PD IEC/TS 62702-2:2016

BSI Standards Publication

Audio archive system

Part 2: Audio data preservation

bsi.

National foreword

This Published Document is the UK implementation of IEC/TS 62702-2:2016.

The UK participation in its preparation was entrusted to Technical Committee EPL/100, Audio, video and multimedia systems and equipment.

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.

Published by BSI Standards Limited 2016

ISBN 978 0 580 86235 9
ICS 33.160.30; 35.220.30

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

This Published Document was published under the authority of the Standards Policy and Strategy Committee on 30 June 2016.

Amendments/corrigenda issued since publication

Date	Text affected

IEC TS 62702-2

Edition 1.0 2016-05

TECHNICAL SPECIFICATION

Audio archive system –
Part 2: Audio data preservation

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 33.160.30; 35.220.30

ISBN 978-2-8322-3286-6

CONTENTS

INTERNATIONAL ELECTROTECHNICAL COMMISSION

_____

AUDIO ARCHIVE SYSTEM –

Part 2: Audio data preservation

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

The main task of IEC technical committees is to prepare International Standards. In exceptional circumstances, a technical committee may propose the publication of a technical specification when

- the required support cannot be obtained for the publication of an International Standard, despite repeated efforts, or
- the subject is still under technical development or where, for any other reason, there is the future but no immediate possibility of an agreement on an International Standard.

Technical specifications are subject to review within three years of publication to decide whether they can be transformed into International Standards.

IEC 62702-2, which is a technical specification, has been prepared by technical area 6: Storage media, storage data structures, storage systems and equipment, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

The text of this technical specification is based on the following documents:

Enquiry draft	Report on voting
100/2461/DTS	100/2519/RVC

Full information on the voting for the approval of this technical specification can be found in the report on voting indicated in the above table.

A list of all parts in the IEC 62702 series, published under the general title *Audio archive system*, can be found on the IEC website.

This publication has been drafted in accordance with the ISO/IEC Directives, Part 2.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC website under "http://webstore.iec.ch" in the data related to the specific publication. At this date, the publication will be

- transformed into an International standard,
- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

A bilingual version of this publication may be issued at a later date.

INTRODUCTION

Sound recordings such as music, speech, and storytelling are an important human heritage and should be preserved whenever possible. However, we were unable to record and preserve sounds until Edison achieved the first recording in 1877. Although various technologies were invented later, most of them have a limited lifespan with respect to audio archiving because storage and sound quality deteriorates when it is transferred to the next generation storage device.

The progress of LSI technology made it possible to digitize recorded sound. The digital recording is very suitable for audio archiving because the migration is performed by copying digital data.

There can be various recording materials for this purpose, they are optical disks, magnetic disks, magnetic tape and non-volatile memories such as phase change memory.

This Technical Specification specifies physical and logical aspects for a standard of audio archives of various storage types which are typically used for audio archives in markets.

The IEC 62702 series currently consists of:

Part 1 which specifies the minimum requirements on physical aspects of optical disks for digital sound recordings. Part 1-1 specifies DVD optical disk, Part 1-2 specifies BD optical disk.

Part 2 which specifies the minimum requirements for digitization of content, format of digitised content, content information and media inspection.

AUDIO ARCHIVE SYSTEM –

Part 2: Audio data preservation

1 Scope

This part of IEC 62702, specifies the requirements for digitization of audio data for audio preservation.

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.

IEC 62227, *Multimedia home server systems – Digital rights permission code*

3 Terms and definitions

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

3.1
audio archive
archive that consists of audio data preservation

3.2
audio data preservation
data of audio stored in physical media for preservation

3.3
AIP
archival information package

3.4
dissemination
distribution of preserved audio content to users

3.5
objective media
media whose storage is based on impartial criteria

4 Objective media inspection

4.1 Criteria of the objective media

In order to objectively determine whether recorded audio content should be digitised and migrated to an archival media for long term preservation, the following criteria should be applied.

- Evaluate the availability of the media and its playback means in the long term with consideration to the format of the media; whether the media specification is internationally

standardized or publically accessible and available. If the availability is limited in its lifespan, i.e. less than the archive system's target term, then the media is worth preserving.

- Evaluate the degradation of the media. If the degradation of the media causes degradation of the reproduction, of sound, or if playback is difficult, then the media should be preserved.
- Evaluate the continuity of the organization that possesses the media to determine whether the media should be preserved.

