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Photography — Digital still cameras — Measuring shooting time lag, shutter release time lag, shooting rate, and start-up time lag

Photographie — Caméras numériques — Décalage dans le temps du mesurage de la prise, décalage dans le temps de l'ouverture de l'objectif, cadence de prise et temps de démarrage

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Contents

Page

Foreword

ISO (the International Organization for Standardization) is a worldwide federation of national standards bodies (ISO member bodies). The work of preparing International Standards is normally carried out through ISO technical committees. Each member body interested in a subject for which a technical committee has been established has the right to be represented on that committee. International organizations, governmental and non-governmental, in liaison with ISO, also take part in the work. ISO collaborates closely with the International Electrotechnical Commission (IEC) on all matters of electrotechnical standardization.

The procedures used to develop this document and those intended for its further maintenance are described in the ISO/IEC Directives, Part 1. In particular, the different approval criteria needed for the different types of ISO documents should be noted. This document was drafted in accordance with the editorial rules of the ISO/IEC Directives, Part 2 (see www.iso.org/directives).

Attention is drawn to the possibility that some of the elements of this document may be the subject of patent rights. ISO shall not be held responsible for identifying any or all such patent rights. Details of any patent rights identified during the development of the document will be in the Introduction and/or on the ISO list of patent declarations received (see www.iso.org/patents).

Any trade name used in this document is information given for the convenience of users and does not constitute an endorsement.

For an explanation of the voluntary nature of standards, the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the World Trade Organization (WTO) principles in the Technical Barriers to Trade (TBT) see www.iso.org/iso/foreword.html.

This document was prepared by Technical Committee 42, *Photography*.

This third edition cancels and replaces the second edition (ISO 15781:2015), which has been technically revised.

The main changes compared to the previous edition are as follows:

— Current scope includes digital still cameras that continuously shoot images into the buffer and select an image depending on the moment the exposure button is pressed.

Any feedback or questions on this document should be directed to the user's national standards body. A complete listing of these bodies can be found at www.iso.org/members.html.

Introduction

Taking pictures of a moving target was nearly impossible in the early days of digital photography. After pressing the exposure button it took a significant amount of time to capture the image and the chance to preserve the desired moment was gone.

Part of the time between pressing the exposure button and the exposed picture is needed to focus, another part is needed to adjust the exposure, etc. This unwelcome but unavoidable period of time is called shooting time lag. This is often mixed with the term shutter release time lag, which is also defined in this document. Optimized systems are nowadays able to decrease these time lags.

Capturing the different stages of a fast moving object is sometimes very important especially in areas like sports or people photography. This high shooting rate requires fast image processing within the digital still camera that can be measured according to the method described in this document.

When a photographer decides to capture an image of a changing scene, if his or her digital still camera takes a long time to be ready to shoot once it is turned on, the opportunity to capture the image is lost. This time named start-up time lag is therefore another important value, which can be determined using this document.

Photography — Digital still cameras — Measuring shooting time lag, shutter release time lag, shooting rate, and start-up time lag

1 Scope

This document specifies how to measure and report the shooting time lag, shutter release time lag, shooting rate and start-up time lag for digital still cameras, including camera modules in phones and tablet computers. It includes a method that uses control signals inside the digital still camera and a method that determines the timing values without requiring access to the inside of the digital still camera.

This document does not address the measurement either of auto focus speed below recommended illumination level or auto focus accuracy.

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.

ISO 7589, *Photography — Illuminants for sensitometry — Specifications for daylight, incandescent tungsten and printer*

3 Terms and definitions

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

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

— ISO Online browsing platform: available at https://www.iso.org/obp

— IEC Electropedia: available at http://www.electropedia.org/

3.1
digital still camera
device which incorporates an image sensor and produces a digital signal representing a still picture (1)

Note 1 to entry: A digital still camera is typically a portable, hand-held device. The digital signal is usually recorded on a removable memory, such as a solid-state memory card or magnetic disk.

[SOURCE: ISO 12231, 3.40, modified — Note 2 to entry has been deleted.]

