



Specification Guidelines for Digital Camera

CIPA DCG-X002 -Translation-2012

This translation is based on the original Guidelines (CIPA DCG-X002-2012). In the event of any doubts arising as to the contents, the original Guidelines in Japanese shall prevail.

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This draft reflects only a technological review; further revisions may be made to parts of this draft before Guideline DCG-X002 is formally issued. This draft is for reference only.

CONTENTS

1. Introduction	1
2. Scope	1
3. Guidelines	1
3.1 Concept of the guidelines	1
3.2 Definitions of terms	3
3.3 Reference standards	3
3.4 List of specification items	4
..1. Focal length of the lens	4
..2. 35mm film equivalent focal length	5
..3. f-number	5
..4. Zoom magnification	6
..5. Shooting distance	7
..6. Lens construction	8
..7. Shutter type	8
..8. Shutter speed	8
..9. Light metering system	9
10. Exposure mode	9
11. Effective subject brightness value range	9
12. Exposure range	10
13. Exposure compensation	10
14. Focus system	10
15. White balance mode	11
16. Shooting mode	11
17. Motion blur suppression	11
18. Flash	13
19. Built-in flash mode	13
20. Built-in flash working range	13
21. Built-in flash guide number	14
22. Image sensor	14
23. Picture monitor	14
24. Viewfinder	17
25. Recording capacity	21
26. Recording time for continuous movie capture	21
27. Image file format	22
28. Number of effective pixels	22
29. Number of recorded pixels	22
30. Sound codec	23
31. Movie clip	23
32. Compressed recording for motion picture and sound	23
33. Sensitivity	23
34. Defective pixels	24
35. Resolution	24

36. Low contrast luminance amplitude/frequency response	24
37. Signal to noise ratio.....	25
38. Tone characteristics.....	25
39. Dynamic range	25
40. Geometric distortion of image.....	25
41. Luminance non-uniformity	26
42. Color non-uniformity	27
43. White balance.....	28
44. Color reproduction	28
45. Lateral chromatic displacement	28
46. Flare	29
47. Proper exposure.....	30
48. Minimum subject illumination	30
49. Depth of field	30
50. Image stabilization performance	31
51. Start-up time.....	32
52. Shutter release time lag	32
53. Shooting time lag	32
54. Shooting rate	33
55. Number of recordable pictures in continuous shooting mode.....	33
56. Shooting interval	33
57. AF speed	34
58. Zoom magnification of playback mode.....	36
59. Battery life.....	36
60. Weight.....	38
61. Dimensions.....	39
62. Volume.....	40
63. Power source	40
64. Interface	41
65. Operating temperature range.....	41
66. Operating humidity range.....	41
67. Applicable laws and regulations	41

Annex A (normative) Methods of measuring picture quality items of specification standard for digital cameras	42
A.1 Introduction.....	42
A.2 Scope.....	42
A.3 Conditions of measurement	42
A.3.1 Environment for measurement.....	42
A.3.2 Conditions of measurement (setting of camera for measurement)	42
A.3.3 Conditions of shooting.....	43
A.4 Measurement methods	44
A.4.1 Geometric distortion of image	44
A.4.2 Low contrast luminance amplitude/frequency response	47
A.4.3 Flare	48

A.4.4	Lateral chromatic displacement	50
A.4.5	Luminance non-uniformity	51
A.4.6	Color non-uniformity	52
Annex B (normative).....		53
B.1	Introduction.....	53
B.2	Scope.....	53
B.3	Conditions of measurement	53
B.3.1	Environment for measurement.....	53
B.3.2	Conditions of measurement (setting of camera for measurement)	53
B.3.3	Conditions of shooting.....	54
B.4	Measurement methods	54
B.4.1	Battery life of movie clip	54
B.4.2	AF speed	59
Commentary		61

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1. Introduction

The Camera & Imaging Products Association (CIPA) has created guidelines for the notation used in catalogs and other documents for digital still cameras (DSC), such as CIPA DCG-001-2005 “Guideline for Noting Digital Camera Specifications in Catalogs, Revised Version”, as well as separate CIPA standards for battery life, resolution and sensitivity, weight, and dimensions. In addition, CIPA DCG-002-2007, “Guideline for Digital Camera Specifications” stipulates definitions and methods of presenting the specifications of DSC in general. Digital camera suppliers have used these documents when compiling catalogs and other materials throughout the world, thus helping to inform consumers of product specifications fairly and accurately, and to develop a sound market and digital camera business by encouraging fair competition in the market. However, the present revision became necessary due to the following changes since CIPA DCG-002-2007 was established:

- New relevant standards have been established within the CIPA and by such international organizations as ISO.
- The emergence of new DSC product specifications with technological progress has made it necessary to issue new stipulations.

2. Scope

This guideline applies to DSC for consumer use. The guideline need not be applied to products for business or industrial use, for example, for which individual special specifications are agreed between the user and the supplier. This guideline is intended to be used mainly for catalogs and other printed materials in which product specifications are stated, or to be used for presentation in software. The guideline should also be followed for indications on the camera body, individual packaging box, POP sales materials, and so on, as well as for advertising and publicity.

3. Guidelines

3.1 Basic Concept of the guidelines

To inform consumers of product specifications fairly and accurately and to develop a sound market and digital camera business by encouraging fair competition, this Guideline is based on the following concepts:

- 3.1.1 The present guidelines do not mandate the indication of any items in catalogs or other documents, but merely provide a reference on what presentation methods and written expressions should be used for particular items indicated in catalogs or other documents.
- 3.1.2 The present guidelines do not require or stipulate particular specification values and specifications (function) that the product must achieve, for the following reason:
Specification values and specifications (function) in a product are closely related with other specification values (e.g. size and cost), and tend to vary with time and due to technological development. Each supplier decides the specification values and specifications (function) of their own products based on their own judgment of the product’s competitiveness in order to provide various types of products, and based on feedback from the market. Any attempt to impose industry-wide requirements or mandatory definitions for specification values and specifications (function) on products would impede technical progress, interfere with fair competition, and hinder the development of the DIGITAL CAMERA industry, as well as restrict the range of products and

choice for consumers.

3.1.3 As for item names, Japanese long-sound symbols, and the distinction between single-byte and double-byte characters, expressions different from those used in this guidelines, such as customary expressions or company-specific terms, may be used, unless they cause serious misunderstanding.

It should be noted that:

- Unified expressions should be used for terms for which it is expressly designated to use unified ones;
- Any item name should not be used under a different definition, if it is likely to be confused with some item name defined in the present guidelines.

3.1.4 The specification values and specifications (function) set at factory shipping (or the default values) should be indicated for each item in the first place; the measurement conditions may be omitted. If values other than those set at factory shipping are also to be indicated, the measurement conditions for those values must be indicated as well. However,

- For functions that cannot be used with the settings at factory shipping, the specification values and specifications (function) shall be indicated under conditions when such functions are set to be available. If there are multiple modes or settings for the function, we recommend using the mode or setting that is most likely to be used by the user. However, if this would affect the specification values and specifications (function), then indicate what mode or setting is selected.
- If any parameters or modes cannot be fixed with the settings at factory shipping, use the setting that is most likely to be used by the user. However, if this would affect the specification values and specifications (function), then indicate the setting.
- For some items, it is redundant to present default specification values and specifications (function), or to distinguish them from those available by setting various functions and modes. Also, for some items, specification values and specifications (function) other than the factory shipping values may be more accurate and definitive; these items may be treated as exceptions to the stipulation on indicating the default specification values and specifications (function), provided they are indicated as such in the presentation method in the relevant column for each item.

3.1.5 In the case of cameras with interchangeable lens, it is essential to indicate the specification values with the lens attached. Selection of the lens is left to the supplier's discretion, but the conditions (name or type of lens, etc.) must be specified for those items for which specification values vary with the types of lens.

3.1.6 If the concept of this Guideline differs from the details stipulated individually for each item, the latter shall prevail.

3.1.7 It is essential to indicate the specification values based on measurements of the actual product. For those items for which no clear and exact measurement method has been established, values based on the product design may be indicated.

3.1.8 Regardless of the stipulated number of significant digits for each item, the number of decimal places may be omitted if doing so results in an integer value, unless otherwise stated in the column for each item.

Examples: 4.0 times → 4 times; 2.0 seconds → 2 seconds; 2.0 m → 2 m

3.1.9 Care is required when applying any standards established for cameras used for other purposes for specification items stipulated explicitly as “not covered” in this Guideline.

3.2 Definitions of terms

The terms used in this Guideline are defined as follows:

- 3.2.1 Output image: Unless otherwise specified, this means both the image recorded in the recording medium and that being output from the digital camera through any communication means.
- 3.2.2 Preferred notation: This means “to note the wording solely, or in the case of noting plural terms, to note the specified term more conspicuously than others”.
- 3.2.3 Factory shipping conditions: This means the settings at factory shipping including parameters and modes of the product.
- 3.2.4 Stipulation of names of items, etc.:
{xxx} means that xxx may be omitted in the description, and [yyy/zzz] means that either yyy or zzz may be included in the description.
- 3.2.5 The “company” used in the “Specifications (Definitions)” column of Table 1, in “3.4 Guidelines for specifications” means the “supplier”.
- 3.2.6 To depress the shutter button means not only the operation of pressing the button but also other general means for starting exposure.

3.3 Reference standards

3.3.1 List of reference standards

- 1) CIPA DCG-001–2005: Guideline for noting digital camera specifications in catalogs (revised version)
- 2) CIPA DC-002–2003: Standard procedure for measuring digital still camera battery consumption
- 3) CIPA DC-003–2003: Resolution measurement methods for digital cameras
- 4) CIPA DC-004–2004: Sensitivity of digital cameras
- 5) CIPA DCG-005–2009: Measurement and Description Method for Weight and Dimensions of Digital Cameras
- 6) CIPA DC-X011–2012: Methods for measurement and presentation of performance of correcting camera shake of digital cameras – Part 1. Optical system
- 7) ISO 517:2008: Photography – Apertures and related properties pertaining to photographic lenses – Designations and measurements
- 8) ISO 516:1999: Photography – Camera shutters – Timing
- 9) ISO 15739:2003: Photography – Electronic still-picture imaging – Noise measurements
- 10) ISO 14524:1999: Photography – Electronic still-picture cameras – Method for measuring optoelectronic conversion functions (OECFs)
- 11) ISO 12232:2006: Photography – Digital still cameras – Determination of exposure index, ISO speed ratings, standard output sensitivity, and recommended exposure index
- 12) ISO 12233:2000: Photography – Electronic still-picture cameras – Resolution measurements
- 13) ISO 15781:201x: Photography – Digital cameras – Measuring shooting lag, shutter release time lag, shooting rate, and start-up time
- 14) IEC 61146-1: 1994 Video cameras (PAL/SECAM/NTSC) – Methods of measurement – Part 1: Non-broadcast single-sensor cameras
- 15) IEC 61146-2: 1997 Video cameras (PAL/SECAM/NTSC) – Methods of measurement – Part 2: Two- and three-sensor professional cameras
- 16) IEC 61747-1: 2003 Liquid crystal and solid-state display devices – Part 1: Generic specification
- 17) IEC 61747-6: 2003 Liquid crystal and solid-state display devices – Part 6: Measuring methods for liquid crystal modules – Transmissive type
- 18) IEC 61966-2-1: 1999 Multimedia systems and equipment – Colour measurement and

management – Part 2-1: Colour management – Default RGB colour space – sRGB

- 19) EIAJ ED-2522: Measuring methods for matrix liquid crystal display modules (liquid crystal display modules using back-light)
- 20) JEITA CP-3202B: Specification standard for color video cameras and camera-recorders
- 21) JEITA CPR-3451A: Presentation method of compressed recording for motion picture and sound for digital cameras (movie/still)

3.3.2 Response to revision of reference standards

When any standards to which this Guideline refer are revised, the following response shall be taken:

- For standards controlled by the Camera & Imaging Products Association (CIPA), the revised edition shall be observed.
- For other standards, the provisions described in this Guideline shall be observed until this Guideline is reviewed.

3.4 List of specification items

Table 1 lists the definitions of digital camera specifications.

In the Standards for individual items stipulated by ISO or CIPA, detailed ways of indicating specifications and various characteristics are presented. However, they tend to be too complicated for descriptions in catalogs for general consumers. Therefore, this Guideline gives compact ways of notation for individual items that are not inconsistent with official standards and presents examples of notations.

Table 1 – Definitions for specifications

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
1	focal length {of the lens}	<p>1. Definition This means the distance along the optical axis between the secondary (rear) principal point and the focus when focusing on a subject at infinity.</p> <p>2. Measurement method Interchangeable lenses and other products in the form of marketable goods whose focal length can be measured shall comply with ISO 517:2008.</p> <p>3. Presentation method</p> <p>(1) The value based on the design may be indicated.</p> <p>(2) The value shall be given in units of mm.</p> <p>(3) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal).</p> <p>(4) For cameras with zoom function, not only the factory shipping value but also the range of values available by zooming may be indicated.</p> <p>4. Presentation examples</p> <ul style="list-style-type: none"> • 3.5 mm • 3.5 {mm} to 10.5 mm 	<ul style="list-style-type: none"> • A clear or accurate measurement method in product form has not been established for digital cameras with built-in lens. • For commonly used lenses, the shooting angle of view (the diagonal angle) can be calculated by the formula: $2 \times \tan^{-1}(\text{diagonal length of image area} / (2 \times (\text{focal length of lens})))$.

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
2	35 mm {film} equivalent focal length {of the lens}	<p>Shall comply with CIPA DCG-001 (an outline is shown below). However, (4) of “3. Presentation method” below shall also apply</p> <p>1. Definition This means the focal length of a DC lens converted into that of a 35 mm {film} camera lens that has the same input field angle as the DC lens.</p> <p>2. Method for converting the focal length of a DC lens to 35 mm {film} equivalent focal length: 35 mm {film} equivalent focal length = focal length of DC lens × {diagonal length of image area of 35 mm film (43.27 mm)}/(diagonal length of image area of image sensor)</p> <p>3. Presentation method</p> <ol style="list-style-type: none"> (1) Diagonal length of image area shall be used as the basis of conversion. (2) The value shall be given in units of mm. (3) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal). (4) For cameras with a zoom function, not only the factory shipping value but also the range of values available by zooming may be indicated. 	
3	[f-number/aperture]	<p>Shall comply with ISO 517:2008 (an outline is shown below). “Presentation method” below shall also apply.</p> <p>1. Definition This means the f-number (= f/D), where f is the focal length of the lens and D is the effective aperture of the lens.</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) Either expressing only the f-number in open-aperture or providing additional information on other aperture is acceptable. In the case of a zoom lens, however, it is recommended to indicate both the maximum wide angle (W) and maximum telephoto (T). In addition, the minimum open-aperture f-number in the entire zoom range shall be indicated. (2) When indicating the aperture for which an ND filter is used together, use the equivalent f-number which apply the same light value as the aperture, and also add a description that recommends the concurrent use of an ND filter. (3) Record the equivalent f-number for Exif. (4) The value based on the design may be indicated. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • F2.8 (W)/F4.8 (T)/F5.6 (M) • F2.8 (W) to 5.6 to 4.8 (T) • F2.8 (W)/F5.6 (T) (use ND filter together) 	<ul style="list-style-type: none"> • A clear or accurate measurement method in product form has not been established for digital cameras with built-in lens.

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
4	Zoom [ratio/magnification]	<ul style="list-style-type: none"> • If the camera has only an optical zoom function, select description (b). • If the camera has only a digital zoom function, select description (c). • If the camera has both functions, the optical zoom function shall be indicated with higher priority. • Not only the factory shipping value but also the available values of zoom magnification may be indicated. 	
	(a) [total/combined] zoom [ratio/magnification]	<p>1. Definition This means the total zoom magnification of the optical zoom and digital zoom combined.</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) The optical zoom magnification shall be indicated conspicuously. (2) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal). (3) Not only the factory shipping value but also the available values of zoom magnification may be indicated. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 3 times by optical zoom (12 times total zoom magnification) • 3 times by optical zoom (12 times total zoom magnification/4 times by digital zoom) • 3 times by optical zoom, 4 times by digital zoom (12 times total zoom magnification) 	
	(b) optical zoom [ratio/magnification]	<p>1. Definition This means the ratio of lens focal length at the maximum telephoto (T) position to that at the maximum wide angle (W).</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal). (2) The details (whether actual value or nominal value is used, etc.) of the focal length used in the calculation of optical zoom ratio are not stipulated. (3) Not only the factory shipping value but also the available values of zoom magnification may be indicated. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 3.8 times • 5 times 	The measured “effective zoom ratio (by the ratio of the size of shot image)” at a measurable subject distance significantly differs from the real zoom ratio calculated from the real focal length (subject distance ∞).

