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Digital cameras — Measurement method for image stabilization performance —

Part 1:
Optical systems

Caméras numériques — Méthode de mesure de la perfomance de stabilisation de l'image —

Partie 1: Systèmes optiques

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Introduction

The image stabilization function is important for digital cameras and has become a selling point in marketing materials. Therefore, the measurement methods and its reporting method are then very important to compare the image stabilization performance among cameras based on their brochures.

The Camera & Imaging Products Association (CIPA) issued CIPA standard DC-011 in 2012 to specify how to measure and describe the optical image stabilization performance of digital cameras. When image stabilization performance is measured and described according to this standard, end users have unbiased and useful information to help them select from a variety of digital cameras (see Bibliography).

This document is based on the CIPA standard, which is referenced in the Bibliography. The standardized measurement method primarily includes performance assessment with simulated handheld camera movements.

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Digital cameras — Measurement method for image stabilization performance —

Part 1: Optical systems

1 Scope

This document defines the measurement method of optical image stabilization performance for still images compensating for handheld blur consisting of two rotational components, yaw and pitch.

It applies to consumer digital cameras with optical image stabilization for still images. Apparatuses such as camcorders and mobile phones with still image shooting functionality are within the scope of this document.

2 Normative references

There are no normative references in this document.

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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

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

3.1
image stabilization
camera function that prevents handheld blur by using a means of camera movement detection

Note 1 to entry: Even if a camera function uses a means of camera movement detection, it is not regarded as an image stabilization function if its primary means of blur mitigation is shortening exposure time based on exposure control program optimization.

3.2
optical image stabilization
function that compensates for image displacement on the focal plane due to movement of a handheld camera by moving a part or whole of the optical system and/or image sensor, based on a means of camera movement detection

3.3
handheld blur
loss of image sharpness caused by movement of a handheld camera during exposure

3.4
stop
number that expresses a doubling or halving of the amount of light let in when taking a picture and which is typically represented by an exposure value

Note 1 to entry: For instance, the difference between exposure times of 1/1 000 s (TV10) and 1/500 s (TV9) or 1/125 s (TV7) and 1/60 s (TV6) is one stop.

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Note 2 to entry: “TVn" expresses that time value of APEX equals to n. See Annex C of Reference [5] for APEX.

3.5
handheld blur threshold
level of handheld blur at which image stabilization performance is determined

Note 1 to entry: In this document, this level is 63 µm of motion in the focal plane on one frame of 35 mm film, where one frame means the picture size (24 mm × 36 mm).

3.6
average vibration angle
expected deflection angle of camera rotation under handheld vibration during exposure

Note 1 to entry: The handheld vibration is given as the vibration waveform data that is specified in document.

Note 2 to entry: The average vibration angles are given as amount of angle in degrees of each exposure time as shown in Figure 7. The values are statistical expectation and are calculated from average of oscillation amplitude from peak to bottom of the vibration waveform when certain exposure time is applied.

3.7
35 mm film equivalent focal length
focal length of a lens attached to a camera with a sensor size of 24 mm × 36 mm (originated from 35 mm film) that produces the same field of view as the camera system with a lens at a given focal length for which the 35 mm sensor equivalent focal length is specified

4 Measurement method

4.1 General

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The objective of this document is to specify how to measure optical image stabilization performance of a camera held in the user’s hands. Accordingly, a measurement session would better simulate a real shooting situation if the camera was actually held by a test photographer. However, this makes it difficult to eliminate variation among individual photographers or how well the camera is designed for handheld shooting. In order to cancel these effects, the test camera shall be mounted on a vibration generator that shakes the camera with a simulated handheld vibration waveform, and image stabilization performance shall be measured with images of a test chart specified by this document.

This document specifies two waveforms that simulate the important characteristics of how a camera shakes when it is held by hand. These waveforms were developed by analysing extensive measurement data and adding further theoretical observations.

Figure 1 shows an overview of the measurement method. Annex E collaterally gives additional explanations for background of specifying measurement method, vibration generator, vibration waveform and reference information.

