IEC 62563-2

Edition 1.0 2021-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Medical electrical equipment – Medical image display systems – Part 2: Acceptance and constancy tests for medical image displays

Appareils électromédicaux – Systèmes d'imagerie médicale – Partie 2: Essais d'acceptation et de constance des systèmes d'imagerie médicale

IEC 62563-2:2021-11 (en-fr)

Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

THIS PUBLICATION IS COPYRIGHT PROTECTED
Copyright © 2021 IEC, Geneva, Switzerland

All rights reserved. Unless otherwise specified, no part of this publication may be reproduced or utilized in any form or by any means, electronic or mechanical, including photocopying and microfilm, without permission in writing from either IEC or IEC's member National Committee in the country of the requester. If you have any questions about IEC copyright or have an enquiry about obtaining additional rights to this publication, please contact the address below or your local IEC member National Committee for further information.

Droits de reproduction réservés. Sauf indication contraire, aucune partie de cette publication ne peut être reproduite ni utilisée sous quelque forme que ce soit et par aucun procédé, électronique ou mécanique, y compris la photocopie et les microfilms, sans l'accord écrit de l'IEC ou du Comité national de l'IEC du pays du demandeur. Si vous avez des questions sur le copyright de l'IEC ou si vous désirez obtenir des droits supplémentaires sur cette publication, utilisez les coordonnées ci-après ou contactez le Comité national de l'IEC de votre pays de résidence.

IEC Central Office
3, rue de Varembé
CH-1211 Geneva 20
Switzerland

Tel.: +41 22 919 02 11
info@iec.ch
www.iec.ch

About the IEC
The International Electrotechnical Commission (IEC) is the leading global organization that prepares and publishes International Standards for all electrical, electronic and related technologies.

About IEC publications
The technical content of IEC publications is kept under constant review by the IEC. Please make sure that you have the latest edition, a corrigendum or an amendment might have been published.

IEC publications search - webstore.iec.ch/advsearchform
The advanced search enables to find IEC publications by a variety of criteria (reference number, text, technical committee, …). It also gives information on projects, replaced and withdrawn publications.

IEC Just Published - webstore.iec.ch/justpublished
Stay up to date on all new IEC publications. Just Published details all new publications released. Available online and once a month by email.

IEC Customer Service Centre - webstore.iec.ch/csc
If you wish to give us your feedback on this publication or need further assistance, please contact the Customer Service Centre: sales@iec.ch.

IEC online collection - oc.iec.ch
Discover our powerful search engine and read freely all the publications previews. With a subscription you will always have access to up to date content tailored to your needs.

Electropedia - www.electropedia.org
The world's leading online dictionary on electrotechnology, containing more than 22 000 terminological entries in English and French, with equivalent terms in 18 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

A propos de l'IEC
La Commission Electrotechnique Internationale (IEC) est la première organisation mondiale qui élabore et publie des Normes internationales pour tout ce qui a trait à l'électricité, à l'électronique et aux technologies apparentées.

A propos des publications IEC
Le contenu technique des publications IEC est constamment revu. Veuillez vous assurer que vous possédez l'édition la plus récente, un corrigendum ou amendement peut avoir été publié.

Recherche de publications IEC - webstore.iec.ch/advsearchform
La recherche avancée permet de trouver des publications IEC en utilisant différents critères (numéro de référence, texte, comité d'études, …). Elle donne aussi des informations sur les projets et les publications remplacées ou retirées.

IEC Just Published - webstore.iec.ch/justpublished
Restez informé sur les nouvelles publications IEC. Just Published détaille les nouvelles publications parues. Disponible en ligne et une fois par mois par email.

Service Clients - webstore.iec.ch/csc
Si vous désirez nous donner des commentaires sur cette publication ou si vous avez des questions contactez-nous: sales@iec.ch.

IEC online collection - oc.iec.ch
Découvrez notre puissant moteur de recherche et consultez gratuitement tous les aperçus des publications. Avec un abonnement, vous aurez toujours accès à un contenu à jour adapté à vos besoins.

