



**International  
Standard**

**ISO 11999-4**

**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 4:  
Gloves**

**Second edition  
2024-08**

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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](http://www.iso.org/directives)).

ISO draws attention to the possibility that the implementation of this document may involve the use of (a) patent(s). ISO takes no position concerning the evidence, validity or applicability of any claimed patent rights in respect thereof. As of the date of publication of this document, ISO had not received notice of (a) patent(s) which may be required to implement this document. However, implementers are cautioned that this may not represent the latest information, which may be obtained from the patent database available at [www.iso.org/patents](http://www.iso.org/patents). ISO shall not be held responsible for identifying any or all such patent rights.

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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](http://www.iso.org/iso/foreword.html).

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

This second edition cancels and replaces the first edition (ISO 11999-4:2015), which has been technically revised.

The main changes are as follows:

— technical and editorial changes have been made throughout the document.

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](http://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 4: Gloves

### 1 Scope

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

### 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 811, *Textiles — Determination of resistance to water penetration — Hydrostatic pressure test*

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

ISO 3175-1, *Textiles — Professional care, drycleaning and wetcleaning of fabrics and garments — Part 1: Assessment of performance after cleaning and finishing*

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

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 11999-1, *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 12127-1, *Clothing for protection against heat and flame — Determination of contact heat transmission through protective clothing or constituent materials — Part 1: Contact heat produced by heating cylinder*

ISO 12947-4, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 4: Assessment of appearance change*

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*

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ISO 13994, *Clothing for protection against liquid chemicals — Determination of the resistance of protective clothing materials to penetration by liquids under pressure*

ISO 13996, *Protective clothing — Mechanical properties — Determination of resistance to puncture*

ISO 13997, *Protective clothing — Mechanical properties — Determination of resistance to cutting by sharp objects*

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

ISO 16604, *Clothing for protection against contact with blood and body fluids — Determination of resistance of protective clothing materials to penetration by blood-borne pathogens — Test method using Phi-X 174 bacteriophage*

ISO 17493:2016, *Clothing and equipment for protection against heat — Test method for convective heat resistance using a hot air circulating oven*

ISO 21420:2020, *Protective gloves — General requirements and test methods*

ISO 23388:2018, *Protective gloves against mechanical risks*

EN 13087-1:2000, *Protective helmets — Test methods — Conditions and conditioning*

ASTM F2010/F2010M-10, *Standard test method for evaluation of Glove effects on wearer finger dexterity using a modified pegboard test*

### 3 Terms and definitions

For the purposes of this document, the terms and definitions given in ISO 11999-1 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/>

### 4 Glove design requirements

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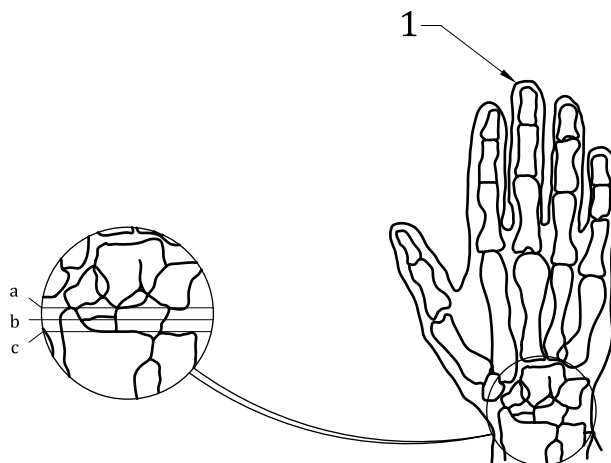
#### 4.1 General

Gloves shall consist of a component assembly meeting the design and performance requirements of this document, ISO 21420 and ISO 11999-1. The component assembly shall be permitted to be configured as a continuous or joined single layer or as continuous or joined multiple layers. The component assembly shall be permitted to be different for the palm, back, and fingers.

#### 4.2 Glove body length

The glove shall extend circumferentially beyond the wrist crease for not less than 25 mm. The location of the wrist crease shall be determined as shown in [Figure 1](#).



