

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Live working – Eye, face and head protectors against the effects of electric arc –
Performance requirements and test methods**

**Travaux sous tension – Protecteurs des yeux, du visage et de la tête contre les
effets de l'arc électrique – Exigences de performances et méthodes d'essai**

<https://standards.iteh.ai/catalog/standards/sist/14cf850d-3f38-4d8c-b10b-0e44cb335c75/iec-62819-2022>



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2022 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Secretariat
3, rue de Varembe
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC

The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications

The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform

The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, ...). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished

Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc

If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org

The world's leading online dictionary on electrotechnology, containing more than 22 300 terminological entries in English and French, with equivalent terms in 19 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC

La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC

Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC -

webstore.iec.ch/advsearchform

La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, ...). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished

Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc

Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC Products & Services Portal - products.iec.ch

Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org

Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 300 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 19 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

INTERNATIONAL STANDARD

NORME INTERNATIONALE



**Live working – Eye, face and head protectors against the effects of electric arc –
Performance requirements and test methods**

**Travaux sous tension – Protecteurs des yeux, du visage et de la tête contre les
effets de l'arc électrique – Exigences de performances et méthodes d'essai**

<https://standards.iteh.ai/catalog/standards/sist/14cf850d-3f38-4d8c-b10b-0e44cb335c75/iec-62819-2022>

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 13.260; 29.240.99; 29.260.99

ISBN 978-2-8322-5690-9

**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.....	4
INTRODUCTION.....	6
1 Scope.....	7
2 Normative references	7
3 Terms, definitions and symbols.....	8
3.1 Terms and definitions.....	8
3.2 Abbreviated terms, symbols and units	15
4 Requirements	15
4.1 General.....	15
4.2 Design requirements	15
4.3 Mechanical and optical requirements	16
4.3.1 Mechanical and optical requirements for a device or the part of a device covering eyes or face	16
4.3.2 Mechanical requirements for a device or a part of a device other than those protecting the eyes or face	20
4.4 Arc thermal protection requirements	20
4.4.1 General	20
4.4.2 General requirements for protective devices or combination of devices	21
4.4.3 Additional requirements for face shields	21
4.4.4 Additional requirements for helmets.....	21
4.4.5 Protection requirement of protectors protecting against an electric arc	21
4.4.6 Other requirements for textile components.....	22
4.4.7 Performance verification for exposed and not exposed accessories.....	22
4.5 Marking.....	23
4.6 Instructions for use	24
5 Test procedures	26
5.1 General.....	26
5.2 Test against the effects of an electric arc.....	26
5.2.1 Type tests.....	26
5.2.2 Type testing method for the determination of the arc rating values ATPV, EBT and/or ELIM	26
5.2.3 Type testing method for the determination of the arc protection class	32
5.2.4 Testing of protectors intended to provide 360° protection	35
5.2.5 Additional tests for face shields allowing various wearing distances to the face or different wearing distances associated with different helmets.....	36
5.3 Test report	37
5.4 Marking.....	37
5.4.1 Visual inspection	37
5.4.2 Durability of marking.....	37
5.5 Instructions for use	37
6 Method of assessment of defects and verification of performance applicable to protectors having completed the production phase	37
6.1 General.....	37
6.2 Completeness and correctness of assembly.....	38
6.3 Product finishing	38
6.4 Functioning	38
6.5 Optical properties	38

