INTERNATIONAL STANDARD

ISO 11612

Third edition
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Protective clothing — Clothing to protect against heat and flame — Minimum performance requirements

Vêtements de protection — Vêtements de protection contre la chaleur et les flammes — Exigences de performance minimales

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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 documents 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).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: Foreword — Supplementary information.

The committee responsible for this document is ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 13, and by Technical Committee CEN/TC 162, *Protective clothing including hand and arm protection and lifejackets* in collaboration.

This third edition cancels and replaces the second edition (ISO 11612:2008), of which it constitutes a minor revision with the following changes:

— modify clause in design requirements regarding garment overlaps;

— modify clause in design requirements regarding the areas of the body covered by protective suits;

— modify clause on sampling requirements;

— modify clause for ageing due to washing (maximum number of cleaning procedures as indicated by the manufacturer);

— modify pre-treatment clause to include requirements for single-use garments;

— include new requirement for measuring property value for rating and classification;

— modify requirement for optional heat resistance testing at 260 °C;

— remove reference to melting from flame spread requirements;

— modify afterflame requirement for flame spread;

— modify afterglow requirement for flame spread;

— modify requirement that hardware is tested only after pre-treatment;

— include statement for flame spread testing in regard to interlining materials;

— modify test procedure for the flame testing of labels, badges, and retro-reflective materials;

— modify requirements for tear strength;

— specify test area for burst strength testing;
— modify innocuousness clause to include reference to ISO 13688;
— specify limit for Chromium(VI) Content;
— include new table for summary of tests;
— modify clause for information to be supplied by the manufacturer;
— include new Annex for measuring property value for rating and classification;
— update observation clause in Annex C, prediction of burn injury using an instrumented manikin;
— include new definition for uncertainty of measurement, Annex E.

Introduction

The purpose of this International Standard is to provide minimum performance requirements for clothing to protect against heat and flame, which could be worn for a wide range of end uses. All the other standards listed in this Introduction deal also with clothing to protect against heat and flame, but rather for quite specific products or end uses.

Within many of the hazards listed in this International Standard there are three performance levels:

— Level 1 to indicate exposure to low risk;

— Level 2 to indicate exposure to medium risk;

— Level 3 to indicate exposure to high risk.

For protection against extreme exposures to radiant heat, there is a fourth performance level to take into account, high performance materials such as aluminized and similar materials. The level of personal protection to be provided is based on the outcome of the risk assessment and some comments on risk assessment are given in Annex D.

For complete protection against exposure to heat and/or flame, it is probable that 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 [[[1]]], which sets out guidelines for selection, use, care, and maintenance of protective clothing against heat and flame.

Nothing in this International Standard is intended to restrict any jurisdiction, purchaser, or manufacturer from exceeding these minimum requirements. It is one of several standards for clothing that have been developed to protect persons against heat and/or flames. Other standards include:

— ISO 11611, *Protective clothing for use in welding and allied processes*;

— ISO 11613, *Protective clothing for firefighters — Laboratory test methods and performance requirements*;

— ISO 14460, *Protective clothing for automobile racing drivers — Protection against heat and flame — Performance requirements and test methods*;

— ISO 15384, *Protective clothing for firefighters — Laboratory test methods and performance requirements for wildland firefighting clothing*;

— ISO 15538, *Protective clothing for firefighters — Laboratory test methods and performance requirements for protective clothing with a reflective outer surface*;

— EN 469, *Protective clothing for firefighters — Performance requirements for protective clothing for firefighting*;

— EN 1486, *Protective clothing for fire-fighters — Test methods and requirements for reflective clothing for specialized fire fighting*;

— EN 13911, *Protective clothing for firefighters — Requirements and test methods for fire hoods for firefighters*;

— EN 15614, *Protective clothing for firefighters — Laboratory test methods and performance requirements for wildland clothing.*

Protective clothing — Clothing to protect against heat and flame — Minimum performance requirements

1 Scope

This International Standard specifies performance requirements for protective clothing made from flexible materials, which are designed to protect the wearer's body, except the hands, from heat and/or flame. For protection of the wearer's head and feet, the only items of protective clothing falling within the scope of this International Standard are gaiters, hoods, and overboots. However, concerning hoods, requirements for visors and respiratory equipment are not given.

The performance requirements set out in this International Standard are applicable to protective clothing which could be worn for a wide range of end uses, where there is a need for clothing with limited flame spread properties and where the user can be exposed to radiant or convective or contact heat or to molten metal splashes.

