



**International
Standard**

ISO 24232

**Protective clothing — Protection
against rain**

Habillement de protection — Protection contre la pluie

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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 Technical Committee ISO/TC 94, *Personal safety — Personal protective 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 accordance with the Agreement on technical cooperation between ISO and CEN (Vienna Agreement).

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.

Introduction

In this document the measured properties of materials and seams of protective garments and their subsequent classification are intended to ensure an adequate protection level. Water proofness and water vapour resistance are the essential properties tested and marked on the label.

Water proofness is the most important property and it is measured on material of the outer garment layer. Tests are made on pretreated fabric samples and on parts with seams. A test method for an optional readymade garment test after cleaning is described (rain tower test).

Some waterproof materials are impermeable to water vapour transmission. However other materials on the market combine water proofness with water vapour permeability. This property expressed by low water vapour resistance enhances sweat evaporation and significantly contribute to body cooling. This is valuable, because it contributes to better comfort and less physiological strain and prolongs the wearing time in certain climatic conditions (see [Annex A](#)).

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Protective clothing — Protection against rain

1 Scope

This document specifies requirements and test methods for the performance of materials and readymade garments for protection against the effects of precipitation (e.g. rain, snowflakes), fog and ground humidity. Garments for protection against other effects than precipitation (e.g. water splashes, waves) are excluded from this document.

The protective effects and requirements of footwear, gloves and separate headwear are excluded from the scope of this document.

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 811:2018, *Textiles — Determination of resistance to water penetration — Hydrostatic pressure test*

ISO 1421:2016, *Rubber- or plastics-coated fabrics — Determination of tensile strength and elongation at break*

ISO 1817:2024, *Rubber, vulcanized or thermoplastic — Determination of the effect of liquids*

ISO 4674-1:2016, *Rubber- or plastics-coated fabrics — Determination of tear resistance — Part 1: Constant rate of tear methods*

ISO 7854:1995, *Rubber- or plastics-coated fabrics — Determination of resistance to damage by flexing*

ISO 11092:2014, *Textiles — Physiological effects — Measurement of thermal and water-vapour resistance under steady-state conditions (sweating guarded-hotplate test)*

ISO 12947-1:1998, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 1: Martindale abrasion testing apparatus*

ISO 12947-2:2016, *Textiles — Determination of the abrasion resistance of fabrics by the Martindale method — Part 2: Determination of specimen breakdown*

ISO 13688:2013, *Protective clothing — General requirements*

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

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 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 23388:2018, *Protective gloves against mechanical risks*

ISO 24231:2024, *Protective clothing — Protection against rain — Test method for ready-made garments against high energy droplets from above*

EN 530:2010, *Abrasion resistance of protective clothing material — Test methods*

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

water vapour resistance

R_{et}

water-vapour pressure difference between the two faces of a material divided by the resultant evaporative heat flux per unit area in the direction of the gradient

Note 1 to entry: It is a quantity specific to textile materials or composites, which determines the “latent” evaporative heat flux across a given area in response to a steady applied water-vapour pressure gradient. The evaporative heat flux can consist of both diffusive and convective components.

Note 2 to entry: The water-vapour resistance is expressed in square metres pascal per watt.

[SOURCE: ISO 11092:2014, 2.2]

3.2

water penetration resistance

W_p

property of a material to support the hydrostatic pressure based on the opposition to the passage of water through the material

[SOURCE: ISO 11610:2023, 4.6.9]

3.3

outer shell material

outermost shell material of which the garment is made

Note 1 to entry: Based on the definition of outer material, ISO 11610:2023, 4.3.27.

3.4

waterproof liner

liner with a waterproof property

3.5

waterproof thermal liner

thermal liner with a waterproof property

3.6

lining

innermost lining

innermost layer of fabric or other material inserted in a garment which is intended to be nearest to the wearer's body

Note 1 to entry: Where the lining forms part of a quilted assembly, the quilted assembly shall be regarded as the innermost lining

Note 2 to entry: In this document, lining is without waterproof property.

[SOURCE: ISO 11610:2023, 4.3.7, modified — added Note 2 to entry]

4 Performance assessment and requirements

4.1 General requirements and innocuousness

4.1.1 General requirements

All the individual results of the specimens of a test shall meet the performance requirement. If a material exhibits differing behaviour for a property in the length and cross directions of the material, the resultant property value shall be the value obtained in the lesser performing direction. In the event that only one specimen fails, another set of specimens shall be tested and all the individual results of this second set of specimens shall meet the requirements. Otherwise, the sample is considered to have failed the requirement.