3.2
shooting time lag
t_{SL}
time elapsed from stand-by state to reaching capture point on a digital still camera or a module built into a mobile device and the beginning of the exposure

Note 1 to entry: This period of time includes all measurements and adjustments (e.g. auto focus and exposure control) a digital still camera needs to make prior to the beginning of the exposure.

Note 2 to entry: When the exposure button of a digital still camera is pressed it performs a number of time-consuming measurements and adjustments, e.g. determination of the exposure and focus adjustment. The time needed for these procedures is part of the shooting time lag.

Note 3 to entry: A capture point is often initiated from stand-by state by firmly depressing the shutter button to the maximum extent without introducing a discontinuity, see 3.8.

3.3
shutter release time lag
t_{RL}
time elapsed from pre-capture point (3.7) to the time of starting the exposure by reaching capture point after having stabilized the focus operation (often due to half pressing of the shutter button), in the case of digital still cameras that distinguish between pre-capture and *capture points* (3.8) (often the half pressing and the fully pressing of the shutter button)

Note 1 to entry: Instead of shutter release time lag, the terms shutter lag and release lag are used in some publications.

Note 2 to entry: A capture point is often initiated from pre-capture point by fully pressing down the shutter button.

3.4
start-up time lag
$t_{start\text{-}up}$
time elapsed between switching a digital still camera on and the moment the camera has reached a standby state (3.6) ready to shoot

Note 1 to entry: Start-up time lag excludes the initialization of a memory card.

Note 2 to entry: How this time is determined for the different devices is described in 5.2.1.

3.5
shooting rate
$f_{shooting}$
reciprocal of the time elapsed between the beginning of the exposure of an image until the beginning of the exposure of the next image, that is, between successive capture start states

3.6
standby state
state achieved following the power-up process, in which a digital still camera is powered on and ready to capture an image

Note 1 to entry: If the digital still camera uses an electronic viewfinder, a preview image is normally displayed during the standby state.

Note 2 to entry: Standby state excludes the initialization of a memory card.

3.7
pre-capture point
position of a user control of a digital still camera which activates pre-capture processes, such as auto-focus and exposure calculation

Note 1 to entry: The pre-capture point is typically reached by pressing an exposure button roughly halfway down on traditional digital still camera. On mobile devices with touchscreen this point might be reached by long pressing the trigger button.

3.8
capture point
position of a user control of a digital still camera which activates the image capture operation

Note 1 to entry: The capture point is typically reached by fully depressing the exposure button on traditional digital still cameras. On mobile devices with touchscreen this point can be reached either when pushing the trigger button, or releasing it.

3.9
push duration
total elapsed time during which the trigger button is pushed

Note 1 to entry: This duration is not usually associated with a particular function on traditional digital still camera other than capture burst. On mobile devices that use a touchscreen, it can trigger some particular functions such as the autofocus.

