

BS EN 6059-304:2017



BSI Standards Publication

# **Aerospace series — Electrical cables, installation — Protection sleeves — Test methods**

Part 304: Flammability

**National foreword**

This British Standard is the UK implementation of EN 6059-304:2017.

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

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## Aerospace series - Electrical cables, installation - Protection sleeves - Test methods - Part 304: Flammability

Série aérospatiale - Câbles électriques, installation -  
Gaines de protection - Méthodes d'essais - Partie 304:  
Résistance au feu

Luft- und Raumfahrt - Elektrische Leitungen,  
Installation - Schutzschläuche - Prüfverfahren - Teil  
304: Flammwidrigkeit

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## European foreword

This document (EN 6059-304:2017) 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of an identical text or by endorsement, at the latest by September 2017, and conflicting national standards shall be withdrawn at the latest by September 2017.

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## 1 Scope

This European Standard specifies methods for determining the flammability characteristics of protective sleeves, including heat shrink dual wall sleeves, for electric cable and cable bundles. It shall be used together with EN 6059-100.

These tests are designed to satisfy the requirements in JAR-25 Section 1, Part 1, Appendix F.

There are two methods included in this standard:

Method 1 – Applicable for textile fabric sleeves.

Method 2 – Applicable non-textile sleeves for use on electrical/ optical cables and harness components.

## 2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

EN 1057, *Copper and copper alloys — Seamless, round copper tubes for water and gas in sanitary and heating applications*

EN 3844-1, *Aerospace series — Flammability of non-metallic materials — Part 1: Small burner test, vertical — Determination of the vertical flame propagation*

EN 6059-100, *Aerospace series — Electrical cables, installation — Protection sleeves — Test methods — Part 100: General*

JAR-25, *Joint Aviation Requirements for Large Aircraft*

## 3 Preparation of specimens

### 3.1 Method 1

The specimen for fabric sleeves shall be a rectangular shape of at least 75 mm by 305 mm.

### 3.2 Method 2

A length of sleeving of at least 250 mm is to be mounted on a bundle of 7 AD 8 cables which has been covered in a copper braid <sup>1)</sup>. If necessary to ensure that the sleeve is correctly fitted it may be secured at either end by ptfе/glass ties. Figure 1.

Heat shrinkable sleeves shall be recovered onto a copper tube, Table 1, of diameter approximately one size larger than the specified maximum recovered internal diameter. The copper tube shall have a maximum wall of not greater than 1,05 mm.

The specimen shall be marked 100-105 mm from the lower end to indicate the central point for flame application.

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1) Alternatively a length of thin wall copper tube pipe could be substituted for the cable bundle.

## 4 Apparatus

### 4.1 Test chamber

Method 1: the test chamber and specimen holder is described in EN 3844-1 alternatively the chamber used for Method 2 can be utilised.

Method 2: this shall be a chamber measuring not less than 700 mm high × 300 mm wide × 300 mm deep, open at the top, open at the front and situated in a draught-free environment but with sufficient air supply to provide normal combustion. General arrangements are shown in Figures 1 and 2.

### 4.2 Burner

Bunsen type gas burner: the burner shall have a 6 mm inlet, a needle valve in the base for gas adjustment, a nominal bore of 9,5 mm and a barrel of approximately 100 mm above the air inlets. Methane, propane or natural gas may be used provided it meets the temperature requirements of 5.2.

**WARNING — NOTE** Care should be exercised in setting up and performing this test as toxic fumes may be given off during combustion. The test chamber shall be placed in a fume cabinet that will allow evacuation of gaseous products of combustion at the end of the test.

## 5 Methods

### 5.1 Method 1 – Vertical test

The specimen shall be hung vertically in the centre of the test cabinet. For fabrics, the direction of weave corresponding to the most critical flammability conditions must be parallel to the longest dimension. Each specimen must be supported vertically.

The test shall be carried out in accordance with EN 3844-1 and the flame shall be not less than 1550°F (843,33 °C) when measured in the centre of the flame

Six separate specimens shall be tested, three with application times of 12-14 s and three with application times of 60-62 s.