When tested in accordance with [5.2.1](#), the requirements according to ISO 13688:2013, 4.3.1, 4.3.2, 4.4.1 and the following requirements shall be met:

- all pockets shall be constructed to avoid water penetration inside the garment;
- closures, such as slide fasteners, fasteners, buttons etc. shall not open inadvertently.

If the protective clothing claims to have other protective properties, it shall also meet applicable requirements in relevant product standards.

For material testing the application of the single tests to each component is shown in [Table 1](#).

Hoods are not a mandatory part of rain protection clothing. If a hood is part of the rain protection garment, and the rain protection garment claims the optional requirement given in [Table 4](#), wicking length on hood hems shall be tested and reported.

NOTE Protective clothing against rain typically consist of the outermost shell of a garment ensemble containing additional layers underneath. It has been demonstrated that the garment layers underneath can support the overall breathability and comfort if they provide a moisture management capability.

Table 1 — Application of performance tests on the components

Property	Reference subclause	Outer shell material	Waterproof liner or waterproof thermal liner	Lining
Water penetration resistance ^a (before and/or after pretreatment)	4.2	X	X	— ^d
Water vapour resistance ^b	4.3	X	X	X
Tensile strength	4.4	X (wovens)	—	—
Tear resistance	4.5	X (wovens)	—	—
Bursting strength	4.6	X (knits)	—	—
Dimensional change ^c	4.7	X	X	X
Seam strength	4.8	X	—	—
^a The outer shell or liner material with any applied waterproof layers shall be tested together. ^b All layers to be tested together. ^c Materials to be tested separately. ^d “—” means: no requirement.				

4.1.2 Innocuousness

When tested in accordance with [5.2.2](#) the requirements of ISO 13688:2013, 4.2 and as impacted by ISO 13688:2013/Amd.1:2021, shall be met with regard to innocuousness.

4.2 Water penetration resistance, W_p

When tested in accordance with 5.4, resistance to water penetration W_p shall be in accordance with Table 2.

For each class all requirements given in Table 2 shall be met.

If specimens from the garment get different classes of classification in the different tests for marking in accordance with Clause 7, the lowest value of water penetration from all specimens shall be used to classify the garment.

Table 2 — Classification of water penetration resistance

Water penetration resistance W_p	Class			
	1	2	3	4
Specimen to be tested — material before pretreatment	$W_p \geq 8\,000^a$ Pa	— ^b	—	—
— material after each pretreatment (see 5.3.2 to 5.3.5)	—	$W_p \geq 8\,000$ Pa	$W_p \geq 13\,000$ Pa	$W_p \geq 20\,000$ Pa
— seams before pretreatment	$W_p \geq 8\,000$ Pa	$W_p \geq 8\,000$ Pa	$W_p \geq 13\,000$ Pa	no test required
— seams after pretreatment by cleaning (see 5.3.2)	—	—	—	$W_p \geq 20\,000$ Pa
^a 1 000 Pa is approximately 102 [mmH ₂ O]. ^b “—” means: no test required.				

4.3 Water vapour resistance, R_{et}

WARNING — All classes can result in a restricted wearing time, see Annex A.

When tested in accordance with 5.5, water vapour resistance R_{et} of all layers of the garment in combination shall be in accordance with Table 3.

Table 3 — Classification of water vapour resistance

Water vapor resistance R_{et}	Class			
	1	2	3	4
$\frac{m^2 \cdot Pa}{W}$	$R_{et} > 40$	$25 < R_{et} \leq 40$	$15 < R_{et} \leq 25$	$R_{et} \leq 15$

4.4 Tensile strength of the woven outer shell material

When tested in accordance with 5.6, the outer shell material shall withstand a minimum tensile force of 450 N in both orthogonal directions of the material. For materials with an elongation of more than 50 % this requirement is not applicable.

4.5 Tear resistance of the woven outer shell material

When tested in accordance with 5.7 the outer shell material shall withstand a minimum tearing force of 20 N in both orthogonal directions of the material.

4.6 Bursting strength of the knitted outer shell material

When tested in accordance with 5.8 the knitted outer shell material shall withstand a minimum bursting strength of 100 kPa for the 50 cm² test area or 200 kPa for the 7,3 cm² test area.