BRITISH STANDARD AEROSPACE SERIES

BS 3F 126:2002

35 g/m^2 nylon parachute fabric

ICS 49.025.60

Committees responsible for this British Standard

The preparation of this British Standard was entrusted to Technical Committee ACE/54, Wide fabrics and coated fabrics for aerospace purposes, upon which the following bodies were represented:

British Rubber Manufacturers' Association Ltd.

Ministry of Defence

Society of British Aerospace Companies Ltd.

Textile Finishers' Association

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Foreword

This British Standard, prepared by Technical Committee ACE/54, Wide fabrics and coated fabrics for aerospace purposes, is one of a series of specifications for textiles of a quality suitable for aerospace purposes, and is a revision of BS 2F 126:1990, which is withdrawn.

This revision updates the standard, introduces intermingled yarns and deletes the imperial units for air permeability. Quality requirements as defined in the latest edition of BS F 100 are also included, as are details of information to be supplied by the purchaser.

NOTE The latest revision of an aerospace series standard is indicated by a prefix number.

Annex A is informative and Annex B is normative.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, pages 1 to 7 and a back cover.

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1 Scope

This British Standard specifies the requirements for a range of nylon fabrics, of nominal mass per unit area of 35 g/m^2 for aerospace purposes, primarily for parachute canopies.

NOTE The information to be supplied by the purchaser in the contract or order should be as listed in Annex A.

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.

BS F 100, *Procedure for inspection and testing of textiles for aerospace purposes.*

BS EN ISO 7500-1:1999, *Metallic materials — Verification of static uniaxial testing machines — Part 1: Tension/compression testing machines — Verification and calibration of the force-measuring system.*

BS EN ISO 2061:1996, *Textiles — Determination of twist in yarns — Direct counting method.*

BS EN ISO 2062:1995, *Textiles — Yarns from packages — Determination of single-end breaking force and elongation at break.*

3 Terms and definitions

For the purposes of this British Standard, the following terms and definitions apply.

3.1
heat ageing
breaking strength lost after a specified heat treatment

NOTE This is usually expressed as a percentage of the original strength.

3.2
intermingle
impart cohesion to the filament bundle of a multifilament yarn by entwining the filaments

4 General requirements

4.1 In addition to the requirements specified in Clause **4** to Clause **11** of this standard, the requirements and tests of the latest edition of BS F 100 as specified in Table 1 shall apply.

4.2 The breaking force and elongation at break of the yarn (see **5.2**) shall be determined in accordance with BS EN ISO 2062:1995, Method A or B, except that the number of packages to be tested shall be a minimum of five, and the number of tests required to produce a package mean shall be five.

4.3 The yarn twist shall be determined in accordance with BS EN ISO 2061, except that the number of packages to be tested shall be a minimum of five, and the number of tests required to produce a package mean shall be five.

Table 1 — General requirements (given in BS F 100)

Section of BS F 100	Section title	Requirements and tests in BS F 100
1	General	All requirements
2	Quality requirements	Requirements for the manufacture of wide fabrics Requirements for dyed textiles Requirements for dimensions and tolerances, general and wide fabrics Requirements for freedom from corrosive impurities (see also section **4**) Requirements for freedom from faults in wide fabrics
3	Physical tests	Test for the determination of the number of threads in woven fabrics Test for the determination of mass of wide fabrics Tests for breaking strength and extension under force of wide fabrics Test for tearing strength Test for air permeability of parachute fabrics
4	Chemical tests	Test for water extractable matter If required by section **2** — test for pH value of aqueous extract — test for water-soluble chloride — test for water-soluble sulfate

5 Yarn

5.1 Type

The fabric shall be woven from continuous-filament, round cross-section, high-tenacity nylon 6.6 yarn manufactured from bright, heat-resistant polymer.

5.2 Properties

5.2.1 The yarn prior to twisting shall have the following properties:

a) a nominal linear density of 33 dtex[1)] and contain 10 filaments;

b) a mean breaking strength per package of not less than 170 cN, and a mean elongation at break per package not exceeding 30 %.

5.2.2 The yarn prior to twisting shall not lose more than 20 % of its original strength, when tested in accordance with the heat ageing test described in Annex B.

5.2.3 Yarn twist shall comply with the values stated in Table 2.

Table 2 — Yarn twist

Fabric designation	Yarn twist	
	Warp turns/m	**Weft** turns/m
220	Intermingled	Intermingled
254	200 ± 20	Intermingled
1312	200 ± 20	Intermingled
1316	200 ± 20	Intermingled

[1)] 1 tex = 10^{-6} kg/m.

