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

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

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## 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](http://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](http://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 on the meaning of ISO specific terms and expressions related to conformity assessment, as well as information about ISO's adherence to the WTO principles in the Technical Barriers to Trade (TBT), see the following URL: [Foreword — Supplementary information](#).

The committee responsible for this document is ISO/TC 42, *Photography*.

This second edition cancels and replaces the first edition (ISO 15781:2013), of which it constitutes a minor revision.

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## 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 while another part is needed to adjust the exposure, etc. This unwelcome, but unavoidable period of time is called the **shooting time lag**. This is often mixed with the term **shutter release time lag** which is also defined in this International Standard. 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 a fast image processing within the digital still camera that can be measured according to the method described in this International Standard.

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** is therefore another important value which can be determined using this International Standard.

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

## 1 Scope

This International Standard specifies how to measure and report the shooting time lag, shutter release time lag, shooting rate, and start-up time 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.

Depending on the method used to start the timing device, there can be a time lag between the activation of the timing device and the closure of the exposure switch of the digital still camera.

This International Standard does not address the measurement of auto focus accuracy and speed at low light conditions.

For digital still cameras that continuously shoot images into the buffer, the exposure button only acts as a selector of an image that was taken before the exposure button was pressed. The methods to measure shutter time lag and shooting time lag do not address this case and cannot be used for this type of digital still camera.

## 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.

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.

### 3.1

#### **digital still camera**

device which incorporates an image sensor and produces a digital signal representing a still picture

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.

Note 2 to entry: This term is also defined in ISO 12231, ISO 12232, ISO 15739, and ISO 17321-1.

### 3.2

#### **shooting time lag**

time between pressing the exposure button (firmly depressing the shutter button to the maximum extent without introducing a discontinuity) on a *digital still camera* [3.1] 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.

### 3.3 shutter release time lag

time duration to the time of starting the exposure from the time of fully pressing down the shutter button after having stabilized the focus operation due to half pressing of the shutter, in case of *digital still cameras* [3.1] that distinguish between the half pressing and the fully pressing

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

### 3.4 start-up time

time between switching a *digital still camera* [3.1] on and the moment the camera has reached a *standby state* [3.6] ready to shoot

Note 1 to entry: It excludes the initialization of a memory card.

### 3.5 shooting rate

reciprocal of the time between the beginning of the exposure of an image until the beginning of the exposure of the next image

### 3.6 standby state

state achieved following the power-up process in which a *digital still camera* [3.1] 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.

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### 3.7 pre-capture point

position of a user control of a *digital still camera* [3.1] 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.

### 3.8 capture point

position of a user control of a *digital still camera* [3.1] which activates the image capture operation

Note 1 to entry: The capture point is typically reached by fully depressing the exposure button.

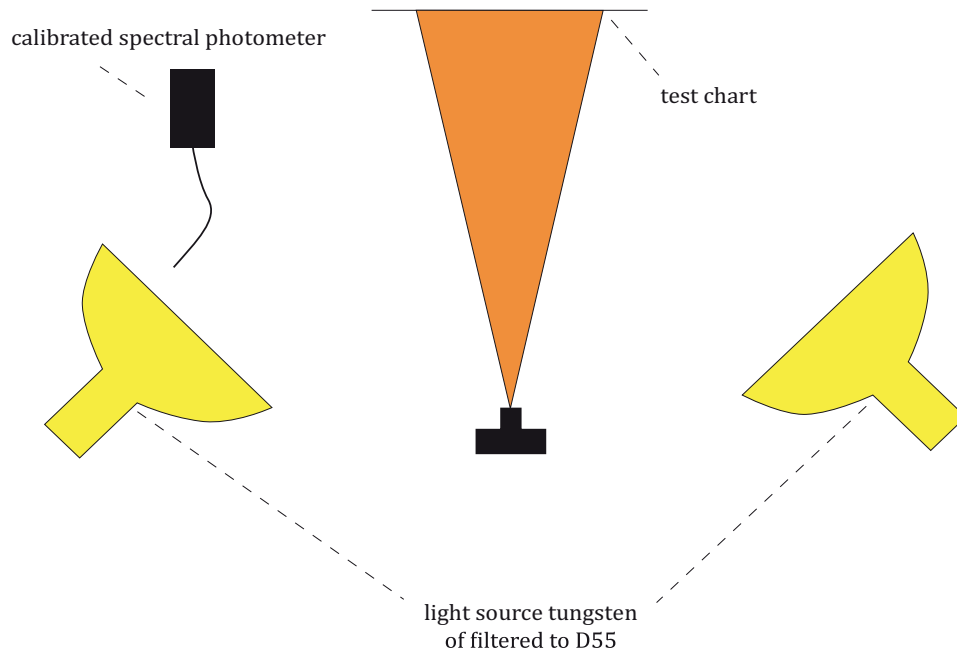
## 4 Test conditions

### 4.1 Illumination of the test scene

The illumination level of the shooting area including the test chart should be even and above 500 lx and below 5 000 lx. The test scene shall be illuminated in a way that avoids specular reflection (see [Figure 1](#)). This can be achieved by using geometry typical for reproduction photography which means positioning the light sources in approximately 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 for OECF measurements is an acceptable match to the daylight illuminant shall be conducted in accordance with ISO 7589.