4.2 Criteria of the archival media for preservation and dissemination

To determine what kind of media should be used for archival media for preservation and dissemination media, the following criteria should be applied.

- For archival media, evaluate the long term availability, durability and energy efficiency. However, it depends on the policy of the archive organization.
- For dissemination of media, evaluate the media format of availability, popularity, availability of reproduction devices or software. Copy protection or rights management systems are considered if the content is copyrighted. If rights management systems apply, see IEC 62227.

5 Digitization of audio content

5.1 Condition and environment

The objective media has its own original characteristics of reproduced sound quality. The condition and environment including digitise equipment should be determined to guarantee the original sound quality of audio content. The sound quality factors are:

- S/N ratio;
- frequency characteristics;
- frequency deviation (jitter, wow-flatter).

5.2 Digitization method

5.2.1 Content of analogue media

5.2.1.1 System

The digitization of analogue signals of analogue media is described in Figure 1.

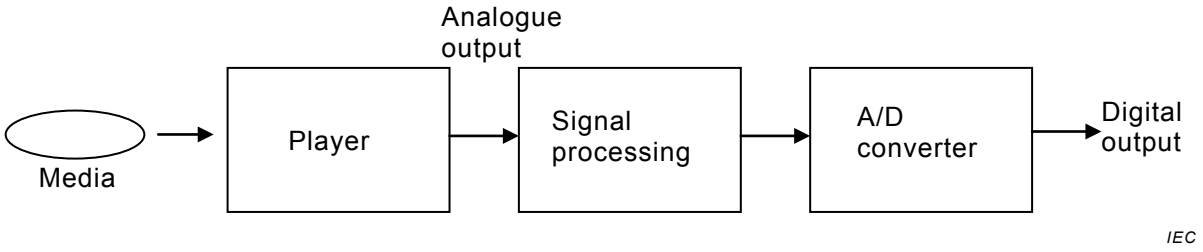

Figure 1 – Digitization of analogue signals

There are various types of signal processing methods with respect to the analogue output signal. The choice of method depends on the policy of preservation. If all signals are preserved exactly as they are, signal processing is not applied. Signal processing is used to enhance or modify audio signals. For noise reduction, or any compensation for noise of the audio signal of content, see Annex C.

5.2.1.2 Digital signal format

The player of the analogue media reproduces analogue signals. An analogue to digital converter digitises that analogue signal to digital data. The basic format of analogue to digital conversion is described in Table 1.

Table 1 – Digital signal format

Codec	Liner PCM
Sampling frequency	48 kHz or 96 kHz
Bit length	24 bit
Channels	Same as the analogue content

The sampling frequency depends on the content frequency characteristic. For instance, LP analogue records have a frequency response over 30 kHz that may be utilized for a 4 channel application, in this case 96 kHz sampling is recommended.

5.2.1.3 Audio file format

The file format for digital signals is is described in Table 2.

Table 2 – File format

File format	BWF
	RIFF/WAVE

5.2.1.4 Information of time code or address

Content of analogue media may not have a time code or address information. Mostly playing time information is provided separately by other media. Playing time, or start and end time or address of an audio track may not be provided. However, after digitization, the time code or address can be embedded in digitised content or provided separately. All information concerning time code or address of audio track of analogue media should be provided.

5.2.2 Content of digital media

5.2.2.1 System

The player of the digital media reproduces analogue and/or digital signals. If the available player has only an analogue signal output, a digital signal before an A/D converter in the player should be used as a reproduced signal. In case an available player has a digital audio signal output or interface, a reproduced signal is obtained from that.

If players have only an analogue signal output, the system is the same as the analogue system described in 5.2.1.1.

For players with digital signal outputs, the system is described in Figure 2.

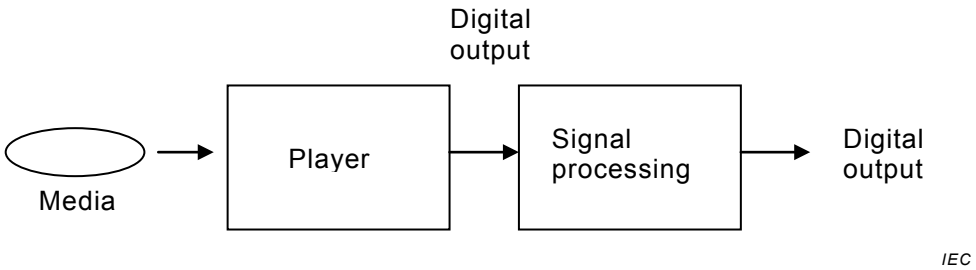

Figure 2 – Digital signal capturing

The signal processing of output signals is the same as described in 5.2.2.2.

