DIN EN ISO 4589 -2 Plastics â€“Determination of Burning Behavior by Oxygen Index â€“Part 2: Ambient-Temperature Test

Description



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1 Scope

This part of ISO 4589 specifies methods for determining the minimum concentration of oxygen, in admixture with nitrogen, that will support combustion of small vertical test specimens under specified test conditions. The results are defined as oxygen index values. Methods are provided for testing materials that are self-supporting in the form of vertical bars or sheet up to 10,5 mm thick. These methods are suitable for solid, laminated or cellular materials characterized by an apparent density greater than 100 kg/m3. The methods may also be applicable to some cellular materials having an apparent density of less than 100 kg/m3. A method is provided for testing flexible sheet or film materials while supported vertically. For comparative purposes, a procedure is provided for determining whether or not the oxygen index of a material lies above some specified minimum value. Oxygen index results obtained using the methods described in this part of ISO 4589 can provide a sensitive measure of the burning characteristics of materials under certain controlled laboratory conditions, and hence may be useful for quality control purposes. The results obtained are dependent upon the shape, orientation and isolation of the test specimen and the conditions of ignition. For particular materials or applications, it may be necessary or appropriate to specify different test conditions. Results obtained from test specimens of differing thickness or by using different ignition procedures may not be comparable and no correlation with flammability behaviour under other fire conditions is implied. Results obtained in accordance with this part of ISO 4589-2 must not be used to describe or appraise the fire hazard presented by a particular material or shape under actual fire conditions, unless used as one element of a fire risk assessment that takes into account all of the factors pertinent to the assessment of the fire hazard of a particular application for the material. NOTE 1 It may not be possible to apply these methods satisfactorily to materials that exhibit high levels of shrinkage when heated, e.g. highly oriented thin film. NOTE 2 For assessing the flame propagation properties of cellular materials of density < 100 kg/m3, attention is drawn to the method of ISO 3582:2000, Flexible cellular polymeric materials â€” Laboratory assessment of horizontal burning characteristics of small specimens subjected

to a small flame.

5 Apparatus

5.1 Test chimney, consisting of a heat-resistant glass tube supported vertically on a base through which oxygen-containing gas mixtures can be introduced (see Figures 1 and 2).

