

**Implementation of
EN ISO/IEC 11172-4:1996**

Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s —

Part 4: Compliance testing

The European Standard EN ISO/IEC 11172-4:1996 has the status of a British Standard

ICS 35.040

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National foreword

This British Standard has been prepared by Technical Committee IST/37 and is the English language version of EN ISO/IEC 11172-4:1996 *Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s — Part 4: Compliance testing*, published by the European Committee for Standardization (CEN). It is identical with ISO/IEC 11172-4:1995 published by the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC).

This British Standard is published under the direction of the Information Systems Technology Assembly whose Technical Committee IST/37 has the responsibility to:

- aid enquirers to understand the text;
- present to the responsible international committee any enquiries on interpretation, or proposals for change, and keep UK interests informed;
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Summary of pages

This document comprises a front cover, an inside front cover, pages i and ii, the EN ISO/IEC title page, page 2, the ISO/IEC title page, pages ii to iv, pages 1 to 43 and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

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(ISO/IEC 11172-4:1995)

Technologies de l'information — Codage de l'image animée et du son associé pour les supports de stockage numérique jusqu'à environ 1,5 Mbit/s —
Partie 4: Essais de conformité
(ISO/IEC 11172-4:1995)

Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s —
Part 4: Compliance testing
(ISO/IEC 11172-4:1995)

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Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CEN member.

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Foreword

The text of the International Standard from ISO/IEC/JTC 1, Information Technology, of the International Organization for Standardization (ISO) and the International Electrotechnical Commission (IEC) has been taken over as a European Standard by CEN Technical Board.

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 August 1996, and conflicting national standards shall be withdrawn at the latest by August 1996.

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

INTERNATIONAL STANDARD

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Part 4: Compliance testing

*Technologies de l'information — Codage de l'image animée et du son
associé pour les supports de stockage numérique jusqu'à environ
1,5 Mbit/s —*

Partie 4: Essais de conformité



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Foreword

ISO (the International Organization for Standardization) and IEC (the International Electrotechnical Commission) form the specialized system for world-wide standardization. National Bodies that are members of ISO and IEC participate in the development of International Standards through technical committees established by the respective organization to deal with particular fields of technical activity. ISO and IEC technical committees collaborate in fields of mutual interest. Other international organizations, governmental and non-governmental, in liaison with ISO and IEC, also take part in the work.

In the field of information technology, ISO and IEC have established a joint technical committee, ISO/IEC JTC 1. Draft International Standards adopted by the joint technical committee are circulated to national bodies for voting. Publication as an International Standard requires approval by at least 75 % of the national bodies casting a vote.

ISO/IEC 11172 consists of the following parts, under the general title *Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s*:

- *Part 1: Systems*;
- *Part 2: Video*;
- *Part 3: Audio*;
- *Part 4: Compliance testing*.

Annex A forms an integral part of this part of ISO/IEC 11172. Annex B is for information only.

Introduction

This International Standard was prepared by ISO/IEC JTC1/SC29/WG11 also known as MPEG (Moving Pictures Expert Group). MPEG was formed in 1988 to establish an International Standard for the coded representation of moving pictures and associated audio stored on digital storage media. Parts 1, 2 and 3 of this International Standard were unanimously approved by the participating National Bodies in November 1992.

This International Standard is published in four parts. Part 1 — Systems — specifies the system coding layer of the standard. It defines a multiplexed structure for combining audio and video data and means of representing the timing information needed to replay synchronized sequences in real-time.

Part 2 — video — specifies the coded representation of video data and the decoding process required to reconstruct pictures. Part 3 — audio — specifies the coded representation of audio data and the decoding process required to reconstruct audio. Part 4 — compliance testing — specifies procedures to determine characteristics of coded bitstreams and to test compliance of bitstreams and decoders with the requirements specified in parts 1, 2 and 3.

Parts 1, 2 and 3 of ISO/IEC 11172 specify a multiplex structure and coded representations of audiovisual information. Parts 1, 2 and 3 of ISO/IEC 11172 allow for large flexibility, achieving suitability of this International Standard for many different applications. The flexibility is obtained by including parameters in the bitstream that define the characteristics of coded bitstreams. Examples are the audio sampling frequency, picture size, picture rate and bitrate parameters.

