

SLOVENSKI STANDARD

SIST EN IEC 61482-1-1:2019

01-november-2019

Nadomešča:

SIST EN 61482-1-1:2009

Delo pod napetostjo - Oblačila za zaščito pred temperaturno nevarnostjo električnega obloka - 1-1. del: Preskusne metode - 1. metoda: Določanje zaščitnega razreda pri obloku (ELIM, ATPV in/ali EBT) materialov za oblačila in zaščitnih oblačil z uporabo odprtega obloka

Live working - Protective clothing against the thermal hazards of an electric arc - Part 1-1: Test methods - Method 1: Determination of the arc rating (ELIM, ATPV and/or EBT) of clothing materials and of protective clothing using an open arc

standards.iteh.ai

[SIST EN IEC 61482-1-1:2019](https://standards.iteh.ai/catalog/standards/sist/21c3330a-fe4c-4ebf-b1ce-537c988e67d9/sist-en-iec-61482-1-1-2019)

<https://standards.iteh.ai/catalog/standards/sist/21c3330a-fe4c-4ebf-b1ce-537c988e67d9/sist-en-iec-61482-1-1-2019>

Ta slovenski standard je istoveten z: EN IEC 61482-1-1:2019

ICS:

13.260	Varstvo pred električnim udarom. Delo pod napetostjo	Protection against electric shock. Live working
13.340.10	Varovalna obleka	Protective clothing

SIST EN IEC 61482-1-1:2019

en

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN IEC 61482-1-1:2019

<https://standards.iteh.ai/catalog/standards/sist/21c3330a-fe4c-4ebf-b1ce-537c988e67d9/sist-en-iec-61482-1-1-2019>

EUROPEAN STANDARD

EN IEC 61482-1-1

NORME EUROPÉENNE

EUROPÄISCHE NORM

August 2019

ICS 13.220.40; 29.260

Supersedes EN 61482-1-1:2009 and all of its
amendments and corrigenda (if any)

English Version

Live working - Protective clothing against the thermal hazards of
an electric arc - Part 1-1: Test methods - Method 1:
Determination of the arc rating (ELIM, ATPV and/or EBT) of
clothing materials and of protective clothing using an open arc
(IEC 61482-1-1:2019)

Travaux sous tension - Vêtements de protection contre les
dangers thermiques d'un arc électrique - Partie 1-1:
Méthodes d'essai - Méthode 1: Détermination de la valeur
assignée d'arc (ELIM, ATPV et/ou EBT) des matériaux pour
vêtements et des vêtements de protection utilisant un arc
ouvert
(IEC 61482-1-1:2019)

Arbeiten unter Spannung - Schutzkleidung gegen
thermische Gefahren eines Lichtbogens - Teil 1-1:
Prüfverfahren - Verfahren 1: Bestimmung der Lichtbogen-
Kennwerte (ELIM, ATPV und/oder EBT) von
Bekleidungsstoffen und Schutzkleidung mithilfe eines
offenen Lichtbogens
(IEC 61482-1-1:2019)

ITeH STANDARD PREVIEW
(standards.iteh.ai)

This European Standard was approved by CENELEC on 2019-08-07. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the CEN-CENELEC Management Centre or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the CEN-CENELEC Management Centre has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Bulgaria, Croatia, Cyprus, the Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, the Netherlands, Norway, Poland, Portugal, Republic of North Macedonia, Romania, Serbia, Slovakia, Slovenia, Spain, Sweden, Switzerland, Turkey and the United Kingdom.



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

CEN-CENELEC Management Centre: Rue de la Science 23, B-1040 Brussels

EN IEC 61482-1-1:2019 (E)**European foreword**

The text of document 78/1256/FDIS, future edition 2 of IEC 61482-1-1, prepared by IEC/TC 78 "Live working" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 61482-1-1:2019.