6 Manufacture

6.1 Fabric 1316 shall be plain weave. Other fabrics shall be plain weave with a rip-stop pattern as specified in **6.2** or **6.3**.

6.2 Fabric 220 shall have ribs spaced at constant pitch. These shall be formed by two ends in the warp and two picks in the weft weaving as double threads. There shall be 14 single ends or picks respectively between the ribs.

6.3 Fabrics 254 and 1312 shall have ribs spaced at constant pitch. These shall be formed by four ends in the warp and four picks in the weft weaving as two adjacent double threads. There shall be 14 single ends or picks respectively between the ribs.

7 Finish

7.1 General

7.1.1 All fabrics shall be scoured.

7.1.2 Fabric 220 shall be supplied either:

a) undyed, subjected to a silicone treatment (see **7.4**) and calendered on both sides; or

b) dyed (see **7.2**), subjected to a silicone treatment (see **7.4**) and calendered on both sides.

7.1.3 Fabric 254 shall be supplied:

a) undyed and calendered on both sides; or

b) undyed, subjected to a silicone treatment (see **7.4**) and calendered on both sides; or

c) dyed (see **7.2**) and calendered on both sides; or

d) dyed (see **7.2**) subjected to a silicone treatment (see **7.4**) and calendered on both sides.

7.1.4 Fabric 1312 shall not be pressed or calendered and shall be supplied either:

a) undyed and subjected to a silicone treatment (see **7.4**); or

b) dyed (see **7.2**) and subjected to a silicone treatment (see **7.4**).

7.1.5 Fabric 1316 shall not be pressed or calendered and shall be supplied either:

a) undyed; or

b) dyed (see **7.2**).

7.2 Dyeing

Where dyeing is required, the colour of the fabric shall be specified either by reference to a British Standard or otherwise by pattern.

NOTE 1 An appropriate British Standard would be BS 381C:1996.

NOTE 2 The requirement for dyed fabric should be specified by the purchaser in the contract or order (see Annex A).

7.3 Calendering

Where calendering is required, the method of calendering shall be at the discretion of the finisher provided that the finished fabric complies with Table 3 and Clause **9**, and has a similar appearance on both faces.

7.4 Silicone treatment

Where silicone treatment is required, the fabric shall be treated with a non-ionic silicone emulsion, of viscosity nominally 10 000 cSt[2)] and containing 35 % silicone, to give an added nominal mass of 2 % silicone on fabric mass per unit area.

NOTE The requirement for silicone treatment should be stated by the purchaser on the contract or order (see Annex A).

[2)] 1 St = 10^{-4} m^2/s.

8 Construction and properties of finished fabric

8.1 When tested in accordance with **4.1**, the fabric in the finished state shall comply with the requirements of Table 3.

8.2 Unless otherwise stated by the purchaser in the contract or order (see Annex A):

— the minimum usable width of the finished fabric 220 shall be 1 200 mm;

— the minimum usable width of the finished fabric 254 shall be 940 mm and;

— the minimum usable width of the finished fabrics 1312 and 1316 shall be 920 mm.

NOTE The fabric may be woven in multiple widths with leno weave selvedges, and slit to yield finished fabric of the minimum usable width stipulated.

Table 3 — Construction and properties of finished fabric

Designation	Minimum number of threads per centimetre[a]		Maximum mass per unit area g/m^2	Minimum average breaking strength N/50 mm		Minimum breaking extension %		Minimum tearing strength[b] N	
	Warp	Weft		Warp	Weft	Warp	Weft	Warp	Weft
220	48	48	38	400	400	25	25	40	40
254	48	48	38	400	400	22	22	30	30
1312	48	48	38	420	420	22	22	40	40
1316	43	39	34	350	350	22	22	22	27

[a] Calculated from the number of threads in a measured length of not less than 20 mm.
[b] Warp tear means tearing across warp threads. Weft tear means tearing across weft threads.

9 Permeability

When tested in accordance with **4.1**, each piece of finished fabric shall have a mean permeability as shown in Table 4.

NOTE It is most desirable that the mean permeability of the fabric should be as near as possible to the relevant mean figure shown in Table 4, and that the variation between the individual readings should be as low as possible.

Table 4 — Permeability requirements

Fabric	Mean permeability[a]
220	350 max.
254	915 max.
1312	4 000 ± 600
1316	7 000 ± 920

[a] Mean permeability readings refer to l/(m^2·s), i.e. volume of air in litres passing through 1 m^2 of fabric in 1 s at 2.5 kN/m^2 (25.4 cm water gauge).

10 Water extractable matter

When tested in accordance with **4.1**, the amount of water extractable matter in the finished fabric shall not exceed 1.0 % by mass.

