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## Arbete med spänning – Elektriskt ledande kläder

*Live working –  
Conductive clothing*

Som svensk standard gäller europastandarden EN IEC 60895:2020. Den svenska standarden innehåller den officiella engelska språkversionen av EN IEC 60895:2020.

### Nationellt förord

Europastandarden EN IEC 60895:2020

består av:

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- **IEC 60895, Third edition, 2020 - Live working - Conductive clothing**

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ICS 13.260.00; 29.260.01; 29.240.20

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EUROPEAN STANDARD

**EN IEC 60895**

NORME EUROPÉENNE

EUROPÄISCHE NORM

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ICS 13.260; 29.240.20; 29.260.01

Supersedes EN 60895:2003 and all of its amendments  
and corrigenda (if any)

English Version

## Live working - Conductive clothing (IEC 60895:2020)

Travaux sous tension - Vêtements conducteurs  
(IEC 60895:2020)

Arbeiten unter Spannung - Leitfähige Kleidung  
(IEC 60895:2020)

This European Standard was approved by CENELEC on 2020-05-25. 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.

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

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SEK Svensk Elstandard

SS-EN IEC 60895, utg 3:2020

## **European foreword**

The text of document 78/1309/FDIS, future edition 3 of IEC 60895, prepared by IEC/TC 78 "Live working" was submitted to the IEC-CENELEC parallel vote and approved by CENELEC as EN IEC 60895:2020.

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) 2021-02-25
- latest date by which the national standards conflicting with the document have to be withdrawn (dow) 2023-05-25

This document supersedes EN 60895:2003 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.

This document has been prepared under a mandate given to CENELEC by the European Commission and the European Free Trade Association.

## **Endorsement notice**

The text of the International Standard IEC 60895:2020 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 60456:2010	NOTE	Harmonized as EN 60456:2016 (modified)
IEC 60743:2013	NOTE	Harmonized as EN 60743:2013 (not modified)

## 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](http://www.cenelec.eu).

<u>Publication</u>	<u>Year</u>	<u>Title</u>	<u>EN/HD</u>	<u>Year</u>
IEC 60212	2010	Standard conditions for use prior to and during the testing of solid electrical insulating materials	EN 60212	2011
IEC 60417	-	Graphical symbols for use on equipment.- Index, survey and compilation of the single sheets.	-	-
IEC 61318	-	Live working - Conformity assessment applicable to tools, devices and equipment	EN 61318	-
IEC 61477	-	Live working - Minimum requirements for the utilization of tools, devices and equipment	EN 61477	-
ISO 3175	series	Textiles – Professional care, drycleaning and wetcleaning of fabrics and garments	EN ISO 3175	series
ISO 6330	-	Textiles – Domestic washing and drying procedures for textile testing	EN ISO 6330	-
ISO 12947-1	-	Textiles - Determination of the abrasion resistance of fabrics by the Martindale method – Part 1: Martindale abrasion testing apparatus	EN ISO 12947-1	-
ISO 12947-2	-	Textiles – Determination of the abrasion resistance of fabrics by the Martindale method – Part 2: Determination of specimen breakdown	EN ISO 12947-2	-
ISO 13937-2	-	Textiles - Tear properties of fabrics - Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)	EN ISO 13937-2	-
ISO 13938-1	-	Textiles – Bursting properties of fabrics – Part 1: Hydraulic method for determination of bursting strength and bursting distension	EN ISO 13938-1	-
ISO 15797	-	Textiles – Industrial washing and finishing procedures for testing of workwear	EN ISO 15797	-