The following dates are fixed:

- latest date by which the document has to be implemented at national level by publication of an identical national standard or by endorsement (dop) 2020-05-07
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2022-08-07

This document supersedes EN 61482-1-1:2009 and all of its amendments and corrigenda (if any).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CENELEC shall not be held responsible for identifying any or all such patent rights.

iTeh STANDARD PREVIEW (standards.iteh.ai)

Endorsement notice

[SIST EN IEC 61482-1-1:2019](https://standards.iteh.ai/catalog/standards/sist/21c3330a-fe4c-4ebf-b1ce-537c988e67d9/sist-en-iec-61482-1-1-2019)

[https://standards.iteh.ai/catalog/standards/sist/21c3330a-fe4c-4ebf-b1ce-](https://standards.iteh.ai/catalog/standards/sist/21c3330a-fe4c-4ebf-b1ce-537c988e67d9/sist-en-iec-61482-1-1-2019)

[537c988e67d9/sist-en-iec-61482-1-1-2019](https://standards.iteh.ai/catalog/standards/sist/21c3330a-fe4c-4ebf-b1ce-537c988e67d9/sist-en-iec-61482-1-1-2019)

The text of the International Standard IEC 61482-1-1:2019 was approved by CENELEC as a European Standard without any modification.

In the official version, for Bibliography, the following notes have to be added for the standards indicated:

IEC 60060-1	NOTE	Harmonized as EN 60060-1
IEC 61482-1-2:2014	NOTE	Harmonized as EN 61482-1-2:2014 (not modified)
ISO 3175-2	NOTE	Harmonized as EN ISO 3175-2
ISO 6330	NOTE	Harmonized as EN ISO 6330
ISO 9151	NOTE	Harmonized as EN ISO 9151
ISO 13688	NOTE	Harmonized as EN ISO 13688
ISO 15797	NOTE	Harmonized as EN ISO 15797

Annex ZA (normative)

Normative references to international publications with their corresponding European publications

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

NOTE 1 Where an International Publication has been modified by common modifications, indicated by (mod), the relevant EN/HD applies.

NOTE 2 Up-to-date information on the latest versions of the European Standards listed in this annex is available here: www.cenelec.eu.

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60584-1	-	Thermocouples - Part 1: specifications and tolerances	EMF EN 60584-1	-
IEC 61482-2	2018	Live working – Protective clothing against the thermal hazards of an electric arc – Part 2: Requirements		-
ISO/IEC 17025	2017	General requirements for the competence of testing and calibration laboratories	EN ISO/IEC 17025	2017
ISO/TR 11610	-	Protective clothing – Vocabulary	CEN ISO/TR 11610	-
ISO 11612	2015	Protective clothing – Clothing to protect against heat and flame – Minimum performance requirements	EN ISO 11612	2015

iTeh STANDARD PREVIEW
(standards.iteh.ai)

SIST EN IEC 61482-1-1:2019

<https://standards.iteh.ai/catalog/standards/sist/21c3330a-fe4c-4ebf-b1ce-537c988e67d9/sist-en-iec-61482-1-1-2019>



IEC 61482-1-1

Edition 2.0 2019-07

INTERNATIONAL STANDARD

NORME INTERNATIONALE



Live working – Protective clothing against the thermal hazards of an electric arc – Part 1-1: Test methods – Method 1: Determination of the arc rating (ELIM, ATPV and/or EBT) of clothing materials and of protective clothing using an open arc

Travaux sous tension – Vêtements de protection contre les dangers thermiques d'un arc électrique – Partie 1-1: Méthodes d'essai – Méthode 1: Détermination de la valeur assignée d'arc (ELIM, ATPV et/ou EBT) des matériaux pour vêtements et des vêtements de protection utilisant un arc ouvert