**Key**

- 1 dactylion III
- a Styloid.
- b Wrist crease.
- c Proximal edge of navicular.

**Figure 1 — Anatomical landmarks at the base of the hand**

### 4.3 Wristlet or cuff

Gloves can be provided with either a cuff or a wristlet or both. Where gloves are provided with a cuff or a wristlet, the sample glove body and the cuff or wristlet shall extend circumferentially for at least 50 mm beyond the wrist crease, taking into consideration the requirement specified in 4.2. Where gloves are not provided with a cuff or a wristlet, the sample glove shall extend circumferentially for at least 50 mm beyond the wrist crease, which is a 25 mm addition to the requirement in 4.2.

### 4.4 Glove sizing

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Glove sizing shall be as required in 4.4.1 and 4.4.2.

#### 4.4.1 Minimum sizing

Gloves shall be provided in a range of seven sizes based on cluster analysis to better cover the diverse range of hand sizes due to gender, race and age. The manufacturer shall indicate the range in hand circumference and hand length for wearers of each glove size as determined in 4.4.2 and in ISO 21420:2020, 6.1.

**NOTE** The intent of this requirement is to allow manufacturers to report information to the user that assists in their selection of the appropriate size. Standard sizes are not defined by this document. To better cover the diverse range of hand sizes due to gender, race and age. See Reference [1].

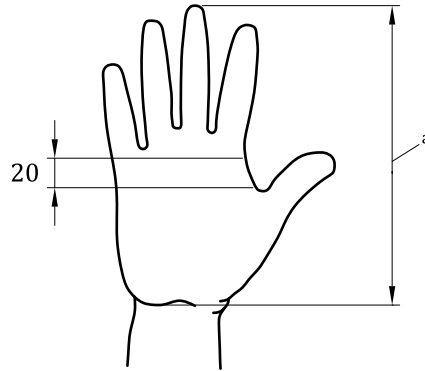
#### 4.4.2 Hand dimensions

Hand dimensions for the selection of proper glove size shall consist of measuring two dimensions, namely hand circumference and hand length, as shown in Figure 2.

Hand circumference shall be measured by placing the measuring tape on a table or other flat surface with the numerals facing downward. The subject shall place the right hand, palm down and fingers together, in the middle of the tape so that the tape can pass straight across the knuckles (metacarpals). The circumference shall be measured to the nearest millimetre, 20 mm from the crotch between the thumb and the index finger, as shown in Figure 2.

Hand length shall be measured by placing the subject's hand, palm down, on a piece of paper with the fingers together and the hand and arm in a straight line. The thumb shall be fully abducted, extended away from the palm as far as possible. The paper shall be marked at the tip of the third, or middle, finger. A pencil mark shall be placed in the notch at the base of the thumb where the thumb joins the wrist. The straight-line distance between the two points shall be measured to the nearest millimetre, as shown in [Figure 2](#).

Dimensions in millimetres



<sup>a</sup> Hand length.

**Figure 2 — Method of measuring hand dimensions for the selection of proper gloves**

#### 4.4.3 Innocuousness

Gloves shall conform the innocuousness of protective gloves requirements specified in ISO 21420:2020, 4.2.

#### 4.4.4 Other design requirements

Gloves shall be designed to be close fitting at the wrist to restrict the entry of embers or foreign particles through the glove openings.

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## 5 Glove sampling, testing, and pretreatment

### 5.1 General

Sampling shall be as required in [5.2](#) and [5.3](#), testing as required in [5.4](#), and pretreatment as required in [5.5](#).

### 5.2 Sampling levels for testing

Unless otherwise specified, the number and size of specimens for the different tests shall be in accordance with the respective standards.

### 5.3 Sampling level for determining design compliance

Inspection for determining compliance with the design requirements specified in [4.2](#) to [4.4](#) shall be performed on whole gloves with all labels and accessories.

### 5.4 Testing

Testing for determining material and component conformity with the requirements specified in [Clauses 6](#) to [9](#) shall be performed on samples representative of materials and components used in the actual construction of the protective glove. If suitably sized representative materials and components for the respective test method cannot be obtained, then samples from the glove shall be used as specified in the