



FINAL DRAFT International Standard

ISO/FDIS 11999-9

PPE for firefighters — Test methods and requirements for PPE used by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures —

Part 9: Firehoods

*Équipement de protection personnelle pour pompiers —
Méthodes d'essai et exigences pour les équipements de protection
personnelle utilisés par les pompiers qui sont à risque d'une
exposition à des niveaux élevés de chaleur et/ou de flamme quand
la lutte contre les incendies survient dans les structures —*

Partie 9: Hottes de feu

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Foreword

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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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This document was prepared by Technical Committee ISO/TC 94, *Personal safety — Protective clothing and equipment*, Subcommittee SC 14, *Fire-fighters' personal equipment*.

This second edition cancels and replaces the first edition (ISO 11999-9:2016), which has been technically revised.

The main changes are as follows:

- the design requirement have been amended and added to (particulate protection)
- all the heat and flame properties have been brought to amended single levels (see [Table 1](#));
- all the mechanical properties have been brought to amended single levels (see [Table 1](#));
- additional tests have been added or changed (including resistance evaporative transfer (RET), size retention)

A list of all parts in the ISO 11999 series can be found on the ISO website.

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.

PPE for firefighters — Test methods and requirements for PPE used by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures —

Part 9: Firehoods

1 Scope

This document specifies the minimum design and performance requirements for a fire hood as part of personal protective equipment (PPE) to be used by firefighters, primarily but not solely to protect against exposure to flame, high thermal loads and particulate protection.

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 3146, *Plastics — Determination of melting behaviour (melting temperature or melting range) of semi-crystalline polymers by capillary tube and polarizing-microscope methods*

ISO 3175-2, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 2: Procedure for testing performance when cleaning and finishing using tetrachloroethene*

ISO 5077, *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 8559-1:2017, *Size designation of clothes — Part 1: Anthropometric definitions for body measurement*

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

ISO 11092, *Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)*

ISO 11999-1:2024, *PPE for firefighters — Test methods and requirements for PPE used by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures — Part 1: General*

ISO 11999-2, *PPE for firefighters — Test methods and requirements for PPE used by firefighters who are at risk of exposure to high levels of heat and/or flame while fighting fires occurring in structures — Part 2: Compatibility*

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

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

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ISO 13938-2, *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*

ISO 16900-5, *Respiratory protective devices — Methods of test and test equipment — Part 5: Breathing machine, metabolic simulator, RPD headforms and torso, tools and verification tools*

ISO 16900-5:2016/A1:2018, *respiratory protective devices – Methods of test and test equipment – Part 5: Breathing machine, metabolic simulator, RPD headforms and torso, tools and verification tools*

ISO 17492, *Clothing for protection against heat and flame — Determination of heat transmission on exposure to both flame and radiant heat*

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

ISO/TR 19591, *Personal protective equipment for firefighters — Standard terms and definitions*

NFPA 1970-P2025, *Standard on Protective Ensembles for Structural and Proximity Fire Fighting, Work Apparel and Open-Circuit Self-Contained Breathing Apparatus (SCBA) for Emergency Services, and Personal Alert Safety Systems (PASS)*

ASTM F2299/F2299M-24, *Standard Test Method for Determining the Initial Efficiency of Materials Used in Medical Face Masks to Penetration by Particulates Using Latex Spheres*

3 Terms and definitions

For the purposes of this document, the terms and definitions in ISO/TR 19591 and the following apply.

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

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

3.1 fire hood

item worn directly in contact with the head to protect exposed parts of the head and neck where the protective coat/helmet/respiratory protective device (RPD) facepiece interface

3.2 particulate protection

barrier layer that principally inhibits airborne particles of solid or liquid substance in the finely divided state

3.3 yoke

area of the fire hood interfacing with the coat

4 General design requirements

4.1 General

General requirements which are not specifically covered in this document shall be in accordance with ISO 13688 and ISO 11999-1.