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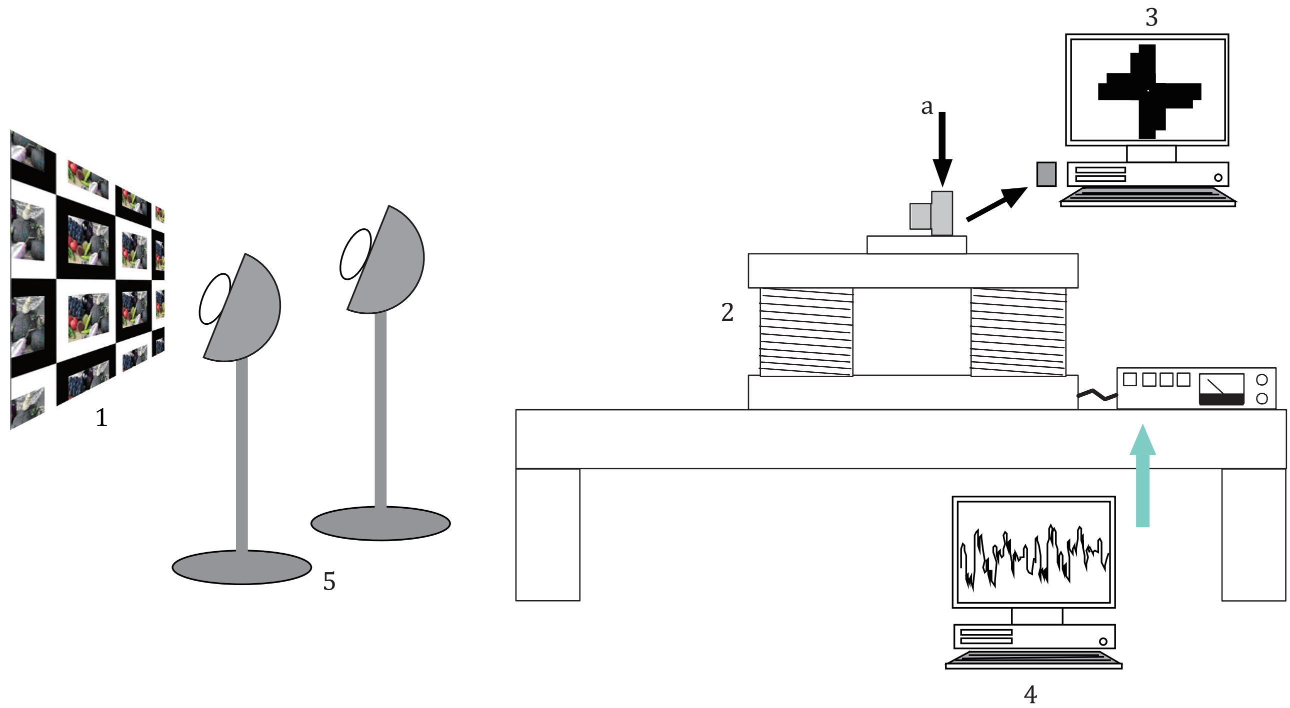

Key

1 chart

2 vibration generator

3 pc for handheld blur measurement

4 vibration waveform

5 variable brightness

a Release operation.

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Figure 1 — Overview of measurement method

4.2 Equipment and environment for measurement

4.2.1 Test chart

For this document, the test chart shall meet following requirements. Specifications and usage of the test chart are described in Annex B and alternatives are described in Annex C.

a) The chart shall contain orthogonal edges consisting of a dark portion and a bright portion near the centre.

b) The contrast ratio of the dark portion to the bright portion shall be 1:4 or more.

c) The dark and bright portions shall be wide enough to accommodate the total image degradation which is described in 4.4.1, when the image stabilization (IS) function is OFF within the exposure time range for measuring the image stabilization performance.

4.2.2 Lighting

Lighting shall be flicker-free. The light source should illuminate the chart with minimal direct reflection and illuminance variation.