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(c) digital zoom [ratio/ magnification]	<p>1. Definition This means the ratio of the diagonal length of the image area without the digital zoom function to that with the function.</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) Image area is defined pursuant to CIPA DCG-001. (2) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal). (3) The term “shooting digital zoom” can be shortened to “digital zoom” (refer to Item 58). (4) Not only the factory shipping value but also the available values of zoom magnification may be indicated. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 3.5 times • 5 times 	
5	[focus/shooting] [range/distance]	<p>1. Definition This means the subject distance at which shooting results in a proper picture. The shortest shooting distance means the distance on the closest side. Use the distance from the front surface of the lens or the distance from the effective image area of the image sensor. Which to select for this item is left to the supplier's discretion, on condition that the selected distance shall be expressly described.</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) For the AF mode, indicate the distance at which the AF function works in-focus, and for the MF mode, indicate the distance of in-focus that conforms to the relevant supplier's standard. (2) If the longest shooting distance is ∞, only the shortest shooting distance need be indicated. (3) Not only the factory shipping value but also the available subject distance may be indicated. The conditions for shooting mode (macro mode, etc.) and maximum wide-angle and maximum telephoto required to achieve the available subject distance shall be indicated. (4) The conditions for the f-number of the lens are not stipulated. (5) The number of significant digits to be indicated should be one or more for less than 1 m distance and two or more for 1 m or longer distance (round the value to the nearest decimal). <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 50 cm to ∞ (W-end), 1.5 m to ∞ (T-end) (from lens surface) • Shortest shooting distance 50 cm (W-end), 1.5 m 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		(T-end) (from lens front) <ul style="list-style-type: none"> • 0.5 m to ∞ (W-end), 1.5 m to ∞ (T-end) (from effective image area) • 1 {cm} to 50 cm (W-end) (from lens surface when in macro mode) 	
6	lens [construction/ configuration]	1. Definition This means the construction of the lens (number of groups, number of pieces, etc.). 2. Presentation method The customary expressions or designations of the relevant company may be used. 3. Presentation examples <ul style="list-style-type: none"> • 14 pcs in 10 groups (3 aspherical lenses, 1 low dispersion lens) • 7 pcs in 6 groups (1 double-side aspherical lens, 1 set of cemented lens) 	
7	shutter type	1. Definition This means the system of the shutter. 2. Presentation method The customary expressions or designations of the relevant company may be used. 3. Presentation examples <ul style="list-style-type: none"> • Electronic system along with the mechanical shutter • Focal-plane shutter 	
8	shutter speed	Shall comply with ISO 516:1999 (an outline is shown below), and the following “Presentation method”. 1. Definition This means the range of available shutter speed. 2. Presentation method <ol style="list-style-type: none"> (1) If any values that are available in any mode other than factory shipping mode are indicated together, the shooting mode in which users can achieve such indicated values shall be indicated. (2) The whole range of available shutter speed may be indicated together, provided the meaning of the indicated value is expressly described. 3. Presentation examples <ul style="list-style-type: none"> • 1 {second} to 1/2000 second, 15 {seconds} to 1 second (long shutter mode) • 1/2000 {second} to 8 seconds (automatic), 60 seconds at maximum (bulb mode) • 1 {second} to 1/1500 second (automatic mode), 15 {seconds} to 1/1500 second (throughout all shooting modes) 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
9	[light/exposure] metering [system/mode]	<p>1. Definition This means not only the factory shipping conditions but also the metering system and modes used for available exposure control.</p> <p>2. Presentation method The customary expressions or designations of the relevant company may be used.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • TTL open-aperture metering • Center-weighted metering • Spot metering • Multiple pattern metering • Evaluative metering 	
10	exposure [mode/control]	<p>1. Definition This means not only the factory shipping conditions but also the available system and modes of exposure control.</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) The customary expressions or designations of the relevant company may be used. (2) This term may be put in Item 16, “shooting mode”. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Program AE • Shutter (speed) priority AE • Lens aperture priority AE • Manual exposure 	
11	effective subject brightness value range	<p>1. Definition This means the range of subject brightness that allows the user to shoot a practically exposed image without using a flash.</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) The definition and decision of “practical exposure” are left to the discretion of the relevant company. (2) The digital camera shall be set to the factory shipping condition with flash trigger prohibited. If it is not possible to prohibit the flash from being triggered, the value should be evaluated with the subject at a distance that is too far for the flash beam to reach the subject. (3) It is recommended to indicate the APEX value. (4) The whole range of brightness value available for the camera may be indicated in addition to or in preference to the APEX value but if so, the fact should be explicitly stated. (5) If any value available in modes other than the default mode is also indicated, the shooting mode to which the value applies shall also be indicated. <p>3. Presentation example BV3 to 13 (W-end), BV4 to 14 (T-end)</p>	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
12	exposure range	<p>1. Definition This means the range of controllable exposure.</p> <p>2. Presentation method</p> <p>(1) The value shall be calculated from the variation range of the APEX value of lens aperture (AV) and the APEX value of shutter speed (TV) by the following formula: EV = AV + TV</p> <p>(2) It is recommended to indicate the APEX value.</p> <p>(3) The whole range of exposure value available for the camera may be indicated in addition to or in preference to the APEX value but if so, the fact should be explicitly stated.</p> <p>(4) If any value available in modes other than the default mode is also indicated, the shooting mode to which the value applies shall also be indicated.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • EV 6 to 16 (W-end), EV 7 to 17 (T-end) • EV 3 to 17 (W-end), EV 4 to 18 (T-end) (shooting mode: P mode) 	
13	exposure compensation	<p>1. Definition This means whether or not the digital camera is equipped with an exposure compensation function.</p> <p>2. Presentation method (if the function is equipped) The range and the step of compensation should be indicated.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • ±2 stages (1/3 stage step) • ±2 EV (1/3 EV step) 	
14	focus [system/mode/type]	<p>1. Definition This means not only the factory shipping conditions but also the available system and modes of focus control.</p> <p>2. Presentation method The customary expressions or designations of the relevant company may be used.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Central one-point AF • Multiple point AF (9 points) • 9-points AF • Manual focusing • One-shot AF • TTL phase difference detection system (Manual focusing/One-shot AF/Continuous AF) 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
15	white balance [system/mode/control]	<p>1. Definition This means not only the factory shipping conditions but also the available system and modes of white balance control</p> <p>2. Presentation method The customary expressions or designations of the relevant company may be used.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Auto/Fine/Cloudy/Fluorescent/Incandescent/Flash/Set mode/Manual • Preset (Sunlight/Cloudy/Fluorescent/Incandescent/ Flash) 	
16	[scene/shooting] mode	<p>1. Definition This means not only the factory shipping conditions but also the available shooting modes (scene selection, etc.). This item may be broadly interpreted to mean exposure control mode, etc.</p> <p>2. Presentation method The customary expressions or designations of the relevant company may be used.</p> <p>3. Presentation examples Normal/Easy shooting/Macro/Portrait/Sports/Nightscape/Night-scene portrait/Fireworks/Snow/Starry sky/etc.</p>	
17	motion blur suppression	This is a generic term for image stabilization and motion blur reduction. The term “blur” may be replaced with other expressions such as “camera shake” or “subject blur”, if necessary.	<p>If the function may be classified as either (a) or (b) because the function has the nature of both (a) and (b), the classification is left to the discretion of the relevant company.</p> <p>However, image stabilization and motion blur reduction should not be confused, as their technical aspects differ greatly.</p> <p>Examples of the classification are presented in 3.(6) of the Commentary.</p>

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(a) image stabilizer	<p>1. Definition This means the method of correction and/or suppression of blur (bokeh) in the output image caused by the motion of the digital camera body (camera shake, etc.) and/or the motion of the subject by using the output of the blur detection means. However, a technique is assumed to be a “motion blur reduction” system mentioned in (b) below if it only takes pictures in high-speed shutter mode by optimizing the exposure control program, even if it employs the output of a blur detection means, and if the technique does not show significant improvement in stabilized output images.</p> <p>2. Presentation method (1) The system name, mode and other data shall be indicated (if the camera is equipped with this function). (2) The system name, mode name and other data may follow the customary terms or designations of the relevant company. (3) Not only the factory shipping conditions, but also any image stabilizing mode available may be indicated.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Optical system • Electronic system • Hybrid system 	<p>(1) Optical system includes the following:</p> <ul style="list-style-type: none"> • lens shift system • imaging sensor shift system <p>(2) Electronic system includes the following:</p> <ul style="list-style-type: none"> • system that processes images adaptably based on blur information detected from the blur of images by taking more than one shot.^{*1} <p>(3) Hybrid system means a combination of optical and electronic systems. ^{*1} Even if an image processing system processes images by taking more than one shot, it is not considered to be an image stabilizing system if it does not detect blur information or does not perform adaptable processing in response to the blur information.</p>
	(b) motion blur reduction {mode}	<p>1. Definition This means a function or mode that reduces the blur (bokeh) of output images caused by either subject motion or camera shake primarily by shooting in high-speed shutter mode by optimizing the exposure control program. Independent description of this function as a motion blur reduction function or mode is allowable, although this function is a kind of exposure control mode or sensitivity control mode.</p> <p>2. Presentation method (1) The mode names, function names and other descriptions may follow the customary terms or designations of the relevant company. (2) Not only the factory shipping conditions, but also any motion blur reduction mode available may be indicated.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Blur reduction mode • Blur reduction function 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
18	flash	<p>1. Definition This means whether the camera has a built-in flash or whether an external auxiliary flash can be mounted, where a flash means a light source which emits a flash of light.</p> <p>2. Presentation method (1) The customary expressions or designations of the relevant company may be used. (2) If the camera accepts the mounting of an external flash, it is recommended to indicate examples of available flash units.</p>	
19	{built-in} flash mode	<p>1. Definition This means not only the factory shipping conditions but also the applicable flash modes.</p> <p>2. Presentation method The customary expressions or designations of the relevant company may be used.</p> <p>3. Presentation example • Auto/ Forced flash/ Suppressed flash/ Automatic red eye reduction/ Slow sync.</p>	
20	{built-in} flash {working} range	<p>1. Definition This means the range of distance at which flash helps the user take a picture with practical picture quality.</p> <p>2. Presentation method (1) If this item is to be shown, the distance range shall be indicated. (2) The flash range shall be the value for photographing under conditions dark enough for using the flash light. (3) The closest distance e (a) The practical level of picture quality is left to the discretion of the relevant company. (b) The value shall be indicated if it is longer than the [minimum/shortest] shooting distance of the digital camera. (c) Whether to apply (b) to the macro mode or to add some comments is left to the discretion of the relevant company. (4) The [maximum/farthest] distance The practical level of picture quality is left to the discretion of the relevant company. (5) The number of significant digits to be indicated shall be one or more for less than 1 m distance and two or more for 1 m or longer distance (round the value to the nearest decimal). (6) Not only the default setting but also the available range of distance may be indicated, but in this case indicate in what shooting mode the indicated range is available.</p> <p>3. Presentation examples • 0.5 {m} to 5 m (W-end), 1.5 {m} to 3.5 m</p>	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		(T-end) • 0.5 {m} to 3.0 m (standard), 30 {cm} to 50 cm (macro)	
21	{built-in} flash guide number	1. Definition This means the amount of flash light. 2. Presentation method (1) Use the value for ISO 100, in units of meter (if this item is to be indicated). (2) The customary notation without the unit (m) may be used. (3) Additional values for ISO speeds other than 100 may be indicated, in which case the ISO speed shall also be indicated. 3. Presentation examples • Gno.7 (ISO 100• m), Gno.14 (ISO 400• m) • Gno.7 • GN7, GN14 (ISO 400• m)	
22	image sensor ----- (a) [system/type] ----- (b) size	----- 1. Definition This means the classification of image sensor (type, system, etc.). 2. Presentation method Customary expressions may be used. 3. Presentation examples • CCD • CMOS sensor ----- 1. Definition This means the size of image sensor. 2. Presentation method Customary expressions may be used. 3. Presentation examples • 1/2.5 type • 36 {mm} × 24 mm • 35 mm format film size • APS-C	----- Some examples of notation are given in CIPA DCG-001.
23	{picture} [monitor/display] ----- (a) [system/type]	----- 1. Definition This means the form of picture monitor. 2. Presentation method (1) Customary expressions may be used. (2) In case of a monochrome monitor, it shall explicitly be indicated. 3. Presentation examples • Transflective TFT liquid crystal display • TFT liquid crystal display • Organic EL	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(b) image size	<p>1. Definition This means the image size on the {picture/LCD} monitor, where the size means the dimensions of the area excluding all sections that do not contribute to the display of images or characters.</p> <p>2. Presentation method Customary expressions may be used.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 2.5 type • 75 mm diagonally 	
	(c) {number of} [pixels/dots]	<p>1. Definition This means the number of effective pixels or dots of the {picture/LCD} monitor, where the number means the effective pixels or dots of the area excluding all sections that do not contribute to the display of images or characters. The relationship between the number of pixels and the number of dots is: three dots of consecutive R, G and B dots constitute one pixel in a display by three primary colors, R, G and B. (refer to IEC 61747-1:2003)</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal). (2) It is recommended to indicate the value in units of 10,000 in Japanese, and in units of 1,000 (or k) in English. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 215,000 dots • 72,000 pixels 	
	(d) [defect/defective {pixels}]	<p>1. Definition This means the pixels that do not illuminate according to the received signals as they should normally do, or more specifically, those pixels that significantly differ in output from the other pixels so that the user can clearly perceive the defect.</p>	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(e) maximum luminance	<p>1. Definition This means the monitor brightness (luminance) when the maximum signals (255 in the case of 8-bit digital signal) are given in a white window pattern. The provision of this item, however, shall be limited only to the standard measurement method in the darkroom condition in which the luminance on the measured surface is not affected by any external light. (The present guidelines do not define the maximum luminance in different environments.)</p> <p>2. Measurement method Shall comply with IEC 61747-6, 5 Measuring methods 5.1 Luminance and luminance uniformity.*1</p> <p>3. Presentation method (1) If the digital camera has a brightness adjustment function, set the brightness to the maximum. (2) Reflective type monitors is out of scope of this stipulation. (3) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal).</p> <p>4. Presentation example 210 cd/m² or higher</p>	<p>*1 The same contents are stipulated in the JEITA standard, EIAJ ED-2522, 5.9 Measuring methods for luminance and luminance non-uniformity. Note:</p> <ul style="list-style-type: none"> • This performance expresses the characteristics in the darkroom condition; it does not express characteristics in various environments. • Note that the luminance of a liquid crystal display has a trade-off relationship with other liquid crystal display characteristics (contrast, color reproduction characteristics, reflectance, etc.).

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(f) [picture] coverage/field of view]	<p>1. Definition</p> <ul style="list-style-type: none"> • When displaying a recorded image: The term means the percentage (%) of the image range shown on the monitor to the recorded image. • When displaying the scene for shooting: The term means the percentage (%) of the image range shown on the monitor to the range of image to be recorded. <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) Two values in the width (horizontal) and height (vertical) directions shall be indicated respectively. (Indicate the values of the two directions using a one-dimensional expression.) (2) If the difference in the monitor coverage between the horizontal and vertical directions is small, the two values may be unified into one, using the root-mean-square (rms) of the values for the two directions. (3) Use the values on the centerline of the image (the width monitor coverage is defined on the horizontal line at the vertical center and the height monitor coverage is defined on the vertical line at the horizontal center). (4) If the monitor coverage values are different between the playback picture and the shooting picture, which of the two modes the values apply to shall be indicated. (5) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal). <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 96% • Approximately 100% • 97% (for shooting), 100% (for displaying) 	
24	viewfinder		For an electronic viewfinder, details that are not stipulated here should conform to the guidelines for picture monitors stipulated in Item 23.
	(a) [system/type]	<p>1. Definition This means the type of viewfinder.</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) Customary expressions may be used. (2) In case of a monochrome viewfinder, it shall explicitly be indicated. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Optical viewfinder • Viewfinder of single-lens reflex camera optics • Liquid crystal EVF • TFT monochrome liquid crystal viewfinder 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(b) [picture coverage/field of view]	<p>1. Definition This means the percentage (%) of the range of the image seen in the viewfinder to the range of the recorded image.</p> <ul style="list-style-type: none"> • Use the values on the centerline of the image. (The width viewfinder coverage is defined on the horizontal line at the vertical center and the height viewfinder coverage is defined on the vertical line at the horizontal center.) <p>2. Measurement method The view point shall be set at the center at measuring.</p> <p>3. Presentation method</p> <ol style="list-style-type: none"> (1) If the difference in the viewfinder coverage between the horizontal and vertical directions is large, it is recommended to indicate two values in the width (horizontal) and height (vertical) directions, respectively. (Indicate the values of the two directions using a one-dimensional expression.) (2) If the difference in the viewfinder coverage between the horizontal and vertical directions is small, the two values may be unified into one, using the root-mean-square (rms) of the values for the two directions. (3) If the value changes greatly by zooming, it is recommended to indicate both the values at two points of the maximum telephoto (T) position and maximum wide angle (W). (4) If the range of image to be recorded is smaller than the range that is seen in the viewfinder, then the expression of the viewfinder coverage will exceed the value of 100%. In such cases, it is recommended to state the range to be recorded expressly. (5) The subject should be at the distance of 3 m in principle. If the value at a distance other than 3 m is to be indicated, then that distance shall be indicated together. (6) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal). <p>4. Presentation examples</p> <ul style="list-style-type: none"> • 93% • Horizontal; 85%; vertical: 96% • 80% (W-end), 90% (T-end) 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(c) parallax	<p>1. Definition This means the displacement between the center of visual field and that of the output image in the vertical and horizontal directions.</p> <p>2. Presentation method</p> <p>(1) Express the displacement as a ratio (%) of the number of displaced pixels in the horizontal and vertical directions to that of pixels of the output image in the corresponding directions.</p> <p>(2) Subject distance and other data shall be expressly indicated although they are not stipulated here.</p>	
	(d) [diopter/diopic] adjustment	<p>1. Definition This means whether the camera is provided with a viewfinder adjustment function (mechanism) or not.</p> <p>2. Presentation method (if the function is provided)</p> <p>(1) It is recommended to indicate its adjustment range together (only the range may be indicated, suggesting that the function is provided).</p> <p>(2) Indicate the adjustment range in units of m^{-1}, with the positive and negative signs (+, -) relative to the reference diopter scale.</p> <p>3. Presentation example Diopter scale adjustment range $-3 m^{-1}$ to $+1 m^{-1}$</p>	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(e) eye point	<p>1. Definition This means “the position at which the photographer can see the entire area of the picture and all information in the viewfinder.”</p> <p>1.1 Details of the definition Express as the maximum distance from the “position closest to the photographer out of the structural components around the camera's eyepiece frame” or the “rear end of the camera's eyepiece including the protective glass” to the “position at which the pupil can see all screen pictures and all information in the viewfinder”.</p> <p>Further, move the distance from the “position closest to the photographer out of the structural components around the camera's eyepiece frame” may be defined in a state where any structural components removable from the camera's eyepiece frame such as the eyecup, are removed.</p> <p>2. Presentation method</p> <p>(1) It shall be expressly indicated which value is used out of the above two values for the maximum distance, unless “the position closest to the photographer out of the structural components around the camera's eyepiece frame” is used.</p> <p>(2) The number of significant digits to be indicated shall be one or more for a distance shorter than 10 mm, and two or more for a distance of 10 mm or longer (round the value to the nearest decimal).</p> <p>3. Presentation example eye point 21 mm (from the rear end of the camera's eyepiece)</p>	<p>◆ (Recommended) measurement method Place a douser that has a pinhole with a diameter of 2 mm or smaller between the viewfinder and the observer on the optical axis of the viewfinder, and move the pinhole along the optical axis of the viewfinder until the observer can see the entire area of the picture and all information in the viewfinder. Then take the position of the pinhole as the “position at which the pupil can see the entire area of the picture and all information in the viewfinder”.</p>