The design requirements for fire hood, the face mask of RPD and helmet (including shikoro) shall be verified by visual inspection during the procedure laid out in ISO 11999-2.

NOTE Shikoro requirements, providing coverage of the neck, ears, chin, and facial area, are covered in ISO 11999-5.

4.2 Innocuousness

Acceptability of materials in relation to innocuousness shall be according to ISO 13688:2013+Amd 1:2021, 4.2 with due consideration to Note 1 and Annex F, materials shall not release substances generally known to be toxic, carcinogenic, mutagenic, allergenic, toxic to reproduction or otherwise harmful.

4.3 Flexibility

The fire hood shall fit close to the head and be able to be worn without discomfort. It shall not restrict head movement, reduce the field of view, or interfere with use of the respiratory protective device. The fire hood shall also be compatible with the respiratory device.

NOTE 1 Excess material in the construction of the fire hood may hamper the wearer and compromise the wearing of other personal protective equipment.

4.4 Facial opening

The fire hood shall have a facial opening creating an interface to fit around an RPD face mask.

The design requirements specified shall be verified by visual inspection during the procedure laid out in ISO 11999-2.

4.5 Yoke interface area

The fire hood shall have a yoke creating an interface with the protective coat (see ISO 11999-3) that stays secure under the protective coat without being attached.

The design requirements specified shall be verified by visual inspection during the procedure laid out in ISO 11999-2.

NOTE The yoke is not always symmetrical on the back, upper shoulders and front (upper chest).

4.6 Sizing

The fire hood shall be manufactured in various sizes or be sufficiently elastic to be compatible with various head sizes, shapes and hair styles. The design requirements specified shall be verified by visual inspection during the procedures in [Annex A](#).

NOTE Overstretching has the potential to reduce the thermal protection.

4.7 Labels

The label(s) for the marking requirement shall be positioned in the area defined as the front dorsal plane of the yoke of the fire hood. Assess by visual inspection.

4.8 Seam construction

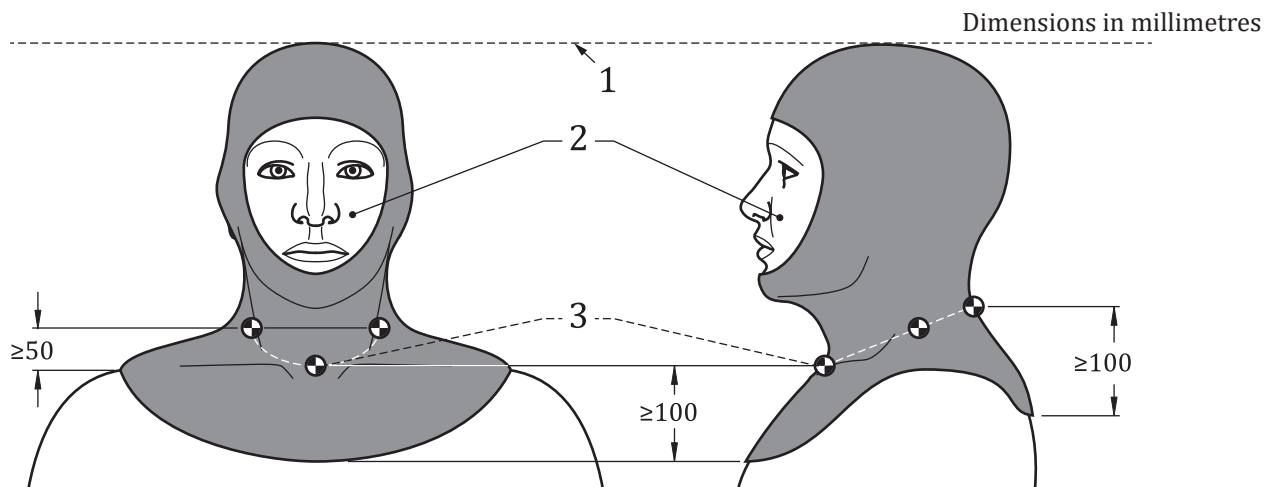
Seams shall be constructed to give the minimum loss of strength and to maintain the integrity of the fire hood. Seams shall meet the requirements of [6.2](#).

