Identification card systems — Man-machine interface

Part 3: Keypads

ICS 35.180; 35.240.15

BSi

British Standards

National foreword

This British Standard is the UK implementation of EN 1332-3:2008. It supersedes BS EN 1332-3:1999 which is withdrawn.

The UK participation in its preparation was entrusted to Technical Committee IST/17, Cards and personal identification.

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

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

Compliance with a British Standard cannot confer immunity from legal obligations.

Amendments/corrigenda issued since publication

Date	Comments

EUROPEAN STANDARD

NORME EUROPÉENNE

EUROPÄISCHE NORM

EN 1332-3

August 2008

ICS 35.240.15

English Version

Identification card systems - Man-machine interface - Part 3: Keypads

Systèmes de cartes d'identification - Interface homme-machine - Partie 3: Claviers

Identifikationskartensysteme - Schnittstelle Mensch-Maschine - Teil 3: Tastenfelder

This European Standard was approved by CEN on 18 July 2008.

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 CEN 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 CEN Management Centre has the same status as the official versions.

CEN members are the national standards bodies of Austria, Belgium, Bulgaria, Cyprus, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Italy, Latvia, Lithuania, Luxembourg, Malta, Netherlands, Norway, Poland, Portugal, Romania, Slovakia, Slovenia, Spain, Sweden, Switzerland and United Kingdom.

Contents

Page

2

Foreword

This document (EN 1332-3:2008) has been prepared by Technical Committee CEN/TC 224 "Identification card systems", the secretariat of which is held by AFNOR.

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 February 2009, and conflicting national standards shall be withdrawn at the latest by February 2009.

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. CEN [and/or CENELEC] shall not be held responsible for identifying any or all such patent rights.

This document supersedes EN 1332-3:1999.

This European Standard is one of a series of standards, under the general title "Identification card systems — Man-machine interface" and the different parts are the following:

— *Part 1 : Design principles for the user interface*

— *Part 2 : Dimensions and location of a tactile identifier for ID-1 cards*

— *Part 3 : Keypads*

— *Part 4 : Coding of user requirements for people with special needs*

— *Part 5 : Raised tactile symbols for differenciation of application on ID-1 cards*

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

Introduction

Machine readable cards facilitate the provision of a growing variety of services across Europe. The purpose of EN 1332 is to increase the accessibility of these services for the benefit of consumers. This will be achieved by facilitating the inter-sector and cross-border interoperability of machine readable cards and to do so with the maximum possible degree of user-friendliness.

EN 1332 addresses the needs of all users, including people with special needs, for example the aged, minors, the disabled, the visually impaired, those with learning difficulties, first time users and those not conversant with the local language.

EN 1332 specifies:

a) design principles for the user interface (including symbols) to be incorporated into the design of card operated devices, but not the machine operations associated with the selection and delivery of goods or services ;

b) tactile identifiers incorporated into the design of machine readable cards ;

c) standard layout for the keypads of card operated devices ;

d) coding of user requirements for people with special needs ;

e) tactile markings for differentiating cards by application.

The contents of EN 1332 are generically based, not sector specific, and cover card operated devices. It is recognised that the equipment may also be operated by other means, such as the insertion of notes and coins, but the scope of this standard has been, as indicated, narrowly defined.

Issues relating to such consumer concerns at the man-machine interface as PIN presentation are not dealt with in EN 1332.

The EN 1332 standard has been completed with CEN/TS 15291 – Guidance on design for accessible card-activated devices. This technical specification provides guidance for the design and location of card-activated devices and the immediate environment to facilitate access for the users.

1 Scope

This European Standard covers the ergonomic layout and usability of keypads. The keypad may consist of numeric, command, function and alphanumeric keys. On the basis that keypad layout impacts performance (keying speed and errors), this European Standard aims to:

— enhance usability;

— ensure ease of use through consistency;

— increase customer confidence;

— reduce customer error;

— improve operating time;

— ensure ergonomic data entry.