11 Identification

The fabric shall be identified for ordering purposes by the number and date of this British Standard, i.e. BS 3F 126:2002[3)], together with the relevant designation given in Table 3, if required dyed, the colour, and the finish.

NOTE This identification may be codified, e.g. fabric 254 required dyed olive drab and silicone treated may be identified as BS 3F 126:2002/254/BS 381C:1996 No. 298/silicone treated.

[3)] Marking BS 3F 126:2002 on or in relation to a product represents a manufacturer's declaration of conformity, i.e. a claim by or on behalf of the manufacturer that the product meets the requirements of the standard. The accuracy of the claim is therefore solely the responsibility of the person making the claim. Such a declaration is not to be confused with third-party certification of conformity, which may also be desirable.

Annex A (informative)
Information to be supplied by the purchaser

The following information should be stated by the purchaser in the contract or order:

a) the number of this British Standard, i.e. BS 3F 126;

b) the fabric designation from Table 3;

c) whether the fabric is required dyed or undyed (see Clause **7**);

d) whether the fabric is to be subjected to a silicone treatment (see Clause **7**);

e) the minimum usable width required (see Clause **8**).

Annex B (normative)
Heat ageing test

B.1 Principle

Specimens of yarn are heated in an oven for a specified time and temperature. The specimens are then removed from the oven, conditioned, and the breaking strength is determined. The strength lost during treatment is expressed as a percentage of the unheated yarn breaking strength as determined from unheated comparison specimens.

B.2 Apparatus

B.2.1 *Tensile testing machine*, to BS EN ISO 7500-1:1999 (Class 1 or better) and fitted with the appropriate load cell and clamps.

B.2.2 *Laboratory oven*, of suitable size, capable of providing temperatures within the range 150 °C to 250 °C with control of the selected temperature to ±2 °C.

NOTE To ensure uniform temperature distribution the oven should preferably be fitted with a fan. It is important that the oven regains the set temperature within 3 min of shutting the door, without any appreciable overshoot (not greater than 2 °C).

B.2.3 *Suitable timer.*

B.2.4 *Wrap wheel*, of 1 m circumference.

B.2.5 *Heat-resistant gloves.*

B.2.6 *Means of suspending the yarn samples in the oven*, e.g. a frame or metal rod fitted with bulldog clips.

B.2.7 *Tie-on labels.*

B.3 Conditioning and testing atmosphere

Condition all samples and carry out all tests in the standard atmosphere for testing defined in BS F 100.

B.4 Test specimens

B.4.1 Unwrap and discard the surface layers from each package to be tested.

B.4.2 Using the wrap wheel, run off from each package sufficient yarn to carry out five tests.

B.4.3 Tie the free ends together to form a skein, release the retractable arm of the wrap wheel, and remove the skein, taking care not to damage the yarn.

B.4.4 Double the skein and attach a label noting the specimen reference.

B.4.5 Repeat **B.4.2**, **B.4.3** and **B.4.4** for the unheated samples and place in the conditioning atmosphere while the first samples are heated.

B.5 Procedure

B.5.1 Set the oven temperature to (180 ± 2) °C.

B.5.2 For the yarn that is to be heated, suspend each folded skein from a bulldog clip on the rod, or from a hook on the frame.

B.5.3 When the oven is at the required temperature, open the oven door, immediately insert the rod or hook frame and close the door.

B.5.4 Start the timer.

B.5.5 After (60 ± 1) min put on heat-resistant gloves, open the oven door and remove the rod or frame.

B.5.6 Hang the skeins to condition in the standard atmosphere for testing defined in **B.3**. Condition for a minimum of 2 h.

B.5.7 Determine the breaking strength of the unheated and the heated specimens. Using one of the following sets of conditions:

a) gauge length of (250 ± 1) mm, a cross-head speed of 100 mm/min;

b) gauge length of (500 ± 1) mm, a cross-head speed of 200 mm/min.

B.5.8 Record the breaking strength in newtons to the nearest 0.1 N.

B.6 Calculation and expression of results

B.6.1 Calculate the mean breaking strength for the unheated control sample and for the heated sample in newtons.

B.6.2 Calculate the percentage strength loss as follows:

$$S_L = \frac{S_u - S_h}{S_u} \times 100$$

where

S_L is the percentage strength loss;

S_u is the mean breaking strength of unheated sample;

S_h is the mean breaking strength of heated sample.

B.7 Report

B.7.1 Report the percentage strength loss of the material tested to the nearest 0.1 %.

B.7.2 Report the test conditions used (see **B.5.7**).

Bibliography

Standards publication

BS 381C:1996, *Specification for colours for identification, coding and special purposes.*

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