This part of ISO/IEC 11172 specifies how tests can be designed to verify whether bitstreams and decoders meet the requirements as specified in parts 1, 2 and 3 of ISO/IEC 11172. These tests can be used for various purposes such as:

- manufacturers of encoders, and their customers, can use the tests to verify whether the encoder produces valid bitstreams.
- manufacturers of decoders and their customers can use the tests to verify whether the decoder meets the requirements specified in parts 1, 2 and 3 of ISO/IEC 11172 for the claimed decoder capabilities.
- applications can use the tests to verify whether the characteristics of a given bitstream meet the application requirements, for example whether the size of the coded picture does not exceed the maximum value allowed for the application.

Section 1. General

1.1 Scope

This part of ISO/IEC 11172 specifies how tests can be designed to verify whether bitstreams and decoders meet requirements specified in parts 1, 2 and 3 of ISO/IEC 11172. In this part of ISO/IEC 11172, encoders are not addressed specifically. An encoder is entitled to be an ISO/IEC 11172 encoder if it generates bitstreams compliant with the syntactic and semantic bitstream requirements specified in parts 1, 2 and 3 of ISO/IEC 11172.

Characteristics of coded bitstreams and decoders are defined for parts 1, 2 and 3 of ISO/IEC 11172. The characteristics of a bitstream define the subset of the standard that is exploited in the bitstream. Examples are the applied values or range of the picture size and bitrate parameters. Decoder characteristics define the properties and capabilities of the applied decoding process. An example of a property is the applied arithmetic accuracy. The capabilities of a decoder specify which coded bitstreams the decoder can decode and reconstruct, by defining the subset of the standard that may be exploited in decodable bitstreams. A bitstream can be decoded by a decoder if the characteristics of the coded bitstream are within the subset of the standard specified by the decoder capabilities.

Procedures are described for testing compliance of bitstreams and decoders to the requirements defined in parts 1, 2 and 3 of ISO/IEC 11172. Given the set of characteristics claimed, the requirements that must be met are fully determined by parts 1, 2 and 3 of ISO/IEC 11172. This part of ISO/IEC 11172 summarizes the requirements, cross references them to characteristics, and defines how compliance with them can be tested. Guidelines are given how to construct tests and determine their outcome. Some actual tests are defined only for audio.

1.2 Normative references

The following International Standards contain provisions which, through reference in this text, constitute provisions of this part of ISO/IEC 11172. At the time of publication, the editions indicated were valid. All standards are subject to revision, and parties to agreements based on this part of ISO/IEC 11172 are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

ISO/IEC 11172-1:1993, *Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s — Part 1: Systems.*

ISO/IEC 11172-2:1993, *Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s — Part 2: Video.*

ISO/IEC 11172-3:1993, *Information technology — Coding of moving pictures and associated audio for digital storage media at up to about 1,5 Mbit/s — Part 3: Audio.*

CCIR Recommendation 601-2, *Encoding parameters of digital television for studios.*

CCIR Report 624-4, *Characteristics of systems for monochrome and colour television.*

CCIR Recommendation 648, *Recording of audio signals.*

CCIR Report 955-2, *Sound broadcasting by satellite for portable and mobile receivers, including Annex IV Summary description of Advanced Digital System II.*

CCITT Recommendation J.17, *Pre-emphasis used on Sound-Programme Circuits.*

IEEE Draft Standard P1180/D2 1990, *Specification for the implementation of 8×8 inverse discrete cosine transform*”.

IEC publication 908:1987, *CD Digital Audio System.*

Section 2. Technical elements

2.1 Definitions

For the purposes of this part of ISO/IEC 11172, the following definitions apply. If the definition is specific to a part, this is noted in square brackets.

2.1.1

ac coefficient [video]

any DCT coefficient for which the frequency in one or both dimensions is non-zero

2.1.2

access unit [system]

in the case of compressed audio an access unit is an audio access unit. In the case of compressed video an access unit is the coded representation of a picture

2.1.3

adaptive segmentation [audio]

a subdivision of the digital representation of an audio signal in variable segments of time

2.1.4

adaptive bit allocation [audio]

the assignment of bits to subbands in a time and frequency varying fashion according to a psychoacoustic model

2.1.5

adaptive noise allocation [audio]

the assignment of coding noise to frequency bands in a time and frequency varying fashion according to a psychoacoustic model

2.1.6

alias [audio]

mirrored signal component resulting from sub-Nyquist sampling

2.1.7**analysis filterbank [audio]**

filterbank in the encoder that transforms a broadband PCM audio signal into a set of subsampled subband samples