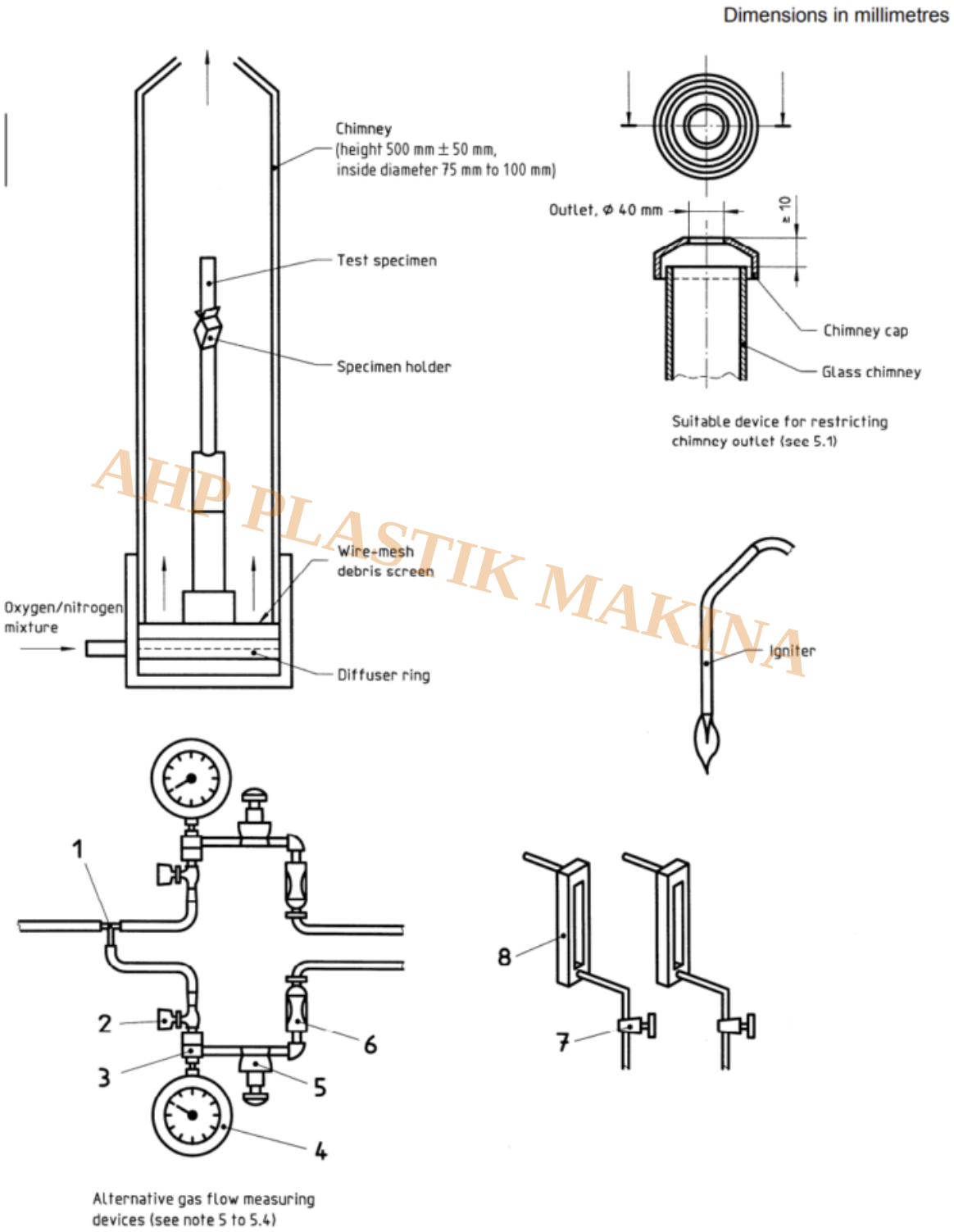
The preferred dimensions of the chimney are 500 mm Â± 50 mm minimum height and 75 mm to 100 mm inside diameter.

The upper outlet shall be restricted as necessary by an overhead cap having an outlet small enough to produce an exhaust velocity of at least 90 mm/s from that outlet.

NOTE 3 A cap converging to an outlet of 40 mm diameter at a level at least 10 mm above the top of the cylindrical chimney has been found satisfactory. Chimneys of other dimensions, with or without restricted outlets, may be used, if shown to give equivalent results. The bottom of the chimney, or the base upon which the chimney is supported, shall incorporate a device for distributing evenly the gas mixture entering the chimney. The preferred device comprises a suitable diffuser and a mixing chamber with metal foil. Other devices, such as radial manifolds, may be used, if shown to give equivalent results. A porous screen may be mounted below the level of the specimen holder, to prevent falling combustion debris from fouling the gas entry and distribution paths. The chimney support may incorporate a levelling device and indicator, to facilitate vertical alignment of the chimney and a test specimen supported therein. A dark background may be provided to facilitate observation of flames within the chimney.

5.2 Test specimen holder, suitable for supporting a specimen vertically in the centre of the chimney. For self-supporting materials, the specimen shall be held by a small clamp which is at least 15 mm away from the nearest point at which the specimen may burn before the extent-of-burning criterion is exceeded. For supported film or sheet test specimens, the specimen shall be supported by both vertical edges in a frame equivalent to that illustrated by Figure 2, with reference marks at 20 mm and 100 mm below the top of the frame. The profile of the holder and its support should preferably be smooth to minimize induction of turbulence in the rising flow gas.