### 5.2 Method 2 – 60° test

The specimen shall be placed at an angle of 60° with the horizontal in the test cabinet. The specimen shall be parallel to and 150 mm from the front of the chamber. The lower end of the specimen must be held rigidly. The upper end of the specimen be retained either by attaching it to a cable which is pass over a pulley to a mass or by means of a spring anchored at the top so that the specimen is held tautly throughout the flammability test.

The burner shall be positioned so that hottest part of the flame is applied to the test mark. The burner must be mounted underneath the test mark on the specimen, perpendicular to the specimen and at an angle of 30° to the vertical plane of the specimen. See Figure 2.

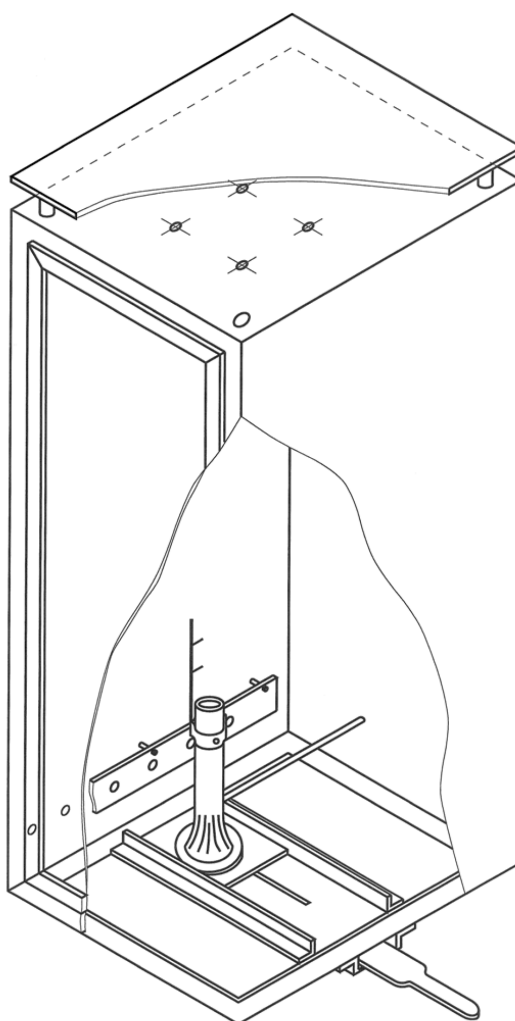
The flame shall be adjusted to provide an overall height of approximately 76 mm with an inner cone approximately one third of the flame height. The hottest part of the flame, tip of the inner cone, is to be measured with a calibrated thermocouple pyrometer, and shall be between 950 °C and 965 °C.

The flame is to be applied to the specimen for 30-32 s and on removal of the flame the maximum after burn time, burn length and the maximum time of any flaming droplets shall be recorded.

Burn length is the distance from the lowest to the highest points where the flame has caused partial or complete consumption and charring. Ignore any areas that are sooted, warped or discoloured and areas where material has shrunk or melted away from the heat source.