Examples of digital signal capturing are provided in Annex A.

5.2.2.2 Format

The basic format of digital signals is described in Table 3.

Table 3 – Digital to digital conversion format

Format	Linear PCM
File format	RIFF/WAVE
Sampling frequency	Same as the source digital content
Bit length	Same as the source digital content
Channels	Same as the source digital content

5.2.2.3 Audio file format

Digital signals are stored in the file format as described in Table 4.

Table 4 – Audio file format

File format	RIFF/WAVE
	BWF

6 Inspection of digitised file and recorded media

Digitised content data is stored in the file format. Before recording to a media, the file should be inspected to ensure that digitization is completed without any defects or degradations.

The data format is WAVE or BWF, the digitised audio data is given in data chunks.

- The file format is verified.
- The data chunk is reproduced and it is ensured that the audio signal is completely digitised by a human hearing check or signal comparison of the reproduced audio signal and original audio signal.

When the file is recorded to a media for preservation, then the media should be inspected to ensure that the recording is completed. The disk media inspection is described in Annex B.

7 Reception of digitised content

The reception of digitised content is executed with information of the digitised content. The information format regarding audio content is defined by various standard developing organizations, these are used in each organization and there is no international standard commonly applicable. This Technical Specification defines the categories and information items for audio preservation. Basic requirements about the archival information package are described in Clause 8. Any information format standard can be used which includes these categories and information items.

8 Archival information package

8.1 Content information

Content information, that is information related to digitised audio content, is categorized as described in Table 5. Each category consists of information items. This Technical Specification specifies the categories and information items as an example of basic requirements, because this kind of information is specified by various standard developing organizations for their purposes. These types of information have been used in each country and organization for conventional archiving.

Table 5 – Content information

Category	Information item	Description
Information of original content	Title information	Content identification in original media, such as what part of what series
	Attribute	Title, composer, player, etc.
	Object information	Content identification
	Location information	Content location identification
Information of media of original content	Media information	Content media format identification
	Player information	Information for playback of the digitised file
Information of digitization equipment and systems	Equipment information	Used equipment and system
	Signal processing	Pre-process, post-process
	Digitiser information	Codec, sampling frequency, digitization bit length
	Integrity ID	Integrity of digitised content
Copyright information and copyright control information	Copyright information	Copyright and DRPC information
	Copyright control information	DRM information and SCMS, CGMS information

Some information items exist as non digital information such as paper documents. For digital data preservation, these non digital data should be digitised and all information is managed as metadata in digital form.

8.2 Package format for AIP

All digitized audio files, other content information and all related metadata should be packed together in a package format. MPEG-A professional archival application format (PA-AF) should be used for the package format for AIP.

If lossless compression is needed to compress the size of audio files, MPEG-4 audio lossless coding should be used along with MPEG-A PA-AF.

9 Preservation

Digitised content with information is preserved with the media. What kind of media should be used depends on the importance of its content.

IEC 62702-1-1 [1] specifies the physically required specification of DVD for audio data preservation. In this standard, the disc rank is specified that indicates the guarantee period of disc durability.

The rank specifies its guaranteed preservation years as 30 years, 60 years and over 100 years. 30 years represents a social or business period, 60 years represents an active human life period, and over 100 years is the utmost disc for any period.

Which ranked disc should be used depends on the policy of the audio archive system. For instance, factors that decide on the disc rank are:

- budget, any cost to maintain the archive;
- maintenance or renewable period of the archive.

10 Access

To enable easy and efficient access to audio archives, the following criteria are applied.

- The description of content including metadata should have a hierarchical structure. A table of content should be provided for the user's better understanding and convenience.
- Depending on the viewpoint of AAL (ambient assisted living), an audio archive should be usable for the user with visual impairments.

NOTE ANSI/NISO Z39.98 (DAISY) is one solution for users with difficulty in seeing. This is also applicable to audio archive content. Dealing with audio preservation content such as read out text, all DAISY properties are available.