This European Standard specifies the arrangement, the number and location of numeric, function and command keys, including placement of alphabetic characters on numeric keys. Design recommendations are also provided.

This standard applies to all identification card systems equipped with a numeric keypad for use by the public. Personal card reading devices, such as mobile phones, are outside the scope of this standard.

This standard does not cover virtual numeric keypad on screens for PIN entry.

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 1332-1, *Identification card systems — Man-machine interface — Part 1: Design principles for the user interface*

3 Definitions

For the purposes of this document, the following definitions apply:

3.1
ergonomics
scientific discipline concerned with the understanding of interactions among human and other elements of a system, and the profession that applies theory, principles, data and methods to design in order to optimize human well-being and overall system performance

[ISO 6385:2004]

3.2
Personal Identification Number
PIN
code or password the customer possesses for verification of identity

3.3
alphanumeric keyboard
input device with many keys that includes both the letters of the alphabet and numerical digits

3.4
graphic symbol
image used to represent an object or idea

NOTE   Often placed on a key or button to signify a particular system function.

3.5
numeric keys
keys on a keyboard that contain the characters 0 to 9

3.6
function keys
set of keys in addition to the alphanumeric and command keys

NOTE   They may either have a dedicated function (hard key) or a variable function which depends on the mode of operation (soft key).

3.7
command keys
keys used in conjunction with numeric keys

NOTE   These keys ("cancel", "enter" and "clear") are described in Table 1.

3.8
disability
restriction or lack of ability to perform an activity in the manner or within the range considered normal for a human being

NOTE   Disability may be temporary.

3.9
keypad
arrangement of numeric, command and, where required, function and/or alphanumeric keys laid out in a specific manner

4   Sections of the keypad

4.1   General

There may be three sections of the keypad:

— numeric section optionally including alphabetic characters;

— command key section;

— function key section.

4.2   Numeric keys

All keypads shall provide for the entry of the decimal numeric characters 0 to 9.

The arrangement of numeric keys shall be according to Figure 1.

To assist blind and visually impaired people, the "5" key shall be identified by a suitable tactile identifier. This should be a raised dot, preferably on the key. The raised dot should be at least 0.3 mm high and its position shall not interfere with the legibility of the key legend. Other tactile identifiers or raised numerals should not be present on the numeric keys as this may be confused with function keys by blind or visually impaired people.
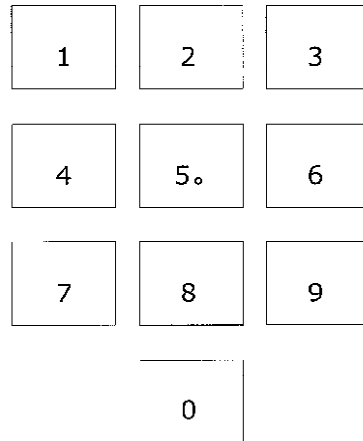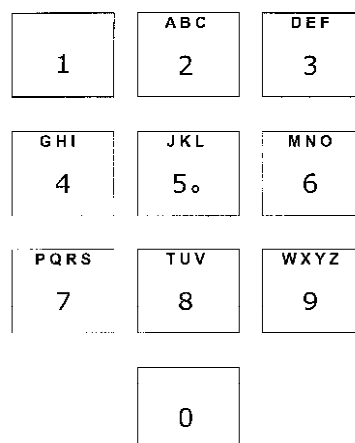

NOTE   Figure 1 is not to scale.

Figure 1 — Arrangement of numeric keys on keypad

4.3   Placement of alphabetic characters on numeric keys

Avoid alphabetic characters unless they are essential for performance of the task. If alphabetic characters are present keys should reflect the local language where the device is located. If the placement of alphabetic characters is required then they shall be placed on the numeric keys as specified on Figure 2.

NOTE   Keys 1 and 0 contain no alphabetic characters.

NOTE 1   Figure 2 is not to scale.

NOTE 2   In some circumstances it may be more appropriate to place the alphabetic characters on the casing instead on the key top.

NOTE 3   There are other alphabetic characters which may also be present on the key surface.