4.9 Particulate protection

The fire hood shall meet the requirements in [6.11](#) and [6.12](#) and the requirements in this sub-clause.

The particulate protection surface shall include at least the area from 50 mm below the side of the neck point, and from 100 mm below both the front of the neck point and back of the neck point up to the top of the head as defined in ISO 8559-1:2017, Figure 1.

The elastic and stitching around the facial opening shall be permitted to exclude particulate blocking material specifically for meeting the requirements of 4.2 for a distance of (20 ± 2) mm from the leading edge of the fire hood face opening to the innermost row of stitching.



Key

- 1 top of fire hood
- 2 face opening
- 3 base neck line with neck points at back, front and sides (see ISO 8559-1:2017, 3.1.6-3.1.8 and 3.2.1)
- shaded area of fire hood

Figure 1 — Fire hood with particulate protection area (shaded)

The distance shall be checked in at least 6 locations with the fire hood lying on a flat surface with the face opening facing upwards.

If the requirements of this subclause are met, add on the label wording equivalent to “This fire hood provides limited particulate protection” (see also [Clause 10](#)).

5 Sampling and pre-treatment

5.1 The number and size of specimens for the different tests shall be in accordance with the respective test method.

5.2 Where specified, the test samples shall be pre-treated by cleaning. The cleaning shall be in line with the manufacturer’s instructions on the basis of standardized processes.

NOTE Manufacturer’s instructions typically indicate one or several of the various methods and processes of ISO 6330, ISO 15797, ISO 3175-2 or equivalent as standardized processes for cleaning.

Samples shall be subjected to five cleaning cycles with a normal load in a front loading horizontal drum machine using non-phosphate reference detergent No 3 in soft water in accordance with the procedures of ISO 6330 at 60 °C normal wash (6 N). The dry procedure of ISO 6330 shall be F tumble dry at low temperature (max 60 °C) measured at the outlet temperature. Materials that are labelled as dry-clean only shall be dry cleaned five times in accordance with ISO 3175-2.

5.3 Unless otherwise specified in the specific test methods, all specimens shall be conditioned for a minimum of 24 h by exposure to a temperature of $20 \text{ °C} \pm 2 \text{ °C}$ and a relative humidity of $65 \% \pm 5 \%$ prior to testing.

6 Performance requirements

6.1 General

Performance requirements are as specified in [Table 1](#).

Table 1 — Fire hood performance requirements

Performance property	Fire hood	Pre-treatment	Requirement/Level
Limited flame spread	6.2.2	before and after	See Table 2
	6.2.3	before and after	See Table 3
Heat resistance (260 $\begin{smallmatrix} +8 \\ 0 \end{smallmatrix}$ °C)	6.3	before and after	not melt, drip, separate, or ignite, or shrink $\leq 10\%$
Heat transfer (flame)	6.4	before	HTI ₂₄ ≥ 11 HTI ₂₄₋₁₂ ≥ 4
Heat transfer (radiant)	6.5	before	RHTI ₂₄ ≥ 14 RHTI ₂₄₋₁₂ ≥ 4
Heat transfer (combined exposure)	6.6	before and after	> 840 kJ/m ²
Residual strength after radiant heat exposure to 10 kW/cm ²	6.7	after	≥ 260 kPa (for 7,3 cm ²), or ≥ 100 kPa (for 50 cm ²)
Seam burst strength	6.8	after	Knitted ≥ 300 kPa (ISO 13938-2) Woven ≥ 300 N (ISO 13935-2)
Dimensional change	6.9	after	$\leq 5\%$ for knitted fabric or $\leq 3\%$ for woven fabric
Thread heat resistance (260 $\begin{smallmatrix} +5 \\ 0 \end{smallmatrix}$ °C)	6.10	before	not ignite, melt, or char.
Particulate protection (fabric and seams)	6.11	after	particulate penetration $\leq 10\%$ (particulate filtration efficiency of $\geq 90\%$)
Water vapour resistance (optional)	6.12	—	≤ 10 Pa/W

The performance requirements shall be met after sampling and pre-treatment according to [Clause 5](#) unless otherwise stated.

