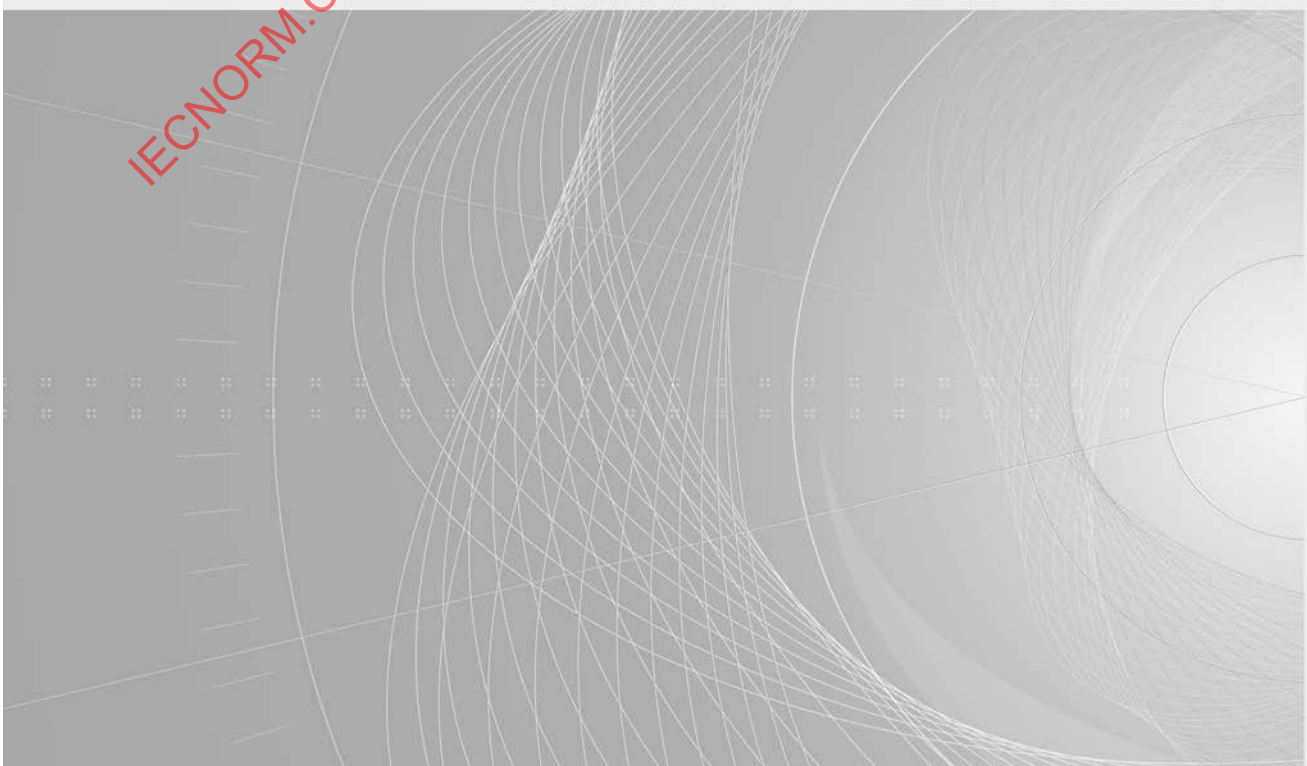
IEC TS 62312-1-1

Edition 2.0 2018-11

TECHNICAL SPECIFICATION

Guideline for synchronization of audio and video –
Part 1-1: Measurement methods for synchronization of audio and video equipment and systems – General



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Guideline for synchronization of audio and video – Part 1-1: Measurement methods for synchronization of audio and video equipment and systems – General

INTERNATIONAL ELECTROTECHNICAL COMMISSION

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

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GUIDELINE FOR SYNCHRONIZATION OF AUDIO AND VIDEO –

Part 1-1: Measurement methods for synchronization of audio and video equipment and systems – General

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

IEC TS 62312-1, which is a technical specification, has been prepared by technical area 11: Quality for audio, video and multimedia systems, of IEC technical committee 100: Audio, video and multimedia systems and equipment.

This second edition cancels and replaces the first edition published in 2008. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

a) new Annex B informs of general measurement and test method of audio latency;

b) comments from SMPTE (including small technical issues).

The text of this Technical Specifications is based on the following documents:

Enquiry draft	Report on voting
100/3048/DTS	100/3105/RVDTS

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.

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

The list of all the parts of IEC 62312, published under the general title *Guideline for synchronization of audio and video*, can be found on the IEC website.