11 Dissemination

11.1 Format

To disseminate preserved content, the format of preserved content may not be appropriate because the size of the file is large and may not be suitable for dissemination purposes.

Dissemination methods are streaming, file distribution and broadcasting. A format depends on each method, factors of the format are described in Table 6.

Table 6 – Dissemination format

	Streaming	File	Broadcasting
Format	Not specified	Not specified	Not specified
File format	Not specified	Not specified	Not specified
Sampling frequency	Same as original	Same as original	Same as original
Bit length	Same as digitised or less	Same as digitised or less	Same as digitised or less
Channels	Same as original	Same as original	Same as original

[1] Under consideration.

11.2 Copyright management

The preserved content has copyright and related information, this information should be bound to the content. The information system is specified in IEC 62227 as digital rights permission code. In case the content needs to be encrypted, any DRM (Digital Rights Management) method may be applied.

Annex A
(informative)

Digital signal capturing

This annex explains digital signal capturing for the purpose of audio preservation. Copy control issues of digital audio content may need to be solved between content owner and archive owner.

In case the player has a digital audio interface, a digital audio signal is output through a digital audio interface and captured, if the player has no digital audio output then the signal before a D/A converter is captured.

IEC 60958-3 is a digital audio interface standard, which is commonly used by consumer audio/video players. Professional audio/video player uses IEC 60958-4 or AES3. These standards specify the method to carry Linear PCM format data. In case of compressed audio data, the IEC 61937 series or SMPTE ST 337 and other specifications are used. Also, some players are equipped with other digital interfaces. The receiver equipment can receive digital audio interface data, output D/A converted analogue signals for reproduction, but it cannot capture digital data of this receiver equipment.

To capture digital audio data, there are two methods. One method is to capture the data before the D/A converter of the receiver equipment. This resembles the case when the player has no digital output. The other method is to process digital audio interface output signals to capture Linear PCM audio data. However, this method requires dedicated equipment.

Figure A.1 shows the capturing of digital audio signals from the D/A converter input. The capture of a D/A converter input signal is bypassed, instead it is processed to the appropriate digital audio signal format such as WAVE.

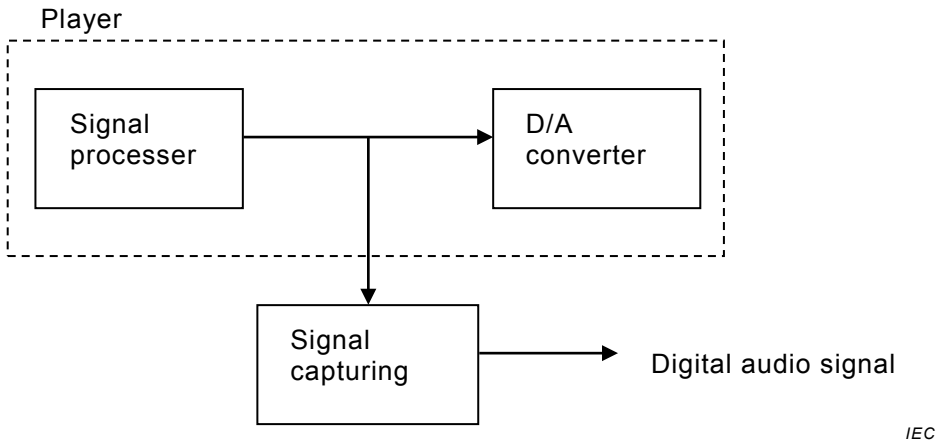

Figure A.1 – Signal capturing from the D/A converter signal

Figure A.2 shows the capturing of digital audio signals from the digital audio interface. The digital audio signal is captured form the interface output. It is processed to obtain an appropriate digital audio signal format such as WAVE.