6.6	Alternative means to test protectors against the effects of an electric arc when the production phase has been completed	38
6.7	Packaging and labelling	38
7	Modifications	38
Annex A (normative)	Symbol: Protection against the thermal effect of the electric arc (IEC 60417-6353:2016-02).....	39
Annex B (informative)	Marking examples	40
Annex C (informative)	Use and maintenance	42
C.1	Use	42
C.2	Maintenance	42
Annex D (normative)	Chronological order of type tests.....	43
Annex E (normative)	Classification of defects	45
Annex F (informative)	Rationale for the classification of defects.....	46
Bibliography	47
Figure 1	– Reference points	19
Figure 2	– Schematic view of test set-up, indicating vertical and horizontal positioning of test head on top of mannequin with respect to arc electrodes for open-arc test.....	29
Figure 3	– Test head with four calorimetric sensors for open-arc test.....	30
Figure 4	– Test set-up: Schematic view of test set-up, indicating vertical and horizontal positioning of test head on top of torso with respect to arc electrodes for box-test	33
Figure 5	– Test head with four calorimetric sensors for the box-test.....	34
Table 1	– LT classes.....	17
Table 2	– Minimum of specimens mounted on a test head exposed to an arc from the side and/or the back	36
Table B.1	– Protective performance information.....	41
Table D.1	– List of type tests	43
Table E.1	– Classification of defects and associated requirements and tests	45
Table F.1	– Justification for the type of defect.....	46

INTERNATIONAL ELECTROTECHNICAL COMMISSION

**LIVE WORKING – EYE, FACE AND HEAD PROTECTORS
AGAINST THE EFFECTS OF ELECTRIC ARC –
PERFORMANCE REQUIREMENTS AND TEST METHODS**

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.

IEC 62819 has been prepared by IEC technical committee 78: Live working. It is an International Standard.

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

Draft	Report on voting
78/1397/FDIS	78/1399/RVD

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

The language used for the development of this International Standard is English.

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

Terms defined in Clause 3 are given in *italic* print throughout this document.

The committee has decided that the contents of this document will remain unchanged until the stability date indicated on the IEC website under 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 document 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.

iTeh STANDARD PREVIEW (standards.iteh.ai)

[IEC 62819:2022](https://standards.iteh.ai/catalog/standards/sist/14cf850d-3f38-4d8c-b10b-0e44cb335c75/iec-62819-2022)

<https://standards.iteh.ai/catalog/standards/sist/14cf850d-3f38-4d8c-b10b-0e44cb335c75/iec-62819-2022>

INTRODUCTION

This document has been prepared in accordance with the requirements of IEC 61477 where applicable.

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

This document 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.

iTeh STANDARD PREVIEW
(standards.iteh.ai)

[IEC 62819:2022](#)

<https://standards.iteh.ai/catalog/standards/sist/14cf850d-3f38-4d8c-b10b-0e44cb335c75/iec-62819-2022>

LIVE WORKING – EYE, FACE AND HEAD PROTECTORS AGAINST THE EFFECTS OF ELECTRIC ARC – PERFORMANCE REQUIREMENTS AND TEST METHODS

1 Scope

This document is applicable to eye, face and head *protectors* used in work where there is a risk of exposure to an *electric arc* hazard.

Such *protectors* consist of one or several *devices* (e.g. *hood, goggles, balaclavas, face shields, helmets*, etc.), which might need to be combined together in order to give protection to eye, face and head for the intended use.

This document covers the performance requirements for *protectors* and single protective *devices* considering thermal, optical and mechanical hazards of an *electric arc*.

Because of the limitations of test apparatus at very high energy arcs, no *arc rating* above 4 100 kJ/m² (100 cal/cm²) can be assigned to *protectors*.

This document does not cover protection against electric shock, noise, the consequences of physical and mental shock and the toxic influences caused by an *electric arc*.

This document does not cover *protectors* for work intentionally using an *electric arc*, e.g. arc welding, plasma torch.

This document does not cover face-screens for the reduction of an electric field inside conductive clothing in accordance with IEC 60895.

Any other claims of the manufacturer for protection against other hazards to eye or face (e.g. welding radiation, hazards occurring during fire-fighting) are outside the scope of the document.

