BRITISH STANDARD

BS EN 13758-1:2002
Incorporating Corrigendum No. 1

Textiles — Solar UV protective properties —

Part 1: Method of test for apparel fabrics

The European Standard EN 13758-1:2001 has the status of a British Standard

ICS 59.080.30

National foreword

This British Standard is the official English language version of EN 13758-1:2001. It supersedes BS 7914:1998 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee TCI/66, Apparel, which has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible European committee any enquiries on the interpretation, or proposals for change, and keep the UK interests informed;
- monitor related international and European developments and promulgate them in the UK.

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

Cross-references

The British Standards which implement international or European publications referred to in this document may be found in the *BSI Catalogue* under the section entitled "International Standards Correspondence Index", or by using the "Search" facility of the *BSI Electronic Catalogue* or of British Standards Online.

This publication does not purport to include all the necessary provisions of a contract. Users of this publication are responsible for their correct application.

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

This British Standard, having been prepared under the direction of the Sector Policy and Strategy Committee for Materials and Chemicals, was published under the authority of the Standards Policy and Strategy Committee on 28 January 2002

Summary of pages

This document comprises a front cover, an inside front cover, the EN title page, pages 2 to 12, an inside back cover and a back cover.

The BSI copyright date displayed in this document indicates when the document was last issued.

Amendments issued since publication

Amd. No.	Date	Comments
13962 Corrigendum No. 1	18 June 2002	Correction of clause numbering for Clauses **8** and **9**

ISBN 0 580 38967 7

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 13758-1

November 2001

ICS 59.080.30; 61.020

English version

Textiles — Solar UV protective properties — Part 1: Method of test for apparel fabrics

Textiles — Propriétés de protection contre le rayonnement UV solaire — Partie 1: Méthode d'essai pour étoffes destinées à l'habillement

Textilien — Schutzeigenschaften gegen ultraviolette Sonnenstrahlung — Teil 1: Prüfverfahren für Bekleidungstextilien

This European Standard was approved by CEN on 5 October 2001.

CEN members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration. Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Management Centre or to any CEN member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CEN member into its own language and notified to the Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

EUROPEAN COMMITTEE FOR STANDARDIZATION
COMITÉ EUROPÉEN DE NORMALISATION
EUROPÄISCHES KOMITEE FÜR NORMUNG

Management Centre: rue de Stassart, 36 B-1050 Brussels

Ref. No. EN 13758-1:2001 E

Foreword

This European Standard has been prepared by Technical Committee CEN/TC 248, Textiles and textile products, the Secretariat of which is held by BSI.

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 May 2002, and conflicting national standards shall be withdrawn at the latest by May 2002.

This standard includes a normative annex A and informative annexes B and C.

According to the CEN/CENELEC Internal Regulations, the national standards organizations of the following countries are bound to implement this European Standard: Austria, Belgium, Czech Republic, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and the United Kingdom.

1 Scope

This European Standard specifies a method for the determination of the erythemally weighted ultraviolet (UV) radiation transmittance of standard conditioned apparel fabrics to assess their solar UV protective properties.

This method is not suitable for fabrics which offer protection at a distance such as umbrellas, shade structures or artificial sources.

NOTE This standard may not be appropriate for fabrics with small colour and construction variations.

2 Normative references

This European Standard incorporates, by dated or undated reference, provisions from other publications. These normative references are cited at the appropriate place in the text and the publications are listed hereafter. For dated references, subsequent amendments to or revisions of any of these publications apply to this European Standard only when incorporated in it by amendment or revision. For undated references the latest edition of the publication referred to applies (including amendments).