## CONTENTS

FOREWORD .....	6
INTRODUCTION .....	8
1 Scope .....	9
2 Normative references .....	9
3 Terms and definitions .....	10
4 Requirements .....	12
4.1 General .....	12
4.2 Requirements for conductive clothing .....	12
4.2.1 Design .....	12
4.2.2 Classification .....	12
4.2.3 Integrity of the conductive clothing .....	12
4.2.4 Equipotential bonding .....	13
4.2.5 Screening efficiency .....	13
4.2.6 Spark-discharge protection .....	13
4.3 Mechanical requirements for the outer layer material .....	13
4.3.1 General .....	13
4.3.2 Tear resistance .....	13
4.3.3 Burst strength .....	13
4.3.4 Abrasion resistance .....	13
4.4 Requirements for material .....	13
4.4.1 General .....	13
4.4.2 Flame retardancy .....	14
4.4.3 Electrical resistance .....	14
4.4.4 Current-carrying capability .....	14
4.4.5 Shielding efficiency .....	14
4.4.6 Resistance to cleaning .....	14
4.5 Specific requirements for component parts .....	14
4.5.1 Conductive gloves, overshoe socks and socks .....	14
4.5.2 Conductive footwear .....	14
4.5.3 Conductive head cover, scarf and helmet .....	15
4.5.4 Conductive face screen .....	15
4.5.5 Requirements for garment – Electrical resistance .....	15
4.6 Marking .....	15
4.7 Packaging .....	16
4.8 Instructions for use .....	16
5 Tests .....	16
5.1 General .....	16
5.2 Mechanical tests for the outer layer material .....	17
5.2.1 Type test .....	17
5.2.2 Alternative method to mechanical test in cases where outer layer materials have completed the production phase .....	17
5.3 Tests of the material .....	17
5.3.1 General .....	17
5.3.2 Flame-retardancy test .....	17
5.3.3 Electrical resistance test .....	23
5.3.4 Current-carrying capability .....	26

5.3.5	Shielding efficiency.....	27
5.3.6	Resistance to cleaning.....	31
5.3.7	Spark-discharge protection.....	33
5.4	Tests of garment – Measurement of electrical resistance.....	34
5.4.1	General.....	34
5.4.2	Type test.....	34
5.4.3	Alternative method to electrical resistance test in cases where garments have completed the production phase.....	35
5.5	Tests of the complete conductive clothing.....	35
5.5.1	General.....	35
5.5.2	Integrity of the conductive clothing.....	35
5.5.3	Bonding test.....	35
5.5.4	Screening efficiency.....	36
5.6	Tests of the component parts.....	43
5.6.1	General.....	43
5.6.2	Type test.....	43
5.6.3	Alternative methods in cases where component parts have completed the production phase.....	51
5.7	Marking.....	51
5.7.1	Presence and correctness of marking.....	51
5.7.2	Durability of marking.....	51
5.8	Packaging.....	51
5.9	Presence and correctness of instructions for use.....	51
6	Conformity assessment of products having completed the production phase.....	52
7	Modification.....	52
Annex A (informative) Guidelines for the selection of the maximum voltage class of conductive clothing in relation to the nominal voltage of an electric system.....		53
Annex B (normative) Suitable for live working; double triangle (IEC 60417-5216:2002-10)...		54
Annex C (normative) General procedure for type tests.....		55
C.1	Tests on the outer layer material.....	55
C.2	Tests on material.....	55
C.3	Tests on the conductive garment.....	55
C.4	Tests on the conductive component parts.....	56
C.5	Tests on the complete conductive clothing.....	56
Annex D (normative) Classification of defects and tests to be allocated.....		57
Annex E (informative) Rationale for the classification of defects.....		60
Annex F (informative) In-service use and care.....		63
F.1	General.....	63
F.2	Care, storage and repair.....	63
F.2.1	Care.....	63
F.2.2	Storage.....	63
F.2.3	Cleaning and washing.....	63
F.2.4	Patching and repair of conductive fabric.....	63
F.3	Inspection before use.....	64
F.3.1	General.....	64
F.3.2	Conductive clothing.....	64
F.3.3	Conductive boots and leg straps.....	64
F.3.4	Conductive socks and gloves.....	64