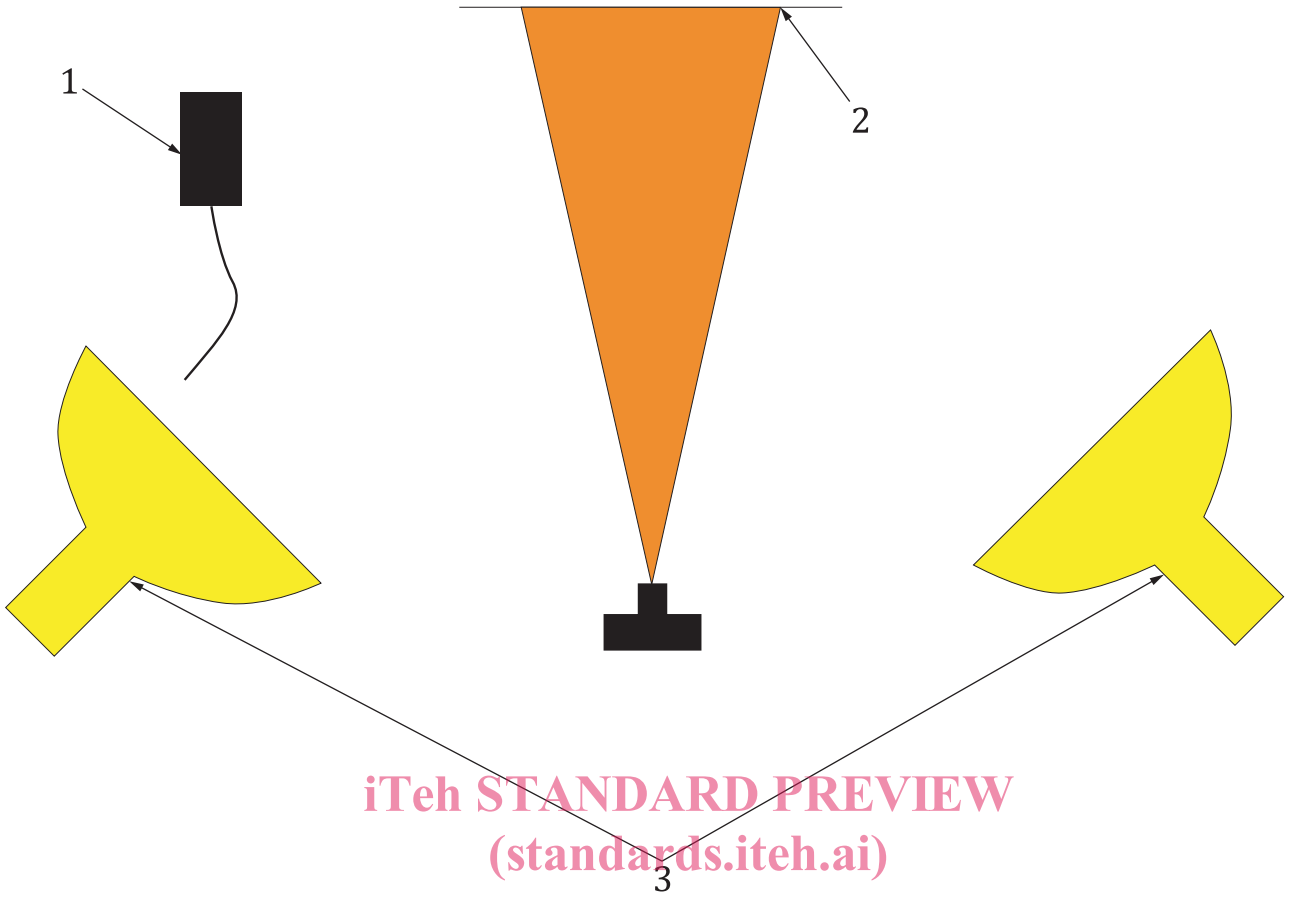
4 Test conditions

4.1 Illumination of the test scene

An illumination level between 500 lx to 5 000 lx is recommended. Special measurement purposes may require other levels.

The test scene shall be illuminated in a way that avoids specular reflection (see Figure 1). This can be achieved by using a geometry typical for reproduction photography, which means positioning the light sources in approximately a 45° angle to the surface of the chart. The illumination level of the area shall be reported together with the measurements.

Timing measurements shall be performed under daylight conditions or a tungsten lamp. Procedures for determining whether the illumination used is an acceptable match to the daylight illuminant, shall be conducted in accordance with ISO 7589.



Key

1 calibrated spectral photometer

2 test chart

3 light source tungsten or filtered to D55

Figure 1 — Principle for illuminating the target

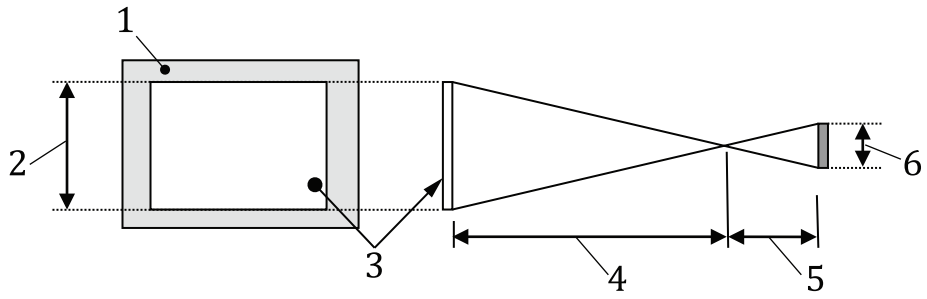
4.2 The chart and positioning of the digital still camera

The digital still camera shall be mounted on a solid stand (e.g. heavy tripod) perpendicular to and facing the surface of the chart (see Figure 2).