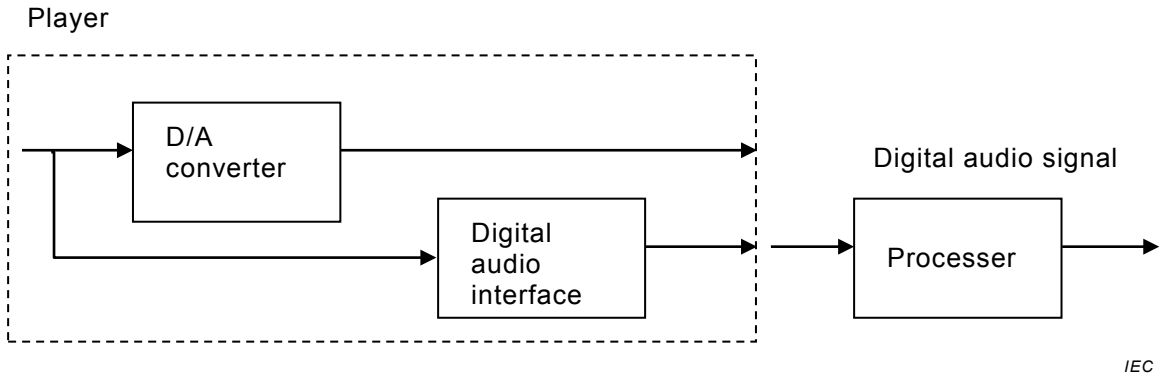

Figure A.2 – Signal capturing from the digital audio interface

Digital audio data of digital media such as CD, DAT can be captured, but digital media such as DVD, BD employs copy control, these media allow only the digital audio signal output without copy protection when audio quality is equal or under 48 kHz sampling and 16 bit length. This copy restriction is applied in order to prevent unauthorized copying. If the content owner agrees to capture high quality digital audio signals for audio preservation, copy control is deactivated with cooperation between the content owner and stake holders.

A PC can playback a CD with a CD drive, the data of a CD can be captured with the PC. CD file systems are specified in ISO 9660. A PC can capture a complete CD file system as a disc image, and can also capture only audio data to the WAVE file. Therefore, the audio data of a CD is directly captured to the disc image or the WAVE file. The disc image also contains other information than audio data such as time code, subcode.

Annex B
(informative)

Digitised content inspection in disk media

Disk media has its own nature of recording and playback characteristics. Recorded digital data should be inspected for playback to avoid any defects or artefacts, and ensured playability. The items to be inspected are described as follows.

- Visual inspection; executed by human eyes
  - Recorded layer, whether there is visual noise, defects or degrading.
- Machinery inspection; executed by the dedicated playback equipment
  - Playback
  - Noise, defects or degrading of reproduced audio signal except those from original content.

To determine whether the disc should be remade depends on the criteria that the archive system employs.

Annex C
(informative)

Treatment of content noise

The method to deal with noise, defects or degradation in original media or content depends on the concept of the archive system.

There are two cases of noise, defects or degradation, one is caused by the media and its playback system, the other is included in the original content.

The question is whether the audio preservation should record the original content before it was recorded to the media, or record the content with the media and playback system characteristics. For instance, the analogue record media and its playback system produces noise, defects or degradations which are not included in the original content. However, media and playback systems are subject to historical evolution, therefore these may be preserved as they are. Or, depending on another viewpoint, the preservation may record the original content at its best quality.

Bibliography

IEC 60958-3, *Digital audio interface – Part 3: Consumer applications*

IEC 60958-4, *Digital audio interface – Part 4: Professional applications*

IEC 61937 (all parts), *Digital audio – Interface for non-linear PCM encoded audio bitstreams applying IEC 60958*

IEC 62702-1-1, *Audio archive system – Part 1: DVD disk and data migration for long term audio data storage*[2]

ISO/IEC 14496-3, *Information technology – Coding of audio-visual objects – Part 3: Audio*

ISO/IEC 23000-6:2012, *Information technology – Multimedia application format (MPEG-A) – Part 6: Professional archival application format*

ISO 9660, *Information processing – Volume and file structure of CD-ROM for information interchange*

ISO 14721, *Space data and information transfer systems – Open archival information system (OAIS) – Reference model*

AES3-1, *AES standard for digital audio – Digital input-output interfacing – Serial transmission format for two-channel linearly-represented digital audio data – Part 1: Audio Content*

AES3-2, *AES standard for digital audio – Digital input-output interfacing – Serial transmission format for two-channel linearly-represented digital audio data – Part 2: Metadata and Subcode*

AES3-3, *AES standard for digital audio – Digital input-output interfacing – Serial transmission format for two-channel linearly-represented digital audio data – Part 3: Transport*

AES3-4, *AES standard for digital audio – Digital input-output interfacing – Serial transmission format for two-channel linearly-represented digital audio data – Part 4: Physical and electrical*

AES31-2, *AES standard on network and file transfer of audio – Audio-file transfer and exchange – File format for transferring digital audio data between systems of different type and manufacture*

EBU Tech 3285, *Specification of the broadcast wave format (BWF) – A format for audio data files in broadcasting*

SMPTE ST 337, *Format for Non-PCM Audio and Data in AES3 Serial Digital Audio Interface*

Multimedia Programming Interface and Data Specifications 1.0: 1991

ANSI/NISO Z39.98, *Authoring and Interchange Framework for Adaptive XML Publishing Specification*

_____

2 Under consideration.

This page deliberately left blank

This page deliberately left blank

British Standards Institution (BSI)

BSI is the national body responsible for preparing British Standards and other standards-related publications, information and services.