F.4	Non-destructive periodic testing .....	64
F.4.1	General .....	64
F.4.2	Time between periodic tests .....	64
F.4.3	Resistance test.....	64
F.4.4	Record keeping .....	65
Annex G (informative)	Face protection .....	66
G.1	General.....	66
G.2	Face screen design.....	66
Annex H (informative)	Example of general arrangement of complete conductive clothing.....	68
Bibliography.....		69
Figure 1	– Flame-retardancy test – Test chamber .....	18
Figure 2	– Flame-retardancy test – Test piece holder and support .....	20
Figure 3	– Electrical resistance test – Test set-up.....	24
Figure 4	– Orientation of test pieces for electrical resistance and current-carrying capability tests.....	25
Figure 5	– Electrical resistance test – Electrical circuit.....	25
Figure 6	– Shielding efficiency .....	30
Figure 7	– Screening efficiency of conductive clothing – First method: Test set-up .....	39
Figure 8	– Screening efficiency of conductive clothing – First method – Details of the measurements .....	40
Figure 9	– Position of ammeters for screening efficiency test.....	41
Figure 10	– Second method to check the screening efficiency.....	42
Figure 11	– Electrical resistance test – Conductive gloves .....	44
Figure 12	– Electrical resistance test – Conductive overshoe socks and socks .....	45
Figure 13	– Electrical resistance test – Conductive footwear.....	47
Figure 14	– Electrical resistance test – Conductive head covers, scarves and face screens.....	50
Figure B.1	– Symbol for live working with its dimensions (IEC 60417-5216:2002-10) .....	54
Figure G.1	– Electric field strength as a function of mesh opening radius.....	67
Figure H.1	– Example of general arrangement of complete conductive clothing .....	68
Table 1	– Arithmetic mean and maximum resistance of a unit square of the conductive material according to the maximum voltage class of the conductive clothing .....	26
Table 2	– Minimum shielding efficiency of conductive material according to the maximum voltage class of the conductive clothing .....	31
Table 3	– Maximum resistance for garment according to the maximum voltage class of the conductive clothing .....	35
Table 4	– Maximum bonding resistance of the conductive clothing according to its maximum voltage class.....	36
Table 5	– Maximum phase-to-earth test voltage according to the maximum voltage class of the conductive clothing .....	37
Table 6	– Minimum screening efficiency of conductive clothing according to the maximum voltage class.....	42
Table 7	– Parameters of the alternative test and minimum screening efficiency of conductive clothing according to the maximum voltage class .....	43

Table 8 – Maximum resistance of glove according to the maximum voltage class of the conductive clothing .....	44
Table 9 – Maximum resistance of overshoe socks and socks according to the maximum voltage class of the conductive clothing .....	45
Table 10 – Maximum resistance of conductive hood, scarf, helmet and face screen according to the maximum voltage class of the conductive clothing .....	51
Table A.1 – Designation of maximum use voltage .....	53
Table C.1 – List of type tests to be carried out on the outer layer material .....	55
Table C.2 – List of type tests to be carried out on the material .....	55
Table C.3 – List of type tests to be carried out on the conductive garment .....	56
Table C.4 – List of type tests to be carried out on the component parts .....	56
Table C.5 – List of type tests to be carried out on the complete conductive clothing.....	56
Table D.1 – Classification of defects on the outer layer material and associated requirements and tests .....	57
Table D.2 – Classification of defects on the conductive material and associated requirements and tests .....	57
Table D.3 – Classification of defects on the conductive garment and associated requirements and tests .....	58
Table D.4 – Classification of defects on the conductive component parts and associated requirements and tests .....	58
Table D.5 – Classification of defects on the complete conductive clothing and associated requirements and tests .....	59
Table E.1 – Justification for the type of defect.....	60

# INTERNATIONAL ELECTROTECHNICAL COMMISSION

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## LIVE WORKING – CONDUCTIVE CLOTHING

### 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.
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International Standard IEC 60895 has been prepared by IEC technical committee 78: Live working.

This third edition cancels and replaces the second edition, published in 2002. This edition constitutes a technical revision.