EN 20139:1992, *Textiles — Standard atmospheres for conditioning and testing (ISO 139:1973).*

3 Terms, definitions and abbreviations

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

3.1.1
wavelength (λ)
spatial period of radiation expressed in nanometres

3.1.2
ultraviolet radiation (UVR)
electromagnetic radiation with wavelength between 180 nm and 400 nm

UVA: ultraviolet radiation with wavelength between 315 nm and 400 nm

UVB: ultraviolet radiation with wavelength between 280 nm and 315 nm

3.1.3
solar irradiance [$E(\lambda)$]
quantity of energy emitted by the sun received at the surface of the earth per unit wavelength and per unit area. It is expressed as $W \cdot m^{-2} \cdot nm^{-1}$. The solar UVR spectrum as measured at the earth's surface extends between 290 nm and 400 nm

3.1.4
erythema
reddening of the skin caused by various physical or chemical agents

3.1.5
erythema action spectrum $\varepsilon(\lambda)$
relative erythemal effectiveness of radiation with wavelength λ

3.1.6
spectral transmittance $T(\lambda)$
ratio of transmitted radiation and incident radiation at a wavelength λ

3.1.7
integrating sphere
hollow sphere whose internal surface is a non-selective diffuse reflector

3.1.8
fluorescence
absorption of radiation of a particular wavelength and its re-emission within a short time as optical radiation of greater wavelength

3.1.9
spectral bandwidth
width in nanometres at half peak intensity of optical radiation emerging from a monochromator

3.1.10
sample recess error
error introduced when the sample is recessed from the port of the integrating sphere (e.g. by using a filter between the port and the sample). In this case part of the diffused transmitted radiation is intercepted and will not enter the sphere. The sample recess error depends on sample construction, distance of sample from port and ratio of port and illumination patch dimensions

3.1.11
shade
particular hue, depth or lightness of colour

3.1.12
construction
set of parameters such as materials, interlacing and pattern which describe the fabric

3.1.13
Ultraviolet Protection Factor (UPF)
expression of the level of protection as attained by the method described in this standard

4 Principle

The UPF of a textile material is determined from the total spectral transmittance $T(\lambda)$ as follows:

$$\text{UPF} = \frac{\sum_{\lambda=290}^{\lambda=400} E(\lambda)\varepsilon(\lambda)\Delta\lambda}{\sum_{\lambda=290}^{\lambda=400} E(\lambda)T(\lambda)\varepsilon(\lambda)\Delta\lambda}$$

with:

$E(\lambda)$: the solar irradiance (see annex A);

$\varepsilon(\lambda)$: the erythema action spectrum (see annex A);

$\Delta\lambda$: the wavelength interval of the measurements;

$T(\lambda)$: the spectral transmittance at wavelength λ.

The total spectral transmittance is measured by irradiating the sample with monochromatic or polychromatic UV radiation and collecting the total (diffuse and direct) transmitted radiation. In the case of polychromatic incident radiation, the transmitted radiation is collected monochromatically. The apparatus shall either irradiate the sample with a parallel beam and collect all transmitted radiation with an integrating sphere or irradiate the sample hemispherically and collect a parallel beam of transmitted radiation.

5 Apparatus

The measurement device consists of the following:

5.1 A UV source, providing UV radiation throughout the wavelength range 290 nm to 400 nm. Suitable UV sources include Xenon arc lamps, Deuterium lamps and Solar simulators.

5.2 An integrating sphere, having total openings representing not more than 10 % of the internal spherical surface. The internal surface shall be lined with a highly reflective matt surface, e.g. barium sulfate paint. It shall be fitted with baffles to shield the inner detector or the inner source from the specimen port and, if applicable, the sphere wall where the incident flux is measured.

5.3 A monochromator, suited for measurements with a spectral bandwidth of 5 nm or less in the wavelength region 290 nm to 400 nm.

5.4 UV transmitting filter, which transmits significantly only at wavelengths less than approximately 400 nm and which does not fluoresce.

5.5 A specimen holder to hold a specimen in a flat, tensionless or in a predefined stretched state. This device shall not obstruct the entrance port of the integrating sphere and shall ideally position the fabric in the plane of the integrating sphere port.

In the case where a parallel incident beam is used, the surface of the beam should be at least 25 mm^2 and should cover at least 3 times the repeat fabric construction. Moreover, in the case of a monochromatic incident beam and for reducing the sample recess error, the ratio of the smallest dimension of the port of the integrating sphere to the largest dimension of the illumination patch shall also be larger than 1,5. The beam should be normal to the fabric to within ±5 degrees. The angular divergence of the beam should be less than 5 degrees about the beam axis. These conditions should apply to the collected beam if diffuse illumination is used.