Wherever in [Clause 6](#), the requirements for a property value are expressed in terms of a minimum or maximum value for that property, the resultant property value shall be determined according to [Annex C](#) and evaluated in accordance with [Annex D](#).

6.2 Limited flame spread

6.2.1 General

Testing of materials and seams shall take place in accordance with ISO 15025:2016, Procedure A and Procedure B. The test shall be carried out on all specimens before and after pre-treatment by cleaning as specified in [5.2](#).

6.2.2 Flame resistance (surface ignition)

Carry out the flame spread test in accordance with ISO 15025:2016, Procedure A (face ignition) using a flame application time of 10 s.

For seams, three specimens containing a structural seam shall be tested. Specimens shall be oriented with the seam running up the centreline of the outer surface of the test specimen so that the burner flame impinges directly upon the seam. Seams shall not separate.

The requirements in [Table 2](#) shall be satisfied.

Table 2 — Limited flame spread performance requirements ISO 15025:2016, Procedure A

Property	Requirement
Flame spread	No specimen shall permit any part of the lowest boundary of any flame to reach the upper or either vertical edge.
Flaming debris	No specimen shall give flaming or molten debris.
Hole formation	No specimen shall give hole formation of 5 mm or greater in any direction, except for an interlining that is used for specific protection other than flame.
Afterglow	Afterglow time shall be ≤ 2 s. A glowing inside the charred area is defined in ISO 15025 as afterglow without combustion and for the purpose of this clause, shall be not regarded as afterglow
Afterflame	Afterflame time shall be ≤ 2 s.

NOTE 1 [Table 2](#) and [3](#) are taken from ISO 14116. Requirement for limited flame spread Index 3.

Elastics and seams, when located along the edges of the fire hood, are not required to be tested.

NOTE 2 The edges of the hood consist of the hem seams and the face opening leading edge.

Three specimens containing the labels, elastic, seams, badges, material, or transfers etc, which are applied to the outmost surface of the fire hood, shall be tested before and after pre-treatment in accordance with [5.2](#), in combination with the outer layer, to obtain samples with the dimensions complying with ISO 15025. The items shall be oriented with the longer dimensions of the specimen to be exposed running up the centre line of the test specimen so that the burner flame impinges directly upon the middle surface of the item, not the edge. The combination with the outermost layer of the garment shall have the same limited flame spread index as the material to which they are applied. This requirement is not applicable for labels with a surface area of less than 10 cm².

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6.2.3 Flame resistance (bottom edge) [/iso/a1cbad79-0fd5-41fe-a718-e6b659ebbd94/iso-fdis-11999-9](#)

When tested in accordance with ISO 15025:2016, Procedure B, hemmed specimens from single-layer garments shall meet the following requirements (see [Table 3](#)):

Table 3 — Limited flame spread performance requirements, ISO 15025:2016, Procedure B

Property	Requirement
Flame spread	No specimen shall permit any part of the lowest boundary of any flame to reach the upper or either vertical edge.
Flaming debris	No specimen shall give flaming or molten debris.
Afterglow	Afterglow time shall be ≤ 2 s. Glowing inside the charred area is defined in ISO 15025 as afterglow without combustion and for the purpose of this clause is not regarded as afterglow.
Afterflame	Afterflame time shall be ≤ 2 s.

For seams, three hemmed specimens containing a structural seam shall be tested in accordance with ISO 15025:2016, Procedure B. Specimens shall be oriented with the seam running up the centreline of the test specimen so that the burner flame impinges directly upon the seam. Seams shall not separate. Except for leather, seams shall be tested only after pre-treatment according to [5.2](#).

The hemmed fabric specimen shall be taken from the original garment or prepared in the same manner as used in the construction of the clothing.