Electropedia - www.electropedia.org
Le premier dictionnaire d'électrotechnologie en ligne au monde, avec plus de 22 000 articles terminologiques en anglais et en français, ainsi que les termes équivalents dans 16 langues additionnelles. Egalement appelé Vocabulaire Electrotechnique International (IEV) en ligne.

Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

IEC 62563-2

Edition 1.0 2021-11

INTERNATIONAL STANDARD

NORME INTERNATIONALE

Medical electrical equipment – Medical image display systems – Part 2: Acceptance and constancy tests for medical image displays

Appareils électromédicaux – Systèmes d'imagerie médicale – Partie 2: Essais d'acceptation et de constance des systèmes d'imagerie médicale

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

COMMISSION
ELECTROTECHNIQUE
INTERNATIONALE

ICS 11.040.55; 31.120

ISBN 978-2-8322-1039-8

Warning! Make sure that you obtained this publication from an authorized distributor.
Attention! Veuillez vous assurer que vous avez obtenu cette publication via un distributeur agréé.

® Registered trademark of the International Electrotechnical Commission
Marque déposée de la Commission Electrotechnique Internationale

Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

CONTENTS

FOREWORD 4
INTRODUCTION 6
1 Scope 7
2 Normative references 7
3 Terms, definitions, symbols and abbreviated terms 7
3.1 Terms and definitions 7
3.2 Symbols 8
3.3 Abbreviated terms 9
4 General 9
5 Categories 10
6 ACCEPTANCE TEST 11
6.1 General 11
6.2 When to test 11
6.3 Evaluation items and CRITERIA for ACCEPTANCE TEST 11
6.4 ACCEPTANCE TEST result 15
7 CONSTANCY TEST 16
7.1 General 16
7.2 Frequency of CONSTANCY TEST 16
7.3 Evaluation items and CRITERIA 16
7.4 CONSTANCY TEST result 16
Annex A (informative) Sample test reports 17
A.1 General 17
A.2 ACCEPTANCE TEST sample report of a category I-A diagnostic display 17
A.2.1 General information 17
A.2.2 Displays 17
A.2.3 Test results 17
A.3 CONSTANCY TEST sample report of a category I-A diagnostic display 21
A.3.1 General information 21
A.3.2 Displays 21
A.3.3 Test results 21
Annex B (informative) Ambient light control 24
Annex C (informative) Evaluation CRITERIA examples of clinical images 29
C.1 General 29
C.2 Chest image 29
Bibliography 34
Index of defined terms 35

Figure B.1 – L_{min} and E relationship when $r' \geq 250$ 24
Figure B.2 – Possible deviation range of E conforming to GSDF ±10 % 26
Figure B.3 (1 of 2) – Example charts of possible deviation ranges of ILLUMINANCE (E), calibrated at four different ambient LUMINANCE (L_{amb}) levels (shown at right) 27
Figure B.3 (2 of 2) – Example charts of possible deviation ranges of ILLUMINANCE (E), calibrated at four different ambient LUMINANCE (L_{amb}) levels (shown at right) 28
Figure C.1 – Chest clinical image 29

AVA Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021

Figure C.2 – Visually sharp reproduction of the vessel from hilum to peripheral area 30
Figure C.3 – Visibility of vessels under retro-cardiac area and under diaphragm 30
Figure C.4 – Visually sharp reproduction of trachea and proximal bronchia 31
Figure C.5 – Distinct reproduction of frame of spine, lateral protrusion, and spinous process 31
Figure C.6 – Distinct reproduction of edge of heart 31
Figure C.7 – Excellent graininess (no artefacts or significant noise) of thorax and underarm soft tissue 32
Figure C.8 – Distinct reproduction of the border of rib and peripheral lung, border of lower edge of lung 33

Table 1 – Overview to the definitions of physical parameters 8
Table 2 – Tests and TEST ITEMs for quantitative evaluation 11
Table 3 – Tests and TEST ITEMs for visual evaluation 13
Table 4 – Quantitative acceptance and CONSTANCY TESTs 14
Table 5 – Visual acceptance and CONSTANCY TESTs 15

Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

INTERNATIONAL ELECTROTECHNICAL COMMISSION

MEDICAL ELECTRICAL EQUIPMENT – MEDICAL IMAGE DISPLAY SYSTEMS –

Part 2: Acceptance and constancy tests for medical image displays

FOREWORD

1) The International Electrotechnical Commission (IEC) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of IEC is to promote international co-operation on all questions concerning standardization in the electrical and electronic fields. To this end and in addition to other activities, IEC publishes International Standards, Technical Specifications, Technical Reports, Publicly Available Specifications (PAS) and Guides (hereafter referred to as "IEC Publication(s)"). Their preparation is entrusted to technical committees; any IEC National Committee interested in the subject dealt with may participate in this preparatory work. International, governmental and non-governmental organizations liaising with the IEC also participate in this preparation. IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
2) The formal decisions or agreements of IEC on technical matters express, as nearly as possible, an international consensus of opinion on the relevant subjects since each technical committee has representation from all interested IEC National Committees.
3) IEC Publications have the form of recommendations for international use and are accepted by IEC National Committees in that sense. While all reasonable efforts are made to ensure that the technical content of IEC Publications is accurate, IEC cannot be held responsible for the way in which they are used or for any misinterpretation by any end user.
4) In order to promote international uniformity, IEC National Committees undertake to apply IEC Publications transparently to the maximum extent possible in their national and regional publications. Any divergence between any IEC Publication and the corresponding national or regional publication shall be clearly indicated in the latter.
5) IEC itself does not provide any attestation of conformity. Independent certification bodies provide conformity assessment services and, in some areas, access to IEC marks of conformity. IEC is not responsible for any services carried out by independent certification bodies.
6) All users should ensure that they have the latest edition of this publication.
7) No liability shall attach to IEC or its directors, employees, servants or agents including individual experts and members of its technical committees and IEC National Committees for any personal injury, property damage or other damage of any nature whatsoever, whether direct or indirect, or for costs (including legal fees) and expenses arising out of the publication, use of, or reliance upon, this IEC Publication or any other IEC Publications.
8) Attention is drawn to the Normative references cited in this publication. Use of the referenced publications is indispensable for the correct application of this publication.
9) Attention is drawn to the possibility that some of the elements of this IEC Publication may be the subject of patent rights. IEC shall not be held responsible for identifying any or all such patent rights.

IEC 62563-2 has been prepared by subcommittee 62B: Diagnostic imaging equipment, of IEC technical committee 62: Electrical equipment in medical practice.

The text of this International Standard is based on the following documents:

Draft	Report on voting
62B/1254/FDIS	62B/1262/RVD

Full information on the voting for its approval can be found in the report on voting indicated in the above table.

The language used for the development of this International Standard is English.

Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

This document was drafted in accordance with ISO/IEC Directives, Part 2, and developed in accordance with ISO/IEC Directives, Part 1 and ISO/IEC Directives, IEC Supplement, available at www.iec.ch/members_experts/refdocs. The main document types developed by IEC are described in greater detail at www.iec.ch/standardsdev/publications.

In this document, the following print types are used:

– requirements and definitions: roman type;

– informative material appearing outside of tables, such as notes, examples and references: in smaller type. Normative text of tables is also in a smaller type;

– TERMS DEFINED IN CLAUSE 3 OF THIS INTERNATIONAL STANDARD, OR AS NOTED: SMALL CAPITALS.

A list of all parts in the IEC 62563 series, published under the general title *Medical electrical equipment – Medical image display systems*, can be found on the IEC website.

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

- reconfirmed,
- withdrawn,
- replaced by a revised edition, or
- amended.

Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

INTRODUCTION

This document defines ACCEPTANCE and CONSTANCY TESTS for medical image displays. It defines TEST ITEMS for the ACCEPTANCE and CONSTANCY TESTS, as well as the performance CRITERIA and the test frequency for each TEST ITEM, elements of the measurement method related to an image quality parameter in an IMAGE DISPLAY SYSTEM. The evaluation methods of the TEST ITEMS are not described in this document; rather, evaluation methods, along with prerequisites, equipment and tools for the TEST ITEMS, are defined in IEC 62563-1.