A suitable UV transmitting filter shall be positioned between the sample and the detector if the instrument monochromates before the sample. When this is not practical the filter shall be placed at the specimen port between the specimen and the sphere. The thickness of the UV transmitting filter shall be between 1 mm and 3 mm.

6 Preparation and conditioning of test specimens

6.1 Preparation

For uniform materials, at least 4 specimens shall be prepared. These specimens shall be as widely spaced as possible across the fabric width. The first 5 cm from each selvedge shall be discarded and samples shall not be taken closer than 1 m from the beginning or the end of the fabric piece.

For materials with areas of various shades and/or construction at least two specimens of each colour and of each texture area shall be tested.

The specimen dimensions shall be sufficient to cover the specimen aperture of the instrument.

6.2 Conditions for testing

The conditioning and testing shall be done in accordance with EN 20139:1992. If the testing instrument is not cited in these standard atmospheric conditions transportation and testing of the conditioned test specimen shall be finished within 10 min.

7 Procedure

7.1 Place the specimen to be tested before the entrance port of the integrating sphere such that the face of the fabric intended to be worn away from the skin is exposed to the UV source.

7.2 In instruments that monochromate before the sample, check for fluorescence. If a fluorescent agent is present use a UV transmitting filter and verify its effectiveness.

7.3 Record the transmittance between 290 nm and 400 nm and record the data at least every 5 nm.

8 Calculation and expression of the results

8.1 General

Calculate the arithmetic mean of the UVA transmittance (UVA_i) for each specimen i as follows:

$$\text{UVA}_i = \frac{1}{m}\sum_{\lambda=315}^{400} T_i(\lambda)$$

Calculate the arithmetic mean of the UVB transmittance (UVB_i) for each specimen i as follows:

$$\text{UVB}_i = \frac{1}{k}\sum_{\lambda=290}^{315} T_i(\lambda)$$

where:

— $T_i(\lambda)$ is the spectral transmittance of specimen i at wavelength λ;

— m and k are the number of measurement points between 315 nm and 400 nm and between 290 nm and 315 nm respectively.

These definitions are applicable only when the wavelength interval, $\Delta\lambda$, is fixed, e.g. 5 nm, during the measurements.

Calculate the Ultraviolet Protection Factor for each specimen i as follows:

$$\text{UPF}_i = \frac{\sum_{\lambda=290}^{\lambda=400} E(\lambda)\varepsilon(\lambda)\Delta\lambda}{\sum_{\lambda=290}^{\lambda=400} E(\lambda)T_i(\lambda)\varepsilon(\lambda)\Delta\lambda}$$

where:

$E(\lambda)$ = solar spectral irradiance in $\text{W}\cdot\text{m}^{-2}\ \text{nm}^{-1}$ (see annex A, Table 1)

$\varepsilon(\lambda)$ = relative erythemal effectiveness (see annex A, Table 2)

$T(\lambda)$ = spectral transmittance of specimen i at wavelength λ

$\Delta\lambda$ = wavelength step in nm

8.1.1 Uniform sample

In the case of a uniform sample, calculate the mean UPF of the sample as follows:

$$\text{UPF}_{\text{average}} = \frac{1}{n}\sum_{i=1}^{n} UPF_i$$

The standard deviation (s) of the mean UPF is given as follows:

$$s = \sqrt{\frac{\sum_{i=1}^{n}(\text{UPF}_i - \text{UPF}_{\text{average}})^2}{n-1}}$$

with n the number of specimens.

The sample UPF is given as:

$$\text{UPF} = \text{UPF}_{\text{average}} - t_{\alpha/2,\,n-1}\frac{s}{\sqrt{n}}$$

with $t_{\alpha/2,\,n\text{-}1}$ as specified in Table 1:

Table 1 — Determination of $t_{\alpha/2,\,n\text{-}1}$ for α = 0,05

Number of specimen	n-1	$t_{\alpha/2,\,n\text{-}1}$
4	3	3,18
5	4	2,77
6	5	2,57
7	6	2,44
8	7	2,36
9	8	2,30
10	9	2,26

When UPF is less than the lowest positive UPF measured for a particular specimen, then the UPF of that specimen shall be reported.