Figure 2 — Placement of Latin alphabetic characters on the numeric keys

4.4 Command keys

4.4.1 Generality

If command keys are required, the keys "cancel" and "enter" shall be present on a keypad as a minimum. If required, the command key "clear" may also be present.

The functional description of the command keys is as according to Table 1.

Table 1 — Functional description of command keys

Name	Description	Key colour	Key legend	Tactile symbol
Enter	Confirms an action.	Green	OK	O
Cancel	Cancels the whole transaction. If no clear key is present, its function is context dependent and it may cancel the operation in progress.	Red	X	X
Clear	Erases the numeric or alphabetic characters previously entered.	Yellow	<	<

It is recognised that the name of the command may be in local language equivalents. The initial letter should be upper case and the rest in lower case.

Other keys shall not be coloured in red, yellow or green.

4.4.2 Principles for the arrangement of command keys

When the command keys are horizontally arranged, "cancel" shall be located the furthest left, "enter" the furthest right. These keys shall be located on the bottom row of the keypad as shown in Figures 3 and 4. When the command keys are vertically arranged, "cancel" shall be the uppermost key, "enter" the lowest as shown in Figure 5. For all arrangements, the "enter" key is always located at the bottom right of the keypad.

When only "cancel" and "enter" in addition to the numeric keys are present, the keypad arrangement shall be according to Figure 3.

When "clear" is present in the horizontal layout it shall be placed between "cancel" and "enter" according to Figure 4. In the vertical layout, "clear" shall be placed just below "cancel" (see Figure 5).
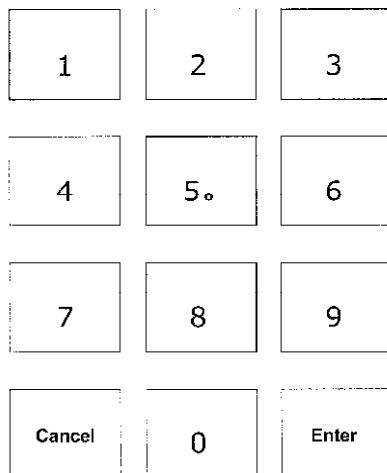
NOTE 1   Figure 3 is not to scale.

NOTE 2   The words "cancel" and "enter" refer to the function of the keys and not the key legend.
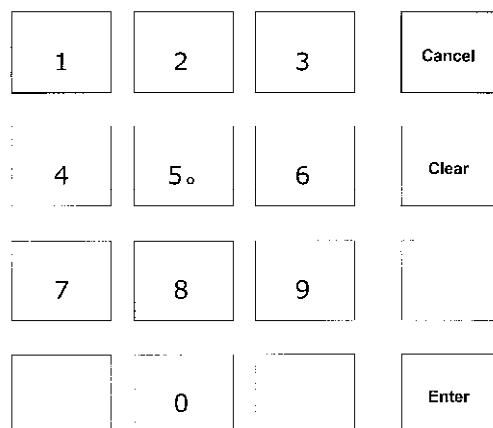
Figure 3 — Keypad layout when only numeric keys and the command keys "cancel" and "enter" are present
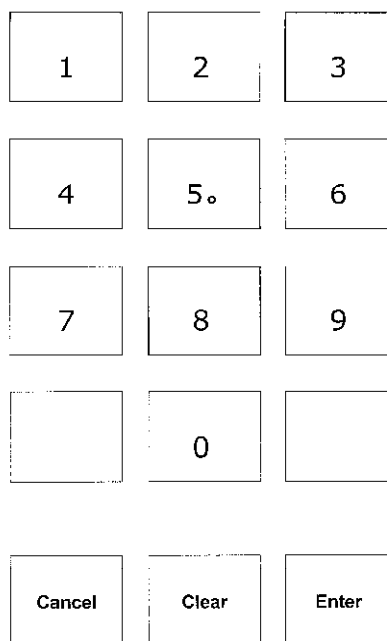
NOTE 1   Figure 4 is not to scale.

NOTE 2   The words "cancel", "clear" and "enter" refer to the function of the keys and not the key legend.

