BRITISH STANDARD

BS EN
659:2003

Protective gloves for firefighters

The European Standard EN 659:2003 has the status of a British Standard

ICS 13.340.40

National foreword

This British Standard is the official English language version of EN 659:2003. It supersedes BS EN 659:1996 which is withdrawn.

The UK participation in its preparation was entrusted by Technical Committee PH/3/8, Protective gloves, to Subcommittee PH/3/8/1, Firefighters gloves, which has the responsibility to:

— aid enquirers to understand the text;

— present to the responsible international/European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;

— monitor related international and European developments and promulgate them in the UK.

A list of organizations represented on this subcommittee can be obtained on request to its secretary.

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EN 659

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English version

Protective gloves for firefighters

Gants de protection pour sapeurs-pompiers

Feuerwehrschutzhandschuhe

This European Standard was approved by CEN on 7 February 2003.

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EUROPEAN COMMITTEE FOR STANDARDIZATION
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EUROPÄISCHES KOMITEE FÜR NORMUNG

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Contents

Foreword

This document (EN 659:2003) has been prepared by Technical Committee CEN/TC 162, "Protective clothing including hand and arm protection and lifejackets", the secretariat of which is held by DIN.

This European Standard shall be given the status of a national standard, either by publication of an identical text or by endorsement, at the latest by December 2003, and conflicting national standards shall be withdrawn at the latest by December 2003.

This document supersedes EN 659:1996

This document has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association, and supports essential requirements of EU Directive(s).

For relationship with EU Directive(s), see informative annex ZA, which is an integral part of this document.

Annex A is informative.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Luxembourg, Malta, Netherlands, Norway, Portugal, Slovakia, Spain, Sweden, Switzerland and the United Kingdom.

Introduction

Suitable gloves for firefighters can enable the firefighters to work for long periods under hazardous conditions. However, it is not possible to relate the performance levels achieved in laboratory testing to protection levels under actual use conditions because the thermal hazards in wet and dry conditions may be very different.

1 Scope

This standard defines minimum performance requirements and test methods for firefighters' protective gloves.

This standard applies only to firefighters' protective gloves which protect the hands during normal firefighting, including search and rescue.

These gloves are not intended for deliberate handling of liquid chemicals, but provide some protection against accidental contact with chemicals.

Protective gloves for special operations within firefighting service are excluded from the scope of this standard.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate places in the text and the publications are listed hereafter. For dated references, subsequent amendments or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 344-1:1992*, Requirements and test methods for safety, protective and occupational footwear for professional use.*

EN 344-1:1992/A1:1997, *Requirements and test methods for safety, protective and occupational footwear for professional use.*

EN 367, Protective *clothing- protection against heat and fire- method of determining heat transmission on exposure to flames.*

EN 368, *Protective clothing- Protection against liquid chemicals- Test method: Resistance of materials to penetration by liquids.*

EN 388, *Protective gloves against mechanical risks.*

EN 407, *Protective gloves against thermal risks (heat and/or fire).*

EN 420:1994, *General requirements for gloves.*

EN 702, *Protective clothing — Protection against heat and flame — Test method: Determination of the contact heat transmission through protective clothing or its materials.*

EN 20811, *Textile — Determination of resistance to water penetration —- Hydrostatic pressure test.*

EN 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 6942:2002)*

EN 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 13935-2:1999)*

ISO 15383, *Protective gloves for firefighters — Laboratory test methods and performance requirements.*

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

3 Requirements

3.1 General requirements

Firefighters' protective gloves shall conform with all the general requirements of EN 420 except the lengths which are defined in 3.2.

When parts of the palm and/or parts of the back of the glove are made from dissimilar materials, these dissimilar materials shall be tested separately. In those circumstances when the sample size is significantly larger than the particular part of the glove being tested, then the manufacturer shall be requested to supply samples of the appropriate materials.

After each thermal test (3.7, 3.8, 3.9, 3.10), the innermost lining material shall be visually inspected. The glove is deemed to have failed the test if there is evidence of melting.

3.2 Sizes

When measured according to 6.2 of EN 420:1994, the sizes shall correspond with those requirements established in the applicable clause of EN 420, but the minimum length shall be in accordance with table 1.