When the sample UPF is greater than 50, only “UPF > 50” need be reported.

8.1.2 Non-uniform sample either in shade and/or construction

For materials with areas of various shades and/or construction the lowest positive UPF value measured shall be reported as the sample UPF. When the sample UPF is larger than 50 only “UPF > 50” need be reported.

8.2 Accuracy of measurements

The repeatability and reproducibility standard deviation, s_r and s_R, has been determined by means of an interlaboratory trial using 14 materials tested in 8 laboratories. The $\text{UPF}_{\text{average}}$ range of the samples was between 10 and 65. Statistical analysis based on ISO 5725:1994 showed that the repeatability standard deviation (s_r) was $\text{UPF}_{\text{average}}$ independent and equal to 1,36. The reproducibility standard deviation, s_R, satisfied the following equation: $s_R = 0{,}37 + 0{,}11 \times \text{UPF}_{\text{average}}$.

9 Test report

The test report shall contain the following information:

a) a reference to this standard;

b) a complete definition of the product tested, including type, source, colour and manufacturer's reference numbers;

c) method of sampling and by which organization;

d) a complete description of the stretching and the state of the fabric, if required;

e) temperature and relative humidity;

f) the number of samples tested and if necessary a description of the sample;

g) in the case of a uniform sample the $UVA_{average}$ and $UVB_{average}$ together with their standard deviations;

h) the solar spectrum used in the calculation of the UPF;

i) the UPF for each specimen tested and in the case of a uniform sample the standard deviation of the mean UPF of the sample;

j) the UPF of the sample;

k) any deviation from this standard.

Annex A
(normative)

Solar spectral irradiance and erythemal effectiveness

A.1 Solar spectral irradiance

Table A.1 — Spectral irradiance in W·m^{-2}·nm^{-1} of the solar summer spectrum measured at Albuquerque