Figure 4 — Horizontal keypad layout when numeric keys and command keys "cancel" "clear" and "enter" are present

NOTE 1   Figure 5 is not to scale.

NOTE 2   The words "cancel" and "enter" refer to the function of the keys and not the key legend.

Figure 5 — Vertical keypad layout when numeric keys and command keys "cancel" "clear" and "enter" are present

NOTE   On some keypads, the "enter" key may be combined with the key above when it is not used (see Figures 4 and 5). This allows an "enter" key with a larger size.

4.5   Function keys

The number and type of function keys is dependent upon the application. Function keys may be located on the device, on the screen or adjacent to the screen. They may be dedicated to one function (hard keys) or change function according to the mode of operation (soft keys). If keys are to have a function as specified in EN 1332-1, the function shall be indicated by the relevant graphic symbol provided in EN 1332-1.

Function keys should be clearly separated from numeric and command keys in order to avoid pressing the wrong key.

NOTE   Given the number of different applications and different uses of a card reading device it is not practicable to provide a standard allocation for all functions. This is because the ergonomically correct allocation of function is dependent upon a number of factors as follows:

— intended use of system (task to be performed) ;

— sequence of use (the order in which the task is to be performed) ;

— intended user groups and their different characteristics.

Examples of functions keys are given in Annex A.

5   Recommendations for design

5.1   General design recommendations

For good design practice covering issues such as physical keypad design, feedback when depressing keys, design of key legends, etc, see the references provided in the informative Annex A.

5.2 Optical properties

5.2.1 Colour and keypad surface

Colour should be used to distinguish between different groups of keys. Colours should never be used alone to indicate vital functions, but always in addition to other modes of information such as location or shape of keys, etc. Ideally, colours used should transform into clearly discernible grey-tones on the monochrome grey-scale.

The visible surfaces of the keypad housing and the key caps shall not cause disturbing reflections. No text on the keypad surface should be printed in red, yellow or green as these are colours reserved for distinguishing command keys.

5.2.2 Contrast between characters and keys

The visual contrast between the key background colour and the colour of the legend should be as high as possible since this enhances the readability of the characters considerably.

Recommendations

— The contrast ratio between the colours of the label and of the key should be greater than 10:1.

5.2.3 Contrast between keys and casing

In order for visually impaired people to identify keys, it is recommended that there is a clear visual contrast between the keys and the casing.

Recommendations

— The contrast ratio between the colour of the keys and the colour of the casing should be greater than 3:1.

5.2.4 Illuminated keys

It could be useful to illuminate keys internally at the time the user has to press a given group of keys. This increases the legibility of the keys and guides the user to the next step.

5.3 Dimensions

5.3.1 Size of keys

Large keys are an advantage to many elderly and disabled people, because large keys can help the user press the key correctly. However, if the keys in the numeric keypad are too large it may cause problems for blind people, as it may contravene their expectations with respect to the individual key's position. Function keys may be more difficult to find and activate than numeric keys, because they are not included in the standard keypad layout. Therefore, function keys should be easy to distinguish from the numeric keypad. One way to do this is for the function keys to be larger than the numeric keys and/or to have a different shape.

Recommendations

— Where applicable, the top of numeric keys should have a surface area of 150 mm^2, with a minimum dimension in any direction of 12 mm;

— Where applicable the top of command and function keys should have a surface area of between 150 and 350 mm^2, with a minimum dimension in any direction of 12 mm.

5.3.2 The space between each key

It is easier for people with uncoordinated movements to press the correct key, and easier for blind and visually impaired people to identify each key, when there is sufficient space between the keys. There is some evidence that for the numeric keypad a slight increase in key spacing over the recommendations included in ETR 116 [3] may help the elderly and disabled people. However, this may also improve the user's keying accuracy and keying speed.

Recommendations

— The pitch of the keys (centre to centre) in the numeric keypad should be a minimum of 20 mm, and the space between keys should not be less than 25 % of the width of the key top.