ACCEPTANCE and CONSTANCY TESTS are performed on site at the installation facility. An ACCEPTANCE TEST is carried out after a new IMAGE DISPLAY SYSTEM has been installed or major modifications have been made to the existing IMAGE DISPLAY SYSTEM. Since an IMAGE DISPLAY SYSTEM can degrade over time, CONSTANCY TESTS are carried out periodically to verify that the performance is maintained.

This document describes appropriate TEST ITEMS and CRITERIA that are considered appropriate as an international standard based on survey of quality control testing standards and guidelines across the world. Although other existing standards and guidelines have been defined by other standard organizations and can be given priority over this document, national authorities are encouraged to adopt or harmonize to this document.

Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

MEDICAL ELECTRICAL EQUIPMENT – MEDICAL IMAGE DISPLAY SYSTEMS –

Part 2: Acceptance and constancy tests for medical image displays

1 Scope

This part of IEC 62563 establishes the performance CRITERIA and test frequencies for the ACCEPTANCE TESTS and CONSTANCY TESTS. The evaluation methods are defined in IEC 62563-1. The scope of this document is directed to practical tests that can be visually evaluated or measured using basic test equipment. This document applies to medical IMAGE DISPLAY SYSTEMS, which can display monochrome image information in the form of greyscale values on colour and greyscale IMAGE DISPLAY SYSTEMS. This document does not apply to information displays and to displays used solely for control of technical settings of all medical information.

2 Normative references

The following documents are referred to in the text in such a way that some or all of their content constitutes requirements of this document. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC TR 60788:2004, *Medical electrical equipment – Glossary of defined terms*

IEC 62563-1:2009, *Medical electrical equipment – Medical image display systems – Part 1: Evaluation methods*
IEC 62563-1:2009/AMD1:2016

3 Terms, definitions, symbols and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the terms and definitions in IEC TR 60788:2004, IEC 62563-1:2009/AMD1:2016 and the following apply.

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

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

3.1.1
ACCEPTANCE TEST
test carried out after equipment has been installed or major modifications have been made to existing equipment to verify compliance with manufacturer's specifications or requirements

3.1.2
CONSTANCY TEST
test carried out to confirm that the functional performance of equipment meets established CRITERIA and to enable the early recognition of changes in the properties of components of the equipment

Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021

3.1.3
LUMINANCE STABILIZER
embedded functionality of IMAGE DISPLAY SYSTEM which detects LUMINANCE deviation of light source by sensor (e.g. at bootup, degradation over time, or temperature change) caused by the IMAGE DISPLAY SYSTEM characteristics itself or its environments and adjusts light source automatically to stabilize display LUMINANCE

3.1.4
CRITERIA
acceptable deviation or limit defined for each test described in this document for the results of an ACCEPTANCE or a CONSTANCY TEST which signal a conforming performance of the equipment tested

3.1.5
TEST ITEM
element of the measurement method related to an image quality parameter in an IMAGE DISPLAY SYSTEM

3.1.6
RESPONSIBLE ORGANIZATION
entity accountable for the use and maintenance of a medical electrical (ME) equipment or a medical electrical (ME) system

[SOURCE: IEC 60601-1:2005, 3.101]

3.2 Symbols

The symbols of physical parameters described in IEC 62563-1 are listed in Table 1. All measurements referred to in Table 1 are in the centre of the IMAGE DISPLAY DEVICE; LUMINANCE can also be measured at other locations according to the methodologies described in this document.