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 13.220.40; 29.260.99

ISBN 978-2-8322-6921-3

**Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.**

CONTENTS

FOREWORD.....	5
1 Scope.....	7
2 Normative references	7
3 Terms, definitions, symbols and units	8
3.1 Terms and definitions.....	8
3.2 Symbols and units.....	13
4 Principle of test procedures A and B.....	13
4.1 Procedure A – <i>Material open arc</i> test procedure	13
4.2 Procedure B – <i>Garment open arc</i> test procedure.....	14
5 Significance and use of the test procedures A and B	14
5.1 General.....	14
5.2 Procedure A – <i>Material open arc</i> test procedure	15
5.3 Procedure B – <i>Garment open arc</i> test procedure.....	15
6 Test apparatus	15
6.1 General.....	15
6.2 Calorimetric sensors	15
6.2.1 Calorimeter construction.....	15
6.2.2 Panel sensor construction.....	17
6.2.3 Monitor sensor construction and positioning	19
6.3 Panel construction	20
6.4 Mannequin construction	22
6.5 Arrangement of panels and monitor sensors for testing according to Procedure A.....	23
6.6 Arrangement of mannequin(s) and monitor sensors for testing according to Procedure B.....	24
6.7 Supply bus and electrodes	28
6.7.1 General	28
6.7.2 Structural cage arrangement.....	28
6.7.3 Electrodes	30
6.7.4 Fuse wire.....	30
6.8 Electric supply	30
6.9 Test-circuit control	31
6.10 Data acquisition and data processing system.....	31
6.10.1 General	31
6.10.2 Data acquisition.....	31
6.10.3 Signal synchronization.....	32
7 Operator safety.....	32
8 Specimen preparation.....	33
8.1 Description of the test specimens	33
8.1.1 Test specimens for Procedure A	33
8.1.2 Test specimens for Procedure B	33
8.2 Pre-treatment of test specimens by cleaning.....	34
8.3 Pre-conditioning of the test specimens.....	34
9 Calibration and verification	34
9.1 Data acquisition system pre-calibration.....	34
9.2 Verification of <i>calorimeters</i>	34

9.3	Arc exposure and apparatus verification for the two- <i>sensor</i> panels and the monitoring <i>sensors</i>	35
9.3.1	Set-up of electrodes and fuse wire.....	35
9.3.2	Positioning of the two- <i>sensor</i> panels, mannequins and monitor <i>sensors</i>	35
9.3.3	Verification <i>bare shot</i>	35
9.3.4	Verification <i>bare shot</i> test protocol.....	36
10	Test apparatus care and maintenance	36
10.1	Surface reconditioning	36
10.2	Care of panels, mannequins and <i>sensors</i>	37
10.3	Care of electrodes	37
11	Test procedures	37
11.1	Procedure A – testing with panels.....	37
11.1.1	Test parameter and settings	37
11.1.2	Sequence of tests with test specimens of <i>material</i> or <i>material assembly</i>	37
11.1.3	Criteria for set of data obtained from iterative process of <i>test shots</i>	38
11.2	Procedure B – testing with mannequins	39
11.2.1	Test parameters and settings.....	39
11.2.2	Single test or sequence of tests with test specimen(s) of <i>garment</i> or <i>garment assembly</i>	39
11.3	Air ventilation and initial temperature of <i>sensors</i>	40
11.4	Specimen mounting	40
11.4.1	Procedure A – testing with panels.....	40
11.4.2	Procedure B – testing with mannequins	40
11.5	Specimen description.....	42
11.6	Test protocol.....	42
12	Test results	43
12.1	Heat calculation	43
12.1.1	General	43
12.1.2	Copper heat capacity.....	43
12.1.3	Incident and transmitted energy.....	43
12.1.4	Panel <i>sensor</i> response (transmitted energy (E_t) comparison with <i>Stoll</i> curve).....	44
12.1.5	Monitor <i>sensor</i> responses (<i>incident energy</i> (E_i))	45
12.2	Determination of <i>arc thermal performance value</i> (<i>ATPV</i>).....	46
12.3	Determination of <i>breakopen threshold energy</i> (<i>EBT</i>).....	46
12.4	Determination of the <i>incident energy limit</i> (<i>ELIM</i>).....	47
12.5	Visual inspection.....	47
12.6	<i>Arc rating</i>	49
12.6.1	<i>Arc rating</i> of a <i>material</i> or <i>material assembly</i>	49
12.6.2	<i>Arc rating</i> of a <i>garment</i> or <i>garment assembly</i>	49
13	Test report.....	50
13.1	Reporting requirements common for tests according to Procedures A and B.....	50
13.2	Reporting requirements specific for tests according to Procedure A.....	51
13.3	Reporting requirements specific for tests according to Procedure B	52
	Annex A (informative) Logistic regression technique	54
	Annex B (informative) 95 % confidence intervals of <i>ATPV</i> and <i>EBT</i>	56
	Annex C (informative) Iterative process of <i>test shots</i> of Procedure A	60
	Annex D (informative) Example <i>materials</i> for insulating and mounting boards	61