Products designed and manufactured in accordance with this document 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 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 60417, *Graphical symbols for use on equipment* (available at <http://www.graphical-symbols.info/equipment>)

IEC 61318:2021, *Live working – Methods for assessment of defects and verification of performance applicable to tools, devices and equipment*

IEC 61477:2009, *Live working – Minimum requirements for the utilization of tools, devices and equipment*

IEC 61482-1-1:2019, *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 61482-1-2:2014, *Live working – Protective clothing against the thermal hazards of an electric arc – Part 1-2: Test methods – Method 2: Determination of arc protection class of material and clothing by using a constrained and directed arc (box test)*

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

ISO 3758:2012, *Textiles – Care labelling code using symbols*

ISO 15025:2016, *Protective clothing – Protection against flame – Method of test for limited flame spread*

ISO 16321-1:2021, *Eye and face protection for occupational use – Part 1: General requirements*

ISO 16321-2:2021, *Eye and face protection for occupational use – Part 2: Additional requirements for protectors used during welding and related techniques*

ISO 16976 (all parts), *Respiratory protective devices – Human factors*

ISO 18526-2:2020, *Eye and face protection – Test methods – Part 2: Physical optical properties*

ISO 18526-3:2020, *Eye and face protection – Test methods – Part 3: Physical and mechanical properties*

3 Terms, definitions and symbols

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

3.1.1

arc protection class

APC

<electric arc testing> class of *arc thermal protection* of a product tested in accordance with the box test method

Note 1 to entry: The *arc protection class* is characterized by the test energy level of arc exposure (arc energy and incident energy).

Note 2 to entry: The box test method defines two *arc protection classes* APC 1 and APC 2.

[SOURCE: IEC 60050-651:2022,651-27-03]

3.1.2 arc rating

<electric arc testing> quantity, attributed to a product, that describes the 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).

[SOURCE: IEC 60050-651:2022, 651-27-04]

3.1.3 arc thermal performance value

ATPV

<electric arc testing> quantity of *incident energy* attributed to a product that describes its properties of attenuating the thermal effect of energy generated by an open arc

Note 1 to entry: The ATPV of a product is calculated in principle using logistic regression analysis applied to the data points obtained from testing a sufficiently large 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: However, the ATPV attributed to a product in accordance with this document is either equal to or lower than the ATPV of the product calculated by taking only the Stoll criteria into account, depending on whether the tested specimen(s) fulfil also additional visual design and performance assessment criteria.

Note 3 to entry: Depending on further visual design and performance assessment criteria, the calculation of the value of the ATPV attributed to a product can be based on a smaller set of test specimens than needed for the determination of the ATPV by logistic regression analysis.

[SOURCE: IEC 60050-651:2022, 651-27-05, modified – The notes to entry have been added.]

3.1.4 arc thermal protection

<electric arc testing> degree of thermal protection offered against an *electric arc* under specific arc testing conditions indicated by either an *arc rating* or an *arc protection class*

[SOURCE: IEC 60050-651:2022, 651-27-06]

3.1.5 auto darkening filter

optical filter which varies the transmittance in the visible region of the spectrum depending on the presence of light emitted by an *electric arc*

Note 1 to entry: An *auto darkening filter* combines a *filter* with automatically adapting light transmittance with a passive UV and a passive IR *filter*. It varies the transmittance in the visible region of the spectrum, depending on the presence of light emitted by an *electric arc*. The luminous transmittance of the *auto darkening filter* has an initial high value (light state). After *ignition* of the arc, within a certain switching time, the luminous transmittance of the *filter* changes to a low value (dark state). *Auto darkening filters* include a (clear or tinted) cover plate and a (clear or tinted) inside plate.

Note 2 to entry: Luminous transmittance (shade), switching time, variations of luminous transmittance (homogeneity) and angle dependence are the main specific characteristics of an *auto darkening filter*.

3.1.6 balaclava

one-piece garment designed to fit closely over the entire head and to extend downwards to cover the neck, but leaving the area of the eyes and at most the area of the eyes, nose and mouth uncovered

[SOURCE: ISO/TR 11610:2004, 3.22, modified – The area of the head not covered has been specified.]