Tabelle 1 — Minimum length of protective gloves for firefighters

Glove size	6	7	8	9	10	11
Fits	hands size 6	hands size 7	hands size 8	hands size 9	hands size 10	hands size 11
Minimum length of glove (mm)	260	270	280	290	305	315

NOTE The user should take care that the gloves are compatible with the sleeves of the selected protective clothing and ensure that no skin is exposed when the arms are stretched.

3.3 Abrasion resistance

The glove shall be tested according to the appropriate clause of EN 388, on the palm of the glove. When tested accordingly, it shall be in accordance with at least performance level 3 (2 000 cycles).

3.4 Cut resistance

The glove shall be tested according to the appropriate clause of EN 388, both on the palm and the back of the glove. When tested accordingly, it shall be in accordance with at least performance level 2 (index 2.5).

3.5 Tear resistance

The glove shall be tested according to the appropriate clause of EN 388, on the palm of the glove. When tested accordingly, it shall be in accordance with at least performance level 3 (50 N).

3.6 Puncture resistance

The glove shall be tested according to the appropriate clause of EN 388, on the palm of the glove. When tested accordingly, it shall be in accordance with at least performance level 3 (100 N).

3.7 Burning behaviour

The glove shall be tested according to the appropriate clause of EN 407. When tested accordingly, it shall be in accordance with performance level 4 (after flame time $\leq$ 2 s and after glow time $\leq$ 5 s).

The outside material of the glove shall not drip if the material melts. The seam shall not come apart in the test area after an ignition time of 15 s.

3.8 Convective heat resistance

The material for firefighters' protective gloves shall be tested according to EN 367, both on the back and the palm of the glove. For each material or each material assembly, three samples shall be tested. When tested accordingly, each sample shall be in accordance with at least performance level 3 ($HTI_{24} \geq 13$) of EN 407:1994. The result shall be given as the arithmetic mean of the three individual values and rounded to the nearest whole second.

3.9 Radiant heat resistance

The material for firefighters' protective gloves shall be tested according to EN ISO 6942, on the back of the glove, with a heat flux density of 40 kW/m². A sample 70 mm $\times$ 170 mm is taken from each glove back, from one pair of gloves. The arithmetic mean of the two t_{24} values is calculated and stated to the nearest whole second.

When tested accordingly, the material shall have a time t_{24} of at least 18 s.

3.10 Contact heat resistance

The material for firefighters' protective gloves shall be tested according to EN 702, on the palm of the glove, with a contact temperature of 250°C. A sample with a diameter of 80 mm is taken from each palm area of three gloves. When tested accordingly, each sample shall have a threshold time t_t of at least 10 s.

The gloves shall be tested both after wet conditioning (according to the relevant clause on pretreatments of ISO 15383) and dry conditioning (according to clause 4).

For each conditioning, the arithmetic mean of the three individual values shall be calculated and rounded to the nearest whole second. The lowest mean shall be given as the test result.

3.11 Heat resistance of the lining material

The lining material closest to the skin, when tested according to ISO 17493 at a minimum temperature of 180°C, shall not melt, drip or ignite.

3.12 Heat shrinkage

The glove, when tested according to ISO 17493 at 180°C shall not shrink more than 5 %.

3.13 Dexterity

The glove shall be tested according to the dexterity test described in EN 420. When tested accordingly, the glove shall be in accordance with at least performance level 1 (smallest diameter of pin: 11 mm).

3.14 Seam breaking strength

When tested according to EN ISO 13935-2, the seam breaking force shall be at least 350 N.

3.15 Time for the removal of gloves

Three pairs of gloves shall be donned and then removed by a test subject, after conditioning according to clause 4. The time for removal of each pair shall be recorded. The mean value shall be calculated and rounded to the nearest whole second.

This procedure shall be repeated after wet conditioning of three new pairs of gloves according to the relevant clause of ISO 15383(without applying a pressure of 3.5 kPa).

The mean value of time for removal of a pair of gloves, whether they are dry or wet, shall not be greater than 3 s.

3.16 Resistance of glove material to water penetration (optional)

If required for the application, material of the glove shall be tested for resistance to water penetration in accordance with the appropriate test method as follows:

— For leather: 5.12 of EN 344:1992 and EN 344:1992/A1:1997. The results shall be reported according to Table *2*.

— For textile: EN 20811. The results shall be reported in accordance with EN 20811.