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

Audio and video equipment processes or reproduces the input signals of audio and video, then outputs these signals in various forms. Audio and video equipment needs time to process or reproduce the input signal. This time depends on the signal format, the architecture of the equipment and the design of the equipment. Hence, audio and video equipment may have different output delays for audio and video signals, and this causes unsynchronised audio and video outputs.

This Technical Specification is the general part of the measurement method for that time difference between audio and video outputs. The other parts of IEC 62312-1 describe specific measurement methods for specific audio and video equipment.

GUIDELINE FOR SYNCHRONIZATION OF AUDIO AND VIDEO –

Part 1-1: Measurement methods for synchronization of audio and video equipment and systems – General

1 Scope

The IEC 62312 series gives guidelines for methods of synchronizing audio and video.

This part of IEC 62312-1 describes general measurement methods for the synchronization of audio and video equipment.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements 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.

IEC TS 62312-2:2018, *Guideline for synchronization of audio and video – Part 2: Methods for synchronization of audio and video systems*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

No terms and definitions are listed in this document.

ISO and IEC maintain terminological databases for use in standardization at the following addresses:

- IEC Electropedia: available at http://www.electropedia.org/
- ISO Online browsing platform: available at http://www.iso.org/obp

3.2 Abbreviated terms

EUT equipment under test

4 Measuring conditions

4.1 General conditions

4.1.1 Power supplies

4.1.1.1 Voltage

The supplied AC power voltage shall be the fixed value of the region where the equipment under test is used. The supplied DC power voltage shall be the fixed value specified by the manufacturer. The tolerance shall be within ±1 % in both cases. If this tolerance does not affect the results of measurement, the tolerance can be within ±5 %.

4.1.1.2 Frequency

The frequency of the AC power supply shall be 50 Hz or 60 Hz and the fluctuation shall be within ±2 %.

4.1.1.3 Waveform distortion

4.1.1.3.1 AC power supply

The waveform of the AC power supply shall be a sine wave in which the harmonic content is 2 % or less.

4.1.1.3.2 DC power supply

The ripple voltage shall be 0,1 % or less.

4.1.2 Environmental conditions

4.1.2.1 Environmental air condition

The environmental conditions for measurements shall be:

Ambient temperature: 20^{+15}_{-5} °C

Relative humidity: 60 % ± 15%

Air pressure: 96 kPa ± 10 kPa

4.1.2.2 Warm up

The equipment under test shall be powered on 5 min before starting the test. It may be zero if the warm up does not affect the results of the measurement.

4.1.2.3 Initialization

The equipment under test shall be initialized before starting the test.

4.2 Specific conditions

If specific conditions are required for the measurement of the equipment, those conditions shall be specified.

NOTE IEC TS 62312-2 specifies the measurement method for the specific equipment; the special conditions are specified in that part.

4.3 General settings

General settings for equipment shall be set to the default setting, which is specified by the manufacturer, normally the centre position. If there is no special indication about the functions that affect the results of measurement of sychronization, all controllers shall be switched off.

4.4 Specific settings

If a piece of equipment has its own specific settings, it shall be set to have the results of measurements related to those specific settings.

5 Measurement methods

5.1 General block diagram

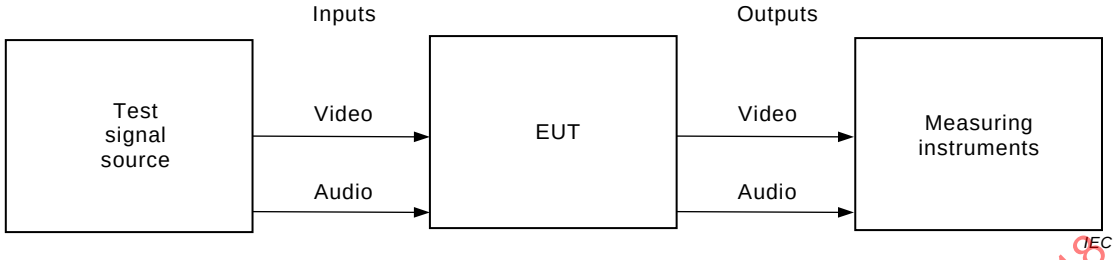

Figure 1 – General block diagram for measurement

The test signal source provides the reference audio and video signal. There is either no time difference between them or the difference is specified. These audio and video test signals are applied to the EUT in the appropriate method for each EUT. The EUT reproduces or processes these test signals and outputs the audio and video signals. The measuring instruments measure the output from the EUT and measure the time difference between audio and video outputs from the EUT.

The test signal source outputs the signal in a format that should be suitable for the EUT to process.

