BS EN 2826:2011

BSI Standards Publication

Aerospace series — Burning behaviour of non metallic materials under the influence of radiating heat and flames — Determination of gas components in the smoke

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National foreword

This British Standard is the UK implementation of EN 2826:2011.

The UK participation in its preparation was entrusted to Technical Committee ACE/65, Non-metallic materials for aerospace purposes (excluding textiles).

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

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Aerospace series - Burning behaviour of non metallic materials under the influence of radiating heat and flames - Determination of gas components in the smoke

Série aérospatiale - Comportement au feu des matériaux non métalliques sous l'action de chaleur rayonnante et de flammes - Détermination des composants de gaz de fumée

Luft- und Raumfahrt - Brandverhalten nicht metallischer Werkstoffe unter Einwirkung von strahlender Wärme und Flammen - Bestimmung von Rauchgaskomponenten

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COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

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Foreword

This document (EN 2826:2011) has been prepared by the Aerospace and Defence Industries Association of Europe - Standardization (ASD-STAN).

After enquiries and votes carried out in accordance with the rules of this Association, this Standard has received the approval of the National Associations and the Official Services of the member countries of ASD, prior to its presentation to CEN.

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of an identical text or by endorsement, at the latest by August 2011, and conflicting national standards shall be withdrawn at the latest by August 2011.

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1 Scope

This European Standard defines a test method to determine the concentration of certain gas components due to pyrolitic decomposition of solid materials and composite materials under the influence of radiant heat only or with simultaneous flame application.

NOTE 1 The gas components in the smoke are determined according to the specific environmental and test conditions defined in EN 2824 and this standard. No studies have been made up to now to determine whether the results can be transferred to different conditions, particularly to actual fire conditions. The inhalatory toxical risk and irritancy affect cannot be assessed by merely measuring the concentration of individual gas components in the smoke.

NOTE 2 The burning behaviour and consequently the gas components in the smoke of aerospace materials are not only influenced by the type of material but also to a large extent by the configuration, the specific surface and mass, the combination with other materials, the means of joining as well as the processing technique.

NOTE 3 These influences shall be taken into account in the preparation of tests, the selection of test specimens and the interpretation of test results.

2 Normative references

The following referenced documents are indispensable for the application 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.

EN 2824, *Aerospace series — Burning behaviour of non-metallic materials under the influence of radiating heat and flames — Determination of smoke density and gas components in the smoke of materials — Test equipment apparatus and media* [1)]

EN 2825, *Aerospace series — Burning behaviour of non metallic materials under the influence of radiating heat and flames — Determination of smoke density*

EN ISO 13943:2008, *Fire safety — Vocabulary (ISO 13943:2008)*

3 Short description of the test method

3.1 General

The specimens are vertically arranged in a closed test chamber according to EN 2824 and subjected to decomposition by radiant heat with or without flame application. During the test, gas samples are taken at specified intervals from the generated decomposition products to determine the concentration of selected components.

The methods described in 3.2 and 3.4 are used to determine the gas components in the smoke.

3.2 The hydrogen chloride (HCl) taken from the test chamber can be indicated directly during the test using colorimetric tubes or analyzed by wet analysis.

3.3 Hydrogen fluoride (HF) is measured by wet analysis.

3.4 For determination of other gases, the fumes are collected in a plastic bag with a high gas-isolation value; they can be measured consecutively using colorimetric tubes.

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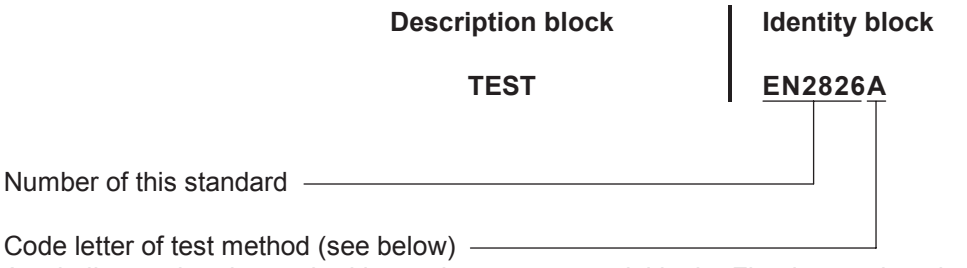
1) Published as ASD-STAN Prestandard at the date of publication of this standard by Aerospace and Defence Industries Association of Europe-Standardization (ASD-STAN), (www.asd-stan.org).