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
25	[recording/ storage] capacity	<p>1. Definition This means the number of images that can be stored in the recording media.</p> <p>2. Presentation method</p> <p>(1) The following conditions that are significantly related to the number of recorded images shall be described expressly.</p> <ul style="list-style-type: none"> • The number of recorded pixels (including the aspect ratio, if necessary) • Compression mode (fine, standard, normal, etc.) • The type of recording media used (xD, CF, SD, MS, built-in memory in the body of the digital camera, etc.) and its nominal capacity • Nominal capacity (In the case of recording to the built-in memory in the body of the digital camera, the capacity available only for recording images shall be indicated.) <p>(2) The number of images recordable in shooting modes other than in the default setting may be indicated, but in this case indicate in what shooting modes the number is available.</p> <p>(3) It is recommended to include comments such as “value for reference only”, “minimum value” or “depends on the subject”.</p> <p>(4) The designation and details of compression mode are left to the discretion of the relevant company.</p>	
26	recording time for continuous movie capture	<p>1. Definition This means the time duration of recording motion pictures continuously (the time duration until continuous shooting is stopped, regardless of the cause).</p> <p>2. Measurement method Shall comply with the method of measuring battery life for continuously shooting motion pictures for DSC described in Annex B-4.1.</p> <p>3. Presentation method</p> <p>(1) The following factors that stop continuous shooting are to be stated:</p> <ul style="list-style-type: none"> • limit due to rise in temperature • limit due to file format • limit due to specifications of the product • limit due to capacity of recording medium (value when using a recording medium with the maximum capacity) • limit due to battery life ^{*1} <p>(2) It is recommended to indicate factors that limit continuous shooting.</p> <p>(3) Values should be presented in units of minute rounded by truncating seconds, but this does not apply to cases in which the time is accurately defined due to the limit of the product specifications or file format.</p>	*1 The limit value due to battery life is the same as indicated in Item 59 “battery life”.

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		<p>(4) In cases of limits due to the file format or capacity of the recording medium, it is recommended to indicate setting conditions such as motion picture recording mode.</p> <p>4. Presentation examples</p> <ul style="list-style-type: none"> • 10 minutes (heat rise limit, at room temperature of 23°C) • 10 min. 10 sec. (in Full HD shooting: limited by file size of 2 GB) • 29 min. 30 sec. (limited by product specifications) • 2 hrs. 10 min. (in Full HD shooting: limited by capacity of 32 GB SDHC memory card) 	
27	<p>{[image/record-in g/storage]} file format</p>	<p>Shall comply with “5. (2-b) recorded image file format” of CIPA DCG-001 (an outline is shown below), and for RAW files, follow “Presentation method” given below.</p> <p>1. Definition This means the image file format and directory structure recorded in the digital recording medium.</p> <p>2. Presentation method Additional comments shall be given to explain that RAW and other unique formats are “Original file format”.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Exif 2.3, DCF • RAW (original) • RAW (needs dedicated software) 	
28	<p>number of effective pixels</p>	<p>Shall comply with CIPA DCG-001 (an outline is shown below)</p> <p>1. Definition This means the number of pixels of the imaging sensor receiving light from the lens, for which output information is effectively reflected in the data ultimately output as the still image.</p>	
29	<p>number of recorded pixels</p>	<p>Shall comply with CIPA DCG-001 (an outline is shown below), and the following “Presentation method”.</p> <p>1. Definition This means the number of pixels comprising an image frame recorded in the digital recording medium.</p> <p>2. Presentation method (Add to the presentation method stipulated in CIPA DCG-001.) Not only the factory shipping value but also the number of recorded pixels available may be indicated as a list.</p>	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
30	[sound/audio] codec	<p>1. Definition This means the sound codec system available for still picture recording with audio, for example.</p> <p>2. Presentation method Customary expressions may be used.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • WAVE (monaural) • G.726 • MP3 (stereo) • AC-3 (monaural) 	
31	[movie/video] {[clip/capture]}	Of the items relating to shooting motion pictures, those items that are not dealt with in other items of this Guideline but that are defined in JEITA CP-3202B (Specification standard for color video cameras and camera-recorders) should refer to the applicable JEITA standard.	The relevant items are: recording start time and time for automatically canceling a recording pause.
32	compressed recording for motion picture and sound	Shall comply with JEITA CPR-3451A (Presentation method of compressed recording for motion picture and sound for digital cameras (movie/still)) for various items relevant to compressed recording for motion picture and sound.	The relevant items are: system and file format for motion picture recording, pixel number for motion picture recording and aspect ratio, frame rate for motion picture, recording rate for motion picture, recording mode for motion picture, recording time for motion picture, sound accompanied with motion picture, system and file format for sound recording, sound sampling rate/bit length, sound recording rate, sound recording time, environment for enabling play-back
33	sensitivity	<p>Shall comply with CIPA DC-004 (an outline is shown below) and the following “Presentation method”.</p> <p>1. Definition This means the sensitivity for shooting. Its specific value shall be expressed in Standard Output Sensitivity (SOS) or Recommended Exposure Index (REI).</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) The sensitivity setting value or sensitivity mode name^{*1} may be stated together, provided the fact is expressly indicated. (2) If any sensitivity value other than the factory shipping value is indicated, also indicate the shooting mode in which the indicated value is 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		<p>available.</p> <p>*¹ It is desirable to state the range of sensitivity along with the sensitivity mode name.</p>	
34	[defect/defective pixels]	<p>1. Definition</p> <p>This means the pixels that are not supplied in the output signals from a digital camera as they should normally be, or more specifically, those pixels that significantly differ in output from the other pixels so that the user can clearly perceive the defect.</p>	<ul style="list-style-type: none"> • The present guidelines do not stipulate any measurement method. • This word indicates a defect of the digital camera unit, instead of a defect of individual parts.
35	resolution	<p>Shall comply with CIPA DC-003 (an outline is shown below) and the following “Presentation method”.</p> <p>1. Definition</p> <p>This means the limit of resolution with which fine patterns can be resolved excluding aliasing portions, and is expressed as the number of lines per unit height of the screen.</p> <p>2. Presentation method</p> <p>The factory shipping value shall be indicated in principle.</p>	
36	low contrast luminance amplitude/frequency response	<p>1. Definition</p> <p>This means the luminance amplitude/frequency response characteristics of a low contrast subject.</p> <p>1.1 Detailed definition</p> <p>This means the luminance amplitude/frequency response characteristics obtained by shooting a sine-wave chart that has gray part reflectance Rg% ($R_g = 40\% \pm 5\%$), white peak part reflectance $\{R_g + (0.5 \pm 0.05\%) \times R_g\}\%$, black peak part reflectance $\{R_g - (0.5 \pm 0.05\%) \times R_g\}\%$, and difference in reflectance between white and black peak parts $(1.0 \pm 0.05\%) \times R_g\%$ by exposure^{*2} of which the output value for the gray part is 100 +2/-4 (8-bit digital). However, the frequency response should be indicated as the output after linearization.</p> <p>2. Measurement method</p> <p>As shown in Annex A 4.2.^{*1}</p> <p>3. Presentation method</p> <p>(1) It is recommended to state shooting conditions that significantly affect the characteristics (such as f-number and focal length of lens, subject distance, and ISO sensitivity, etc.).</p> <p>(2) If they are stated, state at least any one of “individual characteristics”, “average characteristics and those in the direction with the minimum value”, and “characteristics in the direction with the minimum value” in four directions, or horizontal, vertical, +45°</p>	<p>*¹ Complies with the concept of IEC 61146-1, 7 Luminance amplitude/frequency response.</p> <p>*² When shooting under the present shooting conditions, the exposure level in the gray part is about 32 (8-bit digital), the signal difference between white and black peak parts is about 32 (8-bit digital), resulting in contrast signals of about 12.5% for signals before gamma processing.</p>

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		diagonal, and -45° diagonal directions. (3) “Characteristics in the center” and “characteristics at a position with the minimum value out of four corner parts” should be stated.	
37	signal to noise ratio	Shall comply with ISO 15739:2003 (an outline is shown below). 1. Definition This means the signal to noise ratio of the output image.	
38	[opto-electronic conversion function/tone characteristics]	Shall comply with ISO 14524:1999 (an outline is shown below). 1. Definition This means characteristics of the output signal level of the output image signals versus the input level of light.	
39	dynamic range	Shall comply with ISO 15739:2003 (an outline is shown below). 1. Definition This means the ratio of the maximum level of luminance signals without saturation to the level of luminance signals where the S/N ratio to random noise is 1 (the minimum level of luminance signals).	
40	image geometric distortion	1. Definition This means the value expressed as the ratio of the displacement from straight lines of the output image, when horizontal and vertical straight lines are shot, to the image height. 2. Measurement method As shown in Annex A4.1. 3. Presentation method (1) It is recommended to add the shooting conditions (focal length of lens, subject distance, etc.) that significantly affect the image geometric distortion. (2) The value shall be expressed as a percentage (%). (3) The number of significant digits to be indicated shall be two or more (round the value to the nearest decimal). 4. Presentation examples <ul style="list-style-type: none"> • Image geometric distortion + 2.5% (height of image 1.0, W-end, subject distance 2 m) • Image geometric distortion (horizontal distortion) + 2.5% (W-end, subject distance 2 m) 	(1) This guideline uses image geometric distortion to indicate the image distortion, after concluding that general consumers can more easily recognize the index of image geometric distortion, which directly indicates how correctly a straight line of a subject is reproduced as an accurate straight line, than the index of optical distortion, which indicates how correctly the distance from the optical center is reproduced (i.e., indicates how correctly a perfect circle of a subject is reproduced as a perfect circle). In addition, we adopted the concept of IEC 61146-1, 24 which stipulates image geometric distortion of a video camera for the measurement method. (2) Due to the increasing

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
			<p>trend of correcting image geometric distortion by means of digital signal processing, it does not necessarily apply that the larger the height of the image (distance from the center of the screen), the larger the distortion. Accordingly, an expansion is introduced in two-dimensional directions and the measurement value of the part of low image height is reflected, while following the concept of the previous stipulation.</p>
41	luminance non-uniformity	<p>1. Definition This means the variation from uniform output luminance signals, when a subject with uniform luminance is shot.</p> <p>1.1 Detailed definition This means the ratio ($= 1 - (m'/M')$) of the difference between M', or the linearized value of the maximum luminance signal level within the whole screen, and m', or the linearized value of the minimum luminance signal level therein, to M', where M and m refer to the average value of the adjacent horizontal H-area \times the vertical V-area (H: area of 10% + 0%/-2% of the horizontal output image, V: area of 10% + 0%/-2% of the vertical output image).</p> <p>2. Measurement method As mentioned in Annex A 4.5.</p> <p>3. Presentation method</p> <ol style="list-style-type: none"> (1) It is recommended to add the shooting conditions (f-number of lens, focal length, etc.) that significantly affect the luminance shading, unless the maximum value by the shooting conditions is to be indicated. (2) The value shall be given as a percentage (%). (3) The number of significant digits to be indicated shall be one or more for less than 10%, and two or more for 10% or more (round the value to the nearest decimal). <p>4. Presentation examples</p> <ul style="list-style-type: none"> • 60% or less • 53% or less (W-end, max-aperture lens aperture) 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
42	color non-uniformity	<p>1. Definition This means the deviation from uniform output color signals, when a subject having uniform color is shot.</p> <p>1.1 Detailed definition This means to shoot a gray chart with uniform chromaticity and luminance having reflectivity of 18%, lit by either an illuminant D light source or its equivalent (color temperature of 6504K ± 500K in continuous spectrum) or a lighting box with uniform chromaticity (illuminant D light source or its equivalent (color temperature of 6504K ± 500K in continuous spectrum)) to obtain output signals, from which the following values are calculated: L*i, a*i, and b*i in CIE L*, a*, and b* spaces in each of the divided areas in each of neighboring horizontal H area × vertical V area within the whole screen. Seek the maximum and minimum values for L*i, a*i, and b*i in the whole screen, respectively. Maximum value: L*i[max], a*i[max], and b*i[max] Minimum value: L*i[min], a*i[min], and b*i[min]</p> <p>Then, calculate D by the formula: $D = \sqrt{\{(L^*i[max] - L^*i[min])^2 + (a^*i[max] - a^*i[min])^2 + (b^*i[max] - b^*i[min])^2\}}$ H: area of 10% +0%/-2% of horizontal output image V: area of 10% +0%/-2% of vertical output image V: area of 10% +0%/-2% of vertical output image</p> <p>2. Measurement method As mentioned in Annex A 4.6.</p> <p>3. Presentation method (1) It is recommended to add the shooting conditions (f-number and focal length of lens, distance of subject, type/color temperature of light source, white point, etc.) that significantly affect the color non-uniformity. The shooting conditions may be omitted, provided the maximum value under the shooting conditions is indicated. (2) The number of significant digits to be indicated shall be two or more places below the decimal point (round the value to the nearest decimal).</p> <p>4. Presentation examples</p> <ul style="list-style-type: none"> • D = 3.50 (W-end, F2.5, subject distance 2 m, full screen, illuminant D light source, (Xn, Yn, Zn) = (109.85, 100.00, 35.58)) • D = 2.15 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
43	white balance	<p>1. Definition This means the deviation from white of the output image, when a gray chart illuminated by light sources with various color temperatures is shot. The present guidelines do not cover this item.*¹</p>	<p>*¹ The present guidelines do not cover this item as the targeted characteristics can not be defined. Colorimetric white balance is different from the preferable white balance of digital cameras, and so a digital camera that always reproduces gray as white may not produce a desirable image.</p>
44	color reproduction	<p>1. Definition This means the difference of color between the actual color of a subject and the output color obtained by shooting. The present guidelines do not cover this item.*¹</p>	<p>*¹ The present guidelines do not cover this item because it is not possible to define the targeted characteristics. Colorimetric color reproduction is different from color reproduction required for digital cameras, and so a digital camera with little error in color reproduction may not produce a desirable image. (Example: it is impossible to evaluate memorized colors, etc. by means of colorimetric performance.)</p>
45	lateral chromatic displacement	<p>1. Definition This means the displacement of R/B signals to G signal in output signals. 1.1 Detailed definition Supposing the reproduction displacement of R/B signals to G signal at each position on a screen to be the number of displaced pixels in the horizontal direction ΔR_{Hi}, ΔB_{Hi}, and the number of displaced pixels in the vertical direction ΔR_{Vi}, ΔB_{Vi}, then the lateral chromatic displacement at each position is represented by the following formulae: $\Delta R_i = (\sqrt{(\Delta R_{Hi})^2 + (\Delta R_{Vi})^2}) / \sqrt{(H^2 + V^2)} (\%)$ $\Delta b_i = (\sqrt{(\Delta B_{Hi})^2 + (\Delta B_{Vi})^2}) / \sqrt{(H^2 + V^2)} (\%)$ where H and V are the number of pixels in the horizontal and vertical directions in the output image, respectively. The lateral chromatic displacement ΔC_i is the larger of ΔR_i or Δb_i. 2. Measurement method As mentioned in Annex A 4.4.*¹ 3. Presentation method (1) State the value with the largest displacement out of the lateral chromatic displacement of each</p>	<p>*¹ Adopted the concept of IEC 61146-2, 3.6 Registration.</p>

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		<p>position. It is recommended also to indicate such position.</p> <p>(2) It is recommended to add the shooting conditions (f-number and focal length of lens, etc.) that significantly affect the characteristic.</p> <p>(3) The value shall be given in units of 0.02% (round the value up to a unit).</p> <p>4. Presentation examples</p> <ul style="list-style-type: none"> • 0.1% in upper-right part (0.9H, 0.9V) (W-end, F2.8) 	
46	flare	<p>1. Definition This means the extent of effect on the black output level in a picture due to light from subjects surrounding the picture.</p> <p>1.1 Detailed definition This means the extent of effect (rate of increase in output level) on the output level of a black portion (reflectivity less than 2%) having an area of $H/10 \times V/10$ of a recorded picture in the center of the picture caused by a white portion (reflectivity 80% or more) having an area of $1.414H (+5\%, -0\%) \times 1.414V (+5\%, -0\%)$ of the recorded picture that surrounds the picture.</p> <p>2. Measurement method As mentioned in Annex A 4.3.*1</p> <p>3. Presentation method</p> <p>(1) It is recommended to add the shooting conditions (f-number and focal length of lens, etc.) that significantly affect the characteristic.</p> <p>(2) The number of significant digits to be indicated shall be one or more for less than 1%, and two or more for 1% or more (round the value to the nearest decimal).</p> <p>4. Presentation examples</p> <ul style="list-style-type: none"> • Flare 1.5% (W-end, F2.8) 	*1 Adopted the concept of IEC 61146-2 2.12 Flare.