In the case that the EUT, such as an audio amplifier, reproduces no video signal, general measurement and the test method of audio latency is available as described in Annex B.

5.2 Test signal source and test signal

5.2.1 General

The test signal source provides audio and video test signals as a reference signal for measuring. The content, format and media of the test signal are different depending on the EUT.

The basic format of the test signal content consists of synchronized audio and video signals that are used as a reference for synchronization and are processed or reproduced by the EUT. The EUT outputs the resulting signal to the measuring instruments. The output signal should be detectable and be able to be measured by the measuring instruments. To conform to this requirement, the test signal content should be made suitable for the measuring instruments.

The form of the test signal is an electrical signal or a signal recorded on media. The format and media of the test signal should be appropriate for the EUT. This would normally be the default format and media appropriate to the functionality of the EUT.

5.2.2 Signal generator

Where a signal generator is applied to an EUT that has a signal input, the format of the output signal of the signal generator should be appropriate for the EUT. The signal will be input through an appropriate signal interface on the EUT.

5.2.3 Test disc

Where a test disc is applied to an EUT that is a disc player, the test disc format should be appropriate for the EUT.

5.3 EUT

5.3.1 Equipment

5.3.1.1 General

In this document, the EUT is an audio and video device that consists of audio and video units. Each unit includes latency and delay. The model of the audio and video device is defined in IEC TS 62312-2.

Figure 2 shows a simplified model of the audio and video device based on the definition of IEC TS 62312-2.

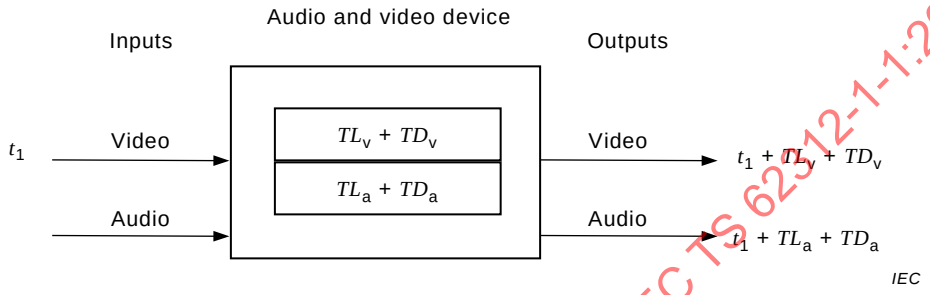

Figure 2 – Audio and video device

The total latency and the delay of the audio and video device are defined.

TL_v: total latency of video

TD_v: total delay of video

TL_a: total latency of audio

TD_a: total delay of audio

Latency and delay are defined for this series, IEC 62312, in Clause 3 of IEC TS 62312-2:2018.

The audio and video device reproduces or processes the input signal, and this causes delay and latency. Between the input and the output, the total delay and the total latency are induced in each of the audio and video signals. The audio and video signals are input to the audio and video device at the time t_1; the total latency and delay are added to the time t_1.The outputs from the source device are audio and video signals in analogue or digital form.

The purpose of this Technical Specification is measurement of the total latency and delay; the assessment of them is specified by the other specifications as described in Annex A.

5.3.1.2 Category of audio and video device

5.3.1.2.1 Source device

Audio and video devices are categorized into specific types of devices.

Figure 3 shows the source device and the signal source that is the input to the source device. The signal source can be in various forms. In the case of a disc player, the disc is the signal source. In the case of a tuner, the received and decoded broadcasting signal is the signal source.

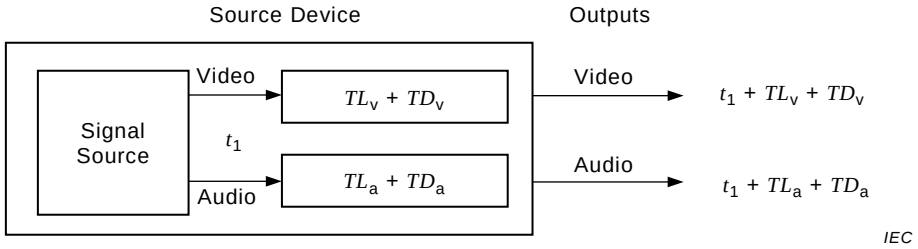

Figure 3 – Source device

5.3.1.2.2 Display device

Figure 4 shows the display device. The outputs from this device are audio and video signals reproduced as sound and visual images realized by a display unit and speakers.