λ	$E(\lambda)$	λ	$E(\lambda)$	λ	$E(\lambda)$	λ	$E(\lambda)$
290	$3,090 \times 10^{-6}$	318	$2,790 \times 10^{-1}$	346	$5,340 \times 10^{-1}$	374	$6,610 \times 10^{-1}$
291	$1,579 \times 10^{-5}$	319	$2,965 \times 10^{-1}$	347	$5,355 \times 10^{-1}$	375	$6,635 \times 10^{-1}$
292	$2,850 \times 10^{-5}$	320	$3,140 \times 10^{-1}$	348	$5,370 \times 10^{-1}$	376	$6,660 \times 10^{-1}$
293	$1,602 \times 10^{-4}$	321	$3,230 \times 10^{-1}$	349	$5,480 \times 10^{-1}$	377	$7,060 \times 10^{-1}$
294	$2,920 \times 10^{-4}$	322	$3,320 \times 10^{-1}$	350	$5,590 \times 10^{-1}$	378	$7,460 \times 10^{-1}$
295	$7,860 \times 10^{-4}$	323	$3,465 \times 10^{-1}$	351	$5,740 \times 10^{-1}$	379	$7,500 \times 10^{-1}$
296	$1,280 \times 10^{-3}$	324	$3,610 \times 10^{-1}$	352	$5,890 \times 10^{-1}$	380	$7,540 \times 10^{-1}$
297	$2,325 \times 10^{-3}$	325	$4,030 \times 10^{-1}$	353	$6,010 \times 10^{-1}$	381	$6,980 \times 10^{-1}$
298	$3,370 \times 10^{-3}$	326	$4,450 \times 10^{-1}$	354	$6,130 \times 10^{-1}$	382	$6,420 \times 10^{-1}$
299	$6,005 \times 10^{-3}$	327	$4,730 \times 10^{-1}$	355	$6,080 \times 10^{-1}$	383	$6,135 \times 10^{-1}$
300	$8,640 \times 10^{-3}$	328	$5,010 \times 10^{-1}$	356	$6,030 \times 10^{-1}$	384	$5,850 \times 10^{-1}$
301	$1,612 \times 10^{-2}$	329	$5,165 \times 10^{-1}$	357	$5,705 \times 10^{-1}$	385	$6,055 \times 10^{-1}$
302	$2,360 \times 10^{-2}$	330	$5,320 \times 10^{-1}$	358	$5,380 \times 10^{-1}$	386	$6,260 \times 10^{-1}$
303	$3,355 \times 10^{-2}$	331	$5,325 \times 10^{-1}$	359	$5,510 \times 10^{-1}$	387	$6,490 \times 10^{-1}$
304	$4,350 \times 10^{-2}$	332	$5,330 \times 10^{-1}$	360	$5,640 \times 10^{-1}$	388	$6,720 \times 10^{-1}$
305	$5,770 \times 10^{-2}$	333	$5,280 \times 10^{-1}$	361	$5,820 \times 10^{-1}$	389	$7,145 \times 10^{-1}$
306	$7,190 \times 10^{-2}$	334	$5,230 \times 10^{-1}$	362	$6,000 \times 10^{-1}$	390	$7,570 \times 10^{-1}$
307	$8,435 \times 10^{-2}$	335	$5,135 \times 10^{-1}$	363	$6,240 \times 10^{-1}$	391	$7,365 \times 10^{-1}$
308	$9,680 \times 10^{-2}$	336	$5,040 \times 10^{-1}$	364	$6,480 \times 10^{-1}$	392	$7,160 \times 10^{-1}$
309	$1,154 \times 10^{-1}$	337	$5,015 \times 10^{-1}$	365	$6,830 \times 10^{-1}$	393	$6,855 \times 10^{-1}$
310	$1,340 \times 10^{-1}$	338	$4,990 \times 10^{-1}$	366	$7,180 \times 10^{-1}$	394	$6,550 \times 10^{-1}$
311	$1,545 \times 10^{-1}$	339	$5,190 \times 10^{-1}$	367	$7,400 \times 10^{-1}$	395	$6,680 \times 10^{-1}$
312	$1,750 \times 10^{-1}$	340	$5,390 \times 10^{-1}$	368	$7,620 \times 10^{-1}$	396	$6,810 \times 10^{-1}$
313	$1,940 \times 10^{-1}$	341	$5,490 \times 10^{-1}$	369	$7,640 \times 10^{-1}$	397	$7,410 \times 10^{-1}$
314	$2,130 \times 10^{-1}$	342	$5,590 \times 10^{-1}$	370	$7,660 \times 10^{-1}$	398	$8,010 \times 10^{-1}$
315	$2,280 \times 10^{-1}$	343	$5,470 \times 10^{-1}$	371	$7,580 \times 10^{-1}$	399	$9,055 \times 10^{-1}$
316	$2,430 \times 10^{-1}$	344	$5,350 \times 10^{-1}$	372	$7,500 \times 10^{-1}$	400	1,010
317	$2,610 \times 10^{-1}$	345	$5,345 \times 10^{-1}$	373	$7,055 \times 10^{-1}$		

NOTE Although other solar irradiance spectra are known (e.g. at Melbourne, Garmisch) the spectrum obtained at Albuquerque is well known and frequently used by European Dermatologists. Moreover UPF values calculated with a spectrum other than the spectrum obtained at Albuquerque do not differ substantially.

A.2 Erythemal effectiveness

Functional representation:

$\varepsilon(\lambda) = 1,0$ if 290 nm $\leq \lambda <$ 298 nm

$\varepsilon(\lambda) = 10^{0,094(298-\lambda\lambda)}$ if 298 nm $\leq \lambda <$ 328 nm

$\varepsilon(\lambda) = 10^{0,015(139-\lambda\lambda)}$ if 328 nm $\leq \lambda \leq$ 400 nm

Table A.2 — Relative erythemal effectiveness [1)]

