

Electrical arc test methods for material and garments, for use by workers at risk from exposure to an electrical arc

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Störlichtbogenprüfverfahren für Materialien und Kleidungsstücke für Anwender, die einer Störlichtbogenegefährdung ausgesetzt sind

Méthodes d'essai d'arc électrique pour les matériaux et vêtements utilisés par des travailleurs exposés à un risque d'arc électrique

<https://standards.iteh.ai/catalog/standards/sist/3da2d914-6741-4958-a4bf-976cc1952999/sist-env-50354-2002>

Ta slovenski standard je istoveten z: ENV 50354:2001

ICS:

13.260	Xæ•ç[Á!^åÁ\^ dã } ä	Protection against electric shock. Live working
13.340.10	Varovalna obleka	Protective clothing

SIST ENV 50354:2002

en

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EUROPEAN PRESTANDARD
PRÉNORME EUROPÉENNE
EUROPÄISCHE VORNORM

ENV 50354

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English version

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for use by workers at risk from exposure to an electrical arc**

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This European prestandard was approved by CENELEC on 2000-09-15 as a prospective standard for provisional application. The period of validity of this ENV is limited initially to three years. After two years the members of CENELEC will be requested to submit their comments, particularly on the question whether the ENV can be converted into a European Standard (EN).

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CENELEC members are required to announce the existence of this ENV in the same way as for an EN and to make the ENV available promptly at national level in an appropriate form. It is permissible to keep conflicting national standards in force (in parallel to the ENV) until the final decision about the possible conversion of the ENV into an EN is reached.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

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

This European Prestandard was prepared by the Technical Committee CENELEC TC 78, Equipment and tools for live working.

The text of the draft was submitted to the questionnaire and vote procedure and was approved by CENELEC as ENV 50354 on 2000-09-15.

The following date was fixed:

- latest date by which the existence of the ENV
has to be announced at national level (doa) 2001-07-01

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Introduction

CENELEC/TC78 is of the opinion that clothing fulfilling this Prestandard, ensures that the consequences for workers, after exposure to electric arcs, will not be aggravated by the clothing itself.

This Prestandard specifies tests and classification for materials and clothing for wearing when at risk of exposure to an electric arc.

The addition of a box to the test rig increases the electric arc energy affecting the test material. This is an attempt to create a realistic scenario.

Specific dangers from accidental electric arcs arise from the high temperature, the pressure surge and the evaporation and spatter of hot and molten metal, the effects of heat flux, noise, UV-emissions, hot oil or the consequences of physical and mental shock.

This Prestandard does not include electrical insulation protection.

1 Scope

The purpose of this Prestandard is to ensure that the consequences for workers of exposure to electric arcs, will not be aggravated by the clothing itself.

The Prestandard does not include protection from current passing through the human body nor thermal protection from the heat/energy generated by the electric arc.

The clothing shall be made of materials that have passed the Method 1 test.

The test methods are divided into two parts:

- Method 1: Testing of material
- Method 2: Testing of clothing

2 Normative references

This European Prestandard 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 listed hereafter. For dated references, subsequent amendments to or revision of any of these publications apply to the European Prestandard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies.

ISO 3175-2	1998	Textiles - Dry cleaning and finishing - Part 2 Procedures for tetrachloroethene
ISO 6330	1984	Textiles - Domestic washing and drying procedures for textile testing

3 Definitions

For the purposes of this European Prestandard, the following definitions apply

3.1

electric arc

self-maintained gas conduction for which most of the charge carriers are electrons supplied by primary-electron emission. (IEV 121-03-12). The electric arc is generated by gas ionisation arising from an unintentional electrical conducting connection between line conductors or between a line conductor and the earth path of an electrical installation or an electrical device

3.2

arc tested clothing

clothing which does not aggravate the electric arc consequences, by catching fire or by melting onto the skin

3.3

material

the material(s) of which the garment is made, this may consist of single or multiple layers

3.4

garment

a single item of clothing

3.5

clothing

an assembly of garments worn by workers

3.6

burning time

time for which a flame is visible

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3.7

melting

deformation of the material structure caused by change of state from solid to liquid

4 Classification

4.1 Material

The material is divided into two classes :

- Class 1 : 4 kA
- Class 2 : 7 kA

4.2 Clothing

The garment is divided into two classes :

- Class 1 : 4 kA
- Class 2 : 7 kA

5 Requirements

5.1 Material

An arc tested material shall fulfill the following requirements when tested, according to its classification, as specified in clause 6 :

Burning time : less than or equal to 5 s after exposure to the electrical arc,

Melting : no melting through to the inside of the material, except holes, as defined below,

Hole formation : maximum 5 mm holes, measured in any direction,

Heat flux : *under consideration*.