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
47	proper exposure	This means the exposure value that produces the optimum picture quality. The present guidelines do not cover this item.* ¹	* ¹ Reason for no stipulation: It is impossible to determine uniformly what the optimum exposure is, as it varies greatly depending on the shooting scene (subject), viewer's personal taste and feeling, type of digital camera, etc. Accordingly, it is inappropriate to stipulate a proper exposure value uniformly in a public standard; it should be left to the discretion of each supplier and the market.
48	minimum subject illumination	This means the minimum luminance of illumination that produces an acceptable picture quality. The present guidelines do not cover this item.* ¹	* ¹ Reason for no stipulation: Picture quality depends on a close relationship or balance of many individual specification items that affect picture quality. It is impossible to determine uniformly what an acceptable picture quality is, as it varies greatly depending on the shooting scene (subject), viewer's personal taste and feeling, type of digital camera, etc. Accordingly, it is inappropriate to stipulate an acceptable picture quality or minimum subject illumination uniformly in a public standard; it should be left to the discretion of each supplier and the market.
49	depth of field	This means the range of depth (distance) within which images are assumed to be in focus on the surface of subjects. The present guidelines do not cover this item.* ¹	* ¹ Reason for no stipulation: Stipulating the depth of field is equivalent to stipulating an acceptable value of resolution or sharpness, that is, acceptable picture quality. An acceptable or optimum picture quality varies greatly depending on the

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
			<p>shooting scene (subject), viewer's personal taste and feeling, type of digital camera, etc.</p> <p>Accordingly, it is inappropriate to stipulate the depth of field uniformly in a public standard; it should be left to the discretion of each supplier and the market.</p>
50	image stabilization performance	<p>Shall comply with CIPA DC-X011 (an outline is shown below).</p> <p>Note: CIPA DC-X011 is a standard for optical systems, but regarding the presentation method and presentation examples, it may be applied to other systems until other standards are established for them.</p> <p>1. Definition This means the effect of the function for correcting camera shake.</p> <p>2. Presentation method</p> <p>(1) This characteristic shall be expressed as the difference of shutter speed (difference of TV value in APEX expression).</p> <p>(2) A value for the image stabilization performance other than under the factory shipping conditions may be indicated with an additional statement on the settings under which such value is valid.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Image stabilization performance: 2.0 steps (W-end), 2.5 steps (T-end) • Image stabilization performance: 2.0 steps or more (in the whole range of focal distance) 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
51	start-up time	<p>Shall comply with ISO 15781^{*1} (an outline is shown below).</p> <p>1. Definition This means the time between switching a digital still camera on and the moment the camera has reached a standby state ready to shoot.</p> <p>2. Presentation method (1) Shall comply with ISO 15781 as to the number of significant digits in spite of the stipulation in 3.1 (8). (2) The time under settings other than the factory shipping conditions may be indicated with an additional statement on the conditions under which such time is valid.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 1.0 second • 1.5 seconds, 0.9 second (when flash is turned OFF) 	<p>^{*1} ISO 15781 is DIS at the end of January 2012</p> <ul style="list-style-type: none"> • “Pre-Exposure” stated in ISO 15781 DIS has the same meaning as “1st release”.
52	shutter release time lag	<p>Shall comply with ISO 15781^{*1} (an outline is shown below).</p> <p>1. Definition This means the 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.</p> <p>2. Presentation method (1) Shall comply with ISO 15781 as to the number of significant digits in spite of the stipulation in 3.1 (8). (2) The time under settings other than the factory shipping conditions may be indicated with an additional statement on the conditions under which such time is valid.</p> <p>3. Presentation examples Shutter time lag: 0.015 second •Release lag: 20 ms (35mm film equivalent focal length: 60 mm)</p>	<p>^{*1} ISO 15781 is DIS at the end of January 2012.</p> <p>(1) Examples of more concise expressions are “shutter {time} lag” or “release {time} lag”.</p>
53	shooting time lag	<p>Shall comply with ISO 15781^{*1} (an outline is shown below).</p> <p>1. Definition This means the time between pressing the exposure button (fully in a breath) and the beginning of the exposure. This period of time includes all measurements and adjustments – like auto focus and exposure control – a digital camera needs to make prior to the beginning of the exposure.</p> <p>2. Presentation method (1) Shall comply with ISO 15781 as to the number of significant digits in spite of the stipulation in 3.1 (8). (2) The time under settings other than the factory shipping conditions may be indicated with an</p>	<p>^{*1} ISO 15781 is DIS at the end of January 2012.</p> <ul style="list-style-type: none"> • In case of a camera with a shutter button having two positions for pre-exposure (1st release) and start of exposure (2nd release), press the button in one motion down to the start of exposure (2nd release) position.

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		<p>additional statement on the conditions under which such time is valid.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Shooting time lag: 0.6 second (subject distance 3 m, F2.8) • Shooting time lag: 1.0 second (liquid crystal touch shutter) 	
54	[burst] shooting rate	<p>Shall comply with ISO 15781^{*1} (an outline is shown below).</p> <p>1. Definition This means that the number of shots (performance) per second a camera can take successively in continuous shooting (mode). It is the reciprocal of the time duration from the start of exposure of an image to the start of exposure of the next image.</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) Shall comply with ISO 15781 as to the number of significant digits in spite of the stipulation in 3.1 (8). (2) State the rate by linking to the number of shots recordable in continuous shooting. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 3.0 shots/second (up to 7 continuous shots) • 3.0 frames/second (up to 7 continuous frames) • 3.5 shots/second (for up to 7 shots); 1.5 shots/second (after the 8th shot) (when xxx medium is used) 	<p>^{*1} ISO 15781 is DIS at the end of January 2012.</p> <p>(1) In the case of indicating the same contents by the shooting interval (time) in continuous shooting (mode), use an item name different from the shooting rate (e.g., continuous shooting interval, etc.).</p> <p>(2) If the shooting rate becomes remarkably slow, indicate the time duration before it becomes remarkably slow.</p>
55	number of [recordable pictures/shots] in [burst {shooting}/continuous shooting] mode	<p>Shall comply with ISO 15781^{*1} (an outline is shown below).</p> <p>1. Definition This means the number of shots that a camera can continuously take at an approximately constant speed in continuous shooting (mode).</p> <p>2. Presentation method</p> <ol style="list-style-type: none"> (1) It is recommended that the value be indicated linked to the continuous shooting speed. <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 7 shots (3.5 shots/second) • 100 shots • Up to the capacity of the recording medium 	<p>^{*1} ISO 15781 is DIS at the end of January 2012.</p>
56	shooting interval	<p>1. Definition This means the time interval from the time of one release to the time of the next available release in single shooting mode that takes pictures one by one, where the time interval is defined as the time duration from the end of an exposure to the start of the next exposure.</p> <p>2. Measurement method Between one shot and the next, there must be a</p>	<p>^{*1} ISO 15781 is DIS at the end of January 2012.</p> <p>If the shutter speed is short enough, the interval from the time of starting an exposure to the time of starting the next exposure will be roughly the same value.</p>


No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		<p>moment when the finger completely leaves the shutter release button. Other conditions of measurement should conform with ISO 15781^{*1}</p> <p>3. Presentation method</p> <p>(1) The number of significant digits should be two or more by rounding the value to the nearest decimal. However, one digit will suffice for times of less than 1 second.</p> <p>(2) In spite of the stipulation of 3.1 (8), shall comply with (1) on the number of significant digits even when the indicated value is a whole number.</p> <p>(3) The time under settings other than the factory shipping conditions may be indicated with an additional statement on the conditions under which such time is valid.</p> <p>4. Presentation examples</p> <ul style="list-style-type: none"> • 0.5 seconds (image size VGA) • 1.2 seconds • 2.0 seconds 	
57	AF {focusing} speed	<p>1. Definition</p> <p>This means the time duration from the start of AF operation to the end of focusing action (including the time required for processing or actions other than the AF action conducted during the period).</p> <p>1.1 Detailed definition</p> <p>This means the time duration from the start of AF operation to the completion of AF action, when the focused state is switched from a pseudo ∞ subject to a subject at X m. Pseudo ∞ is defined as the distance of either 100 times the 35mm film equivalent focal length or 5 m, whichever is the longer, and X m being the distance at which the magnification of shooting is 1/33.^{*1}</p> <p>2. Measurement method</p> <p>Method 1 ([Internal {measurement method}]: method of internal measurement) (details are shown in Annex B.4.2)</p> <p>Under the shooting conditions where exposure and white balance control do not work,^{*2} the time duration is measured from the start time of the AF operation to the time when the focus lens stops. At this time, the position where the focus lens stops is the one where the focused condition^{*3} is satisfied. If it is not possible to detect stopping of the focus lens, it is acceptable to obtain the AF speed by measuring the time duration before the focus driving motor stops (pseudo AF speed), adding the time lag τ of the focus lens movement to this pseudo AF speed, and using the value as the AF speed.</p> <p>The time of starting the AF operation is defined as the time when the pre-exposure operation, such as half-pressing the shutter button, is recognized.</p>	<p>^{*1} Reference is made to ISO 15781. ISO 15781 is DIS at the end of January 2012^{*2}</p> <ul style="list-style-type: none"> • This aims to minimize the effects of any actions other than AF. • It is possible to achieve the shooting condition by disabling the controls for exposure and white balance (WB) in the case of a digital camera with manual modes for each control by setting to the exposure-fixed and WB-fixed mode, respectively, and in the case of a digital camera without any manual mode, by setting the same subject illuminating conditions, for example. <p>^{*3} Determination of the focused condition is left to the discretion of each supplier.</p>

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		<p>Method 2 ([External { measurement method }]): method of external measurement) (Shall comply with ISO 15781 for the specific measurement method)</p> <p>(Method 2 is to be treated as an alternative when measurement by Method 1 is technically not practical.)</p> <p>Under the shooting conditions, where exposure and white balance control do not work,^{*2} the shooting time lag and shutter release time lag are measured. The time duration obtained by subtracting the shutter release time lag from the shooting time lag is assumed as the AF speed. However, it should be in a mode in which the in-focus state is set as the release-enabling condition.</p> <p>Note: In either Method 1 or 2:</p> <ol style="list-style-type: none"> (1) AF mode, in which the AF action is activated without the release operation, is not subject to the measurement methods of the present stipulation. (2) The subject should be a chart that allows the in-focus state to be easily determined, such as the resolution chart and star chart in ISO 12233, three-line chart and black and white checker chart in ISO 15781. <p>(Remark)</p> <p>In some cases, if the above-mentioned measurement is conducted directly after the states of power-off or sleep, some boot processing time may be required. Thus, it is essential that this operation is conducted during the power-on state.</p> <p>3. Presentation method</p> <ol style="list-style-type: none"> (1) Indicate which methods (Method 1 (method of internal measurement) or Method 2 (method of external measurement) is used. (2) The time under settings other than the factory shipping conditions may be indicated with an additional statement on the conditions under which such time is valid. Especially, conditions affecting the AF speed^{*4} should be expressly stated, when the fastest value is stated. (3) Additional conditions significantly affecting AF speed^{*4} should be stated for other cases. However, this additional statement of shooting conditions may be omitted, if the maximum value under shooting conditions is indicated. (4) The measurement value should be indicated as the average value obtained from 8 of 10 measurement values by eliminating the maximum and minimum values. (5) Results should be presented in units of 0.01 second for Method 1 (round the value up to a unit) and in units of 0.1 second for Method 2 (round the value up to a unit). 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
		^{*4} (In the case of an interchangeable lens camera) such conditions as the lens, focal length and f-number of the lens, lighting conditions, multiple/spot measurement of distance, AF mode, release mode, exposure mode, and face recognition. 4. Presentation examples <ul style="list-style-type: none"> • Fastest: 0.15 second (method of internal measurement, f = 14 mm, F3.5, LV7 – 14, face recognition OFF, manual exposure, focus priority mode, center area fixed, and AF-S mode) • Maximum: 0.2 second (method of internal measurement) 	
58	[zoom ratio/magnification] of playback mode	1. Definition This means the ratio of similitude between the enlarged image and the unenlarged image on the picture display in playback mode. 2. Presentation method If the enlarged magnification is different between the horizontal and vertical directions, indicate the ratio of length in the diagonal direction. 3. Presentation example 4 times	
59	battery [consumption/life]	1. Definition This means how many images can be taken without changing or recharging the battery (starting with a new primary battery or fully charged rechargeable battery). Different methods shall be used for still shooting and movie clipping. It is acceptable to indicate only one of the two.	
	(a) battery [consumption/life] of still [shooting/capture]	Shall comply with CIPA DC-002 (an outline is shown below). 1. Definition This means how many images can be taken without changing or recharging the battery during still shooting	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
	(b) battery [consumption/ life] of [movie/video] [clip/capture]	<p>1. Definition This means how long movie clipping can be shot without changing or recharging the battery during movie recording. However,</p> <ul style="list-style-type: none"> • If recording is stopped due to the limit of continuous recording time, resume recording as soon as possible, and battery life is defined as the total duration of movie recording. • If recording is stopped due to the limit of temperature rise, repeat the operation to resume recording after allowing the camera to cool, and battery life is defined as the total duration of movie recording. <p>2. Measurement method As shown in Annex B.4.1.*¹</p> <p>3. Presentation method</p> <ul style="list-style-type: none"> • In principle, indicate the actual shooting battery life. • When this item is indicated in a catalog, indicate also “movie clipping continuous recording time” mentioned in Item 26. 	* ¹ It is intended to keep consistency with the stipulation of JEITA CP-3202B. The measurement methods shown in Annex B.4.1 is drafted by adding some modifications, such as defining detailed conditions suitable for DC, to the measurement methods stated in the above JEITA standard.
	(b-1) battery [consumption/ life] of [movie/video] [clip/capture] in actual use case	<p>1. Definition This means how long movie clipping can be shot and recorded without changing or recharging the battery in a test conducted by a shooting method simulating actual usage conditions of movie recording (activating actions such as zooming the lens position, REC and STBY of shooting, ON-OFF of power in a stipulated sequence).</p> <p>2. Measurement method As shown in Annex B.4.1.1.*¹</p>	* ¹ It is intended to keep consistency with the stipulation of JEITA CP-3202B. The measurement methods shown in Annex B.4.1.1 is drafted by adding some modifications, such as defining detailed conditions suitable for DC, to the measurement methods stated in the above JEITA standard.
	(b-2) battery [consumption/ life] of continuous [movie/video] [clip/capture]	<p>1. Definition This means how long movie clipping can be shot and recorded continuously without changing or recharging the battery under stipulated fixed conditions (such as fixing the lens at the wide angle end, fixing the shooting in REC action, fixing the power at ON, and fixing the subject).</p> <p>2. Measurement method As shown in Annex B.4.1.2.*¹</p>	* ¹ It is intended to keep consistency with the stipulation of JEITA CP-3202B. The measurement methods shown in Annex B.4.1.2 is drafted by adding some modifications such as defining detailed conditions suitable for DC, to the measurement methods stated in the above JEITA standards.

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
60	weight	<p>Shall comply with CIPA DCG-005 (an outline is shown below).</p> <p>1. Definition This means the total weight of the digital camera and interchangeable lens at the time of shooting.</p> <p>2. Measurement method</p> <p>2.1 Digital camera Measure the weight, using a weighing instrument, of the digital camera equipped with the battery used for measuring CIPA battery life and the recording medium recommended as most suitable by the supplier.</p> <p>2.2 Interchangeable lens Measure the weight, using a weighing instrument, of the lens with accessories attached that is not removable without using a tool.*¹</p> <p>3. Presentation method The figures obtained by “2. Measurement method” should be indicated. If an interchangeable lens does not include any part for attaching a tripod, state that fact.</p> <p>4. Presentation examples</p> <p>4.1 Digital camera</p> <ul style="list-style-type: none"> • Weight: 125 g (according to CIAP Guideline) • Weight: 185 g (including supplied battery and recording medium) <p>4.2 Interchangeable lens</p> <ul style="list-style-type: none"> • Weight: 695 g (according to CIAP Guideline) • Weight: 2900 g (including attached part for fitting a tripod) 	* ¹ A substitute tool such as a coin may be deemed to be a tool.