BSI is incorporated by Royal Charter. British Standards and other standardization products are published by BSI Standards Limited.

About us

We bring together business, industry, government, consumers, innovators and others to shape their combined experience and expertise into standards -based solutions.

The knowledge embodied in our standards has been carefully assembled in a dependable format and refined through our open consultation process. Organizations of all sizes and across all sectors choose standards to help them achieve their goals.

Information on standards

We can provide you with the knowledge that your organization needs to succeed. Find out more about British Standards by visiting our website at bsigroup.com/standards or contacting our Customer Services team or Knowledge Centre.

Buying standards

You can buy and download PDF versions of BSI publications, including British and adopted European and international standards, through our website at bsigroup.com/shop, where hard copies can also be purchased.

If you need international and foreign standards from other Standards Development Organizations, hard copies can be ordered from our Customer Services team.

Copyright in BSI publications

All the content in BSI publications, including British Standards, is the property of and copyrighted by BSI or some person or entity that owns copyright in the information used (such as the international standardization bodies) and has formally licensed such information to BSI for commercial publication and use.

Save for the provisions below, you may not transfer, share or disseminate any portion of the standard to any other person. You may not adapt, distribute, commercially exploit, or publicly display the standard or any portion thereof in any manner whatsoever without BSI's prior written consent.

Storing and using standards

Standards purchased in soft copy format:

- A British Standard purchased in soft copy format is licensed to a sole named user for personal or internal company use only.
- The standard may be stored on more than 1 device provided that it is accessible by the sole named user only and that only 1 copy is accessed at any one time.
- A single paper copy may be printed for personal or internal company use only.

Standards purchased in hard copy format:

- A British Standard purchased in hard copy format is for personal or internal company use only.
- It may not be further reproduced – in any format – to create an additional copy. This includes scanning of the document.

If you need more than 1 copy of the document, or if you wish to share the document on an internal network, you can save money by choosing a subscription product (see 'Subscriptions').

Reproducing extracts

For permission to reproduce content from BSI publications contact the BSI Copyright & Licensing team.

Subscriptions

Our range of subscription services are designed to make using standards easier for you. For further information on our subscription products go to bsigroup.com/subscriptions.

With **British Standards Online (BSOL)** you'll have instant access to over 55,000 British and adopted European and international standards from your desktop. It's available 24/7 and is refreshed daily so you'll always be up to date.

You can keep in touch with standards developments and receive substantial discounts on the purchase price of standards, both in single copy and subscription format, by becoming a **BSI Subscribing Member**.

PLUS is an updating service exclusive to BSI Subscribing Members. You will automatically receive the latest hard copy of your standards when they're revised or replaced.

To find out more about becoming a BSI Subscribing Member and the benefits of membership, please visit bsigroup.com/shop.

With a **Multi-User Network Licence (MUNL)** you are able to host standards publications on your intranet. Licences can cover as few or as many users as you wish. With updates supplied as soon as they're available, you can be sure your documentation is current. For further information, email subscriptions@bsigroup.com.

Revisions

Our British Standards and other publications are updated by amendment or revision.

We continually improve the quality of our products and services to benefit your business. If you find an inaccuracy or ambiguity within a British Standard or other BSI publication please inform the Knowledge Centre.

Useful Contacts

Customer Services
Tel: +44 345 086 9001
Email (orders): orders@bsigroup.com
Email (enquiries): cservices@bsigroup.com

Subscriptions
Tel: +44 345 086 9001
Email: subscriptions@bsigroup.com

Knowledge Centre
Tel: +44 20 8996 7004
Email: knowledgecentre@bsigroup.com

Copyright & Licensing
Tel: +44 20 8996 7070
Email: copyright@bsigroup.com

BSI Group Headquarters

389 Chiswick High Road London W4 4AL UK

bsi.