5.2 Clothing

An arc tested garment shall fulfill the following requirements when tested, according to its classification, as specified in clause 6 :

Burning time : less than or equal to 5 s after exposure to the electrical arc,

Melting : no melting through to the inside of the garment, except holes, as defined below,

Hole formation : maximum 5 mm holes, measured in any direction,

Function : the fasteners shall be functional after exposure.

5.3 Other material

All other outer material used in the clothing shall at least pass the Class 1 test.

6 Tests

6.1 Test apparatus

6.1.1 General

Test box : See Figure 1

Test setup : See Figure 2

Table 1 - Test apparatus

Distance from surface of electrode to material	300 mm \pm 5 mm
Composition and dimensions of electrodes	Cu/Al, round, one of each Al-electrode shall be at the top Size : 25 mm \pm 0,1 mm in diameter Electrolytic copper
Gap between arc electrodes	30 mm \pm 1 mm

6.1.2 Method 1 - Testing of material

Size of test sample : (500 \pm 10) mm x (500 \pm 10) mm

Size of Test plate : (400 \pm 10) mm x (400 \pm 10) mm

Material of test plate : Plaster

Thickness of the plaster : Minimum 10 mm.

The sample shall be so fixed to ensure immediate contact with the test plate.

6.1.3 Method 2 – Testing of garment

A test mannequin comprised only of an upper body torso, made of non flammable, non metallic material with a chest measurement of (1 020 \pm 20) mm shall be used for the clothing test.

The test mannequin shall be arranged in such a way, that it remains in position for the duration of the electric arc.

The test mannequin shall be set up such that the middle of the sternum area is horizontally in line with the electrode gap.

The surface of the garment shall be (300 \pm 5) mm from the front of the electrodes. The garment shall be so fixed to ensure immediate contact with the front of the mannequin.

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6.2 Test procedure

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6.2.1 General <https://standards.iteh.ai/catalog/standards/sist/3da2d914-6741-4958-a4bf-976cc1952999/sist-env-50354-2002>

For tests, two test samples shall be used.

6.2.2 Pre-treatment of the test samples

Before testing the test materials or clothing shall be washed five times in accordance with ISO 6330 method 2A (60 °C) and drying by procedure E (tumble drying) unless otherwise specified in the care labelling. Materials or clothing which are labelled as dry cleanable only, shall be dry cleaned five times in accordance with ISO 3175.

Before testing the test samples shall be stored at an ambient temperature of (20 \pm 2) °C and a relative humidity of (65 \pm 5) % for 24 h.

6.2.3 Electric arc characteristics

The characteristics of the electric arc are defined by the following parameters :

Table 2 - Characteristics of the electric arc

Voltage	400 Vac \pm 5 %
Current	Class 1 : 4 kA \pm 5 % Class 2 : 7 kA \pm 5 %, The value of the predicted short-circuit current shall be verified by a suitable calibrated measuring instrument.
Arc duration	500 ms \pm 0,5 %
Frequency	The test shall be carried out at a frequency of (50 \pm 0,1) Hz
Connector between electrodes	Cu., Ø Max. 0,5 mm, placed inside the electrodes

6.2.4 Testing

The materials and garments shall undergo the electric arc test within 2 hours of preconditioning.

The test atmosphere shall be (25 \pm 10) °C and 25 % to 75 % relative humidity.

The electric arc is ignited by the switching of a circuit breaker.

The electric arc is broken after the test duration.

7 Test report

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The test report shall at least contain :

- name of test laboratory, [SIST ENV 50354:2002](https://standards.iteh.ai/catalog/standards/sist/3da2d914-6741-4958-a4bf-976cc1952999/sist-env-50354-2002)
- date, <https://standards.iteh.ai/catalog/standards/sist/3da2d914-6741-4958-a4bf-976cc1952999/sist-env-50354-2002>
- reference to this Prestandard,
- identification reference to the materials tested,
- test results,
- the test shall be recorded on video.