Flame spread tests EN531 and EN533.

These two tests are both means of assessing the degree of resistance to burning and/or heat transfer of **fabrics** and other similar products. They are usually referred to in the description and labelling of garments claiming some degree of protection against **accidental contact with heat and/or flame** and other heat hazards. Such garment labels should contain the letters CE and the pictogram for protection against heat and fire. The test number of the standard to which the fabric has been tested has to be shown above the pictogram, and the level of performance within the test standard that the fabric achieves has to be shown below the pictogram. Typical labelling is illustrated below..

CE EN533 INDEX3 5X40 CE EN531 A B1 C1 D2 E1

CE certification of a flame retardant garment includes, in addition to the verification that the fabric in the garment meets the standard to which it is certified, an assessment of that garment's dimensional stability and its fitness for the purpose intended. Other standards applicable to this area of protection are EN469:2005 for firefighter's clothing and EN470-1:1995 for welder's clothing

EN533:1995 Protective clothing – Protection against heat and flame. Limited flame spread materials and material assemblies.

This standard only covers resistance of a material or assemblies of materials to flame spread

The actual method of testing for flame spread is described in standard EN532. This test consists of the application for a fixed time (10 seconds) of a specific propane gas flame, placed horizontally at a fixed distance from the bottom of a vertically suspended strip of the fabric of fixed width (50mm). Once the fabric has been exposed to the flame it is observed for holes in the fabric, the formation of flaming debris and the spread of afterglow (continued burning without flame). The test specimen is then awarded an index level according to its performance with regard to the three properties mentioned above.

Index 1 – After testing any remaining flame or any hole in the fabric formed by the flame during testing must not reach the edge of the fabric. There must be no flaming debris. Any afterglow (residual burning) must not spread beyond the area affected by the flame during the test.

Index 2 – As index 1 but there most not be any holes in the fabric.

Index 3 – As Index 2 but any flaming of the fabric after the flame source has been removed must cease within 2 seconds of the source's removal

For a fabric to be tested to EN533 it is tested both as received and then also after washing a number of times using the method laid down in standard ISO10528:1995 and dried according to standard ISO 6330:1984. The number of times the fabric has been washed and the temperature of washing is also included in any description of the results. The index level reached and the number of washes and temperature (°C) at which the fabric has been washed are also shown below the heat and flame pictogram as no washes x temp used. 5x40 after the index therefore means that the sample tested after washing was washed 5 times at 40°C.

Manufacturers will sometimes quote results as tested to EN532, quoting an index level only. This means that the fabric has been put through the flame test without washing and not through the full test method required by EN533.

EN 531:1995 Protective clothing – Protection against heat and flame.

In addition to testing for limited flame spread, this standard involves testing for the rate at which convective and radiant heat passes through the fabric and how it reacts to having molten metal poured on it. The fabric is tested after it has been washed 5 times and dried according to ISO6330:1984. All performance levels claimed under this standard must include results of tests to EN532, this result must meet Index 3 as described above and is denoted as **A** in the list of results below the pictogram.

Any product certified to EN531 standard must also have been tested for least one other of the following properties. If the relevant letter does not appear in the list under the pictogram then no claim is made as to the fabric/garments ability to protect against that particular hazard. For example a fabric shown as achieving levels A B1 C1 has only been tested for limited flame spread and items B and C below.

B - Convective heat transfer as tested by method EN367. This involves placing a standard heat source (a flame) a fixed distance in front of the fabric and measuring the time it takes for the temperature on the other side of the fabric to go up by 24°C. The equipment is designed to expose the sample to a heat rate of 81 Kw per square metre. The temperature rise mentioned is effectively how long it would take before burns would be seen on any skin on the other side of the fabric. Levels ranging from 1 to 5 are awarded in accordance with the time it takes the temperature to rise the required amount, this level is represented as a number after the letter B below the pictogram

C - Radiant heat transfer as tested by method EN366. This method is the same as EN367 except that the heat source is radiant (an electric fire bar) which exposes the sample to radiant heat at a rate of 20 KW per square metre. The results levels range from 1 to 4. Both tests EN366 and EN367 have a minimum result below which a level cannot be awarded.

D and E – Resistance to molten aluminium and iron splash as tested by methods EN373 and EN348. Theses tests involves placing a sample of the fabric to be tested at a steep angle to the horizontal with a sheet of simulated skin (PVC) underneath and pouring a known weight of molten metal over the fabric sample from a fixed height. The test is repeated with increasing weights of metal until the simulated skin shows distortion and/or metal adheres to the fabric. A test level of 1 to 3 is awarded according to the weight of metal poured when distortion occurs. Again, the level achieved is shown as a number after the letter D (for aluminium) or E (for Iron) below the pictogram and there is a minimum weight of metal poured required to achieve level 1.