3.1.7

breakopen

<electric arc testing> *material response evidenced by the formation of one or more openings in the material specimen*

[SOURCE: IEC 60050-651:2022, 651-27-09]

3.1.8

breakopen threshold energy

EBT

<electric arc testing> quantity of *incident energy* attributed to a product (*material* or equipment) that describes the properties of a *breakopen* when exposed to heat energy generated by an open arc test

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

Note 2 to entry: However, the EBT attributed to a product according to this document is either equal to or lower than the calculated EBT of the product, depending on whether the tested specimen(s) fulfil also additional visual design and performance assessment criteria.

Note 3 to entry: Depending on further visual design and performance assessment criteria, the calculation of the value of the EBT attributed to a product can be based on a smaller set of test specimens than needed for the determination of the EBT by logistic regression analysis.

[SOURCE: IEC 60050-651:2022, 651-27-10, modified – The notes to entry have been added.]

3.1.9

burning 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).

[SOURCE: IEC 61482-1-1:2019, 3.1.11, modified – The second preferred term has been deleted.]

3.1.10

component

part of a protective *device*, such as a window in a *hood* or a bracket to a *face shield*

3.1.11

charring

formation of carbonaceous residue as the result of pyrolysis or incomplete combustion

[SOURCE: ISO 17492:2019, 3.3]

3.1.12

chin protector

component specifically designed to protect the chin

EXAMPLE Chin-cups, chin-curtains.

Note 1 to entry: Chin protection can be provided by a scarf, which also protects the neck.

3.1.13**closed hood**

bee keeper hood

hood with an integrated *face shield*

Note 1 to entry: The term "bee keeper *hood*" is used as a synonym for "*closed hood*".

Note 2 to entry: In some countries, safety helmets are mandatory for a *closed hood* design.

3.1.14**device**

<protective equipment> product (e.g. *goggles*, *eye-guard/eye shield/face shield*, *balaclava*, *helmet*), possibly combined with additional products for the side and/or the top of the head and/or the neck in order to give protection to eye, face and head for the intended use

3.1.15**electric arc**

self-maintained gas conduction for which most of the charge carriers are electrons supplied by primary-electron emission

Note 1 to entry: During live working, the *electric arc* is generated by gas ionization arising from an unintentional electrical conducting connection or electric breakdown between live parts or a live part and the earth path of an electrical installation or an electrical *device*.

Note 2 to entry: During testing, the *electric arc* is initiated by the current through a fuse wire and its vaporization.

[SOURCE: IEC 60050-121:1998, 121-13-12, modified – Two notes to entry applicable to live working have been added.]

3.1.16**electrically insulating helmet**

safety *helmet* which protects the wearer against electric shocks by preventing the passage of dangerous current through the body via the head

[SOURCE: EN 50365:2002, 3.1]

3.1.17**eye shield**

device which provides protection to the eye area

[SOURCE: ISO 4007:2018, 3.5.1.4, modified – In the definition, "*protector*" has been replaced by "*device*".]

3.1.18**face shield**

eye protective *device* covering the eyes and all, or a substantial part, of the face, which can be mounted directly or by help of an adjustable or non-adjustable carrier on the head using a support (headband) and/or harness, or mounted by help of an adjustable or non-adjustable carrier on a *helmet*

Note 1 to entry: See also *visor* (3.1.35).

Note 2 to entry: Coverage can include parts or all of the scalp, the ears, the throat and the neck.

Note 3 to entry: The areas to be protected are defined in the relevant standard, and should not automatically be assumed to be the same as the areas covered.

[SOURCE: ISO 4007:2018, 3.5.1.6, modified – The definition has been modified to include use of adjustable or non-adjustable carriers. Note 1 to entry has been deleted.]

3.1.19**filter**

optical filter

lens intended to protect the eye from excessive incident radiation by attenuating that radiation, generally within a given wavelength range

Note 1 to entry: Attenuation can be by reflection and/or absorption; it might be neutral (i.e. relatively uniform) or selective (i.e. coloured) across the wavelength range of optical radiation, and might be polarizing.