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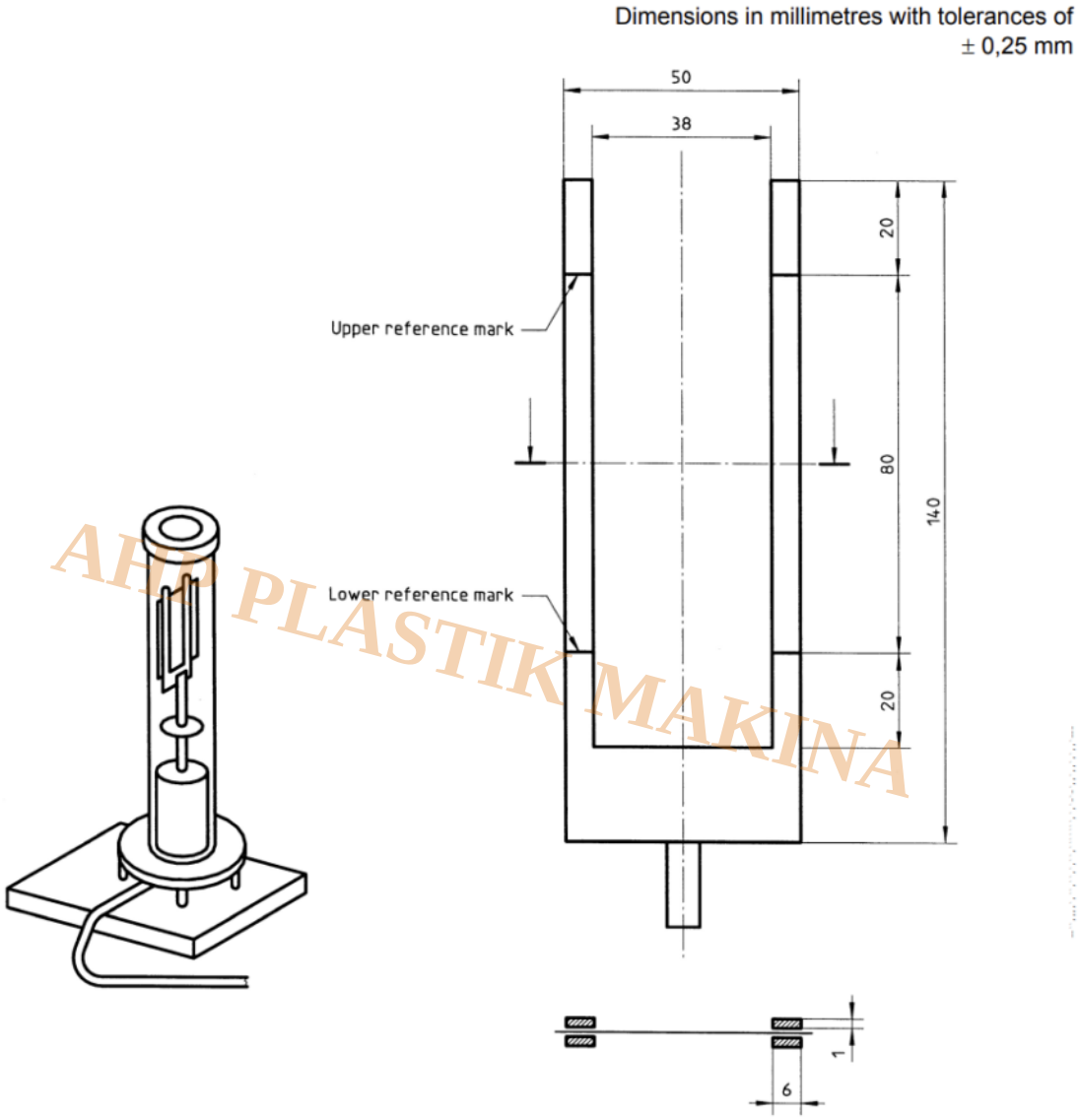


1	Gas premixing point	4	Pressure gauge	7	Needle valve
2	Cut-off valve	5	Precision pressure regulator	8	Gas flow meter
3	Orifice in holder	6	Filter		

Figure 1 — Diagram of typical apparatus for determination of oxygen index

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NOTE The test specimen is held securely along both upright edges between forks made of stainless steel.