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
61	dimensions	<p>Shall comply with CIPA DCG-005 (an outline is shown below).</p> <p>1. Definition This means the external dimensions of the digital camera or interchangeable lens.</p> <p>2. Measurement method</p> <p>2.1 Digital camera Define a rectangular solid with the smallest dimensions that contains the digital camera and measure its three dimensions with a dimension-measuring instrument. In this instance, any member may be deemed to be a protrusion that may be eliminated from the external dimensions (except a lens that cannot be detached), if it has a total area of 20% or less of the projected area viewed from the direction perpendicular to one surface and the area of the protrusion is 10% or less of the dimensions of a surface perpendicular to said surface.</p> <p>2.2 Interchangeable lens Measure the maximum diameter of the circular portion and the length from the mounting surface to the end of the lens. In this instance, any protrusions on the circular portion or any part for attaching a tripod may be eliminated from the external dimensions.</p> <p>3. Presentation method The figures obtained by “2. Measurement method” should be indicated. Drawings may be used to avoid ambiguity.</p> <p>4. Presentation examples</p> <p>4.1 Digital camera</p> <ul style="list-style-type: none"> • Dimensions: 111.2 (width) {mm} × 56.5 (height) {mm} × 19.9 (depth) {mm} • Dimensions: 125.7 (W) {mm} × 62.3 (H) {mm} × 28.9 (D) {mm} (according to CIAP Guideline) <p>4.2 Interchangeable lens</p> <ul style="list-style-type: none"> • Dimensions: ø85 {mm} × 245 mm • Dimensions: ø105 {mm} × 285 mm • Dimensions: See the drawings below. 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
62	volume	<p>1. Definition This means the actual volume of the digital camera, interchangeable lens, and waterproof case, when placed in containment or in the state of usage, where the state of being placed in containment means the state in which the power is off.</p> <p>2. Measurement method Measure by using a volume-measuring instrument. A technique such as submerging it in water may be used, provided the measurement result is not ambiguous.</p> <p>3. Presentation method (1) Indicate in units of cm³. (2) Whether the camera was placed in containment or in the state of usage shall be expressly described. This provision applies only if the volume changes between the state of being placed in containment and the state of usage. (3) The number of significant digits to be indicated shall be two or more (round the value up to a unit).</p> <p>4. Presentation examples</p> <ul style="list-style-type: none"> • Volume: 320 cm³ (in usage) • Volume: 175 cm³ (in containment) 	
63	power source	<p>1. Definition This means the type of power supply such as applicable batteries and external DC input.</p> <p>2. Presentation method (1) Indicate the type of battery if used, and the type of external power supply if used. (2) The battery type may be indicated using customary expressions. (3) The external power supply may be indicated at the relevant company's discretion.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • Lithium-ion battery (3.7V, supplied with the camera) • Rechargeable lithium-ion battery • Two AA (UM3) alkaline (dry) batteries (two cells) • Dedicated AC adaptor (optional) 	

No.	Items	Guidelines for Reference Specifications (Definitions) and Presentation	Remarks (note/reasons for no stipulation, etc.)
64	interface	<p>1. Definition Describe the available external interfaces.</p> <p>2. Presentation method Customary expressions may be used.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • DC input (special terminal) • AV output • Dedicated I/O terminal • USB • High-speed USB 	
65	operating temperature {range}	<p>1. Definition This means the range of temperature at which camera operation is guaranteed.</p> <p>2. Presentation method The details of guaranteed operation are left to the discretion of the relevant company.</p> <p>3. Presentation examples</p> <ul style="list-style-type: none"> • 0°C to 40°C • -10°C to +40°C 	
66	operating humidity {range}	<p>1. Definition This means the range of humidity at which camera operation is guaranteed.</p> <p>2. Presentation method The details of guaranteed operation are left to the discretion of the relevant company.</p> <p>3. Presentation example 10{% } to 90%</p>	
67	applicable laws and regulations	<p>Shall comply with various applicable laws and regulations. The present guidelines do not cover this item. ^{*1}</p>	<p>^{*1} The present guidelines do not cover this item because it relates to compliance with laws and regulations.</p>

Annex A (normative)

Measurement Methods for Digital Cameras for Items relating to Image Quality in the Specifications

A.1 Introduction

The text of “Guidelines for Digital Camera Specifications” covers items dealing with image quality among specification items. The measurement methods provided in Annex A are the fundamental methods that enable values to be directly obtained for the characteristics based on the definition in each item on image quality by directly observing/measuring the output images or their waveforms.

A.2 Scope

This annex stipulates the fundamental measurement methods for measuring items dealing with image quality out of specification items for digital cameras for consumer use stipulated in the text of “Guidelines for Digital Camera Specifications”.

A.3 Conditions for measurement

The measurement of products shall be carried out under the following conditions for measurement.

A3.1 Environments for measurement

The measurement shall be carried out in the following environment unless otherwise stated:

- Temperature: $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$
- Relative humidity: $50\% \pm 20\%$
- Atmospheric pressure: 86 kPa to 106 kPa

A.3.2 Conditions for measurement (setting of digital camera for measurement)

The measurement shall be carried out in the following settings and modes unless otherwise stated.

- (1) The measurement shall be carried out under the factory shipping conditions on factory shipping (“default conditions”). At this time, reporting of the conditions of measurement may be omitted. However, if measured values in conditions other than the default ones are reported together, such other measuring conditions shall be reported.

Note that:

- Functions that are not available in the default settings shall be measured under settings in which such functions become available.
 - If there exist any parameters or modes that cannot be determined with the default settings, measurement shall be carried out under the settings that the supplier expects to be most likely used by users. However, if selection of that setting may affect the specification value, then the setting shall be reported.
- (2) In the case of cameras with interchangeable lenses, in principle measurement shall be carried out with the lens placed in position. Selection of the lens is left to the supplier's discretion, but the conditions (name or type of lens, etc.) must be expressly reported for those items for which characteristic values vary depending on the types of lens.

A.3.3 Conditions of shooting

Each test chart shall be specified, together with the lighting conditions such as illuminance, luminance and color temperature of illumination. The use of a transparent test chart may be permitted; however, the reflection type should be used in questionable cases.

A.3.3.1 Arrangement of measuring equipment

A.3.3.1.1 Reflection type test chart

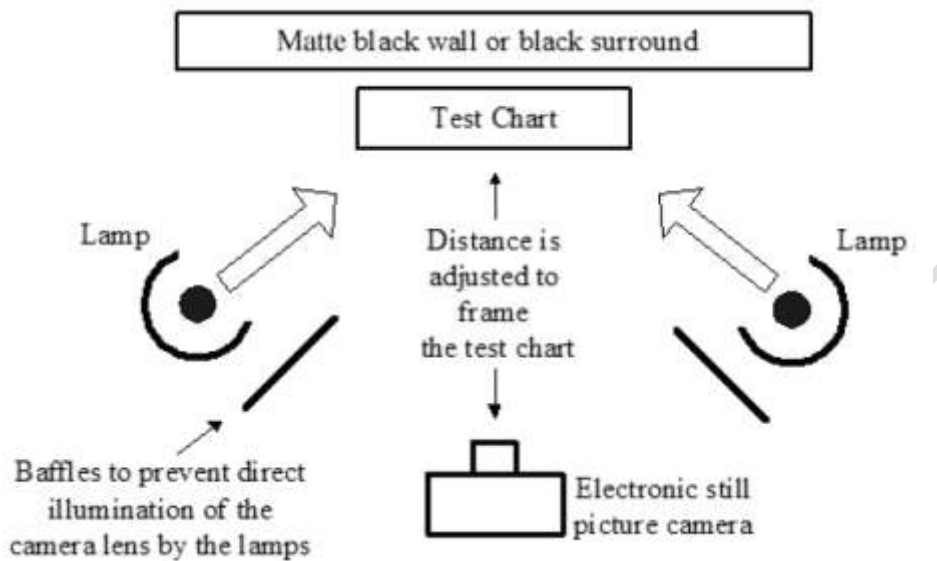


Fig. A.1 Arrangement of measuring equipment for reflection type test chart

A.3.3.1.2 Transparent type test chart

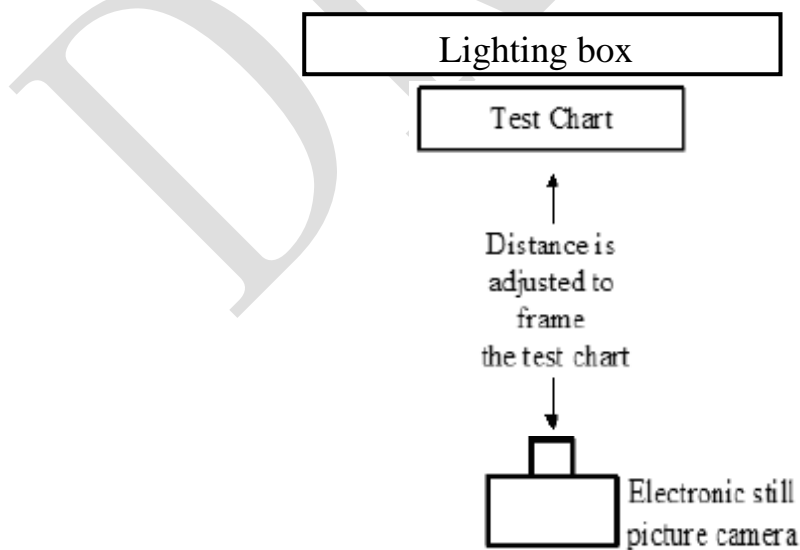


Fig. A.2 Arrangement of measuring equipment for transparent type test chart

A.3.3.2 Conditions of shooting

Unless otherwise stated, the conditions of shooting shall be as follows.

1. Illuminance of illumination of a reflection type test chart: $2000 \text{ lx} \pm 5\%$ ^(*1)
(Luminance of transparent type test chart (at peak white): $637 \text{ cd/mm}^2 \pm 5\%$)
2. Non-uniformity on the chart: less than 5%
3. Color temperature of illumination: $5700 \text{ K} \pm 1000 \text{ K}$
4. When shooting the test chart, it shall be ensured that the specified part shown by arrows, etc. fills the frame of the monitor screen of the output image.
5. It is effective to add a white card or black card to a test chart in order to obtain the desirable exposure level.

Note: *1 Measure the illuminance by a luxmeter at the center of the test chart. (Measure by pointing the receptor in the direction of the digital camera to be measured.)

A.4 Measurement method

A.4.1 Image geometric distortion

(This method follows the basic concept of IEC 61146-1, section 24 “Geometric distortion”.)

- a) The equipment arrangement shall be as stated in A.3.3.1.
- b) Examples of test charts (Fig. A.3: rectangular pattern, Fig. A.4: line grid pattern)

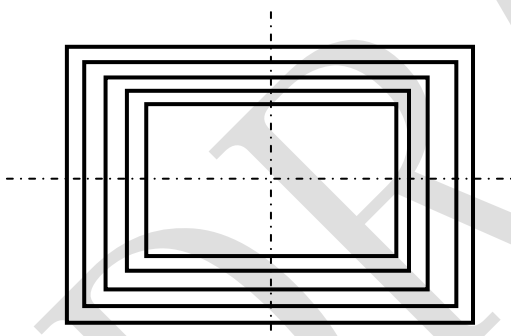


Fig. A.3 Rectangular pattern

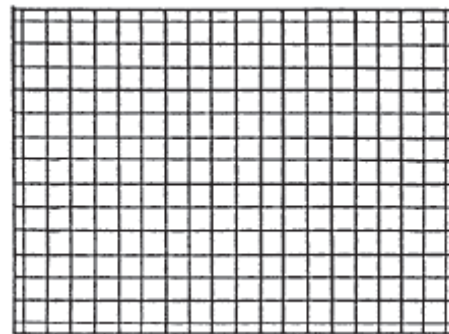


Fig. 4.A Line grid pattern

- c) The conditions of shooting shall be as stated in A.3.3.2.
- d) The measurement shall be carried out using the digital signals of the output images from the measured digital camera with which the test chart is shot.
- e) The exposure shall be by automatic exposure or under an exposure such that the gray part becomes 110 to 160 (8-bit digital).
- f) The white balance shall be in the white set mode or auto-white balance mode.
- g) The focusing shall be in the manual mode or auto-focusing mode under the optimal conditions.
- h) Measurement procedure:
 - When a test chart with rectangular patterns similar to the image area of the output image and having the size of 1, 0.9, 0.8, 0.7, and 0.6 times the output image, respectively (with the tolerance of +0%, -2% for the size of 1 time, and $\pm 2\%$ for other sizes) is shot so that each pattern inscribes a monitor screen of the size of each of them, measurement shall be carried out to measure the

horizontal line distortion Hd and the vertical line distortion Vd. The line/dot grid pattern, etc. may be used as the subject.

(1) Horizontal line distortion Hd:

Let the maximum/minimum value of the height of the image of the subject around the center of the horizontal center line of the screen of the output image be (A_i), the minimum/maximum value of image height at the left and right ends of the screen be (B_i), and the number of pixels in the vertical direction of the output image be (V), then calculate by the following formula:

$$Hdi = (B_i - A_i)/2V [\%] \quad A_i, B_i \text{ and } V \text{ shall be represented by the number of pixels of the output image.}$$

Note that:

- (i) If the image distortion is so complicated that the height of A_i does not represent the maximum or the minimum value in the screen from which each 10% portion is removed at the left and right ends, respectively, then determine the maximum or minimum value, D_i , in the screen from which each 10% portion is removed from both the left and right ends, and use $(B_i - D_i)/2V$.
- (ii) The height means the size of image in the vertical direction, and the left-to-right direction means the horizontal direction.

(2) Vertical line distortion Vd:

Let the maximum/minimum value of the width of the image of the subject around the center of the vertical center line of the screen of the output image be (α_i), the minimum/maximum value of the width of the image at the top and bottom ends of the screen be (β_i), and the number of pixels in the vertical direction of the output image be (V), then calculate by the following formula:

$$Vdi = (\beta_i - \alpha_i)/2V [\%] \quad \alpha_i, \beta_i \text{ and } V \text{ shall be represented by the number of pixels.}$$

Note that:

- (i) If the image distortion is so complicated that the width of α_i does not represent the maximum or the minimum value in the screen from which each 10% portion is removed at the top and bottom ends, respectively, then determine the maximum or minimum value, δ_i , in the screen from which each 10% portion is removed from both the top and bottom ends, and use $(\beta_i - \delta_i)/2V$.
- (ii) The width means the size of image in the horizontal direction, and the top-to-bottom direction means the vertical direction.
 - Image geometric distortion D_i of the subject in each size shall be calculated by the following formula. The sign shall be that of either Hdi or Vdi , whichever is the larger in absolute value.

$$D_i = \sqrt{\{(Hdi)^2 + (Vdi)^2\}}$$

- The D_i which shows the maximum value in absolute value shall be reported as the image geometric distortion D_i .

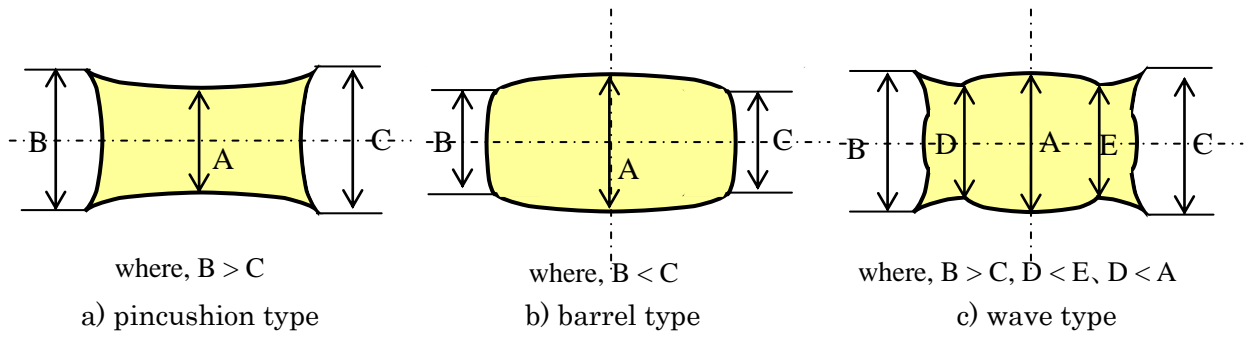


Fig. A.5 Schematic drawings for measuring the horizontal line distortion

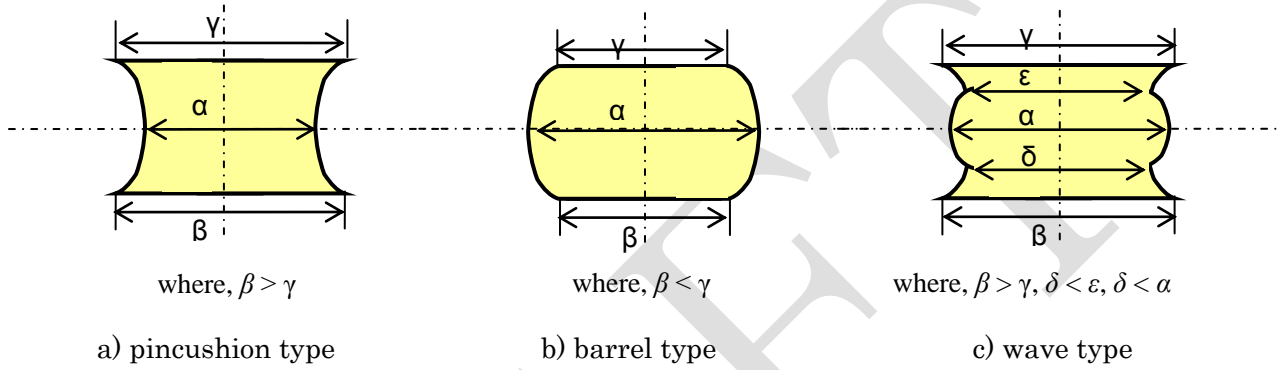


Fig. A.6 Schematic drawings for measuring the vertical line distortion

A4.2 Low contrast luminance amplitude/frequency response

(This method follows the basic concept of IEC 61146-1, section 7 “Luminance amplitude/frequency response”.)