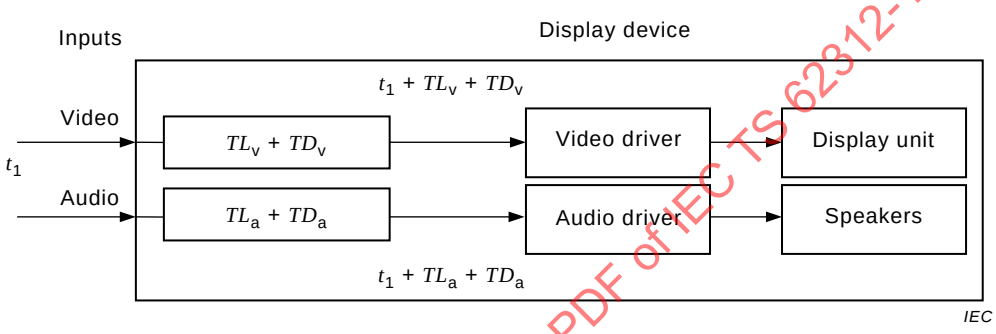

Figure 4 – Display device

5.3.1.2.3 Recorder device

Figure 5 shows the recorder device; the audio and video signals are recorded on the storage and these signals are played and then output. The total delay and latency are the sums of each of the total delay and latency of the recording part and the playback part, as identified by suffix R for the recording part and P for the playback part. In order to measure the recording part delay, the monitor outputs are used.

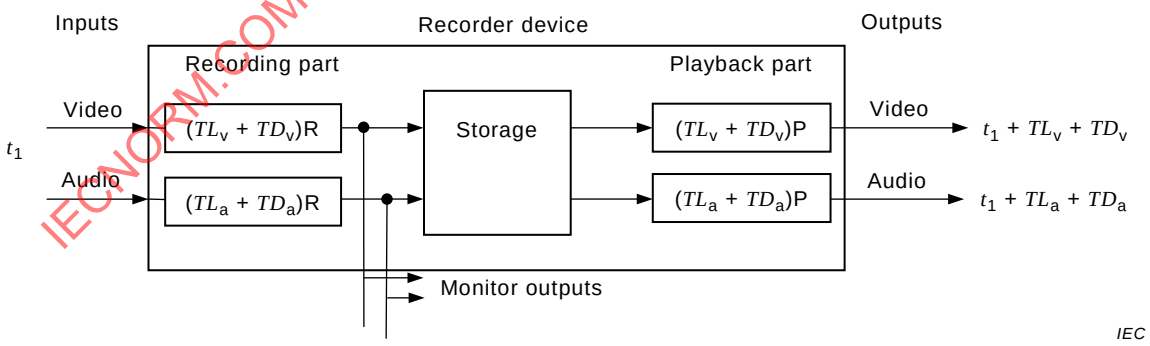

Figure 5 – Recorder device

5.3.2 Compound equipment

Equipment may consist of multiple audio and video devices. Generally, the EUT is defined as the device between the first input and the final output. When it is required to measure the EUT from the second or later input to before the final output, those inputs and outputs should be the subject of measurement. Figure 6 shows compound equipment that consists of multiple (n devices) audio and video devices.

For instance, equipment such as a TV with a video recorder consists of a TV tuner as a source device, recorder device and display device.