2.1.8**audio access unit [audio]**

for Layers I and II an audio access unit is defined as the smallest part of the encoded bitstream which can be decoded by itself, where decoded means “fully reconstructed sound”. For Layer III an audio access unit is part of the bitstream that is decodable with the use of previously acquired main information

2.1.9**audio buffer [audio]**

a buffer in the system target decoder for storage of compressed audio data

2.1.10**audio sequence [audio]**

a non-interrupted series of audio frames in which the following parameters are not changed:

- ID
- Layer
- Sampling Frequency
- For Layer I and II: Bitrate index

2.1.11**backward motion vector [video]**

a motion vector that is used for motion compensation from a reference picture at a later time in display order

2.1.12**bark [audio]**

unit of critical band rate. The Bark scale is a non-linear mapping of the frequency scale over the audio range closely corresponding with the frequency selectivity of the human ear across the band

2.1.13**bidirectionally predictive-coded picture; B-picture [video]**

a picture that is coded using motion compensated prediction from a past and/or future reference picture

2.1.14**bitrate**

the rate at which the compressed bitstream is delivered from the storage medium to the input of a decoder

2.1.15**bitstream characteristics [compliance]**

the subset of the standard that is exploited by the encoder in generating the bitstream. For example, an encoder may apply syntactic and semantic constraints, such as restricted ranges of parameters, to produce a bitstream that exploits a subset of the capabilities supported by parts 1, 2 and 3 of ISO/IEC 11172. Examples are the applied values or range of the picture size and bitrate parameters in video bitstreams

2.1.16**bitstream compliance [compliance]**

a bitstream is compliant, if the bitstream meets the syntactic and semantic bitstream requirements, specified in the normative clauses of parts 1, 2 and 3 of ISO/IEC 11172

2.1.17**bitstream requirements [compliance]**

requirements for bitstreams defined in the normative clauses of parts 1, 2 and 3 of ISO/IEC 11172

2.1.18**block companding [audio]**

normalizing of the digital representation of an audio signal within a certain time period

2.1.19

block [video]

an 8-row by 8-column orthogonal block of pels

2.1.20

bound [audio]

the lowest subband in which intensity stereo coding is used

2.1.21

byte aligned

a bit in a coded bitstream is byte-aligned if its position is a multiple of 8-bits from the first bit in the stream

2.1.22

byte

sequence of 8-bits

2.1.23

channel

a digital medium that stores or transports an ISO/IEC 11172 stream

2.1.24

channel [audio]

the left and right channels of a stereo signal

2.1.25

chrominance (component) [video]

a matrix, block or single pel representing one of the two colour difference signals related to the primary colours in the manner defined in CCIR Rec 601. The symbols used for the colour difference signals are Cr and Cb

2.1.26

coded audio bitstream [audio]

a coded representation of an audio signal as specified in ISO/IEC 11172-3

2.1.27

coded video bitstream [video]

a coded representation of a series of one or more pictures as specified in ISO/IEC 11172-2

2.1.28

coded order [video]

the order in which the pictures are stored and decoded. This order is not necessarily the same as the display order

2.1.29

coded representation

a data element as represented in its encoded form

2.1.30

coding parameters [video]

The set of user-definable parameters that characterize a coded video bitstream. Bitstreams are characterized by coding parameters. Decoders are characterized by the bitstreams that they are capable of decoding

2.1.31

component [video]

a matrix, block or single pel from one of the three matrices (luminance and two chrominance) that make up a picture

2.1.32

compression

reduction in the number of bits used to represent an item of data

2.1.33**constant bitrate coded video [video]**

a compressed video bitstream with a constant average bitrate

2.1.34**constant bitrate**

operation where the bitrate is constant from start to finish of the compressed bitstream

2.1.35**constrained parameters [video]**

the values of the set of coding parameters defined in 2.4.3.2 of ISO/IEC 11172-2

2.1.36**constrained system parameter stream (CSPS) [system]**

an ISO/IEC 11172 multiplexed stream for which the constraints defined in 2.4.6 of this part of ISO/IEC 11172 apply

2.1.37**CRC**

cyclic redundancy code

2.1.38**critical band rate [audio]**

psychoacoustic function of frequency. At a given audible frequency it is proportional to the number of critical bands below that frequency. The units of the critical band rate scale are Barks

2.1.39**critical band [audio]**

psychoacoustic measure in the spectral domain which corresponds to the frequency selectivity of the human ear. This selectivity is expressed in Bark