As for a test chart, the chart shall allow the digital still camera to focus easily and allow an easy determination whether the captured image is correctly focused. Examples include a black-and-white checker board or the three-line chart shown in informative Annex B. If the above condition is met, a typical image assessment chart may be used. Also, the ISO 12233 resolution chart may be placed in the chart area to determine whether the captured images are in focus.

The height of the chart shall be 80 (±10) cm and the distance to the chart shall be adjusted in a way that the height of the image is in accord with the chart height.

The surround areas should be filled with a reflective area of 18 % neutral grey. Prior to the measurement, the digital still camera shall be checked to see if it correctly focuses on the chart. If not, the correct focus shall be obtained by changing the chart or the illumination condition. If different setup conditions are required when the focal length of the lens is extremely long or short, these setup conditions shall be reported together with the measurement results.



Key

1 surround area: 18% grey chart
2 chart height 800 mm
3 chart
4 33 x focal length
5 focal length
6 image height

Figure 2 — Chart and positioning

4.3 Battery status

A secondary battery should always be fully charged and a primary battery should always be a new one prior to performing the measurements in order to avoid inconsistent measurements caused by varying power supply. For cameras that support an AC power supply, the AC power supply should be used.

4.4 Memory card

For digital still cameras that support connection to a removable memory card, a card with a sufficient capacity and speed so that it does not interfere with the test shall be used. Slow cards can interfere with the measurements and increase the measured times. The card shall be initialized and formatted in the camera. After formatting the card, it shall remain in the digital still camera.

If the digital still camera only has internal memory, all images should be deleted and sufficient memory should be free that any lack of memory does not interfere with the test.

4.5 Flash

If the flash is used to perform the measurements, it shall be reported together with the results.

4.6 Image stabilization

In case the image stabilization is used to perform the measurement, it shall be reported together with the results.

4.7 Other camera settings

Since camera settings can impact the measurement results the factory settings of the camera shall be used and any deviation from those shall be reported with the measurement results.