This 3edition includes the following significant technical changes with respect to the previous edition:

- a) increase of the use up to 1 000 kV AC and  $\pm 800$  kV DC;
- b) introduction of two classes of conductive clothing with different electrical requirements;
- c) revision of the electrical requirements of conductive clothing;
- d) definition of specific resistance values for each component part of the conductive clothing;
- e) introduction of conductive helmet and conductive scarf as *component parts* of conductive clothing;
- f) introduction of mechanical requirements and new tests for fabrics;
- g) update of the cleaning test procedures;

- h) revision of the efficiency test of the conductive clothing to improve the feasibility and repeatability;
- i) preparation of the elements of classification of defects, and general application of IEC 61318:2007;
- j) the normative Annex B for the classification of tests has been replaced by normative Annex C for the general type tests procedure, the normative Annex D for the classification of defects and the informative Annex E providing the justification for the classification of defects;
- k) the normative Annex C on sampling procedure has been deleted (not applicable according to IEC 61318:2007);
- l) modification of the recommended frequency of the periodic tests.

The text of this standard is based on the following documents:

FDIS	Report on voting
78/1309/FDIS	78/1312/RVD

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

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

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

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication 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.**

## INTRODUCTION

This document provides specifications for protective *conductive clothing* currently being used without incident in live work by qualified electrical workers throughout the world. The adequacy of this clothing is established by its *screening efficiency* and the electrical resistance of material and *component parts* of the *conductive clothing*. Based on resistance measurements carried out by manufacturers and utilities of used clothing being successfully worn in the field, differences of up to 1 000 fold have been reported.

The whole set-up and preparation work in very high voltage is made to limit the power of electric arcs during work activities.

When, in the preparation phase of the work, the risk assessment leads to a high probability that there may be electric arcs, due to the short distances or unsuitable equipment insulation, the work is not done.

This approach is dictated by the fact that the electric arcs produced by high-voltage installations have very significant thermal and electrical effects, which are hardly attenuated by protective clothing worn by operators.

If protection against electric arc value is required by agreements between customer and manufacturer, it is possible to perform tests on the fabric and/or on the *garment* complete with accessories using the reference standards already published on this topic by IEC TC 78.

This document has been prepared according to the requirements of IEC 61477, where applicable.

The bibliography provides a list of papers of international level that were used during the development of this edition of IEC 60895.

The product covered by this document may have an impact on the environment during some or all stages of its life cycle. These impacts can range from slight to significant, be of short-term or long-term duration, 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 – CONDUCTIVE CLOTHING

### 1 Scope

This document is applicable to *conductive clothing*, worn during live working (especially bare-hand working) on AC and DC electrical installations, to provide electrical continuity between all parts of the clothing and a reduction of electric field inside the clothing.

This document is applicable to *conductive clothing* assembled from a conductive *garment* (jackets and trousers or coveralls forming a one-piece *garment*) and from conductive *component parts* (gloves, hoods or helmets, shoes or boots, overshoe socks and socks) in electrical systems with nominal voltage up to 1 000 kV AC and up to  $\pm 800$  kV DC.

This document does not indicate values of protection from the effects of the electric arc, because any value indicated would not guarantee the necessary protection from the effects of electric arcs, or the operator would need to wear very heavy and rigid conductive clothing, which would not allow the execution of the work in safety.

The products designed and manufactured according to this document contribute to the safety of the users provided they are used by persons trained for the work, in accordance with the live working methods 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 60212:2010, *Standard conditions for use prior to and during the testing of solid electrical insulating materials*

IEC 60417, *Graphical symbols for use on equipment* (available at: <http://www.graphical-symbols.info/equipment>)

IEC 61318, *Live working – Conformity assessment applicable to tools, devices and equipment*

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

ISO 3175 (all parts), *Textiles – Professional care, drycleaning and wetcleaning of fabrics and garments*

ISO 6330, *Textiles – Domestic washing and drying procedures for textile testing*

ISO 12947-1, *Textiles – Determination of the abrasion resistance of fabrics by the Martindale method – Part 1: Martindale abrasion testing apparatus*

ISO 12947-2, *Textiles – Determination of the abrasion resistance of fabrics by the Martindale method – Part 2: Determination of specimen breakdown*

ISO 13937-2, *Textiles – Tear properties of fabrics – Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)*

ISO 13938-1, *Textiles – Bursting properties of fabrics – Part 1: Hydraulic method for determination of bursting strength and bursting distension*

ISO 15797, *Textiles – Industrial washing and finishing procedures for testing of workwear*