Table 1 – Overview to the definitions of physical parameters

Symbol	Mathematically derived	Definition and explanation
L_{amb}		LUMINANCE generated by the ambient light on the surface of an IMAGE DISPLAY DEVICE when the IMAGE DISPLAY DEVICE is off.
L_{min}		Minimum LUMINANCE generated by an IMAGE DISPLAY DEVICE at DIGITAL DRIVING LEVEL (DDL) = 0 measured at the centre of the screen. It includes VEILING GLARE specific to TEST PATTERN used for measurement. It is measured with ambient light totally switched off (ambient ILLUMINANCE lower than 5 lux at the face of the IMAGE DISPLAY).
L_{max}		Maximum LUMINANCE generated by an IMAGE DISPLAY DEVICE at DIGITAL DRIVING LEVEL (DDL) = max. measured at the centre of the screen. It includes VEILING GLARE specific to TEST PATTERN used for measurement. It is measured with ambient light totally switched off (ambient ILLUMINANCE lower than 5 lux at the face of the IMAGE DISPLAY).
L'_{min}	$L_{min} + L_{amb}$	LUMINANCE that shall be perceived by the human eye at the centre of the screen at DIGITAL DRIVING LEVEL (DDL) = 0. It contains VEILING GLARE and L_{amb}.
L'_{max}	$L_{max} + L_{amb}$	LUMINANCE produced by the IMAGE DISPLAY DEVICE that shall be perceived by the human eye at the maximum DIGITAL DRIVING LEVEL (DDL) measured at the centre of the screen. It contains VEILING GLARE and L_{amb}.
L'_{target}		Target LUMINANCE at maximum DIGITAL DRIVING LEVEL (DDL) being the IMAGE DISPLAY DEVICE vendor recommended value or the value used during calibration (including the ambient light contribution).

AVA Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021

Symbol	Mathematically derived	Definition and explanation
$\Delta L'_{max}$	$(L'_{max} - L'_{target})/L'_{target}$ [%]	Percentage of difference from L'_{target} and measured actual L'_{max} at maximum DDL.
a	L_{amb}/L'_{min}	Safety factor
R_d		Diffuse reflection coefficient (provided by manufacturer with a specific measurement method, ideally following the methods described in [1][1] using a CIE standard illuminant A and an aperture size 20 % to 30 % larger than the diameter of the LUMINANCE meter).
r'	L'_{max}/L'_{min}	LUMINANCE ratio of an IMAGE DISPLAY DEVICE containing VEILING GLARE and ambient LUMINANCE.
E		ILLUMINANCE
$\Delta u'v'$	$((u_1'-u_2')^2 + (v_1'-v_2')^2)^{1/2}$	Distance between two points (u_1,v_1) and (u_2,v_2) in u'-v' space.

3.3 Abbreviated terms

CT computed tomography

DDL digital driving level

DICOM digital imaging and communication in medicine

GSDF greyscale standard display function

LCD liquid crystal display

MR magnetic resonance

QC quality control

4 General

In IMAGE DISPLAY SYSTEMS, every individual component can limit or reduce the image quality of the system. Therefore, it is necessary to adopt suitable measures for quality monitoring. If IMAGE DISPLAY SYSTEMS are correctly adjusted and maintained, these devices can consistently generate similar images.

Simple test equipment is used (LUMINANCE meter, TEST IMAGES) with PRECISION appropriate for a test. Before a test, all test equipment shall be checked for its functioning according to the manufacturer's specifications. IMAGE DISPLAY DEVICE should be placed in a likely clinical position while performing the measurements.

According to Clause 5, IMAGE DISPLAY DEVICES shall be categorized, and ACCEPTANCE TEST and CONSTANCY TEST shall be performed respectively. ACCEPTANCE TEST shall be performed after a new IMAGE DISPLAY SYSTEMS installation or major modification of an existing IMAGE DISPLAY SYSTEM. The CONSTANCY TEST shall be performed periodically to confirm that the performance is maintained.

The results of ACCEPTANCE and CONSTANCY TESTING shall be recorded. If the test did not meet the CRITERIA, immediate response (e.g., as recommended by the IMAGE DISPLAY DEVICE manufacturer) such as repair service, re-calibration, or replace of IMAGE DISPLAY DEVICE (s) shall be performed. It is optimal to manage systems properly and not fail the tests. If tests fail, analysis of results or more frequent testing is advisable. Testing conditions, test instruments, TEST PATTERNS and evaluation methods are defined in IEC 62563-1. Annex A shows a sample ACCEPTANCE and CONSTANCY TEST report.

[1] Numbers in square brackets refer to the Bibliography.

Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

5 Categories

IMAGE DISPLAY DEVICES shall be categorized in three categories: I, II and III. Category I is further categorized in 2 subcategories: I-A and I-B.

The following application categories and subcategories are defined.

Category I-A: IMAGE DISPLAY DEVICE which has at least a 2 048 × 2 048 pixel array size and a GSDF LUMINANCE response. This category is recommended if consistent visibility of subtle contrast and finest detail is required for accurate diagnosis. Application examples include mammography and digital breast tomosynthesis.

Category I-B: IMAGE DISPLAY DEVICE which has at least a 1 024 × 1 024 pixel array size and a GSDF LUMINANCE response. This category is recommended if consistent visibility of low contrast and fine detail is required for the clinical application. Application examples include images such as chest X-ray, CT and MR, and breast biopsy.

Category II: IMAGE DISPLAY DEVICE which has a GSDF LUMINANCE response. This category is recommended if consistent visibility of contrast is required for the clinical image viewing application. Application examples include acquisition and viewing workstations, ultrasound, angiography and fluoroscopy.

Category III: IMAGE DISPLAY DEVICE which has a defined LUMINANCE response function other than GSDF. This category is recommended if quality assured visibility of contrast is required for the clinical image viewing application. Application examples include acquisition and viewing workstations, ultrasound, angiography and fluoroscopy.

The application examples given for each of these categories and subcategories are not normative. Before performing an ACCEPTANCE TEST, clinical institutions or physicians shall decide in which category and subcategory a specific IMAGE DISPLAY DEVICE is categorized taking possible regionally applicable regulations into account and the IMAGE DISPLAY DEVICE manufacturer's information.

If an IMAGE DISPLAY DEVICE is used for multiple applications, its application category shall be determined on its most stringent application.

The above application categories and subcategories are defined based on the IMAGE DISPLAY DEVICE technologies currently used in medical IMAGE DISPLAY SYSTEMS. It is possible that newer technology IMAGE DISPLAY DEVICES do not fit into one of the above application categories; in this case, the clinical institution or physician shall define an appropriate application categorization system and QC program.

These categories and subcategories are based on IMAGE DISPLAY DEVICE performance only; however, the entire IMAGE DISPLAY SYSTEM shall be considered. Clinical institutions or physicians shall ascertain if all other IMAGE DISPLAY SYSTEM components besides the IMAGE DISPLAY DEVICES are suitable for the application.

In some cases, in addition to the examples given in the category descriptions, category II and category III IMAGE DISPLAY DEVICES can be part of systems that include diagnostic procedures. For category III IMAGE DISPLAY DEVICES, various types of LUMINANCE responses are currently used depending on the application, and it is difficult to define a set of QC tests applicable for all possible LUMINANCE responses. In this case, the IMAGE DISPLAY SYSTEM shall conform with the QC test(s) defined by the manufacturer or RESPONSIBLE ORGANIZATION.

AVA Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

6 ACCEPTANCE TEST

6.1 General

Based on the category decided by physicians or medical institution, an ACCEPTANCE TEST shall be performed after a new IMAGE DISPLAY SYSTEM or a new IMAGE DISPLAY DEVICE is installed, or after major modifications to the existing IMAGE DISPLAY SYSTEM or IMAGE DISPLAY DEVICE. The test shall be performed in the actually-used environment, including placement and ambient lighting, after calibration if needed. Follow instructions on test preparations according to Clause 4, Clause 5 and Clause 6 of IEC 62563-1:2009.

6.2 When to test

When an IMAGE DISPLAY SYSTEM or an IMAGE DISPLAY DEVICE is installed or following any major modification, testing shall be performed before using them. Major modifications include:

– change on category for IMAGE DISPLAY DEVICE;
– major component replacement which affects the quality of IMAGE DISPLAY DEVICE (e.g. LCD panel) due to repair; contact the manufacturer for the impact;
– major modification of the IMAGE DISPLAY DEVICE (e.g. maximum LUMINANCE, minimum LUMINANCE, or LUMINANCE response);
– change of the installed location (e.g. installed room) or ambient light setting; See Annex B for more details how to control ambient light;
– change to IMAGE DISPLAY SYSTEM which affects the image quality (e.g. change of the display controller or driver software); contact the manufacturer for the impact.