D.1	General.....	61
D.2	<i>Materials</i> for use as thermally insulating mounting board (6.2).....	61
D.3	<i>Materials</i> for use as mounting board, but not sufficiently thermally insulating for use as insulating board (6.3).....	62
Annex E (informative) Recommended provisions for use of the test method for accident replication and for research		63
Bibliography.....		64
Figure 1	– Example of <i>calorimeter</i> construction.....	17
Figure 2	– Example of the panel <i>sensor</i> construction	18
Figure 3	– Example of monitor <i>sensor</i> construction, with optional cover plate	19
Figure 4	– Panel	21
Figure 5	– Example of <i>material</i> clamping assembly of a panel	22
Figure 6	– Arrangement of three two- <i>sensor</i> panels with monitoring <i>sensors</i> (top view) for testing according to Procedure A	24
Figure 7	– Relative positioning of arc electrodes and of mannequin(s) and monitor <i>sensors</i> for testing according to Procedure B	25
Figure 8	– Examples of mannequin configuration	27
Figure 9	– Example of cage arrangement (supply bus, bus tubes and arc electrodes) shown together with three panels for testing according to Procedure A (monitor <i>sensors</i> are not shown).....	29
Figure 10	– Relative positioning of cage arrangement (supply bus, bus tubes and arc electrodes) and of one torso mannequin and its monitor <i>sensors</i> for testing according to Procedure B.....	30
Figure 11	– Typical average transmitted energy curves $Q_{t,avg}$ (i.e. average response of the two <i>sensors</i> of same panel) for test specimens.....	45
Figure B.1	– Probability density function (PDF)	56
Figure B.2	– Cumulative density (CDF)	57
Figure B.3	– Graph with probability, lower and upper limits	59
Table 1	– Positioning of monitor <i>sensors</i> depending on <i>incident energy</i> exposure.....	20
Table 2	– Reporting requirements and rating of visual inspection performance in case of testing clothing <i>material</i> (s) according to Procedure A and <i>garment</i> (s) or an assembly of <i>garments</i> according to Procedure B.....	47
Table 3	– Visual assessment criteria in case of testing <i>garment</i> (s) or a <i>garment assembly</i> according to Procedure B	50
Table B.1	– Example of <i>incident energy</i> X and binary response Y (fulfillment of Stoll criteria) for 21 <i>test shots</i>	58

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIVE WORKING –
PROTECTIVE CLOTHING AGAINST
THE THERMAL HAZARDS OF AN ELECTRIC ARC –

Part 1-1: Test methods –
Method 1: Determination of the arc rating (ELIM, ATPV and/or EBT)
of clothing materials and of protective clothing using an open arc

FOREWORD

- 1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
- 2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
- 3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
- 4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
- 5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
- 6) All users should ensure that they have the latest edition of this publication.
- 7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
- 8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
- 9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

International Standard IEC 61482-1-1 has been prepared by IEC technical committee 78: Live working.