Wavelength λ (nm)	$\varepsilon(\lambda)$
290	1,000
295	1,000
300	0,649
305	0,220
310	$0,745 \times 10^{-1}$
315	$0,252 \times 10^{-1}$
320	$0,855 \times 10^{-2}$
325	$0,290 \times 10^{-2}$
330	$0,136 \times 10^{-2}$
335	$0,115 \times 10^{-2}$
340	$0,966 \times 10^{-3}$
345	$0,810 \times 10^{-3}$
350	$0,684 \times 10^{-3}$
355	$0,575 \times 10^{-3}$
360	$0,484 \times 10^{-3}$
365	$0,407 \times 10^{-3}$
370	$0,343 \times 10^{-3}$
375	$0,288 \times 10^{-3}$
380	$0,243 \times 10^{-3}$
385	$0,204 \times 10^{-3}$
390	$0,172 \times 10^{-3}$
395	$0,145 \times 10^{-3}$
400	$0,122 \times 10^{-3}$

[1)] CIE research note: “A reference action spectrum for ultraviolet induced erythema in human skin”, A.F. McKinlay, B.L. Diffey, CIE, vol. 6, no. 1, p. 17 - 22 (1987).

Annex B
(informative)

Reference samples

Reference materials are an excellent help in checking the calibration of the instrument and the calculations. It is unfortunately very difficult to define reference textile materials because textile materials are generally not very stable with time. It is therefore recommended to select non-textile materials, such as neutral density glass filters.

Annex C
(informative)

Measurements under stretched and wet conditions

Textile materials are often worn under stretched and/or wet conditions. Under these conditions materials will offer different protection than textile materials worn under relaxed conditions. When textile materials are measured under stretched conditions the following should be kept in mind:

i) How the textile material is stretched should be clearly defined. Stretching can be obtained by applying a constant force or by applying a specified elongation. It is clear that UPF will depend on the magnitude of the force or the amount of elongation.

ii) Textile materials generally exhibit anisotropy in the elasticity. By consequence UPF measurements on materials stretched in one direction will not necessarily yield identical results in comparison with UPF measurements on the material stretched in another direction.

iii) Some textile materials will exhibit necking when stretched. The sample holder should be constructed such that this is prevented.

iv) Some textile materials will exhibit relaxation over a short or long period of time. By consequence it should be clearly mentioned in the report when the measurements were taken.

blank

BSI — British Standards Institution

BSI is the independent national body responsible for preparing British Standards. It presents the UK view on standards in Europe and at the international level. It is incorporated by Royal Charter.

Revisions

British Standards are updated by amendment or revision. Users of British Standards should make sure that they possess the latest amendments or editions.

It is the constant aim of BSI to improve the quality of our products and services. We would be grateful if anyone finding an inaccuracy or ambiguity while using this British Standard would inform the Secretary of the technical committee responsible, the identity of which can be found on the inside front cover.
Tel: +44 (0)20 8996 9000. Fax: +44 (0)20 8996 7400.

BSI offers members an individual updating service called PLUS which ensures that subscribers automatically receive the latest editions of standards.

Buying standards

Orders for all BSI, international and foreign standards publications should be addressed to Customer Services. Tel: +44 (0)20 8996 9001.
Fax: +44 (0)20 8996 7001. Email: orders@bsi-global.com. Standards are also available from the BSI website at http://www.bsi-global.com.

In response to orders for international standards, it is BSI policy to supply the BSI implementation of those that have been published as British Standards, unless otherwise requested.

Information on standards

BSI provides a wide range of information on national, European and international standards through its Library and its Technical Help to Exporters Service. Various BSI electronic information services are also available which give details on all its products and services. Contact the Information Centre.
Tel: +44 (0)20 8996 7111. Fax: +44 (0)20 8996 7048. Email: info@bsi-global.com.

Subscribing members of BSI are kept up to date with standards developments and receive substantial discounts on the purchase price of standards. For details of these and other benefits contact Membership Administration.
Tel: +44 (0)20 8996 7002. Fax: +44 (0)20 8996 7001.
Email: membership@bsi-global.com.

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsi-global.com/bsonline.

Further information about BSI is available on the BSI website at http://www.bsi-global.com.

Copyright

Details and advice can be obtained from the Copyright & Licensing Manager.
Tel: +44 (0)20 8996 7070. Fax: +44 (0)20 8996 7553.
Email: copyright@bsi-global.com.

BSI
389 Chiswick High Road
London
W4 4AL