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4.2.3 Temperature and humidity

The temperature and humidity should be (23 ± 2) °C and 30 % to 70 %, respectively.

4.2.4 Vibration generator

4.2.4.1 General

For the measurements in this document, a CIPA-certified vibration generator should be used. If a non-certified vibration generator is used, it shall satisfy the amplitude and phase characteristics under the excitation conditions specified in 4.2.4.2.

4.2.4.2 Excitation conditions

This subclause describes the required specifications for the amplitude and phase characteristics of the vibrations generated by the vibration generator excited with sine waves. Table 1 shows the properties of the sine waves that shall be used to measure the amplitude and phase characteristics. Table 2 and 3 respectively show the input sine wave combinations that shall be used to measure the vibration amplitude characteristics and phase characteristics. To measure the amplitude and phase characteristics, the vibration generator shall be excited in both yaw and pitch directions simultaneously, carrying a load weighing at least as much as the test objects, i.e. camera, storage media, battery and lens. Figure 2 is an overview of how to verify the vibration generator using these waveforms.

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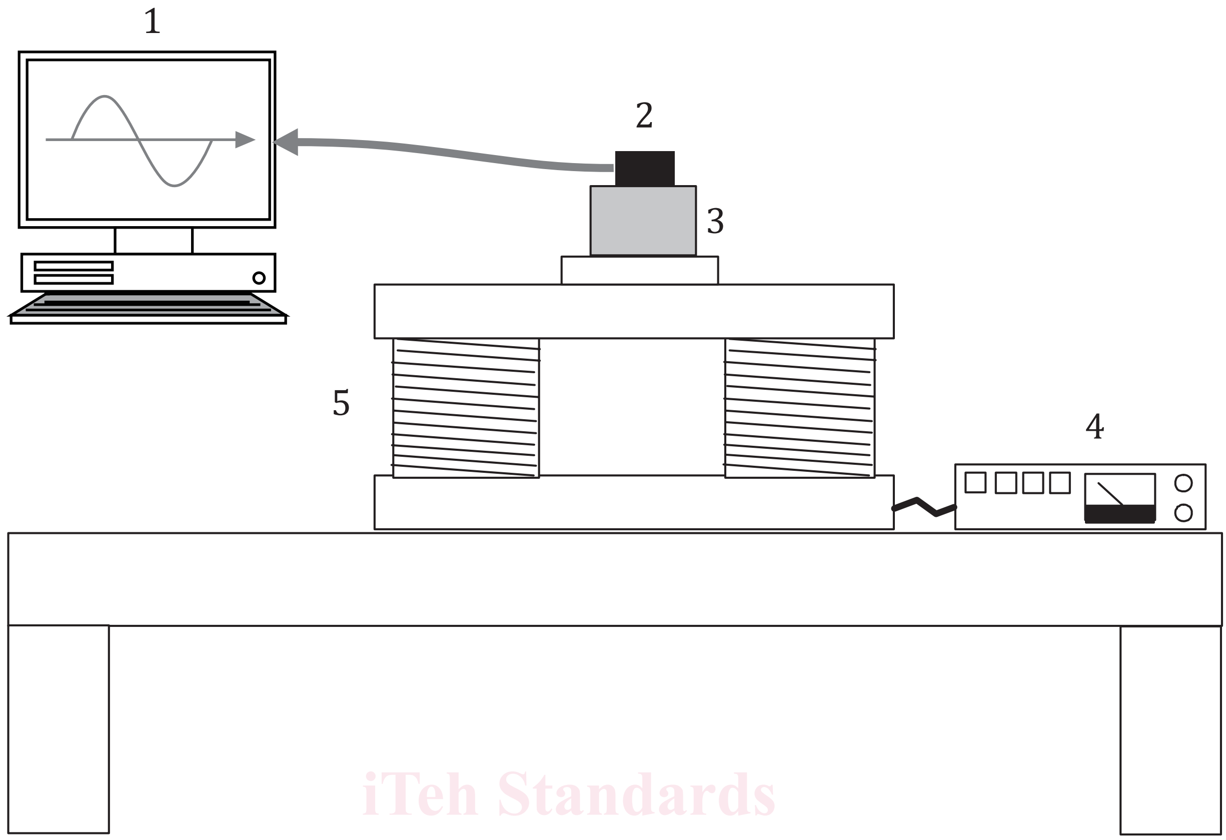

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Key

1 vibration measurement

2 measuring device (sensor, etc.)