4 Terms and definitions

For the purposes of this document, the terms and definitions given in EN ISO 13943 apply.

5 Designation

EXAMPLE



A = indicates that the method is used to test a material in the Flaming mode only.
B = indicates that the method is used to test a material in both the Flaming mode and the Norm-Flaming mode.

6 Test equipment

Testing shall be carried out in a test chamber according to EN 2824.

7 Specimens

7.1 Number of specimens

According to EN 2824.

7.2 Conditioning

According to EN 2824.

7.3 Dimensions and shape of specimens

According to EN 2824.

7.4 Specimen mounting

According to EN 2824.

8 Procedure

The specimens conditioned according to EN 2824 are tested in line with the requirements of EN 2825, Clause 8; gas samples are taken according to Clauses 8 and 10. Testing may be carried out concurrently to the determination of the smoke density according to EN 2825. When the specimens are being examined for gas components in the smoke only, the requirements specified for the adjustment of the optical system are not applicable.

9 Gas sampling and analysis

9.1 General

The gas-sampling test set-up shall conform to EN 2824, Figure 9.

Unless otherwise specified, gas sampling shall be started at 4 min. If gas samples are taken during the measurement of smoke, the smoke measurement values may be affected.

The point of time indicated for the measurement means the beginning of the measurement, i. e. of the gas sampling. If the sampling period exceeds 40 s, this shall be noted separately in the test report.

9.2 Sampling by means of plastic bags

The sampling by means of plastic bags shall be carried out according to EN 2824, Figure 9.

Before starting the test, the sampling bag shall be evacuated.

The bag is introduced into the vacuum chamber and then connected to the quick release coupling on the cover. The shut-off valve on the bag is opened and the tubing between test chamber and plastic sampling bag is evacuated. Then the vacuum chamber is evacuated to a pressure of 500 hPa.

The sample is introduced into the test chamber and tested according to EN 2825. The chamber shut-off valve and the valve of the vacuum chamber are opened at the time required for starting the gas measurement. After filling of the bag, both supply line valves shall be closed. The vacuum chamber shall be ventilated by means of valve 2 [2)]. The shut-off valve 4 [2)] near the gas bag is closed, the bag is closed and disconnected from the cover. The measuring of the gases contained in the plastic bag shall be carried out within 5 h. The measurement of SO_2 shall be carried out within 5 min after the end of the sampling procedure.

9.3 Alternative sampling methods

Alternatively, to the sampling method of filling the bag in a vacuum chamber, other methods may also be appropriate, e.g. filling a sampling bag by a suitable pump.

9.4 Direct sampling using a dosing pump

Sampling to measure hydrogen chloride using colorimetric tubes is affected during the test directly from the test chamber by a dosing pump to EN 2824, 3.15.

The sampling system and the dosing pump shall be checked for leakages.

9.5 Handling of colorimetric tubes

For handling and/or preparation of the test tubes, the instructions of the manufacturer shall be observed.

2) See EN 2824, Figure 9.

9.6 Determination of halogens

9.6.1 Hydrogen chloride (using colorimetric tubes)

Immediately before starting the test, the prepared HCl test tube shall be fixed in the support of the probe in the test chamber. At the specified time after start of the test, the supply line to the gas pump shall be opened by shut-off valve and the gas pump shall be switched on. The duration of the pumping operation shall be noted.

9.6.2 Hydrogen fluoride and hydrogen chloride (potentiometric measurement; wet analysis)

9.6.2.1 Measuring method

The quantity of fluoride and chloride is measured by means of an ion specific fluoride or chloride electrode as indicator electrode and a reference electrode (e.g. silver chloride). The corresponding HF or HCl concentration is determined by means of a calibration curve. In order to plot this curve the electrode potentials of some NaF or NaCl buffer solutions with different molarity are determined and plotted in a calibration curve.

NOTE 1 When measuring HCl, the presence of sulphur may influence the test results. In this case, $Ni(NO_3)_2$ shall be added to the test solution. Care shall be taken to maintain a pH value < 3. Moreover, the electrode shall be recalibrated in the presence of $Ni(NO_3)_2$.

NOTE 2 The presence of bromide, too, substantially influences the measuring of HCl. If the material under test is suspected of containing bromide, this shall be verified by means of other measuring methods (e.g. ion chromatography).