Figure 2 — Support frame for non-self-supporting test specimens

5.3 Gas supplies, comprising pressurized sources of oxygen and/or nitrogen not less than 98 % (m/m) pure and/or clean air [containing 20,9 % (V/V) oxygen], as appropriate. The moisture content of the gas mixture entering the chimney shall be < 0,1 % (m/m), unless the results have been shown to be insensitive to higher moisture levels in the gas mixture. The gas supply system shall incorporate a drying device, or provision for monitoring or sampling the gas supply for moisture content, unless the moisture content of the gas supplies is known to be acceptable. The constituent gas supply lines shall be linked in a manner which thoroughly mixes the gases, before they enter the gas distribution device at the base of the chimney, so that the variation in oxygen concentration in the gas mixture rising in the chimney, below the level of the test specimen, is < 0,2 % (V/V).

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NOTE 4 It should not be assumed that bottled oxygen or nitrogen will always contain < 0,1 % (m/m) of water; moisture contents of 0,003 % (m/m) to 0,01 % (m/m) are typical for commercial supplies as filled bottles of purity > 98 % (m/m), but as such bottled gases are depressurized to below about 1 MPa, the moisture content of the gas drawn off may rise above 0,1 % (m/m).

5.4 Gas measurement and control devices, suitable for measuring the concentration of oxygen in the gas
mixture entering the chimney with an accuracy of Â± 0,5 % (V/V) of the mixture and for adjusting the concentration with a precision of Â± 0,1 % (V/V) of the mixture when the gas velocity through the chimney is (40 Â± 2) mm/s at (23 Â± 2) Â°C. Means shall be provided for checking or ensuring that the temperature of the gas mixture entering the chimney is (23 Â± 2) Â°C. If this involves an internal probe, its position and profile shall be designed to minimize induction of turbulence within the chimney.

NOTE 5 Systems of measurement and control that have proved satisfactory include the following:

a) needle valves on individual and mixed gas supply lines, a paramagnetic oxygen analyser or equivalent that continuously samples the mixed gas, and a flowmeter to indicate when the gas flow through the chimney is within the required limits;
b) calibrated orifices, gas pressure regulators and pressure gauges on the individual gas supply lines;
c) needle valves and calibrated flowmeters on the individual gas supply lines.

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Systems b) and c) may require calibration after assembly to ensure that the cumulative errors of the component parts do not exceed the requirements of 5.4

5.5 Flame igniter, comprising a tube that can be inserted into the chimney to apply to the test specimen a
flame issuing from an outlet of (2 Â± 1) mm diameter at the end of the tube.
The flame fuel shall be propane, without premixed air. The fuel supply shall be adjusted so that the flame will project (16 Â± 4) mm vertically downwards from the outlet when the tube is vertical within the chimney and the flame is burning within the chimney atmosphere.
5.6 Timing device, capable of measuring periods up to 5 min with an accuracy of Â± 0,5 s.
5.7 Fume extraction system, providing sufficient ventilation or exhaust to remove fumes or soot expelled
from the chimney without disrupting the gas flow rate or temperatures in the chimney.
NOTE 6 If soot-generating materials are being tested, the glass chimney may require cleaning to maintain good visibility, and the gas inlets, or inlet screen, and temperature sensor (if fitted) may also require cleaning to function properly. Suitable precautions should be taken to protect personnel from noxious materials or burns during testing or cleaning operations.
5.8 Tool for preparing rolled film, consisting of a stainless-steel rod of 2 mm diameter, with a slit in one end (see Figure 3).

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Oxygen Index Measurement Device

- According to EN ISO 4589-3, TS 11162-3
- Digital timer
- Quartz or Pyrex tube resistant to high temperature
- Pressure display
- Display gas mixture flow
- Sample holders included
- Flow control valves for both gases
- Oxygen sensor is USA made
- Flow display for both gases
- Training video included
- Weight: About 25 Kg
- Dimensions: 70*40*80 Cm

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Category

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