- a) The equipment arrangement shall be as stated in A.3.3.1.
- b) The test chart shall be the low contrast sinusoidal multiburst chart having the following reflectance. An example is shown in Fig. A.7. (*2, *3, *4)

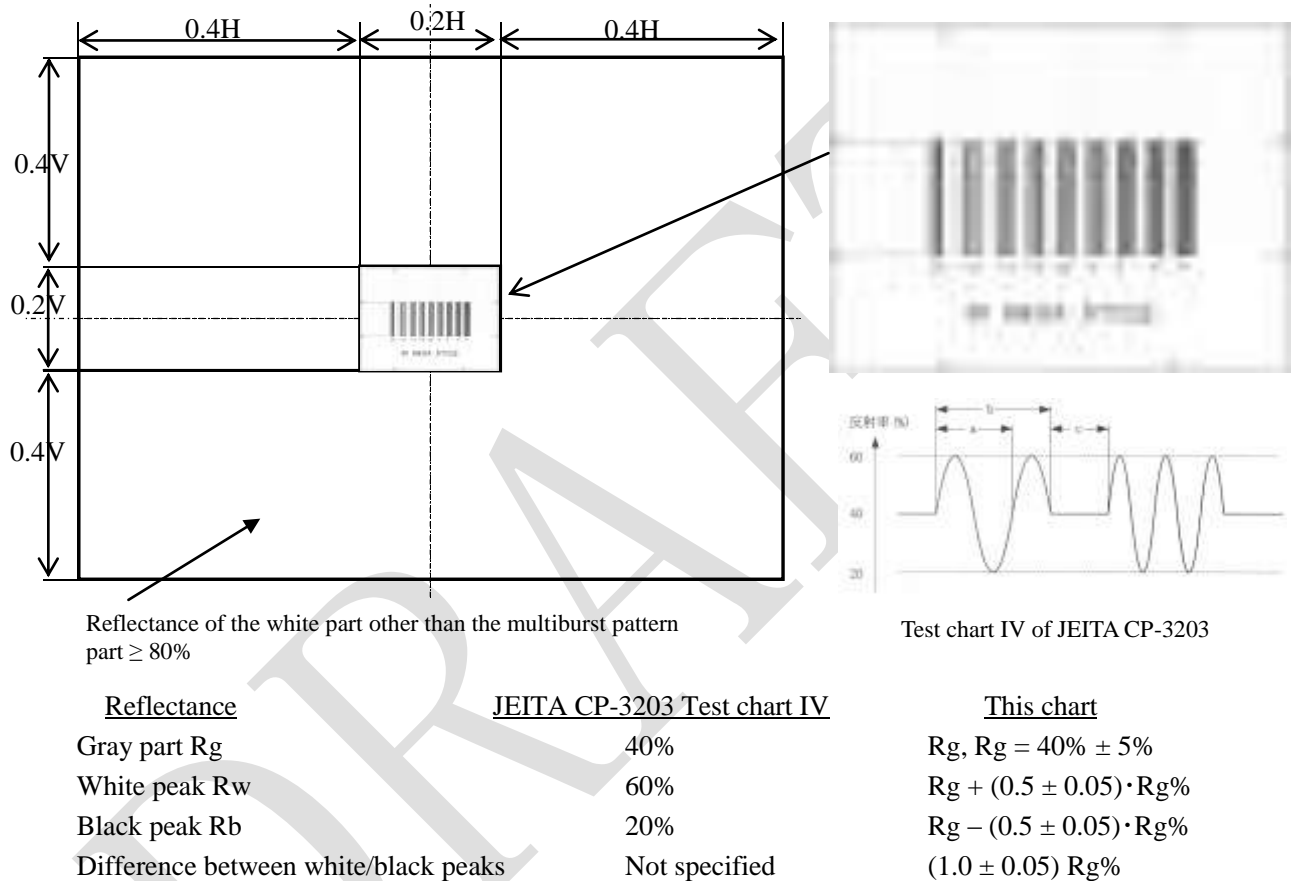


Fig. A.7 Sinusoidal multiburst chart (use Test chart IV of JEITA CP-3203)

- c) The conditions of shooting shall be as stated in A.3.3.2.
- d) The measurement shall be carried out using the digital signals of the output images from the measured digital camera with which the test chart is shot.
- e) The exposure shall be such that the gray part becomes $100 +2/-4$ (8-bit digital). (*5)
- f) The white balance shall be in the white set mode or auto-white balance mode.
- g) The focusing shall be in the manual mode or auto-focusing mode under the optimal conditions.
- h) Measurement procedure:
 - As shown in Fig. A.7, a sinusoidal multiburst chart similar to the test chart of JEITA CP-3203 or the Test Chart No. 6 of IEC 61146-1 shall be shot and the amplitudes of each multiburst test pattern shall be measured.
 - The measured amplitude values shall be linearized. (*6)
 - The linearization shall follow the formula of the sRGB standard (IEC 61966-2-1). As the sRGB

formula is an approximation which closely matches the fundamental formula $\text{Output} = (\text{input})^{2.2}$, it is acceptable to use $\text{Output} = (\text{input})^{2.2}$ (i.e. $Y' = Y^{2.2}$).

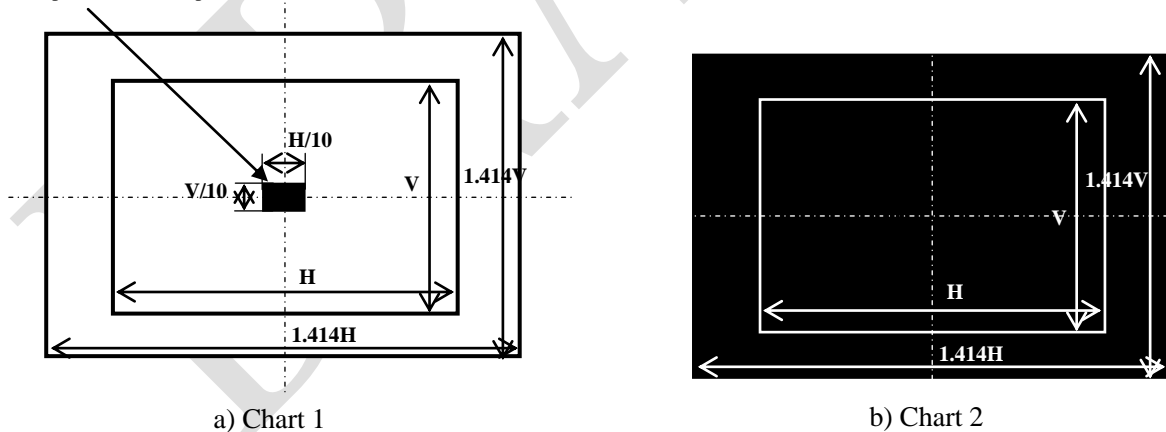
- Notes:
- *2 If a multiburst pattern having the same frequencies as the JEITA CP-3203 test chart is used, the resolution frequencies of each multiburst pattern shall be the values obtained by multiplying the figures stated in the bottom part of each pattern by 400.
 - *3 It is possible to measure responses in any given position and given direction by varying the position and angle of the test chart.
 - *4 It is allowed to shoot the sinusoidal star chart having the same reflectance to obtain the result of measurement by means of auto-measuring software. However, sometimes the measurement by this method shows different characteristics from those of the amplitudes of the reproduced wave forms recognizable by visual observation due to effects of noise or aliasing; therefore, if this method is adopted, it is necessary to confirm whether the amplitude characteristics of the reproduced wave forms recognizable by visual observation will correspond to those of the multiburst test chart. If there is any doubt, the multiburst test chart shall be used.
 - *5 When shooting under these shooting conditions, the exposure level, in signals before γ processing, will be approximately 32 (8-bit digital) and the difference between white and black peak parts will be approximately 32 (8-bit digital), resulting in approximately 12.5% in contrast signals.
 - *6 This is based on the concept of measuring characteristics when reproduced and displayed on an ideal display (the concept of “= output referred”).

A4.3 Flare

(This method follows the basic concept of IEC 61146-2, section 2.12 “Flare”.)

- a) The equipment arrangement shall be as stated in A.3.3.1.
- b) The test chart shall be the window pattern chart as shown in Fig. A.8.

It is recommended to place a wall around the black part to eliminate the effects of light scattering from the white part to the black part on the chart.



Transmittance/Reflectance
 Black part: less than 2% (the same as in charts 1 and 2)
 White part: more than 80%

Fig. A.8 Window pattern chart

- c) The conditions of shooting shall be as stated in A.3.3.2.
- d) The measurement shall be carried out using the digital signals of the output images from the measured digital camera with which the test chart is shot.

- e) The white balance shall be in the white set mode or auto-white balance mode.
- f) The focusing shall be in the manual mode or auto-focusing mode under the optimal conditions.
- g) Measurement procedure:
 - 1) Measurement method 1 (to be applied to a product with manual exposure function or during the development stage)

Step 1: The measurement of the luminance signals of the black part Y_{B1} and the white part Y_{W1} , and the amount of exposure E_1 (luminance B1 or illumination L1, F number F1, exposure time SS1) shall be carried out by placing chart 1 on a lighting box having luminance B1 or by illuminating it with illumination L1 and by exposing and shooting it so as to make the luminance signal (Y) of the white part to be 225 ± 5 bits (8-bit output).

Note that luminance B1 shall be kept at 700 nt or higher, and illumination L1 at 2200 lx or higher in lighting.

Step 2: The measurement of the luminance signal of the black part Y_{B2} shall be carried out by setting chart 2 under the same conditions as in step 1 and exposing and shooting it with the amount of exposure E_1 .

Step 3: The measurement of Y_{B3} shall be carried out by exposing and shooting chart 1 with the amount of exposure E_3 (illumination L3, F number F3, exposure time SS3) that is 10 times \pm 10% that of the exposure in step 1.

Step 4: Y_{B2} , Y_{B3} , and Y_{W1} shall be linearized to obtain the linearized Y'_{B2} , Y'_{B3} , and Y'_{W1} . The linearization shall follow the formula of the sRGB standard (IEC 61966-2-1). As the sRGB formula is an approximation which closely matches the simple fundamental formula $\text{Output} = (\text{input})^{2.2}$, it is acceptable to use $\text{Output} = (\text{input})^{2.2}$ (i.e. $Y' = Y^{2.2}$).

Step 5: The flare shall be calculated by the following formula:

$$F = \frac{Y'_{B3} - Y'_{B2}}{Y'_{W1} \frac{E_3}{E_1}} \times 100\%$$

Note: Each chart shall be shot so that the H-V frame fills the whole monitor screen.

- 2) Measurement method 2 (to be applied to a product without manual exposure function)

Step 1: The measurement of the luminance signals of the black part Y_{B1} and the white part Y_{W1} , and the amount of exposure E_1 (luminance B1 or illumination L1, F number F1, exposure time SS1, and ISO sensitivity ISO1) shall be carried out by placing chart 1 on a lighting box having luminance B1 or by illuminating it with illumination L1.

Note that luminance B1 shall be kept at 700 nt or higher, and illumination L1 at 2200 lx or higher in lighting.

Step 2: The measurement of the luminance signal of the black part Y_{B2} and the amount of exposure E_2 (illumination L1, F number F2, exposure time SS2, and ISO sensitivity ISO2) shall be carried out by setting and shooting chart 2 under the same conditions as in step 1.

Step 3: Y_{B1} , Y_{B2} , and Y_{W1} shall be linearized to obtain the linearized Y'_{B1} , Y'_{B2} , and Y'_{W1} . The linearization shall follow the formula of the sRGB standard (IEC 61966-2-1). As this formula of sRGB is an approximation which closely matches the simple fundamental formula $\text{Output} = (\text{input})^{2.2}$, it is acceptable to use $\text{Output} = (\text{input})^{2.2}$ (i.e. $Y' = Y^{2.2}$).

Step 4: The flare shall be calculated by the following formula:

$$F = \frac{(Y'_{B1} - Y'_{B2}) \times E_2}{Y'_{W1} \times E_1} \times 100\%$$

Note: Each chart shall be shot so that the H-V frame fills the whole monitor screen.

A4.4 Lateral chromatic displacement

(This method follows the basic concept of IEC 61146-2, section 3.6 “Registration”.)

- a) The equipment arrangement shall be as stated in A.3.3.1.
- b) Example of the test chart (V pattern chart) ^{(*)7}

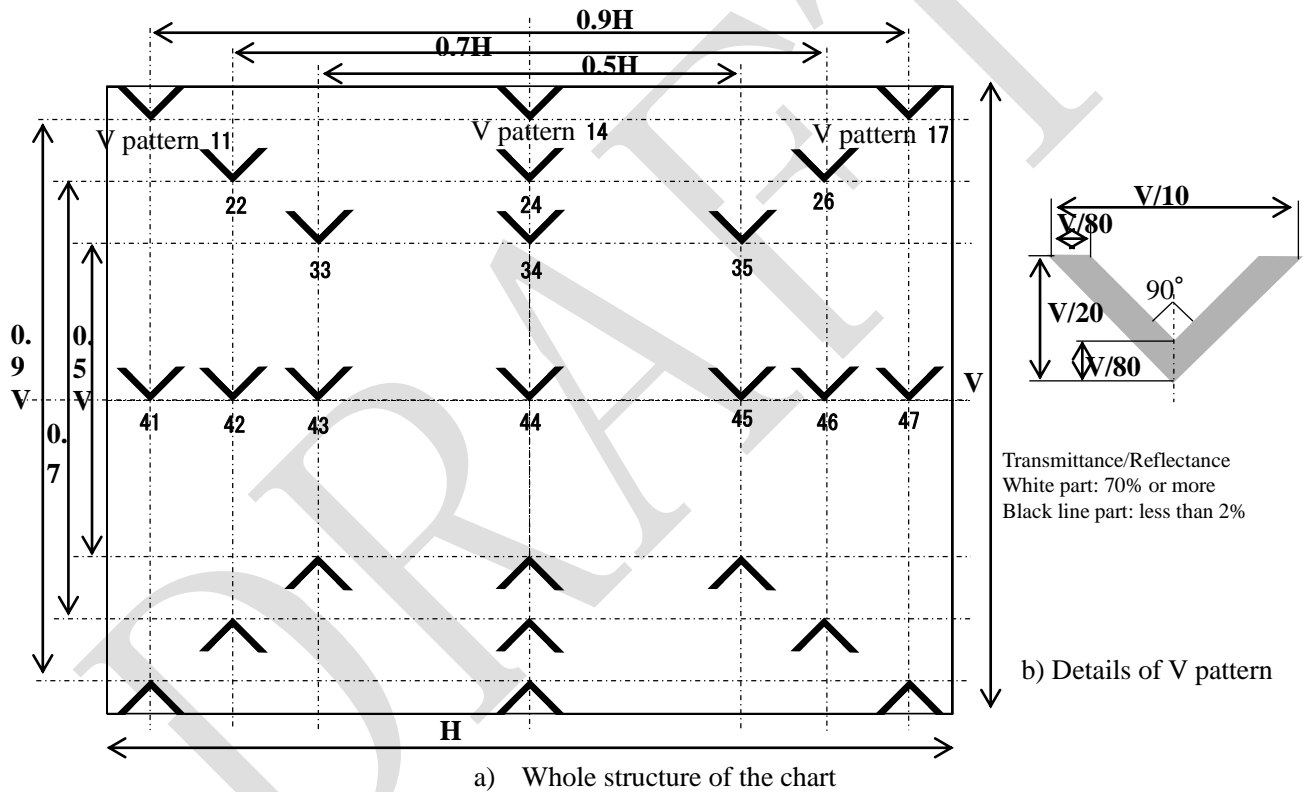


Fig. A.9 V pattern chart

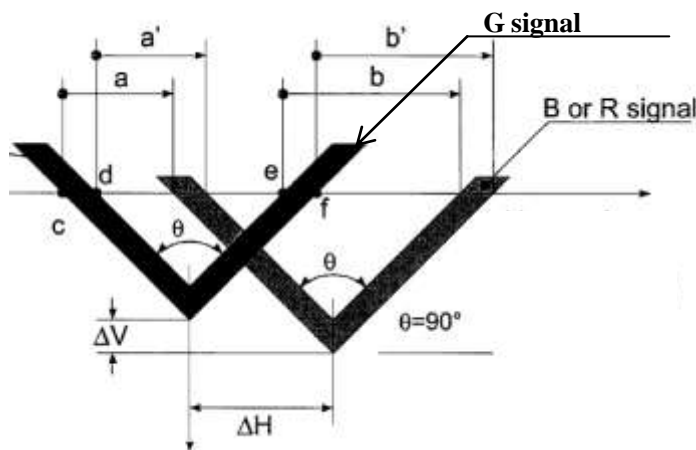
- c) The conditions of shooting shall be as stated in A.3.3.2.
- d) The measurement shall be carried out using the digital signals of the output images from the measured digital camera with which the test chart is shot.
- e) The exposure shall be by automatic exposure or under an exposure such that the gray part becomes 110 to 160 (8-bit digital).
- f) The white balance shall be in the white set mode or auto-white balance mode.
- g) The focusing shall be in the manual mode or auto-focusing mode under the optimal conditions.
- h) Measurement procedure:
 - Measurement shall be carried out by measuring a, a', b, and b', or the number of displaced pixels in the horizontal direction between the B or R signal and G signal at each position of V patterns.

- Calculation shall be carried out by the following formulas to obtain ΔRH_i , and ΔBH_i , or the amounts of displaced pixels in the horizontal direction and ΔRV_i , and ΔBV_i , or those in the vertical direction between the B or R signal and G signal at each position of V patterns (see Fig. A.10).

$$\Delta R_i = \sqrt{\frac{(\Delta RH_i)^2 + (\Delta RV_i)^2}{H^2 + V^2}} \times 100\%$$

$$\Delta B_i = \sqrt{\frac{(\Delta BH_i)^2 + (\Delta BV_i)^2}{H^2 + V^2}} \times 100\%$$

Where; ΔR_i : chromatic displacement of Red signal (lateral chromatic aberration)
 ΔB_i : chromatic displacement of Blue signal (lateral chromatic aberration)
H,V: number of output pixels in the horizontal and vertical directions



$$\Delta H = \frac{A+B}{2} \quad \text{where;} \quad A = \frac{a+a'}{2}$$

$$\Delta V = \frac{A-B}{2} \quad B = \frac{b+b'}{2}$$

a) Measurement of displacement

b) Formulas for calculating displacement

Fig. A.10 Method of calculating displacement

- The larger of the maximum value of the chromatic displacement in the Red signal ($\Delta R_{i(\max)}$) or that in the Blue signal ($\Delta B_{i(\max)}$) shall be used as the lateral chromatic aberration (ΔCi).

Note: *7 The test chart to be used is not necessarily limited to the V pattern chart described here, but use of the V pattern chart enables the amount of displacement to be measured in both the horizontal and vertical directions by only measuring the amount of displacement at reproduced positions in only the horizontal direction.