2.1.40**data element**

an item of data as represented before encoding and after decoding

2.1.41**dc-coefficient [video]**

the DCT coefficient for which the frequency is zero in both dimensions

2.1.42**dc-coded picture; D-picture [video]**

a picture that is coded using only information from itself. Of the DCT coefficients in the coded representation, only the dc-coefficients are present

2.1.43**DCT coefficient**

the amplitude of a specific cosine basis function

2.1.44**decoded stream**

the decoded reconstruction of a compressed bitstream

2.1.45**decoder characteristics [compliance]**

the properties and capabilities of the decoding process applied in the decoder

2.1.46**decoder compliance [compliance]**

a decoder is compliant, if the decoder meets the decoder requirements, specified in the normative clauses of parts 1, 2 and 3 of ISO/IEC 11172, to decode compliant bitstreams within the subset of the standard defined by the specified capabilities of the decoder

2.1.47

decoder input buffer [video]

the first-in first-out (FIFO) buffer specified in the video buffering verifier

2.1.48

decoder input rate [video]

the data rate specified in the video buffering verifier and encoded in the coded video bitstream

2.1.49

decoder

an embodiment of a decoding process

2.1.50

decoding (process)

the process defined in ISO/IEC 11172 that reads an input coded bitstream and produces decoded pictures or audio samples

2.1.51

decoder requirements [compliance]

requirements for decoders defined in the normative clauses of parts 1, 2 and 3 of ISO/IEC 11172

2.1.52

decoding time-stamp; DTS [system]

a field that may be present in a packet header that indicates the time that an access unit is decoded in the system target decoder

2.1.53

de-emphasis [audio]

filtering applied to an audio signal after storage or transmission to undo a linear distortion due to emphasis

2.1.54

dequantization [video]

the process of rescaling the quantized DCT coefficients after their representation in the bitstream has been decoded and before they are presented to the inverse DCT

2.1.55

digital storage media; DSM

a digital storage or transmission device or system

2.1.56

discrete cosine transform; DCT [video]

either the forward discrete cosine transform or the inverse discrete cosine transform. The DCT is an invertible, discrete orthogonal transformation. The inverse DCT is defined in Annex A of ISO/IEC 11172-2

2.1.57

display order [video]

the order in which the decoded pictures should be displayed. Normally this is the same order in which they were presented at the input of the encoder

2.1.58

dual channel mode [audio]

a mode, where two audio channels with independent programme contents (e.g. bilingual) are encoded within one bitstream. The coding process is the same as for the stereo mode

2.1.59

editing

the process by which one or more compressed bitstreams are manipulated to produce a new compressed bitstream. Conforming edited bitstreams must meet the requirements defined in ISO/IEC 11172

2.1.60**elementary stream [system]**

a generic term for one of the coded video, coded audio or other coded bitstreams

2.1.61**emphasis [audio]**

filtering applied to an audio signal before storage or transmission to improve the signal-to-noise ratio at high frequencies

2.1.62**encoder**

an embodiment of an encoding process

2.1.63**encoding (process)**

a process, not specified in ISO/IEC 11172, that reads a stream of input pictures or audio samples and produces a valid coded bitstream as defined in ISO/IEC 11172

2.1.64**entropy coding**

variable length lossless coding of the digital representation of a signal to reduce redundancy

2.1.65**fast forward playback [video]**

the process of displaying a sequence, or parts of a sequence, of pictures in display-order faster than real-time

2.1.66**FFT**

Fast Fourier Transformation. A fast algorithm for performing a discrete Fourier transform (an orthogonal transform)

2.1.67**filterbank [audio]**

a set of band-pass filters covering the entire audio frequency range

2.1.68**fixed segmentation [audio]**

a subdivision of the digital representation of an audio signal into fixed segments of time

2.1.69**forbidden**

the term “forbidden” when used in the clauses defining the coded bitstream indicates that the value shall never be used. This is usually to avoid emulation of start codes

2.1.70**forced updating [video]**

the process by which macroblocks are intra-coded from time-to-time to ensure that mismatch errors between the inverse DCT processes in encoders and decoders cannot build up excessively

2.1.71**forward motion vector [video]**

a motion vector that is used for motion compensation from a reference picture at an earlier time in display order

2.1.72**frame [audio]**

a part of the audio signal that corresponds to audio PCM samples from an audio access unit