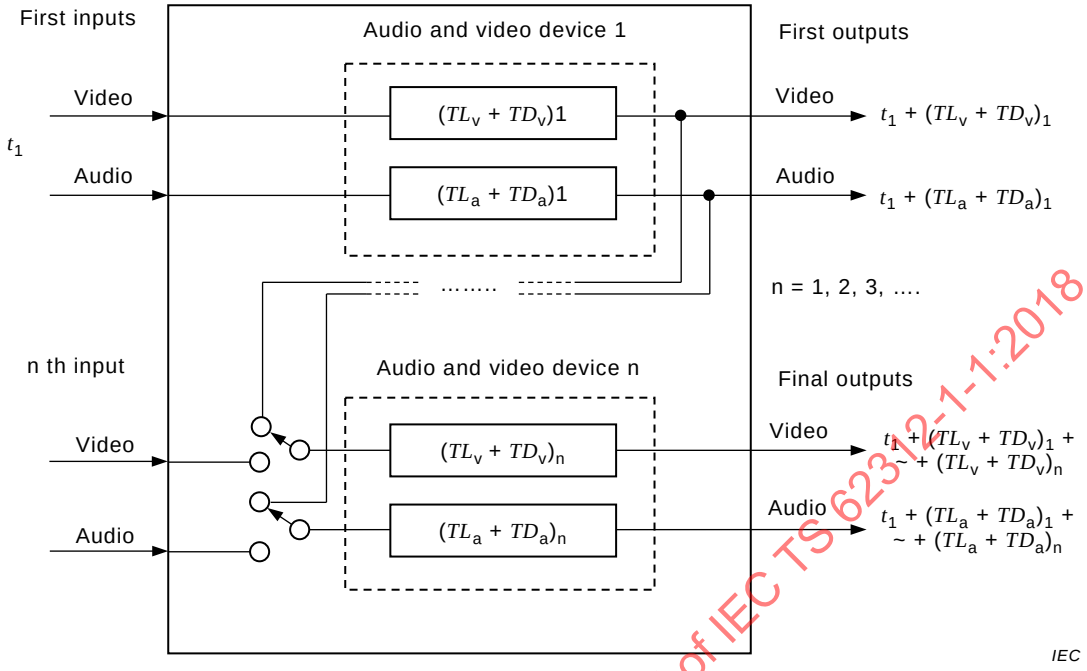

Figure 6 – Compound equipment

5.4 Measuring instruments

5.4.1 General

The audio and video device outputs audio and video signals with the total values of latency and delay as shown in Figure 2. The measuring instruments should have a capability to measure the timing of the output signal that is a processed or reproduced signal of the input signal. The measuring instruments measure the value of the difference between them, or calculation gives the difference, the value is:

$$T_d = (t_1 + (TL_v + TD_v)) - (t_1 + (TL_a + TD_a)) = (TL_v + TD_v) - (TL_a + TD_a)$$

where

T_d is a time value that indicates the total latency and delay of the video against the audio, expressed in ms.

5.4.2 Measurement of signal

The forms of output signals are analogue or digital. When it is in analogue form, the measuring instruments are a video analyser, audio analyser or oscilloscope. When they are in digital form, they are signals in a digital interface. The signal format of a digital interface will be a specific format depending on each interface format. The measuring instruments should have a capability to measure these signals.

5.4.3 Measurement of reproduced signal

To measure the output of the reproduced audio and video signals, measuring instruments should have a capability to measure sound and visual images. Figure 7 shows the measurement of the reproduced signal.

To measure sound, an acoustic to electrical (A/E) transducer is applied. The acoustic spatial delay should be considered for the measurement result.

To measure the visual image, an optical to electrical (O/E) transducer is applied. The O/E transducer senses the visual image on the display unit. Which part of the visual image should be the subject of the measurement depends on the test signal content.

Oscilloscope or other measuring instruments are used to measure these converted electrical signals.

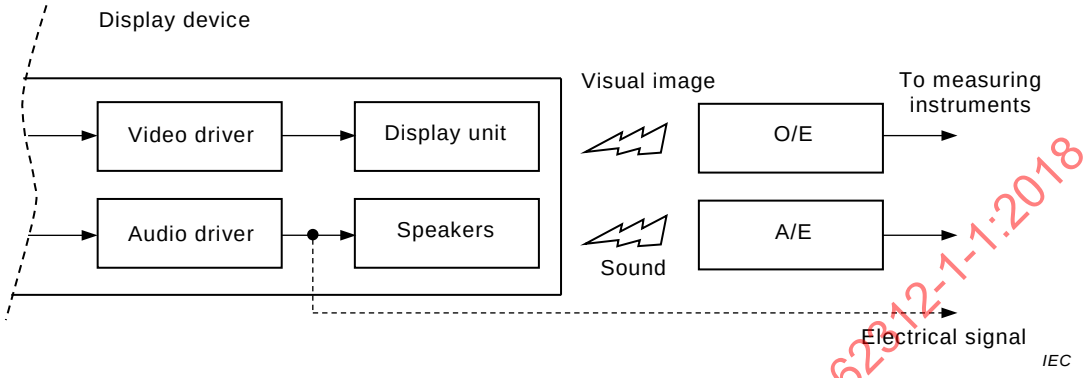

Figure 7 – Measurement of reproduced signal

5.4.4 Specific requirement

The form and format of the audio and video outputs from the EUT vary depending on the kind of EUT. The content of the output from the EUT depends on the test signal.

The measurement instrument should have a capability to measure the outputs from the EUT.

Annex A
(informative)

Assessment of the result of measurement

The results of measurement with this document may be assessable using a criterion of audio and video synchronization or lip-sync.

The results show the presentation time difference between audio and video for the EUT. Criteria are classified into two types. The first is a requirement for the time difference of equipment depending on equipment and systems, and the second is a requirement for the time difference of equipment depending on human perception.

The second criterion depends on the physical response of humans. There are two specifications that detail this. ITU-R BT.1359-1 is a criterion that is specified by professional broadcasting organizations. IEC 62503 is an assessment method for equipment and systems that are used by consumer users.