International Standard

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Protective clothing for use in welding and allied processes

Vêtements de protection utilisés pendant le soudage et les techniques connexes

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Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO document should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

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For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT), see www.iso.org/iso/foreword.html.

This document was prepared by ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, *Protective clothing*, in collaboration with the European Committee for Standardization (CEN) Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets in collaboration,* in accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

This third edition cancels and replaces the second edition (ISO 11611:2015) which has been technically revised.

The main changes are as follows:

a) an introduction has been included;

b) the clause on sampling requirements has been modified;

c) the clause for ageing due to washing (maximum number of cleaning procedures as indicated by the manufacturer) has been modified;

d) a new requirement for measuring the property value for rating and classification has been included;

e) the clause for the manufacturer's instructions and information has been modified;

f) a new Annex G for measuring property value for rating and classification has been included;

g) a procedure for sampling and testing the protective effect of fabrics, garments and gloves for use in welding against UV radiation (UV-A, UV-B, UV-C), taking into account representative manual welding processes, has been included;

h) Annex A comprising general explanations for UV protective characteristics of protective clothing for use in welding, has been included. All other annexes have been renumbered accordingly;

i) Annex B has been complemented by a three-step UV protection classification system (Table B.2) for clothing for use in welding;

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j) Annex C with the testing procedure for the protective effect against UV radiation emitted by welding processes, has been included;

k) Annex D with instructions for calculating the effectively transmitted total irradiance and the resulting maximum time of use related to the exposure limit value by using the determined worst-case UV transmission spectra of fabrics for welding protective garments, has been included;

l) Annex E with the spectral distribution and maximum effectively emitted total irradiance of the selected representative welding processes, has been included;

m) Annex F with the spectral weighing function $s_{\mathrm{eff}}(\lambda)$ for use in Annex D, has been included;

n) the previous Annex C has become Annex G;

o) the previous Annex D has become Annex H and has been revised;

p) Annex I with the summary of conducted Round Robin tests in the development of the UV transmission test procedure, has been included.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

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Introduction

The purpose of this document is to provide minimum performance requirements for clothing for use in welding and allied processes.

For complete protection against exposure to heat and flame, it will be necessary to protect the head, face, hands, and/or feet with suitable personal protective equipment (PPE) and in some cases, appropriate respiratory protection might also be considered necessary.

Attention is drawn to ISO/TR 2801:2007[2], which sets out guidelines for selection, use, care, and maintenance of protective clothing against heat and flame.

Nothing in this document is intended to restrict any jurisdiction, purchaser, or manufacturer from exceeding these minimum requirements.

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Protective clothing for use in welding and allied processes

1 Scope

This document specifies minimum safety requirements and test methods for protective clothing including hoods, aprons, sleeves, and gaiters that are designed to protect the wearer's body including head (hoods) and feet (gaiters) and that are to be worn during welding and allied processes with comparable risks. For the protection of the wearer’s head and feet, this document is only applicable to hoods and gaiters. This document does not cover requirements for feet, hand, face, and/or eye protectors.

This type of protective clothing is intended to protect the wearer against the following hazards:

— spatter (small splashes of molten metal) in 2 risk levels, short contact time with flame, radiant heat from an electric arc used for welding and allied processes,

— harmful artificial optical radiation (UV-A, UV-B and especially UV-C) in 3 risk levels generated during welding and allied processes and

— minimizes the possibility of electrical shock by short-term, accidental contact with live electrical conductors at voltages up to approximately 100 V d. c. in normal conditions of welding. Sweat, soiling, or other contaminants can affect the level of protection provided against short-term accidental contact with live electric conductors at these voltages.

The main manual welding processes are exemplified and are classified into process groups according to the maximum effectively emitted total irradiance, which has been determined and evaluated by measurement[15] for these types of welding processes.

For adequate overall protection against the risks to which welders are likely to be exposed, personal protective equipment (PPE) covered by other standards should additionally be worn to protect the head, face, hands, and feet.

This document is not applicable for laser welding processes (coherent, monochromatic radiation sources).

Guidance for the selection of protective clothing for different welding activities is detailed in Annex B.

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.

ISO 3376:2020, *Leather — Physical and mechanical tests — Determination of tensile strength and percentage elongation*

ISO 3377-1:2011, *Leather — Physical and mechanical tests — Determination of tear load — Part 1: Single edge tear*

ISO 4048:2018, *Leather — Chemical tests — Determination of matter soluble in dichloromethane and free fatty acid content*

ISO 5077:2007, *Textiles — Determination of dimensional change in washing and drying*

ISO 6942:2022, *Protective clothing — Protection against heat and fire — Method of test: Evaluation of materials and material assemblies when exposed to a source of radiant heat*

ISO 9150:1988, *Protective clothing — Determination of behaviour of materials on impact of small splashes of molten metal*

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ISO 13688:2013 + Amd.1:2021, *Protective clothing — General requirements*

ISO 13934-1:2013, *Textiles — Tensile properties of fabrics — Part 1: Determination of maximum force and elongation at maximum force using the strip method*

ISO 13935-2:2014, *Textiles — Seam tensile properties of fabrics and made-up textile articles — Part 2: Determination of maximum force to seam rupture using the grab method*

ISO 13937-2:2000, *Textiles — Tear properties of fabrics — Part 2: Determination of tear force of trouser-shaped test specimens (Single tear method)*

ISO 13938-1:2019, *Textiles — Bursting properties of fabrics — Part 1: Hydraulic method for determination of bursting strength and bursting distension*

ISO 13938-2:2019, *Textiles — Bursting properties of fabrics — Part 2: Pneumatic method for determination of bursting strength and bursting distension*

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

EN 1149-2:1997, *Protective clothing — Electrostatic properties — Part 2: Test method for measurement of the electrical resistance through a material (vertical resistance)*

EN 410:2011, *Glass in building – Determination of luminous and solar characteristics of glazing*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at https://www.electropedia.org/

3.1
ageing
changing of the product performance over time during use or storage

Note 1 to entry: Ageing is caused by a combination of several factors, such as the following:

— cleaning, maintenance, or disinfecting process;

— exposure to visible and/or ultraviolet radiation;

— exposure to high or low temperatures or to changing temperatures;

— exposure to chemicals including humidity;

— exposure to biological agents such as bacteria, fungi, insects, or other pests;

— exposure to mechanical action such as abrasion, flexing, pressure, and strain;

— exposure to contaminants such as dirt, oil, splashes of molten metal, etc.;

— exposure to wear and tear.

3.2
allied processes
processes having similar types and levels of risk as welding

EXAMPLE Cutting, arc air gouging, and hot spraying.

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