A4.5 Luminance non-uniformity

- The equipment arrangement shall be as stated in A.3.3.1.
- The test chart shall be the lighting box having uniform luminance or the gray chart having uniform reflectance. (Non-uniformity of reflectance of the chart: $<0.02R_a$, R_a : the average reflectance of the whole monitor screen)

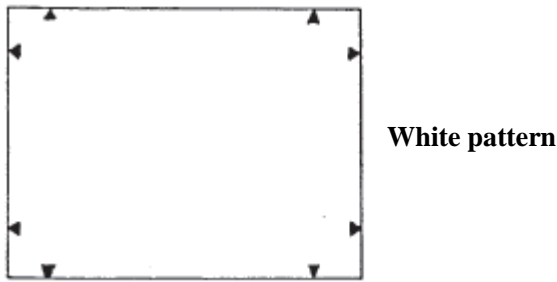


Fig. A.11 White chart

- c) The conditions of shooting shall be:
 - Non-uniformity of the luminance of the lighting box and that of the illuminance on the chart: less than 2.5%;
 - Other conditions shall be as stated in A.3.3.2.
- d) The measurement shall be carried out using the digital signals of the output images from the measured digital camera with which the test chart is shot.
- e) The exposure shall be such that the white part in the center becomes 120 to 150 (8-bit digital).
- f) The white balance shall be in the white set mode or auto-white balance mode.
- g) The focusing shall be in the manual mode or auto-focusing mode under the optimal conditions.
- h) Measurement procedure:
 - Measurement shall be carried out to obtain the maximum level M and the minimum level m of the luminance signal within the whole monitor screen, where M and m represent the average value in the neighboring horizontal H area \times vertical V area.
Where, H : the area of 10% +0%/-2% of the horizontal output image, and V : the area of 10% +0%/-2% of the vertical output image.^(*8)
 - M and m shall be linearized to obtain the linearized M' and m' .
The linearization shall follow the formula of the sRGB standard (IEC 61966-2-1).^(*9)
As this sRGB formula is an approximation which closely matches the simple fundamental formula $\text{Output} = (\text{input})^{2.2}$, it is acceptable to use $\text{Output} = (\text{input})^{2.2}$. At this time, M' and m' shall be obtained by the following formulas:

$$\begin{aligned} M' &= M^{2.2} \\ m' &= m^{2.2} \end{aligned}$$

- The luminance non-uniformity (LNU) shall be calculated by the following formula:

$$LNU = \left(1 - \frac{m'}{M'}\right) \times 100\%$$

- Notes: *8 Suppose H and V are set at 10%, respectively, then the center position of the horizontal H area \times vertical V area located in the extreme circumference part will be a position at 90% of the image height.
- *9 This is based on the concept of measuring characteristics when reproduced and displayed on an ideal display (the concept of “= output referred”).

A4.6 Color non-uniformity

- a) The equipment arrangement shall be as stated in A.3.3.1.
- b) The test chart shall be the lighting box having uniform luminance or the gray chart having uniform reflectance 18%. (Non-uniformity of the reflectance of the chart: $<0.02R_a$, R_a : the average reflectance)

of the whole monitor screen)

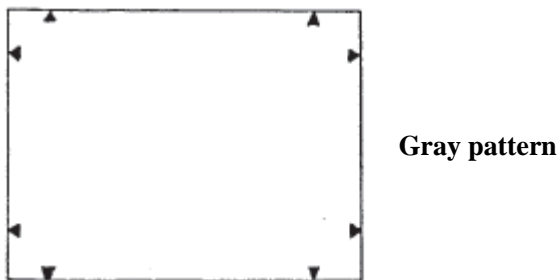


Fig. A.12 Gray chart

- c) The conditions of shooting shall be:
- Non-uniformity of the luminance of the lighting box and that of the illuminance on the chart: less than 2.5%;
 - The light source color temperature shall be illuminant D light source or illuminant D-equivalent light source (color temperature of 6504K ± 500K in continuous spectrum).
 - Other conditions shall be as stated in A.3.3.2.
- d) The measurement shall be carried out using the digital signals of the output images from the measured digital camera with which the test chart is shot.
- e) The exposure shall be by auto-exposure and the exposure for digital camera without auto-exposure shall be such that the white part in the center becomes 120 +10%/–5% (8-bit digital).
- f) The white balance shall be in the white set mode or auto-white balance mode.
- g) The focusing shall be in the manual mode or auto-focusing mode under the optimal conditions.
- h) Measurement procedure:
- Measurement shall be carried out to obtain the values of R_i , G_i , and B_i , or R , G , and B level, respectively, in each of the divided areas in the neighboring horizontal H area × vertical V area within the whole monitor screen.
Where, H : the area of 10% +0%/–2% of the horizontal output image, and V : the area of 10% +0%/–2% of the vertical output image ^(*10)
 - R_i , G_i , and B_i shall be linearized to obtain the linearized R'_i , G'_i , and B'_i .
The linearization shall follow the formula of the sRGB standard (IEC 61966-2-1). ^(*11)
As this sRGB formula is an approximation which closely matches the simple fundamental formula $\text{Output} = (\text{input})^{2.2}$, it is acceptable to use $\text{Output} = (\text{input})^{2.2}$.
 - From R'_i , G'_i , and B'_i , the values of L^*i , a^*i , and b^*i in CIE lab spaces in each of the divided areas are calculated.
 - Seek the maximum values $L^*i[\text{max}]$, $a^*i[\text{max}]$, and $b^*i[\text{max}]$ and minimum values $L^*i[\text{min}]$, $a^*i[\text{min}]$, and $b^*i[\text{min}]$ for L^*i , a^*i , and b^*i values in the whole monitor screen, respectively.
 - The color non-uniformity (CNU) shall be calculated by the following formula:

$$\text{CNU} = \sqrt{\{(L^*i[\text{max}] - L^*i[\text{min}])^2 + (a^*i[\text{max}] - a^*i[\text{min}])^2 + (b^*i[\text{max}] - b^*i[\text{min}])^2\}}$$

- Notes: *10 Suppose H and V are set at 10%, respectively, then the center position of the horizontal H area × vertical V area located in the extreme circumference part will be a position at 90% of the image height.
- *11 This is based on the concept of measuring characteristics when reproduced and displayed on an ideal display (the concept of “= output referred”).

Annex B (normative)

Measurement Methods for Digital Cameras for the Specification Items in the Specifications

B.1 Introduction

This Annex stipulates the measurement methods for the specification items provided in the text of the “Guidelines for Digital Camera Specifications”. The measurement methods for items related to image quality are provided in Annex A.

B.2 Scope

This Annex stipulates the measurement methods for items other than those that are related to image quality, out of the specification items for digital cameras for consumer use stipulated in the text of the “Guidelines for Digital Camera Specifications”.

B.3 Conditions for measurement

The measurement of products shall be carried out under the following conditions for measurement.

B.3.1 Environment for measurement

The measurement shall be carried out in the following environment unless otherwise stated:

- Temperature: $23^{\circ}\text{C} \pm 3^{\circ}\text{C}$
- Relative humidity: $50\% \pm 20\%$
- Atmospheric pressure: 86 kPa to 106 kPa

B.3.2 Conditions for measurement (setting of digital camera in the measurement)

The measurement shall be carried out in the following settings and modes unless otherwise stated.

- (1) The measurement shall be carried out under the factory shipping conditions on factory shipping (“default conditions”). At this time, reporting of the conditions of measurement may be omitted. However, if measured values in conditions other than the default ones are reported together, such other measuring conditions shall be reported.

Note that:

- Functions that are not available in the default settings shall be measured under settings in which such functions become available.
 - If there exist any parameters or modes that cannot be determined with the default settings, measurement shall be carried out under the settings that the supplier expects to be most likely used by users. However, if selection of that setting may affect the specification value, then the setting shall be reported.
- (2) In the case of cameras with interchangeable lenses, in principle measurement shall be carried out with the lens placed in position. Selection of the lens is left to the supplier's discretion, but the conditions (name or type of lens, etc.) must be expressly reported for those items for which characteristic values vary depending on the types of lens.

B.3.3 Conditions of shooting

Details of the test chart shall be specified, together with the lighting conditions such as illuminance, luminance and color temperature of illumination.

B.4 Measurement methods

B.4.1 Battery life when shooting movie clips

(The measurement methods described here are drafted based on those stated in JEITA CP-3202B, sections 13 “Continuous shooting time of the battery for shooting” and 14 “Actual shooting time of the battery for shooting” by adding some modifications for digital cameras.)

Note: It is very difficult to measure the battery life and highly inaccurate measurement results are likely to be obtained unless great care is taken. To avoid this, the measurement should be carried out after thoroughly reading and understanding the commentaries of CIPA DC-002 “Measurement methods of battery life” (especially sections 2 to 5).

B.4.1.1 Battery life of movie clips in actual use case

- a) Equipment arrangement
 - As shown in Fig. B.1.
 - (Fig. B.1 is a copy of Fig. 13.1 in JEITA CP-3202B, section 13 “Continuous shooting time of the battery for shooting”.)
- b) Subject to be shot
 - Not stipulated. It shall be a still life that will not cause hunting in auto-focusing.
- c) Conditions of shooting
 - The correlation between subject illumination and color temperature is not specified but it shall not change during the measurement.
 - Illuminance of the subject illumination: 400 lx to 2000 lx
 - Distance between the subject and the equipment to be tested (camera to be measured): 1.5 m to 2 m
- d) Shooting sequence (mode)
 - This is the sequence (mode) provided in JEITA CP-3202B, section 14 “Actual shooting time of the battery for shooting”. The details are shown in Fig. B.2. (Fig. B.2 is a copy of Fig. 14.2 “Shooting mode” in JEITA CP-3202B, section 14 “Actual shooting time of the battery for shooting”.)
- e) Mode setting of digital camera
 - The parameters for setting the functions of the digital camera are in principle those set by default except those specified in these measurement methods. If the measurement is carried out under settings other than the default settings, the details of the settings shall be expressly reported. If there is any parameter that cannot be determined with the default settings (see 3.1.4 in the text), measurement shall be carried out under the settings that the supplier expects to be most likely used by the user and information necessary to specify such settings shall be expressly reported.
 - Any item for a function may be omitted if that function is not available in the camera to be measured, even though the measuring conditions for it are defined in the present measurement methods. (For example, a function for zooming action during movie clip shooting)
 - In addition to settings of the parameters for setting functions, if some of the settings for larger or

smaller magnitude of power are available, measurement shall be carried out under the default settings. If it is not specified under the default settings, the measurement shall be carried out at full power as far as possible. For example, the measurement shall be carried out in the mode that consumes most electricity if it is possible to select multiple operations (such as electric zooming and manual zooming) or multiple modes.

- The measurement of products that have limitations of functions during shooting movie clips shall be carried out under the default settings under such limitations.

Notes: The order of priority for the above-mentioned conditions is as follows:

1. Conditions such as the measurement methods mentioned in this subparagraph (4.1.1.e).
2. Any parameter for setting a function not mentioned in 4.1.1.e shall be measured in the default settings.
3. Any parameter that cannot be determined with the default settings shall be measured under the setting that the supplier expects to be most likely used by the user.

f) Battery used

- The battery to be used is not specified but information (such as type number) shall be reported that allows the used battery to be specified.
- As for the primary battery, a new one shall be used. As for the secondary (rechargeable) battery, it shall be used in the fully charged condition.

g) Procedures for measurement

- The battery for the shooting measurement shall be loaded in the unit to be measured and the unit shall be firmly placed for shooting and recording.
- Measurement shall be continued until the battery for shooting is discharged and recording is stopped. The conditions for determining the end of measurement at that time shall follow those stated in h) below.
- The recording time shall be measured by reproducing the recorded movie clips from the recording medium.

Note: The battery for shooting shall not be recharged or changed during an ongoing measurement session even if the recording medium is changed.

h) Conditions for determining the end of measurement

- The measurement shall end at the time the power source is first shut down. However, if recording is stopped due to the limit of continuous recording time for movie clips in the middle of recording, the stipulation in item 59 (b) in Table 1 of the text shall be observed.
Namely, in case recording is stopped due to the limit of continuous recording time in the middle of recording, recording shall be resumed as soon as possible, and battery life is defined as the total duration of the recorded movie clips. (If a medium becomes full, it shall be erased by means of the camera immediately, or the full medium shall be changed to an empty one as soon as possible. When changing the medium, care should be taken so as not to affect the battery life as far as possible. Also, erasing or changing the medium before it becomes full is not prohibited.)
- On the other hand, even though the camera is not shut down, if any function relevant to shooting movie clips becomes out of operation, the measurement shall be completed. However, at this time, if such function can resume operation by either automatic or manual operation (except changing the battery and turning on the power again), the function should be resumed at once to

continue the measurement.

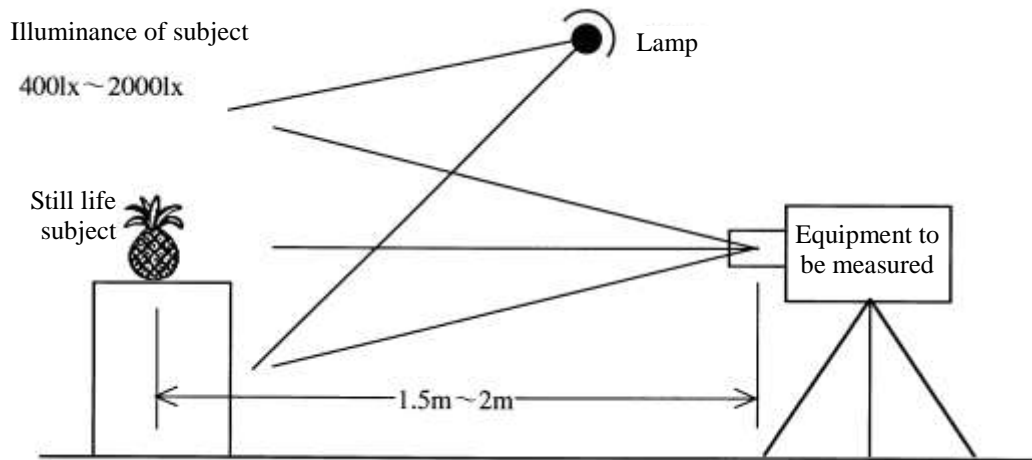
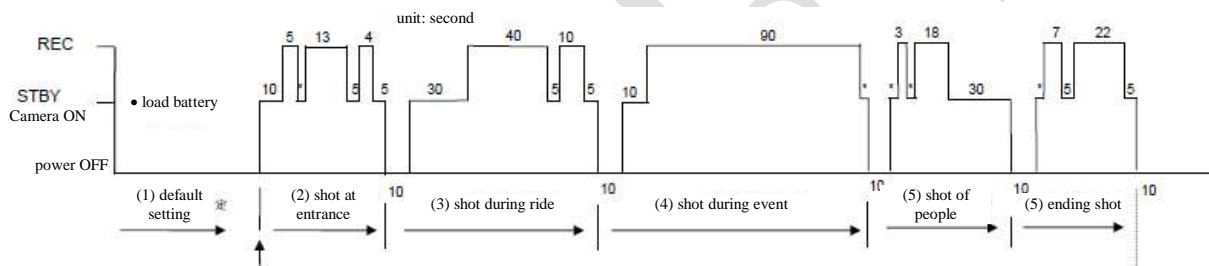


Fig. B.1 Arrangement of equipment for measuring battery life when shooting movie clips

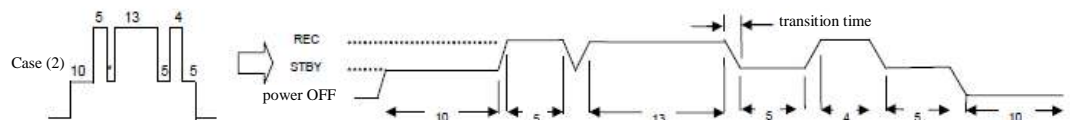
(Fig. B.1 is a copy of Fig. 13.1 “Circuit for measurement of continuous shooting time of the battery for shooting” (block diagram) in section 13 “Continuous shooting time of the battery for shooting” of JEITA CP-3202B)



REC time: actual recording time after mode transition

*mark: go to the next mode just after transition

STBY time/power OFF time: if the transition time is over the specified time, go to the next mode just after transition. See the chart below for details.



Zooming is to be carried out in each of the above cases (2) to (5) in the sequences shown below. Zooming shall be carried out at speeds that enable the timings below. If the timing *(1) is not possible, follow the timing *(2).

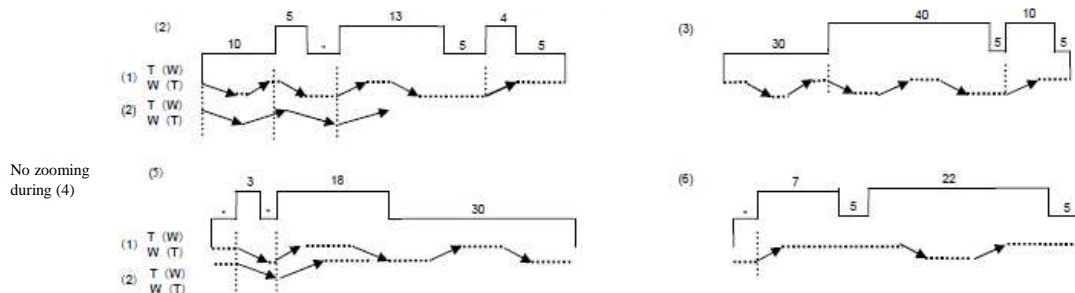


Fig. B.2 Shooting sequence (mode) for battery life in actual shooting of movie clips

(Fig. B.2 is a copy of Fig. 14.2 “Shooting mode” in section 14 “Actual shooting time of the battery for shooting” of JEITA CP-3202B)

B.4.1.2 Battery life of continuous movie clips

a) Equipment arrangement

As shown in Fig. B.1 (the same as the measurement of battery life for actual shooting of movie clips).