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**Figure 1 — Principle for illuminating the target**  
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#### 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 the 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 [Annex B](#). If the above condition is met, a typical image assessment chart can be used. Also, the ISO 12233 resolution chart can be placed in the chart area to determine whether the captured images are in focus.

The height of the chart shall be  $(80 \pm 10)$  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.

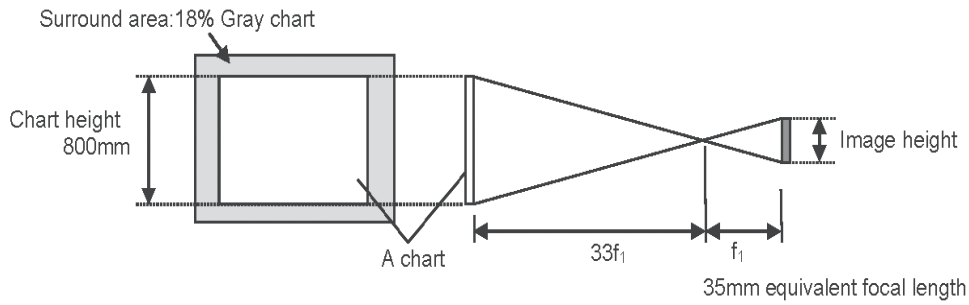


Figure 2 — Chart and positioning

### 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 an external memory card, a card with a sufficient capacity that does not interfere with the test shall be used. 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 the internal memory, all images should be deleted by initializing the memory prior to the measurement.

### 4.5 Flash

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

## 5 Measurements

### 5.1 Definition of measurement

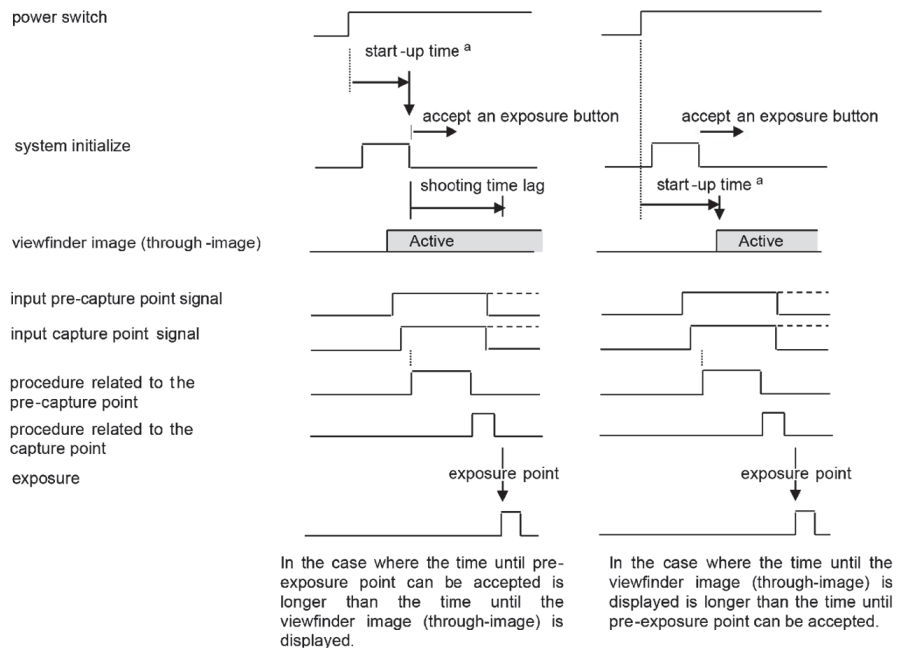
#### 5.1.1 General

This International Standard 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 [Figure 3](#), [Figure 4](#), and [Figure 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.



<sup>a</sup> 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.