This second edition cancels and replaces the first edition published in 2009. This edition constitutes a technical revision.

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

- addition of the *Incident energy limit (ELIM)* as a further *arc rating* performance property value;
- replacement of char length requirement in the scope by indication that Procedure A is applicable for testing of *materials* meeting the limited flame spread requirements of IEC 61482-2;

- clarification of the definition and the meaning of the *Stoll curve*;
- modification of specification of positioning of *monitor sensors* with respect to the *electric arc* as function of intended high *incident energy* exposure of test specimens;
- modification of specifications of *monitor sensor* construction;
- specification of black paint;
- elimination of *calorimeters* from the chest of the mannequin;
- specification for possible positioning of mannequin(s) at a height different from the centre of the *electric arc* and possible turning in order to adequately expose all parts of the *garment* or clothing which would affect performance;
- more explicit description of requirements for data acquisition system;
- preconditioning of the samples;
- modification of requirements for apparatus and arc exposure verification by *bare shots*;
- more explicit description of test procedures A and B, in particular the subclauses dealing with “sequence of test”, “test parameter” and “test criteria”;
- addition of determination of *arc rating* values of *garments* and/or *garment* assemblies.

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

FDIS	Report on voting
78/1256/FDIS	78/1262/RVD

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

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

In this standard terms defined in Clause 3 appear in *italics*.

A list of all parts in the IEC 61482 series, published under the general title *Live working – Protective clothing against the thermal hazards of an electric arc*, can be found on the IEC website.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific document. At this date, the document 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 document using a colour printer.

LIVE WORKING – PROTECTIVE CLOTHING AGAINST THE THERMAL HAZARDS OF AN ELECTRIC ARC –

Part 1-1: Test methods – Method 1: Determination of the arc rating (ELIM, ATPV and/or EBT) of clothing materials and of protective clothing using an open arc

1 Scope

This part of IEC 61482 specifies test method procedures to determine the *arc rating of flame resistant clothing materials and garments or assemblies of garments* intended for use in clothing for workers if there is an *electric arc* hazard.

An *open arc* under controlled laboratory conditions is used to determine the values of *ELIM*, *ATPV* or *EBT* of *materials, garments* or assemblies of *garments*.

NOTE 1 The user can, if he desires, classify the arc protective performance into *arc rating* protection levels based on *ELIM*, *ATPV* and/or *EBT* values which correspond best to the different hazard and risks levels that can result from the user's risk analysis.

NOTE 2 This document is not dedicated to classifying the arc protective performance of the *material* and clothing into arc protection classes. Procedures determining these arc protection classes APC1 and APC2 are specified in IEC 61482-1-2, which uses a constrained arc for testing.

NOTE 3 This test method is not intended and not appropriate to evaluate whether *materials* or *garments* are *flame resistant* or not, as this is covered in IEC 61482-2.

Other effects than the thermal effects of an *electric arc* like noise, light emissions, pressure rise, hot oil, electric shock, the consequences of physical and mental shock or toxic influences are not covered by this document.

Protective clothing for work intentionally using an *electric arc*, e.g. arc welding, plasma torch, is not covered by this document.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60584-1, *Thermocouples – Part 1: EMF specifications and tolerances*

IEC 61482-2:2018, *Live working – Protective clothing against the thermal hazards of an electric arc – Part 2: Requirements*

ISO/IEC 17025:2017, *General requirements for the competence of testing and calibration laboratories*

ISO/TR 11610, *Protective clothing – Vocabulary*

ISO 11612:2015, *Protective clothing – Clothing to protect against heat and flame – Minimum performance requirements*

3 Terms, definitions, symbols and units

3.1 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO/TR 11610 and the following apply.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at <http://www.electropedia.org/>
- ISO Online browsing platform: available at <http://www.iso.org/obp>

3.1.1 ablation

<electric arc testing> *material response* evidenced by formation of one or more openings in one or several outer layers, but not in all layers of a *material assembly specimen*

Note 1 to entry: for the use of this document the opening is defined as follows:

- a) with an opening in the layer of at least 1 600 mm² in area or at least 80 mm in any planar direction,
- b) with one or several individual threads across an opening not reducing the size of the opening.

