall be applied to the metal rod until it creeps.

This force shall be higher than F_c where F_c is the rated creeping force given by the manufacturer. This test shall be repeated for each position of the jaws relative to the axis of the pole.

No change of position shall occur under tensile forces on the metallic rod.

19 Cotter-key plier pole

19.1 Tightening test

A 20 mm diameter metal rod shall be tightened in the jaws with a 35 N·m torque applied on the operating handle. The head of the pole shall be fixed (see Figure B.8 of Annex B) and a force increasing by 20 N/s shall be applied in the direction of the metal rod until it creeps.

This force shall be greater than F_c where F_c is the rated slippage force given by the manufacturer.

19.2 Torsion of the support handle

A 20 mm diameter metal rod shall be tightened in the jaws with a 35 N·m torque applied on the operating handle. The rod shall be fixed in a vice as shown in Figure B.9 of Annex B. A progressive torque of 2 N·m/s shall be applied on the support handle until it reaches $1.25 T_N$ which shall be maintained for 1 min.

No permanent deformation or minor, major or critical defect shall occur.

The torque shall be increased until it reaches $2.5 T_N$.

No major or critical defect shall occur.

19.3 Torsion of the operating handle

A 20 mm diameter metal rod shall be tightened in the jaws. The rod shall be fixed in a vice and a 45° angle shall be maintained between the operating handle and the support handle (see Figure B.10 of Annex B). A progressive torque of 2 N·m/s shall be applied on the operating handle until it reaches $1.25 T_N$, which shall be maintained for 1 min.

No permanent deformation or minor, major or critical defect shall occur.

The torque shall be increased until it reaches $2.5 T_N$.

No major or critical defect shall occur.

20 Insulated oiler pole (insulated oiler stick)

Operation of the control rod

The oil reservoir shall be filled with lubricant. The oiler pole shall be positioned vertically and an increasing force shall be applied at the end of the operating handle (see Figure B.11 of Annex B) until an oil jet appears from the spout. It shall occur between 15 N and 50 N.

A 150 N force shall then be applied on the control handle in the same way as above.

No permanent deformation or minor, major or critical defect shall occur.

The oil reservoir shall be emptied almost entirely with the operating handle in order to repeat the first test. The force shall remain between 15 N and 50 N.

21 Wire-cutter

Cutting capability

Ten cuts shall be made with the same pole for each rated maximum section (of a specified material) given by the manufacturer for the cutter. The rated sections and conductors shall be chosen among those which are in general used by the customer.

At each operation of the cutter, the conductor shall be successfully cut in one operation without damage to the cutting edges.

22 Measuring pole or rod (stick)

22.1 Solvent resistance

The pole (stick) shall be energetically rubbed, mainly on the coloured parts, with a white cloth soaked with a solvent such as ethylene perchloride.

After 30 s there shall be no coloured deposit on the cloth.

22.2 Abrasion resistance

A sample cut from a measuring pole shall be fixed horizontally. A macrogrit abrasive cloth as defined in Annex E shall be applied as shown in Figure B.12 of Annex B. A 1 kg weight shall be hung on one end of the abrasive cloth. The width of the cloth shall be 50 mm and it shall be made to slide over a coloured section between two marks 200 mm apart within 5 s to 10 s. The 1 kg weight shall be lifted to allow the paper to be placed at its starting position.

After five consecutive cycles the original colour of the measuring pole or rod shall not appear (to the naked eye) under the colouring matter.

22.3 Electrical test after abrasion resistance test

Test described in Sub-clauses 13.1, 13.2 and 13.3.

23 Tension puller (dead-end tool)

23.1 Type A

Electrical test

This test shall be made when the tension puller is built with an insulating cover on the flange (earth end). (See Figure B.13a of Annex B.) A voltage of 20 kV at power frequency shall be applied for 1 min between the flange (earth end) and an electrode made of wire gauze or conductive cloth placed on the insulating cover so that the clearance in air between the electrode and the flange is 50 mm.

No puncture, sparkover or flashover shall occur during the test.

23.2 Type B (jacking screw)

Electrical test on the jacking screw end of the puller

This test shall be required on tension pullers designed so that they have a metal part of the jacking screw that passes inside and toward the insulating section of the puller beyond the outer metal end-fitting (see Figure B.13b of Annex B). An electrode made of wire gauze, conductive cloth or braid shall be placed on the insulation at a position 50 mm from the metal part of the jacking screw end. This electrode shall extend at least 20 mm past the innermost position of any metal part that passes inside the insulating tool. The contact of this electrode shall be as good as possible. If an adhesive is used to hold the braid, this adhesive shall be of a conducting type.

An increasing alternating voltage at power frequency shall be applied at a rate of 5 kV/s between the electrode and the metal jack screw end until the voltage reaches 20 kV. This voltage shall remain constant for 1 min. No puncture, sparkover or flashover shall be observed during the test.