5 Measurements

5.1 Definition of measurement

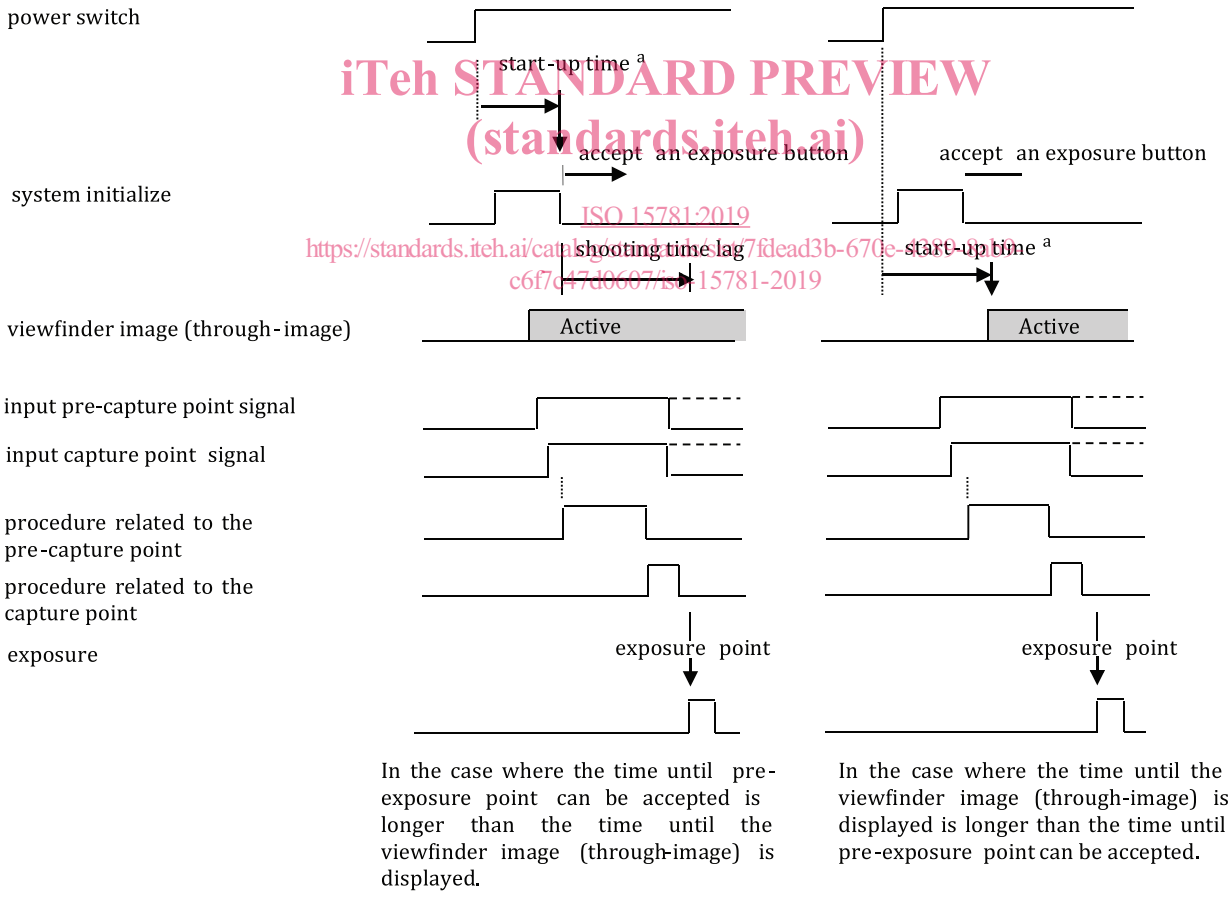
5.1.1 General

This document defines two measurement methods. The first method is the “external measurement” method, which can be performed without disassembling the digital camera. The second method is the “internal measurement” method, which requires the camera body to be partially disassembled, in order to perform measurements using electrical signals inside the camera body. The first method is the preferred method for measurements made by users of digital cameras. The second method is the preferred method for measurements made by digital camera manufacturers.

NOTE 1 Figures 3, 4, and 5 show the periods of time to be measured.

NOTE 2 “Procedure related to the pre-capture point” means the procedure by which the digital still camera measures the light intensity and distance, determines the exposure, and adjusts the focus when the pre-capture point switch of the digital still camera is pressed.

NOTE 3 “Procedure related to the capture point” means the procedure by which the digital still camera processes the image captures and preparation of the image storage when the capture point switch of the camera is pressed.



a The time between switching the power on and the moment the viewfinder image (through-image) is displayed, or the time between switching the power on and the moment pre-capture point can be accepted, whichever is longer.