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Figure 3 — Measurement period for start-up time

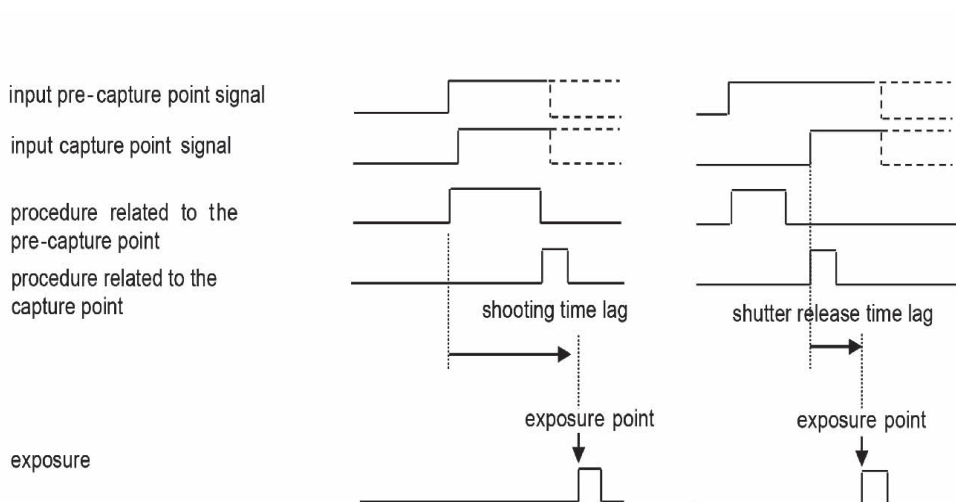


Figure 4 — Measurement period for shooting time lag and shutter release time lag

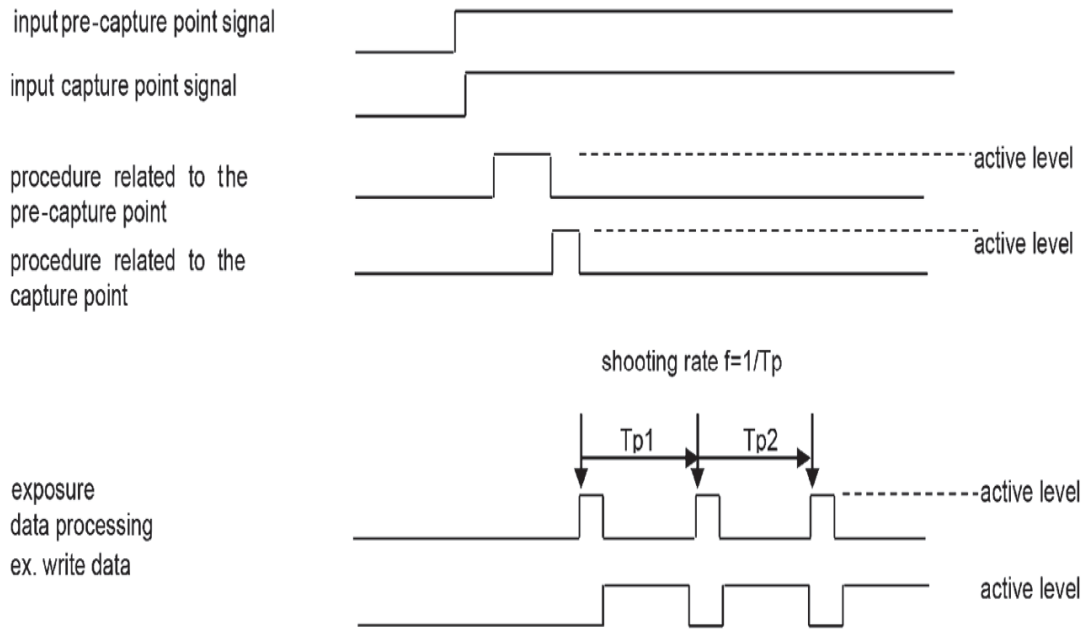


Figure 5 — Measurement period for shooting rate

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5.1.2 External measurement

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The external method of measurement 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 Annex B.

When using the external measurement, 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 Internal measurement

Internal measurement is a method which directly measures a time interval between input signals and device control signals and involves disassembling the camera. This allows the operational timing to be surely obtained and has the advantage that the measurement can be performed accurately and stably. However, camera manufacturers usually use this method because it is very difficult for parties other than camera manufacturers to disassemble the camera and select and measure the device control signals. An example of this method is shown in Annex C.

5.2 Measurement method

5.2.1 Start-up time

The digital still camera shall be switched on and set to record mode. Every setting that requires additional time when switching the camera on (e.g. playing an intro sound) shall be turned off and the camera shall be focused on the timing device before it is switched off again. Start the measurement when the power switch is turned on again. The measurement value shall be an average of at least 10 measurements.

The digital still camera shall not be disconnected from the power supply until the test is finished. The measurement results and conditions shall be reported according to the description in Clause 6.