NOTE 3 Products containing large quantities of HCN, NO, and NO_2, can affect the amount of HCl measured. It is therefore necessary to adjust the solution to a pH value of 3.

9.6.2.2 Procedure

The test set-up shall conform to EN 2824.

A scrubber according to EN 2824 is filled with 10 ml 0,1 molarity CH_3COONa, which has been adjusted to pH6, using glacial acetic acid. 1000 cm^3 of the combustion gas to be tested are passed through this liquid at a flow rate of (400 $\pm$ 50) ml/min. The scrubber location in the test chamber shall conform to EN 2824. The content of the scrubber is put into a 50 ml measuring flask and completed with distilled water, ionic strength adjuster and a buffer solution suitable to bind potentially existing metal ions [e.g. a complexing agent such as 1,2 cyclohexylene-dinitrilotetra-acetic acid (monohydrate)] up to the measuring mark.

9.6.2.3 Calculation

The HF or HCl concentration in V_{ppm} is calculated as follows:

$$V_{ppm}\,(\mathrm{HF}) = \frac{\mathrm{HF\ (molarity)} \times V\ (500\ \mathrm{ml}) \times 22{,}4 \times 10^6}{\mathrm{Quantity\ of\ absorbed\ combustion\ gas\ (1\ 000\ cm^3)}}$$

where

V_{ppm} is the gas concentration in parts, per million;

HF (molarity) is the concentration of HF in molecular weight, per litres;

V is the volume of measuring flask, in millilitres, here 50 ml.

The HF molarity (mol/l) is determined by inserting the mV readout in the calibration curve.

9.7 Determination of other gases

The measurement of other gases is affected by means of sampling bags.

The dosing pump extension hose and the sampling bag filled with flue gas are connected by means of the quick release coupling. The corresponding colorimetric tube provided for the measurement of the gas to be tested is inserted into the connector of the extension hose.

After opening of the shut-off valve on the sampling bag, testing is performed using the dosing pump.

The suitable test tube as well as the number of strokes of the dosing pump shall be selected according to the manufacturer's instructions.

9.8 After the test

After having finished the test, the sampling bag shall be discharged with the aid of the vacuum pump.

The discharged bag can be reused, however, it shall be free from soot deposits. From time to time, the plastic shut-off valve on the bag shall be cleaned with isopropanol.

9.9 Sources of errors

The notes of the test tube manufacturer regarding cross-sensitivities, permissible temperature range and other sources of error shall be observed.

Some cleaning agents for the chamber walls may affect the accuracy of the gas measurements.

10 Test report

The test report (see Annex A) shall include the following:

10.1 Complete description of the specimen material and the specimen construction (material designation, manufacturer's identification, manufacturer/supplier, manufacturing batch number, order number, construction, specimen thickness, density etc.).

10.2 Period and conditions of specimen conditioning.

10.3 Test conditions (with or without flame application).

10.4 Number of tests performed.

10.5 Indication of analytical method.

10.6 Measuring results of the individual smoke gas components in ppm after the specified time and the arithmetic mean.

10.7 Particular observations during the test.

10.8 Date of testing.

10.9 Signature.

Annex A
(normative)

Example for a test report on the determination of gas components in the smoke

Material .....

Material standard .....

Technical specification .....

Semi-finished product standard .....

Trade-mark of the product .....

Name and address of manufacturer .....

Name and address of supplier .....

Purchaser ..... Order No. .....

Delivery bill No. .....

Date of manufacture ..... Manufacturing batch No. .....

Test report No. ..... of laboratory [3] .....

Specimen construction: .....

.....

.....

Specimen conditioning: .....

.....

.....

Analytical method: .....

.....

.....

3) Only to be filled in unless if the tests are carried out in the manufacturer.

Table A.1

Gas components in the smoke to be determined according to material standard	**Specified values as per material standard after 4 min**	**Testing without flame application**		**Testing with flame application**	
		Specimen No.	Measured values in ppm after 4 min	Specimen No.	Measured values in ppm after 4 min
		Mean value		Mean value	
		Mean value		Mean value	
		Mean value		Mean value	
		Mean value		Mean value	

Observations during testing: .....

.....

.....

Notes: .....

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.....

(Signature of the inspector)

.....

(Place and date)

.....

(Stamp of the company and division)

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