- b) Subject to be shot
Not stipulated. It shall be a still life that will not cause hunting in auto-focusing.
- c) Conditions of shooting
 - The correlation between the subject illumination and color temperature is not specified but it shall not change during the measurement.
 - Illuminance of the subject illumination: 400 lx to 2000 lx
 - Distance between the subject and the equipment to be tested (camera to be measured): 1.5 m to 2 m
- d) Shooting sequence (mode)
 - The mode shall be the fixed mode by fixing the lens at the wide angle end, fixing the shooting in REC action, fixing the subject, and fixing the power to ON.
- e) Mode setting of digital camera
 - The parameters for setting the functions of the digital camera are in principle those set by default except those specified in these measurement methods. If the measurement is carried out under settings other than the default settings, the details of the settings shall be expressly reported. If there is any parameter that cannot be determined with the default settings (see 3.1.4 in the text), measurement shall be carried out under the settings that the supplier expects to be most likely used by the user and information necessary to specify such settings shall be expressly reported.
 - Any item for a function may be omitted if that function is not available in the camera to be measured, even though the measuring conditions for it are defined in the present measurement methods. (For example, a function for zooming action during movie clip shooting)
 - In addition to settings of the parameters for setting functions, if some of the settings for larger or smaller magnitude of power are available, measurement shall be carried out under the default settings. If it is not specified under the default settings, the measurement shall be carried out at full power as far as possible. For example, the measurement shall be carried out in the mode that consumes most electricity if it is possible to select multiple operations (such as electric zooming and manual zooming) or multiple modes.
 - The measurement of products that have limitations of functions during shooting movie clips shall be carried out under the default settings under such limitations.

Notes: The order of priority for the above-mentioned conditions is as follows:

1. Conditions such as the measurement methods mentioned in this subparagraph (4.1.1.e).
 2. Any parameter for setting a function not mentioned in 4.1.1.e shall be measured in the default settings.
 3. Any parameter that cannot be determined with the default settings shall be measured under the setting that the supplier expects to be most likely used by the user.
- f) Battery used
 - The battery to be used is not specified but information (such as type number) shall be reported that allows the used battery to be specified.
 - As for the primary battery, a new one shall be used. As for the secondary (rechargeable) battery, it shall be used in the fully charged condition.
 - g) Procedures for measurement
 - The battery for the shooting measurement shall be loaded in the unit to be measured and the unit shall be firmly placed for shooting and recording.
 - Measurement shall be continued until the battery for shooting is discharged and recording is stopped. The conditions for determining the end of measurement at that time shall follow those

stated in h) below.

- The recording time shall be measured by reproducing the recorded movie clips from the recording medium.

Note: The battery for shooting shall not be recharged or changed during an ongoing measurement session even if the recording medium is changed.

h) Conditions for determining the end of measurement

- The measurement shall end at the time the power source is first shut down. However, if recording is stopped due to the limit of continuous recording time for movie clips in the middle of recording, the stipulation in item 59 (b) in Table 1 of the text shall be observed.
Namely, in case recording is stopped due to the limit of continuous recording time in the middle of recording, recording shall be resumed as soon as possible, and battery life is defined as the total duration of the recorded movie clips. (If a medium becomes full, it shall be erased by means of the camera immediately, or the full medium shall be changed to an empty one as soon as possible. When changing the medium, care should be taken so as not to affect the battery life as far as possible. Also, erasing or changing the medium before it becomes full is not prohibited.)
- On the other hand, even though the camera is not shut down, if any function relevant to shooting movie clips becomes out of operation, the measurement shall be completed. However, at this time, if such function can resume operation by either automatic or manual operation (except changing the battery and turning on the power again), the function should be resumed at once to continue the measurement.

B.4.2 AF {focusing} speed

a) Subject to be shot

The subject should be a chart that allows the in-focus state to be easily determined, such as the resolution chart and star chart in ISO 12233, and three-line chart and black and white checker chart in ISO 15781.

b) Conditions of shooting

- Correlation of the subject illumination: Not specified, but it shall be the same at Pseudo ∞ and at X m, and it shall not change during the measurement.
- Illuminance of the subject illumination: 400 lx to 2000 lx (shall be the same at Pseudo ∞ and at X m)
- Distance between the subject and the equipment to be measured: Pseudo ∞ and X m
Pseudo ∞ : the distance of either 100 times the 35mm film equivalent focal length or 5 m, whichever is the longer
X m: the distance at which the magnification of shooting is 1/33.

c) The value of exposure is not specified. During the measurement, care should be taken so as not to change the f-number and shutter speed. It is desirable to set the exposure to fixed in the case of a digital camera with manual mode.

d) White balance is not specified. During the measurement, care should be taken so as not to activate the control for white balance. It is desirable to set the white balance to fixed under the condition of white-set in which white balance is achieved.

e) The measurement shall be carried out by setting the focusing to focus priority AF mode. The measurement shall not be carried out in AF mode, in which the AF action is activated without the

release operation. (AF mode, in which the AF action is activated without the release operation, is not subject to the present stipulation.)

f) Measurement procedure:

f-1) Method 1 of measurement (Internal: method of internal measurement)

- A subject at pseudo ∞ shall be focused.
- The subject shall be changed to the one at X m. The time duration from the start of AF operation to when the focus lens stops shall be measured. This time duration shall be taken as the AF speed. At this time, the position where the focus lens stops should satisfy the focused condition. If it is not possible to detect when the focus lens stops, it is acceptable to obtain the AF speed by measuring the time duration before the focus driving motor stops (pseudo AF speed), adding the time lag τ of the focus lens movement to this pseudo AF speed, and using the value as the AF speed.

Fig. B.3 illustrates the measuring points in the sequence for the shooting actions.

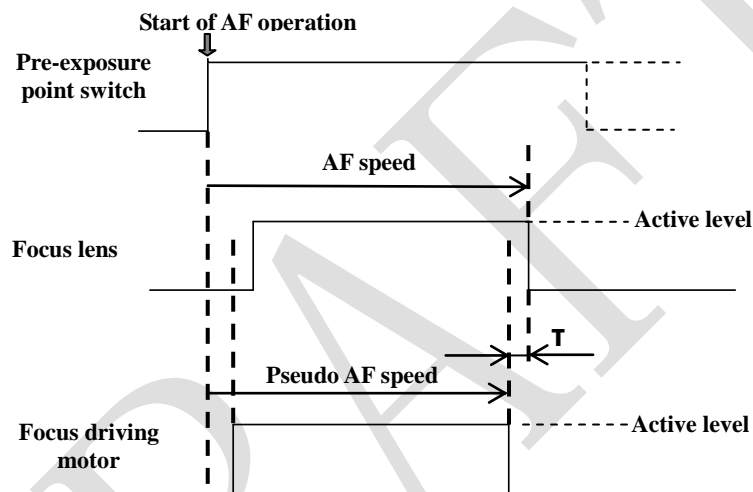


Fig. B.3 Measuring points for AF speed

f-2) Method 2 (External: method of external measurement)

- A subject at pseudo ∞ shall be focused.
- The subject shall be changed to the one at X m. Following the method specified in ISO 15781, the shooting time lag and shutter release time lag shall be measured.
- The time duration obtained by subtracting the shutter release time lag from the shooting time lag shall be assumed as the AF speed.

Commentary

This commentary does not constitute part of these guidelines; it only provides additional explanation about some of the matters contained in the body text and other relevant matters.

1. Application to other products

Although these guidelines are intended to be applied to consumer digital still cameras, there is no reason why people should not apply them to products for which items are presented similar to those for digital still cameras.

2. Application of the specifications to other products

In the current market, there are many equipment/products or functional components that have camera capabilities, even though their primary function is not for taking photographs. Out of the standards established for such equipment/products or functional components relating to functions for camera/shooting, some are supposed to be applicable to digital still cameras but sufficient verification should be made before applying such standards.

3. Details of revisions

The present revisions made to the DCG-002-Translation-2007 “Guideline for Digital Camera Specifications” are as follows:

(1) Addition of specification items

The 11 items below are added to provide guidelines:

26. recording time for continuous movie capture
32. compressed recording for motion picture and sound
36. low contrast luminance amplitude/frequency response
45. lateral chromatic displacement
46. flare
47. proper exposure
48. minimum subject illumination
49. depth of field
50. image stabilization performance
57. AF speed
59. (b) battery life for movie clips

(2) Review of contents of stipulations

The contents of stipulations are revised for the following 14 items:

17. motion blur suppression
31. movie clip
40. image geometric distortion
41. luminance non-uniformity
42. color non-uniformity
51. start-up time
52. shutter release time lag

- 53. shooting time lag
- 54. shooting rate
- 55. number of recordable pictures in continuous shooting mode
- 56. shooting interval
- 60. weight
- 61. dimensions
- 62. volume

(3) Change of format

- All of the definitions of the specification items stipulated in the present guidelines are reported herein so that it is possible to understand an outline of them only by reading the present guidelines without going back to the referred standards, even where other standards are referred to.
- The basic format in which the contents of each item are presented is “definition”, “measurement method”, “presentation method”, and “presentation examples”.
- In order to report relevant items in consecutive ways, some items are given a different item number from that of the 2007 version of DCG-002.

(4) Stipulations of fundamental measurement methods

In order to clarify the measurement methods, the fundamental measurement methods for the following 8 items are provided in Annexes A and B:

- A.4.1 Image geometric distortion
- A.4.2 Low contrast luminance amplitude/frequency response
- A.4.3 Flare
- A.4.4 Lateral chromatic displacement
- A.4.5 Luminance non-uniformity
- A.4.6 Color non-uniformity
- B.4.1 Battery life in shooting movie clip
- B.4.2 AF speed

As stated in the Annexes, the stipulations of the measurement methods in the present guidelines provide only the fundamental ones that enable values for the characteristics to be directly obtained based on the definition in each item on the image quality by directly observing/measuring the output images or their waveforms. This is based on the following concepts:

- In standardizing the measurement methods, the top priority should be given to defining/standardizing the fundamental ones that enable values for the characteristics to be obtained based on the definition by directly observing/measuring the output images or their waveforms, thus making it easy to determine whether the measurement data is appropriate or not.
- After such processes stated above, the new measurement methods (which may be more convenient methods) should be proposed and examined in response to technological development or digital cameras to be measured, while observing the fundamental ones. Whether these new ones are appropriate or not should be verified by checking how well the results of the new ones agree with those of the fundamental ones. After this verification, procedures should be taken to implement/standardize the new ones.
- If any doubt should arise in the results of the new ones, the results of the fundamental ones should be given priority.

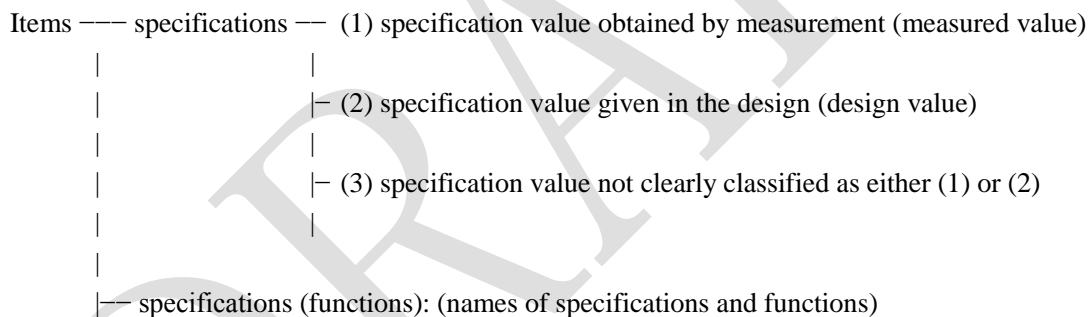
(5) Clarification of presentation method

Section 3.1.4 of 3.1 “Basic Concept of the Guidelines” states the basic concept that “the specification values and specifications (functions) set at factory shipping (or the default values) should be indicated for each item in the first place” and it is followed by several exceptions. The following stipulation is added to those exceptions and this addition is reported in the presentation method of applicable items.

- For some items, it is redundant to present default specification values and specifications (functions) in the first place, or to distinguish them from those available by setting various functions and modes or it may be determined that presenting specification values and specifications (functions) other than the factory shipping values may give more accurate and definitive information to consumers. These items may be treated as exceptions to the stipulation that “the default specification values and specifications (functions) should be indicated in the first place”, and so indicated in applicable items.

Here, “specification values” means specifications (functions) expressed by figures; they are basically classified into those obtained by measurement (measured values) and those given in the design (design values). However, there are some that are difficult to clearly classify as measured values or design values.

The classifications based on the above definitions are shown below.



(6) Further clarification of definitions of “image stabilizer” and “motion blur reduction”

In line with the establishment of “Methods for measurement and presentation relating to the image stabilization performance of digital cameras”, a sentence is added to further clarify the definitions of “image stabilizer” and “motion blur reduction” to item 17 “Motion blur suppression” in Table 1 of the text. Additionally, this commentary includes (6)-1 Examples of “output of blur detection means”, (6)-2 Definition and examples of “to correct”, (6)-3 Examples of “image stabilizer”, and (6)-4 Examples of “motion blur reduction”.

(6)-1 Examples of “output of blur detection means”

- (a) To measure by means of a gyrocompass, etc.
- (b) To measure by comparing images of continuous shooting, etc. (vectors of motions among continuously shot images, etc.)
- (c) To measure by analyzing blur (bokeh), etc. of a single image (calculation of the blur (bokeh) function, etc.)

(6)-2 Commentary on definition of “to correct” and examples

(A) Commentary on definition

“To correct” is assumed to mean “to improve output images”, as it is stipulated in the definition of item 17 that a technique is not considered to be “image stabilizer” if the technique does not have the effect of correction by “image stabilizer” as it does not show any improvement in output images. Accordingly, if significant deterioration in image quality arises as a side effect, if a correction effect does not appear in output images, or if it is very difficult to prove that a correction effect has been obtained, it is not considered that the technique is able “to correct”.

(B) Examples of being not assumed to be able to correct (these are just for examples and not intended as limitation).

- (a) A case with higher sensitivity and shorter shutter speed (with increased noise)
- (b) A system that produces the same extent of noise as that increased by higher sensitivity and shorter shutter speed
- (c) A system that simply makes a selection from several images shot and a system that only changes the shooting conditions
- (d) A system that requires intensive noise suppression but tends to lose details (contrast in parts with small amplitude) as a side effect

(6)-3 Examples of systems that are considered to be suitable to be classified as “image stabilizer” class (these are just examples, and are not intended as limitations)

- (a) A system in which sensitivity is set higher than in the usual shooting mode and multiple shots are taken at a higher-than-usual shutter speed, and then the multiple shots taken are synthesized to compensate for deterioration of S/N in images, where the synthesis (matching positions, etc.) is carried out by using the output of blur detection means to enable a stabilized output image to be obtained having similar S/N as at the usual sensitivity
- (b) A system in which shooting is carried out by each of the usual and higher-than-usual shutter speeds and synthesis of luminance information is processed using images shot at the usual speed and that of positional information is processed using images shot at the higher-than-usual speed, where no deterioration of image quality results due to the synthesis
- (c) A system in which sensitivity is set higher than in the usual shooting mode and multiple shots are taken at a higher-than-usual shutter speed, and then synthesis of multiple shots is carried out to compensate for deterioration of S/N in images only when it is considered that synthesis processing results in better performance, where the synthesis (matching positions, etc.) is carried out by using the output of blur detection means, and no deterioration of image quality results due to the synthesis, even if no synthesis is carried out. Accordingly, such a system, in which processing is not possible to compensate deteriorated S/N, as only a single image shot at the higher shutter speed is used in the case where synthesis is not carried out, should not be classified as the “image stabilizer”.

(6)-4 Examples of systems that are suitable to be classified as “motion blur reduction” (these are just examples, and are not intended as limitations)

- (a) A method in which sensitivity is set higher than in the usual shooting mode and shooting is carried out at a higher-than-usual shutter speed, and image processing such as edge

- enhancement, etc. is performed to compensate the sense of resolution of the shot image
- (b) A method in which sensitivity is set higher than in the usual shooting mode and shooting is carried out at a higher-than-usual shutter speed, and image processing such as edge enhancement, etc. is performed adaptively in response to the shutter speed of shooting to compensate the sense of resolution of the shot image
 - (c) A method in which sensitivity is set higher than in the usual shooting mode and shooting is carried out at a higher-than-usual shutter speed, and noise reduction processing is performed to compensate for deterioration of S/N of the shot image
 - (d) A method in which sensitivity is set higher than in the usual shooting mode and shooting is carried out at a higher-than-usual shutter speed, and noise reduction processing is performed adaptively in response to the shutter speed of shooting to compensate for deterioration of S/N of the shot image
 - (e) A method in which sensitivity is set higher than in the usual shooting mode and shooting is carried out at a higher-than-usual shutter speed, when it is found that part of the subject is moving at a constant speed by detection of movement of the subject
 - (f) A method in which sensitivity is set higher than in the usual shooting mode and shooting is carried out at a higher-than-usual shutter speed in response to the speed of movement of the subject, when it is found that part of the subject is moving at a constant speed by detection of movement of the subject
 - (g) A method in which sensitivity is set higher than in the usual shooting mode and multiple shots are taken at a higher-than-usual shutter speed, and only the image that is determined by the digital camera as having the least blur is recorded
 - (h) A method in which sensitivity and shutter speed are gradually changed during shooting of multiple shots, and only the image that is determined by the digital camera as having the best balance between the amount of blur and S/N is recorded
 - (i) A method in which shooting is carried out at each of the usual and the higher shutter speeds, respectively, and the image shot at the usual speed is recorded if the blur is small and the image shot at the higher shutter speed is recorded if the blur is large

2. Deliberation committee members

This guideline was established through the following process: The original draft was deliberated by the DSC Specification Standards ad-hoc WG of the Technical Working Group of the Standardization Committee, and then the deliberated draft was further discussed by the DSC Specification Sub-Working Group of the Technical Working Group of the Standardization Committee. In addition, the opinions from the Catalogs Sub-Working Group of the Technical Working Group of the Standardization Committee were adopted as valuable input in the course of discussing notations and related matters in this guideline. The following section lists the members who worked on the discussion and establishment of this guideline.

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JCII BLDG., 25, Ichiban-cho, Chiyoda-ku, Tokyo, 102-0082 Japan
TEL +81-3-5276-3891 FAX +81-3-5276-3893

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