5.3.3 Identification of key groups

In order to help visually impaired and blind people identify the various key groups, it is important that they can distinguish between the groups by means of a distinct tactile indication.

Recommendations

— Key groups should be separated by a clearly defined space. This space should be distinguishably larger than the inter-key space used within any of the adjacent key groups. For preference, the shape as well as the size of the keys should be used to help distinguish between the different key groups.

5.3.4 Height of characters on the keys

To improve legibility, the character should be as large as possible within the limits of the top of the keys. Alphabetic characters assigned to numeric keys should not interfere with the legibility of the numbers on the keys.

Recommendations

— The height of the characters on keys should be over 7,5 mm (upper case "X"). The lower case letter height ("x") should be no less than half of the upper case ("X") character height ;

— There should be at least 1 mm between the character and the edge of the key ;

— Sans serif typeface should be used.

5.4 Geometrical properties

5.4.1 Shape of keys

The shape of the plan view of the key does not noticeably affect the keying ability of elderly or disabled people. The key shape, in plan view, may therefore be round, square, oblong, oval, etc.

NOTE   A greater activation force is recommended for larger keys.

5.4.2 Key tops

Concave sculptured key caps are preferable as they help the finger to locate the centre of "resistance". Convex rounded key caps make the fingers slip off the keys and may cause specular reflections so that it is difficult to read the character on the top of the key. A tactile raised "dot" on the "5" key of the numeric keypad helps blind and visually impaired people locate the numeric keys.

Recommendations

— Concave sculptured key caps are preferable, and flat key caps are acceptable for outside use.

5.4.3 Key material

The material of the keys should (not cause glare and) not be slippery. Furthermore, the surface should feel smooth, so that it is comfortable when users slide their fingers over the keys.

Recommendations

— The surface of the keys should be matt, with a specular reflectance of less than 45 % and with a diffuse reflectance between 20 % and 50 %.

5.4.4 Feedback and ease of keying

Feedback shall always be given to the user when keying is performed. Feedback can be provided visually, tactually or audibly, or a combination of these. Keys with snap-action give both tactile and auditory feedback.

Recommendations

— Choose snap-action keys; i.e. when the key is activated, a noticeable "click" should be felt and heard from it. This should be as distinct as possible ;

— The key travel (press and release) should be smooth.

5.4.5 Force key activation

If keys do not activate easily (irrespective of where, on the key top the pressure is applied), people with little muscular strength may have difficulty in activating the keys. Conversely, if keys are activated too easily, mistakes are more likely to occur.

Recommendations

— For table top keypads placed in an attended environment forces used to activate keys should be between 0.5 and 0.9N. There should be no significant difference in the force required to activate a key between keys of the same group ;

— For keypads placed in an unattended environment forces used to activate keys may be between 2 and 9N depending on the key size.

5.4.6 Number and positioning of key legends

The number of legends on each key top shall be kept to a minimum. Where a key is used for a single function the legend should be centred on the key top.

6 Conformance

Equipment is in conformance with this standard if it complies with Clauses 4 and 5. There is no specific test method for testing conformance.

Any claims of conformance with this standard shall list the parts of this standard to which conformance is claimed.

7 Labelling and packaging

No special labelling or packaging is required by this standard.

Annex A
(informative)

Optional function keys that may be present

Table A.1 — Function keys

Name	Description	Key legend	Tactile symbol
Help	Request additional information	?	?
Plus	Allows the user to increase a predetermined operation parameter	+	+
Minus	Allows the user to decrease a predetermined operation parameter	-	-
Up	Scroll up (continuously or page by page)	↑	↑
Down	Scroll down (continuously or page by page)	↓	↓
Next	Action to take the user to the next step in the transaction	→	→
Back	Action to take the user to the previous step in the transaction	←	←
Decimal separator	To permit the entering of a decimal value	. or ,	
Star or asterisk	Used for telephone application located to the left of the 0 key	*	
Hash number or sharp	Used for telephone application located to the right of the 0 key	#	

NOTE 1 The key legends for the star and hash functions will be difficult to discriminate tactually unless the key is very large.