Tabelle 2 — Levels of performance - Resistance to water penetration according to 5.12 of EN 344:1992 and EN 344:1992/A1:1997

Performance level	Time of penetration (min)
1	30
2	60
3	120
4	180

3.17 Whole glove integrity test

If, for the end user, it is necessary to have waterproof gloves, then the glove shall be tested according to the relevant test method in ISO 15383, but with complete immersion of the glove up to the wrist line only.

3.18 Resistance to liquid chemical penetration

Glove material shall be tested according to EN 368, at 20 °C, using an application time of 10 s, with the following test chemicals:

— 30 % by weight H_2SO_4;

— 40 % by weight NaOH;

— 36 % by weight HCl;

— heptane.

When tested accordingly, there shall be no penetration.

4 Preconditioning and testing conditions

Before testing, the test samples shall be conditioned for at least 24 h in the following conditioning atmosphere.

— Temperature (20 ± 2) °C;

— Relative humidity (65 ± 5) %.

Tests are preferably carried out in the conditioning atmosphere. If the tests are carried out under different climatic conditions, then this should be done within 5 min of the time the test samples were removed from the conditioning atmosphere.

For protective gloves with a multilayer construction, the test*s* shall be carried out on all layers simultaneously, even if these, after removal, are no longer connected to one another.

5 Marking

Each glove shall be marked with the number of this standard, i. e. EN 659, and the specific pictogram for firefighters (see figure 1). Otherwise, the marking shall be in accordance with the applicable clause of EN 420. For gloves which are only for firefighter use, no other pictograms relative to protection or applications shall be marked.

Figure 1 — Pictogram for firefighters

6 Information supplied by the manufacturer

Information for use shall be in accordance with the applicable clause of EN 420.

Annex A
(informative)

Test results - Uncertainty of measurement

For each of the required measurements performed in accordance with this standard, a corresponding estimate of the uncertainty of measurement shall be evaluated. This estimate of uncertainty shall be applied and stated when reporting test results, in order to enable the user of the test report to assess the reliability of the data.

Annex ZA
(informative)

Clauses of this European Standard addressing essential requirements or other provisions of EU Directives.

This European standard has been prepared under a mandate given to CEN by the European Commission and the European Free Trade Association and supports essential requirements of EU Directive 89/686/EEC.

WARNING : Other requirements and other EU Directives may be applicable to the product(s) falling within the scope of this standard.

The following clauses of this standard are likely to support requirements of Directive 89/686/EEC, Annex II.

EU Directive 89/686/EEC, Annex II		Clauses of this Standard
1.1.1	Ergonomics	3.1 to 3.8 (and reference to EN 420)
1.1.2.1	Highest level of protection possible	3.3 to 3.18
1.1.2.2	Classes of protection appropriate to different levels of risks	3.16
1.2.1	Absence of risks and other inherent nuisance factors	3.1 (reference to EN 420), 3.15
1.2.1.1	Suitable constituent materials	3.1 (reference to EN 420), 3.11
1.2.1.2	Satisfactory surface condition of all PPE parts in contact with the user	3.1 (reference to EN 420)
1.2.1.3	Maximum permissible impediment	3.2, 3.13, 3.15
1.3.1	Adaptation of PPE to user morphology	3.2
1.3.2	Lightness and design strength	No specific requirement
1.4	Information supplied by the manufacturer	5, 6 (reference to EN 420)
2.1	PPE incorporating adjustment systems	3.2
2.2	PPE enclosing the parts of the body to be protected	3.1 (reference to EN 420)
2.4	PPE subject to ageing	3.1 (reference to EN 420)
2.7	PPE intended for emergency use or rapid installation and/or removal	3.15
2.8	PPE for use in very dangerous situations	No specific requirements, EN 420
2.12	PPE bearing one or more identification or recognition marks directly or indirectly relating to health and safety	5
2.13	PPE capable of signalling the user's presence visually	Not applicable
2.14	Multi-risk PPE	3.3 to 3.8
3.3	Protection against physical injury (abrasion, perforation, cuts, bites)	3.3 to 3.6
3.6	Protection against heat and/or fire	3.7 to 3.12
3.6.1	PPE constituent materials and other components	3.7, 3.8, 3.9
3.6.2	Complete PPE ready for use	3.16, 3.17, 318

Compliance with the clauses of this standard provides one means of conforming with the specific essential requirements of the Directive concerned and associated EFTA regulations.

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