Note 2 to entry: A notch filter, usually made by multi-layer interference coating, is substantially neutral but has a pronounced absorption over a narrow bandwidth of wavelengths in order to absorb radiation from, for example, an LED or laser source.

[SOURCE ISO 4007:2018, 3.10.1.1, modified – The definition has been modified by added "excessive". Note 3 to entry has been deleted.]

3.1.20**frame**

structural *component* which supports and/or supplements the *lens*

Note 1 to entry: A *frame* can be transparent or not.

Note 2 to entry: Chin cups and chin curtains are considered as supplements.

3.1.21**goggle**

eye protective *device* that fully encloses the orbital area and fits firmly on the face

[SOURCE: ISO 4007:2018, 3.5.1.7, modified – In the definition, "*protector*" has been replaced by "eye protective *device*".]

3.1.22**helmet**

device which covers a substantial part of the head

[SOURCE: ISO 4869-1:2018, 3.4]

3.1.23**hood**

product covering all areas of the head including or not the face and covering the neck (possibly offering 360° coverage, and if not an integral part of the clothing), covering also the shoulder area of the protective clothing, and not fitting closely over the entire head, possibly designed for being supported by a *helmet*

3.1.24**ignition**

initiation of flaming and combustion

[SOURCE: IEC 61482-1-1:2019, 3.1.22]

3.1.25**incident energy**

E_i

<*electric arc* testing> heat energy resulting from an *electric arc*, received at a unit surface area at a specified distance from the *electric arc*

[SOURCE: IEC 60050-651:2022, 651-27-11]

3.1.26 incident energy limit ELIM

<electric arc testing> quantity of *incident energy* attributed to a product (*material* or equipment), below which the values of all product responses are underneath the *Stoll curve* and without leading to a *breakopen*

Note 1 to entry: The ELIM of a *material* or *material* assembly is calculated from data points obtained from testing a set of test specimens, which are also used for the determination of the ATPV and/or EBT.

Note 2 to entry: However, the value of the ELIM attributed to a product in accordance with this document is either equal to or lower than the calculated ELIM of the product, depending on whether the tested specimen(s) fulfil also additional visual design and performance assessment criteria.

Note 3 to entry: Depending on further visual design and performance assessment criteria, the calculation of the value of the ELIM attributed to a product can be based on a smaller set of test specimens than needed for the determination of the ATPV and/or EBT.

[SOURCE: IEC 60050-651:2022, 651-27-12, modified – Three notes to entry have been added.]

3.1.27 lens

DEPRECATED: ocular

light transmitting part of an eye or face protective *device* that permits vision

Note 1 to entry: The word "ocular" has mostly been used in Europe, "*lens*" in many other countries. For the purposes of eye and face protection, the word "*lens*" includes a focal *lenses*, corrective *lenses*, prescription *lenses* and is sometimes also used, for example, in sunglasses, for tinted *lenses*, although these are generally termed filters.

Note 2 to entry: For the purposes of eye and face protection, the word "*lens*" includes both *lenses* covering a single eye and *lenses* covering both eyes.

Note 3 to entry: When used as an adjective in eye and face protection standards, the word "ocular" has its normal dictionary meaning, i.e. relating to the eye.

Note 4 to entry: The *lens* can be made of glass or plastic.

3.1.28 material

<protective equipment> substance of which an item of protective equipment is made

[SOURCE: IEC 60050-651:2022, 651-27-20, modified – In the definition, the words "excluding hardware" have been deleted.]

3.1.29 open hood

hood where the eyes and part of the face are not covered

Note 1 to entry: It requires additional *device*(s) for providing eye and full-face protection.

3.1.30 protector

product that can consist of one or more protective *devices* that offers protective performance required by this document for the area which is covered by the *device*

Note 1 to entry: The required protective performance is defined by the corresponding product standard.

[SOURCE: IEC 60050-651:2022, 651-27-22, modified – The type of protective performance is specified in the definition.]