Figure 3 — Measurement period for start-up time lag

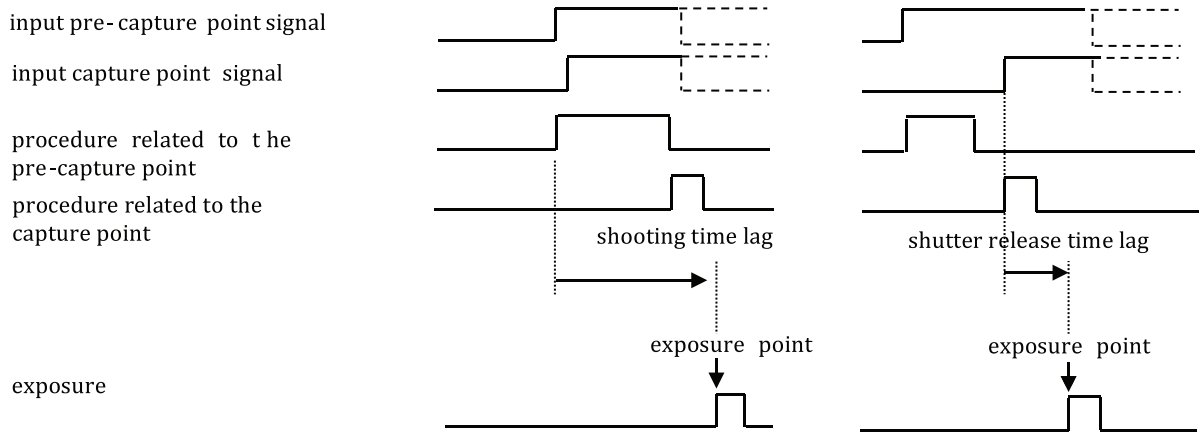


Figure 4 — Measurement period for shooting time lag and shutter release time lag

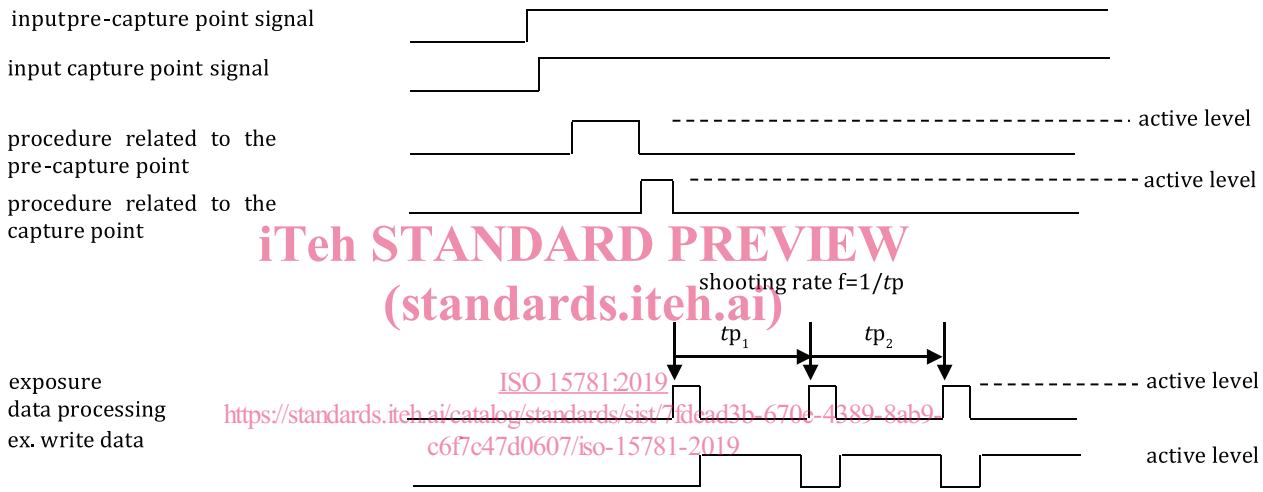


Figure 5 — Measurement period for shooting rate

5.1.2 Measurement with external controls

The measurement with external controls is performed without disassembling the camera with the advantage that the measurement can be performed on the product level. Specifically, for instance, the measurement can be performed shooting a timing device that can determine a time interval from captured images. An example of this method is shown in informative Annex B.

When using the measurement with external controls the acceptable level of the time lag between pressing the exposure button and activating the timing device is application dependent and needs to be considered prior to performing a test and the estimated error caused by this time lag shall be reported together with the results (see Annex B). A test was performed using different approaches and the results are shown in Annex A.

5.1.3 Measurement with internal controls

The measurement using internal controls and connectors enables a direct measurement of time intervals between input signals and device control signals but it involves disassembling the camera. This allows the operational timing to be obtained reliably and has the advantage that the measurement can be performed accurately and stably. With this method, there is no bias due to the accuracy of the actuation device (see Annex B).