

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**



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 It also gives information on projects, replaced and withdrawn publications.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**

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.

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.

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*