3 weight

4 sine wave vibration

5 vibration generator

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Figure 2 — Overview of vibration generator verification scheme

Table 1 — Combinations of sine wave frequency and amplitude for vibration generator verification

	Frequency (Hz)	**Amplitude** (degree)
a	**0,1**	**2**
b	**0,5**	**2**
c	**1**	**1**
d	**5**	**0,2**
e	**10**	**0,1**

Table 2 — Yaw and pitch combinations (for amplitude characteristic evaluation)

	Pattern 1	**Pattern 2**	**Pattern 3**	**Pattern 4**	**Pattern 5**
Yaw	a	b	c	d	e
Pitch	c	d	e	a	b

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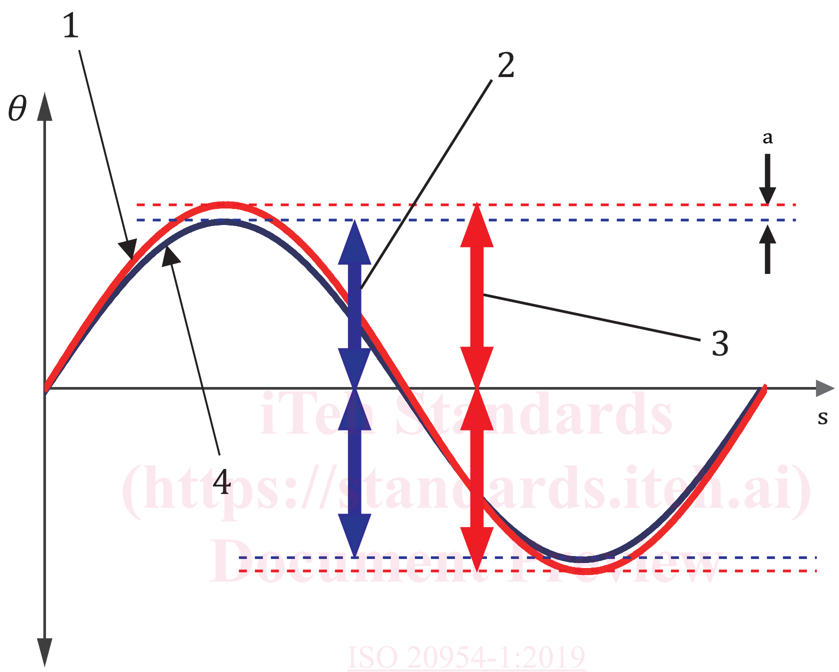
Table 3 — Yaw and pitch combinations (for phase characteristic evaluation)

	Pattern 6	Pattern 7
Yaw	c	d
Pitch	d	c

4.2.4.3 Amplitude characteristics

The amplitude of the measured vibration from the vibration generator shall be within ±5 %, inclusive, of the amplitude of the input sine wave for all excitation conditions, Patterns 1 through 5, shown in Table 2. See Figure 3.



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Key

1 measured vibration form vibration generator

2 amplitude of input sine wave

3 amplitude of measured vibration of vibration generator

4 input sine wave

[a] Difference in amplitude values.

Figure 3 — Illustration of amplitude differences

4.2.4.4 Phase characteristics

The phase difference between the measured yaw and pitch vibrations shall be 90° or less when the vibration generator is excited by both Patterns 6 and 7 in Table 3. See Figure 4. The phase difference between the zero cross position of the low frequency waveform and the zero cross position of the high frequency waveform shall be within 90° of high frequency waveform.

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