This International Standard is not applicable to protective clothing that is specified by other International Standards (see Introduction).

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

ISO 3376:2011, *Leather — Physical and mechanical tests — Determination of tensile strength and percentage extension*

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

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

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

ISO 6942, *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 9151, *Protective clothing against heat and flame — Determination of heat transmission on exposure to flame*

ISO 9185, *Protective clothing — Assessment of resistance of materials to molten metal splash*

ISO 12127-1, *Clothing for protection against heat and flame — Determination of contact heat transmission through protective clothing or constituent materials — Part 1: Test method using contact heat produced by heating cylinder*

ISO 13506, *Protective clothing against heat and flame — Test method for complete garments — Prediction of burn injury using an instrumented manikin*

ISO 13688, *Protective clothing — General requirements*

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

ISO 13935-2, *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, *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 13938-2, *Textiles — Bursting properties of fabrics — Part 2: Pneumatic method for determination of bursting strength and bursting distension*

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

ISO 17493, *Clothing and equipment for protection against heat — Test method for convective heat resistance using a hot air circulating oven*

3 Terms and definitions

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

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:

— cleaning, maintenance, or disinfecting processes;

— 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
cleaning
process by which a PPE is made again serviceable and/or hygienically wearable by removing any dirt or contamination

Note 1 to entry: A cleaning cycle is typically a washing plus drying or a dry cleaning treatment followed, if required, by ironing or finishing.

3.3
clothing assembly
series of garments arranged in the order as worn

Note 1 to entry: They may contain multilayer materials, material combinations, or a series of separate garments in single layers.

3.4
component
any material, part, or sub-assembly used in the construction of an item of PPE

3.5
component assembly
combination of all materials and hardware presented exactly as the finished garment construction

3.6
conditioning
keeping samples under standard conditions of temperature and relative humidity for a minimum period of time

3.7
gaiter
removable covering intended to protect the part of the leg below the knee which can also cover the upper surface of shoes

3.8
hardware
non-fabric items forming part of or optional extras in a garment

EXAMPLE Metal or plastic buttons or zippers and touch and close fasteners or hook and loop fasteners.

3.9
hole
any opening, break, or discontinuity of any size in the original structure of the test specimen's fabric caused by application of the test flame

3.10
hood
item of PPE made from flexible material, which covers the head and neck and may also cover the shoulders

3.11
innermost lining
innermost face of a component assembly closest to the wearer's skin

Note 1 to entry: Where the innermost lining forms part of a material combination, the material combination is regarded as the innermost lining.

3.12
interlining
layer between the outermost layer and the innermost lining in a multilayer garment

3.13
material
substances, excluding hardware, of which an item of clothing is made

3.14
material assembly
combination of all materials of a multi-layer garment presented exactly as the finished garment construction

3.15
material combination
material produced from a series of separate layers, fixed together during the garment manufacturing stage

3.16
multilayer material
material consisting of different layers intimately combined prior to the garment manufacturing stage

EXAMPLE The combining process includes weaving, quilting, coating and gluing.

3.17
outer material
outermost material of which the item of clothing is made

3.18
overboots
single or multiple layers of material covering the footwear to provide protection to the feet and ankles of the wearer against heat and/or flame

Note 1 to entry: Certain types of overboot used for this purpose can also cover parts of the legs and/or ankles.

3.19
patch pocket
pocket located on the exterior of a protective garment, which is stitched as a patch over the outer layer of the protective garment

3.20
pre-treatment
standard way of preparing the samples before testing

Note 1 to entry: This might include a number of cleaning cycles, submitting the sample to heat, mechanical action, or any other relevant exposure and is completed by conditioning.

3.21
protective garment
individual item of protective clothing, which provides protection against specified hazards to the part of the body that it covers

EXAMPLE Protective coat, apron, trousers, gaiters, hoods, boiler suit or coverall.

3.22
protective clothing
clothing which covers or replaces personal clothing and which is designed to provide protection for the wearer's upper and lower torso, neck, arms, and legs

3.23
seam
any method of permanent fastening between two or more pieces of material

3.23.1
overlapping seam
seam where all or part of one or more layers of material covers the other layer or layers causing a ridge

3.23.2
side seam
seam that runs laterally along the garment when it is placed flat on a surface, with the front uppermost

3.23.3
structural seam
seam that is necessary for the integrity of the garment

4 General and design requirements

4.1 General

General requirements which are not specifically covered in this International Standard shall be in accordance with ISO 13688.