



# PROTECTIVE CLOTHING FOR FIREFIGHTERS

## COMPARATIVE VIEW

### Protective clothing for firefighting (EN 469)



The pictogram includes 4 performance levels:  
**Xf1 or Xf2:** Resistance to convective heat.  
**Xr1 or Xr2:** Resistance to radiant heat.  
**Y1 or Y2:** Resistance to water penetration.  
**Z1 or Z2:** Water vapour resistance.

Garments globally labelled as **level 1** or **level 2** are commonly found in the market, meaning this classification the **lowest value** obtained between Xf and Xr, i.e:

- **Xf1 and Xr1, Level 1.**
- **Xf1 and Xr2 / Xf2 and Xr1, Level 1.**
- **Xf2 and Xr2, Level 2.**

Resistance to water penetration is related to hydrostatic pressure properties of the garment, and the water vapour resistance with its breathability. High-visibility materials of the garments are optional, but if present, they have to comply with the thermal and high visibility requirements stated in this standard.

### Wildland clothing (EN 15614)



Codes included in the pictogram, **A1, A2 or both, indicate the test method (Surface ignition or edge ignition, respectively)**, that has been carried out for determining the flame spread resistance.

This type of clothing offers a lower water vapour resistance and, as a result, a higher breathability and lightness, than the clothing designed according to EN 469.

High-visibility materials of the garments are mandatory and they have to comply with the thermal and high visibility requirements stated in this standard.

### Protective clothing for technical rescue (EN 16689:2017)

**EN 16689:2017**  
There is no pictogram in the marking of this clothing.

Protection against radiant and convective heat offered by this clothing is lower than the one offered by both EN 469 and EN 15614, but it does include a requirement for contact heat, not covered by those two standards.

In addition, as a specific characteristic, some other requirements, related to mechanical resistance and penetration by blood borne pathogens resistance need to be reached (see table).

This clothing offers a water vapour resistance (breathability) and therefore lightness, intermediate between the ones offered by clothing according to EN 15614 y la EN 469.

High-visibility materials of the garments are mandatory and they have to comply with the thermal and high visibility requirements stated in this standard.

#### Recommendations for use

This clothing is indicated for fighting fires commonly referred to as “structure fires”. Level 1 can be chosen for outdoor firefighting and support activities, while level 2 is applicable to fighting fires and rescue from fire in structures, where a higher risk fire is expected.

This type of clothing is **not** specifically designed for:

- Wildland fires.
- Specialized firefighting, in which reflective clothing is more appropriate (EN 1486).
- Activities with foreseeable exposure to chemicals while deliberate cleaning operations; This clothing only protects momentarily against small accidental splashes of chemicals.

#### Recommendations for use

This type of clothing is indicated for wildland firefighting and related activities.

Flame spread resistance is similar to the one offered by clothing under EN 469.

Protection against convective heat is not required.

Protection against radiant heat lower than the lowest level offered by clothing under EN 469.

#### Recommendations for use

This clothing is indicated for technical rescue, which involves work associated with scenarios such as but not limited to those found during road traffic collisions or collapsed structures in non-fire conditions, i.e., it offers a certain level of protection against incidental ignited fires, but it is not specifically designed for firefighting.

Unless combined with other specialized PPE this clothing is not intended to protect against risks encountered in fighting fires, wildland fires or rescue from fire, dealing with hazardous chemicals working with chainsaws and water and rope rescue.

**In general, if protection is reached by the combination of two or more garments, this will be declared on the label of all pieces indicating that they shall be worn together.**

#### Comparative summary of thermal requirements

| Requirement / standard     | EN 469   | EN 15614                       | EN 16689                      |
|----------------------------|--|--------------------------------|-------------------------------|
| Flame spread resistance    | Level 3  | Level 3                        | Level 3                       |
| Contact heat resistance    | Not covered  | Not covered                    | 5 s for 100 °C                |
| Convective heat resistance | Level 1 ≥ 9 s<br>Level 2 ≥ 13 s                            | Not covered                    | Not covered                   |
| Radiant heat resistance    | Level 1 ≥ 10 s<br>Level 2 ≥ 18 s<br>(exposure to 40 kW/m²) | 11 s<br>(exposure to 20 kW/m²) | 7 s<br>(exposure to 20 kW/m²) |
| Water vapour resistance    | Level 1 > 30<br>Level 2 ≤ 30<br>m² Pa/W*                   | ≤ 10 m² Pa/W                   | ≤ 20 m² Pa/W                  |
| Heat resistance **         | 5% after 5 min at 180°C                                    | 5% after 5 min at 180°C        | Not covered                   |

In addition, clothing under EN 16689 contains an optional requirement of resistance to **penetration by blood borne pathogens**, not covered by the rest of standards: when tested in accordance with ISO 16604, no detectable transfer of the Phi-X174 bacteriophage on the detection plates shall be demonstrated.

\* For garments that have reached level 1 in water vapour resistance, the manufacturer shall include a note in the information indicating a limitation of time of use due to heat stress. This limitation of time shall be related to the type of activity (metabolic heat production, environmental conditions).

\*\*Maximum dimensional change in % after the indicated heat exposure.

#### Comparative summary of mechanical requirements

| Requirement / standard | EN 469      | EN 15614    | EN 16689                                   |
|------------------------|-------------|-------------|--|
| Abrasion resistance    | Not covered | Not covered | 20,000 cycles (crossbred worsted abradant) |
| Tensile resistance     | ≥ 450 N     | ≥ 450 N     | ≥ 450 N                                    |
| Burst strength         | Not covered | Not covered | 100 or 200 k Pa (depending on simple size) |
| Tear resistance        | ≥ 25 N      | ≥ 20 N      | ≥ 25 N                                     |

From higher to lower protection:  Equivalent

#### Useful information

Recommendations for use contained in this document refer to the applications intended by the standards corresponding to each kind of clothing. Nevertheless, priority will always be laid down by the risk assessment, so if that document justifiably considers it more appropriate, considering the real work conditions, the different garments might be used in applications different from those foreseen by the standards.

For further information (e.g. for categorization purposes), the Guide to application of Regulation (EU) 2016/425 of the European Parliament and of the Council of 9 march 2016 on personal protective equipment may be useful.

It is essential that firefighters are trained in the selection, use, care and maintenance of all personal protective equipment. Attention is drawn to CEN/TR 14560, which sets out guidelines for selection, use, care and maintenance of protective clothing against heat and flame.

#### References

- INSSBT PPE web site (in Spanish): <http://www.insht.es/portal/site/Epi>
- Publication by INSSBT on PPE for fighting wildland fires (in Spanish): <http://www.insht.es/InshtWeb/Contenidos/Documentacion/TextosOnline/postersTecnicos/ficheros/Poster%20Forestales.pdf>

#### Some standards related to other PPE for firefighters

- 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 443.** Helmets for fire fighting in buildings and other structures.
- EN 16471.** Firefighters helmets - Helmets for wildland fire fighting.
- EN 16473.** Firefighters helmets - Helmets for technical rescue.
- EN 659.** Protective gloves for firefighters.
- EN 15090.** Footwear for firefighters.
- EN 14458.** Personal eye-equipment - Faceshields and visors for use with firefighters' and high performance industrial safety helmets used by firefighters, ambulance and emergency services.