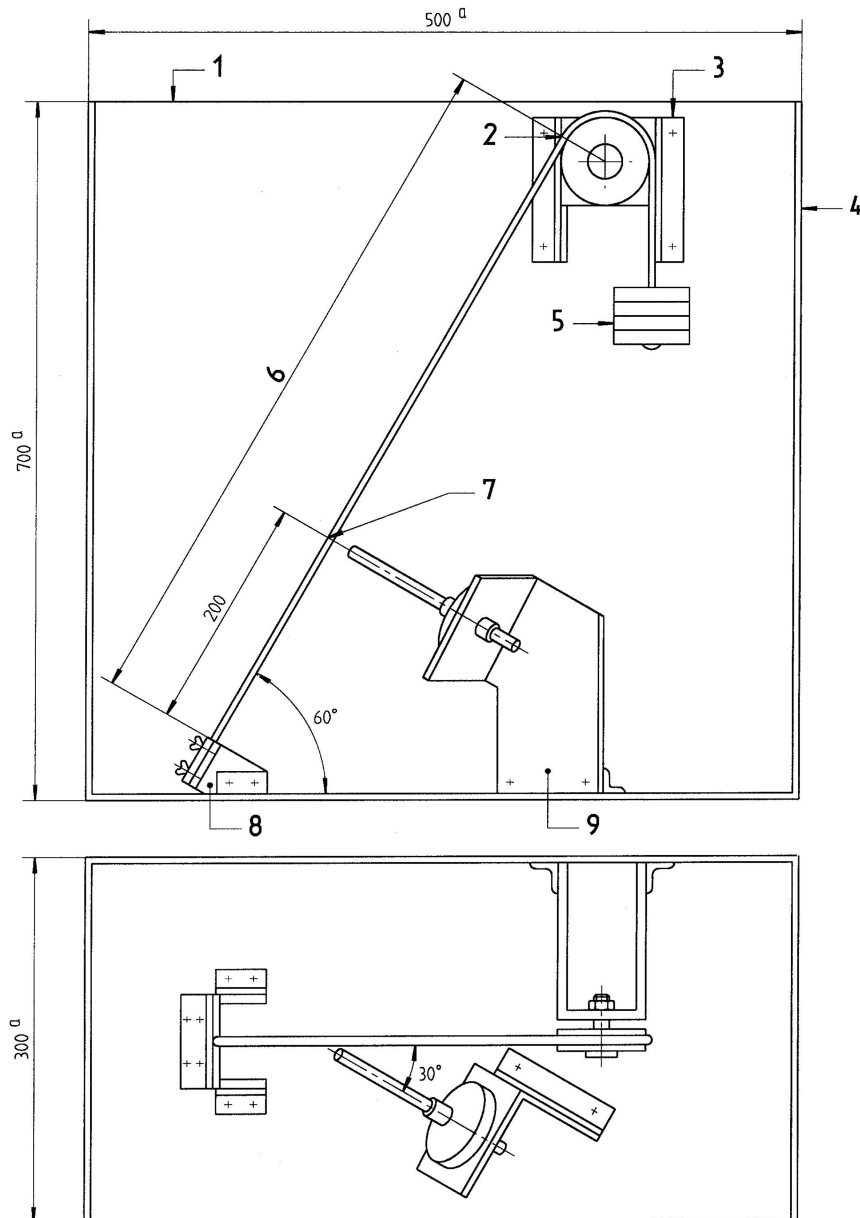
**Table 1 — Copper tube sizes (EN 1057)**

Nominal tube OD mm	6	8	10	12	15	22	28	35	42
Wall thickness mm	0,6 - 0,8	0,6 - 0,8	0,6 - 0,80	0,6 - 0,80	0,7 - 1,0	0,9 - 1,2	0,9 - 1,2	1,2 - 1,5	1,2 - 1,5



**Figure 1 — Method 1 - Vertical test**





### Key

- 1 Box construction aluminium alloy 3,15 mm
- 2 Upper datum point
- 3 Pulley support bracket (lowthermal conductivity)
- 4 Support frame open at front
- 5 Weights as required
- 6 600 mm – Distance between reference marks
- 7 Flame application point (flame centre datum)
- 8 Bottom clamp support (lowthermal conductivity)
- 9 Bunsen burner support (lowthermal conductivity)

a approx.

**Figure 2 — Method 2 - 60° test**

## 6 Requirements

A minimum of three specimens per flame application time shall be tested and results be not greater than.

### 6.1 Method 1

Application time	12 s	60 s
Maximum burn length	203 mm	152 mm
Flame extinction after burner removal	15 s	15 s
Droplets – maximum flaming after dropping	5 s	3 s

### 6.2 Method 2

The maximum burn length shall not exceed 76 mm and the maximum flame time after removal of the flame source shall not exceed 30 s. Droplets from the test specimen shall not continue to flame for more than a maximum of 3 s.

Application time	30 s
Maximum burn length	76 mm
Maximum after burn time	30 s
Maximum time of any flaming droplets	3 s



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