3.1.2 arc duration

time duration of the arc

Note 1 to entry: *Arc duration* is expressed in milliseconds (ms).

3.1.3 arc energy

W_{arc}

<electric arc testing> electrical energy supplied to the arc and converted in the arc

Note 1 to entry: *Arc energy* is calculated as the sum of the instantaneous *arc voltage* values multiplied by the instantaneous *arc current* values multiplied by the incremental time values during the *arc duration*.

Note 2 to entry: *Arc energy* is expressed in kilojoules (kJ).

3.1.4 arc gap

distance between the arc electrodes

Note 1 to entry: *Arc gap* is expressed in millimetres (mm).

3.1.5 arc rating

<electric arc testing> numerical value attributed to a product, that describes its protective performance when tested in accordance with the *open arc test*

Note 1 to entry: The arc rating can be the arc thermal performance value (*ATPV*), the breakopen threshold energy (*EBT*) or the incident energy limit (*ELIM*).

Note 2 to entry: The arc rating values are expressed in kJ/m² (cal/cm²).

3.1.6 arc thermal performance value

ATPV

<electric arc testing> numerical value of *incident energy* attributed to a product that describes its thermal properties of attenuating (reducing) a *heat flux* generated by an *electric arc*

Note 1 to entry: The *ATPV* of a *material* or *material assembly* is calculated using logistic regression analysis applied to the data points obtained from testing a set of test specimens. It is the value of *incident energy* at which the heat transfer through the test specimens is enough to reach the Stoll criteria with 50 % probability.

Note 2 to entry: The *ATPV* attributed to a *garment* or *garment assembly* is either equal to or lower than the *ATPV* of the *material* or *material assembly* of which it is made, depending on whether the tested specimen(s) fulfil also additional visual design and performance assessment criteria.

3.1.7

arc voltage

voltage across the arc

Note 1 to entry: *Arc voltage* is expressed in volts (V).

3.1.8

bare shot

<electric arc testing> *electric arc* event during which panels or mannequins are bare, i.e. they are not covered by test specimens

3.1.9

breakopen

<electric arc testing> *material response* evidenced by the formation of an opening in the *material specimen*

Note 1 to entry: For the use of this document the opening is defined as follows:

- a) with a size of at least 300 mm² in area or at least 25 mm in any planar direction,
- b) with one or several individual threads across an opening not reducing the size of the opening.

Note 2 to entry: A *material assembly specimen* is considered to exhibit *breakopen* when all layers show formation of one or more openings.

Note 3 to entry: *Shrink-open* is considered as a particular form of *breakopen*.

3.1.10

breakopen threshold energy

EBT

<electric arc testing> numerical value of *incident energy* attributed to product (*material* or clothing) that describes its *breakopen* properties when exposed to *heat energy* generated by an *electric arc*

Note 1 to entry: The *EBT* of a *material* or *material assembly* is calculated using logistic regression analysis applied to the data points obtained from testing a set of test specimens. It is the value of *incident energy* at which *breakopen* occurs with 50 % probability.

Note 2 to entry: The *EBT* attributed to a *garment* or *garment assembly* is either equal to or lower than the *EBT* of the *material* or *material assembly* of which it is made, depending on whether the tested specimen(s) fulfil also additional visual design and performance assessment criteria.

3.1.11

burning time

afterflame time

time for which a flaming of the test specimen is visible after the end of the *electric arc duration*

Note 1 to entry: *Burning time* is expressed in seconds (s).

3.1.12

calorimeter

assembly of a copper disc with attached thermocouple, used for measuring the *heat energy* and *incident energy*