If the help key is coloured it should be blue. Any text on the key cap should be high contrasted, e.g. white on dark blue or black on light blue.

NOTE 2 The help key may also call assistance either from an attendant or a remote help desk.

Key legend and tactile symbol should be the same as long as they can be visually and tactually discriminated.

NOTE 3 Optional keys may be present on the keypad in order to enter additional special numeric characters as "00" and "000". On some keypads used for special purposes the numeric section may be complemented with additional characters such as "A" and "B", each of them being placed on one of the two free keys of Figure 1

Bibliography

[1]   BRANDT, A. (ed.), *Telephones for All, Nordic Design Guidelines*, The Nordic Committee on Disability, NNH, 1995

[2]   EN 29241 (all parts), *Ergonomic requirements for office work with visual display terminals (VDTs)*

[3]   ETR 116 (June 1994), *Human Factors (HF); Human factors guidelines for ISDN Terminal equipment design*

[4]   ETSI ES 201 381 (December 1998), *Human Factors (HF); Telecommunication keypads and keyboards: Tactile identifiers*

[5]   ETR 345 (January 1997), *Characteristics of telephone keypads and keyboards; Requirements of elderly and disabled people*

[6]   ETSI DTR/HF 02009 (1996), *Characteristics of telephone keypads*

[7]   ETSI TCR-TR 023 (1994), *Assignment of alphabetic letters to digits on push button dialling keypads*

[8]   IEC 73 (1990), *Colours of pushbuttons and their meanings*

[9]   ISO 9355-2:1999, *Ergonomic requirements for the design of displays and control actuators. Part 2: Displays*

[10]   ISO 9355-1:1999, *Ergonomic requirements for the design of displays and control actuators. Part 1: Human interactions with displays and control actuators*

[11]   ISO/IEC 9995 (all parts), *Information technology - Keyboard layouts for text and office systems*

[12]   ITU E161, *Arrangements of figures, letters and symbols on telephones*

[13]   ITU-T E.902 (1995), *Interactive services design guidelines*

        —   *Part 3 : Keypads;*

        —   *Part 4 : Keyboard requirements*

[14]   EN ISO 9241-4:1998*, Ergonomic requirements for office work with visual display terminals (VDTs) - Part 4: Keyboard requirements (ISO 9241-4:1998)*

[15]   ISO/IEC 9995-1:2006, *Information technology — Keyboard layouts for text and office systems — Part 1 : General principles governing keyboard layouts*

[16]   ISO/IEC 9995-4:2002, *Information technology — Keyboard layouts for text and office systems — Part 4 : Numeric section*

[17]   ISO/IEC 9995-6:1996, *Information technology — Keyboard layouts for text and office systems — Part 6 : Function section*

[18]   EBS 100 V3:2004, *Keyboard layout for ATM and POS PIN Entry Devices*

[19]   ISO 9564-1:2002, *Banking — Personal Identification Number (PIN) management and security — Part 1: Basic principles and requirements for online PIN handling in ATM and POS systems*

[20]   CEN/TS 15291:2006, *Identification card system — Guidance on design for accessible card-activated devices*

[21]   ISO 6385:2004, *Ergonomic principles in the design of work systems*

This page has been intentionally left 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@bsigroup.com You may also buy directly using a debit/credit card from the BSI Shop on the Website http://www.bsigroup.com/shop

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 Information Centre. Tel: +44 (0)20 8996 7111 Fax: +44 (0)20 8996 7048 Email: info@bsigroup.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@bsigroup.com

Information regarding online access to British Standards via British Standards Online can be found at http://www.bsigroup.com/BSOL

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

Copyright

Details and advice can be obtained from the Copyright and Licensing Manager. Tel: +44 (0)20 8996 7070 Email: copyright@bsigroup.com

BSI Group
Headquarters 389
Chiswick High Road,
London, W4 4AL, UK
Tel +44 (0)20 8996 9001
Fax +44 (0)20 8996 7001
www.bsigroup.com/
standards