The RESPONSIBLE ORGANIZATION shall check the test result and shall take appropriate actions if needed.

6.3 Evaluation items and CRITERIA for ACCEPTANCE TEST

Table 2 and Table 3 show quantitative and visual test and its TEST ITEMS for ACCEPTANCE TEST. Table 4 and Table 5 show CRITERIA by categories. Evaluation methods are based on IEC 62563-1.

Table 2 – Tests and TEST ITEMS for quantitative evaluation

IEC 62563-1:2009 and IEC 62563-1:2009/ AMD1:2016	TEST ITEM	TEST PATTERN	Description
7.4.1 Basic LUMINANCE evaluation	Minimum r'	TG18-LN-01,-18, BN-01,-18	Confirm the LUMINANCE ratio r' (= L'_{max}/L'_{min}) is equal or more than specified CRITERIA.
	L_{amb}/L'_{min} relationship	TG18-LN-01, BN-01	Confirm that the minimum value of L'_{min} or the maximum value of L_{amb} satisfies the requirement on the safety factor "a", which defines the relationship L_{amb} and L'_{min}.
	Tolerance of $\Delta L'_{max}$	TG18-LN-18, BN-18	Confirm a deviation from L'_{target} to L'_{max} is equal or less than CRITERIA.
	Minimum of L'_{max}	TG18-LN-18, BN-18	Confirm L'_{max} is equal or more than CRITERIA.
7.4.3 LUMINANCE response evaluation	GSDF tolerance limit	TG18-LN-01 to 18, BN-01 to 18	Confirm GSDF tolerance evaluated by contrast response is equal or less than the CRITERIA. Compute contrast response from measured 18 grey levels and obtain deviation from expected value. See 7.4.3 in IEC 62563-1:2009 for calculation.

Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021

IEC 62563-1:2009 and IEC 62563-1:2009/ AMD1:2016	TEST ITEM	TEST PATTERN	Description
7.4.4 LUMINANCE evaluation of multiple displays	Tolerance of multiple displays (LUMINANCE)	TG18-LN-18, BN-18	The maximum LUMINANCE deviation is calculated as a percent difference between the highest and lowest LUMINANCE values relative to their lowest value, $100 \times (L_{highest} - L_{lowest})/L_{lowest}$ [%] Confirm this value is equal to or less than CRITERIA.
7.4.5 Chromaticity uniformity evaluation	Tolerance of chromaticity uniformity	TG18-UNL80	Using a colour meter, measure the (u',v') colour coordinates at the centre and at the four corners of the screen and compute the distance $\Delta u'v'$, as the maximum distance in u'-v' space between any possible pairs of (u', v') points. Confirm this value is equal to or less than CRITERIA.
7.4.6 Chromaticity evaluation across multiple displays	Tolerance of multiple displays (chromaticity)	TG18-UNL80	If multiple IMAGE DISPLAY DEVICES are associated with the same IMAGE DISPLAY SYSTEM the (u', v') chromaticity in the centre of every IMAGE DISPLAY DEVICE shall be compared. Compute the distance $\Delta u'v'$, as the maximum distance in u'-v' space between any possible pair of central measurements as $\Delta u'v' = ((u_1'-u_2')^2 + (v_1'-v_2')^2)^{1/2}$. If this distance $\Delta u'v'$ is calculated to more than two IMAGE DISPLAY DEVICES, the two with the biggest (u',v') distance shall be used in line with IEC 62563-1. Confirm this value is equal to or less than the CRITERIA.
7.4.7 LUMINANCE uniformity evaluation	Tolerance of LUMINANCE uniformity	TG18-UNL80	LUMINANCE uniformity within the IMAGE DISPLAY DEVICE. The deviation amongst measured LUMINANCE at centre and four corners as $200 \times (L_{highest} - L_{lowest})/(L_{highest} + L_{lowest})$ [%] Confirm this value is equal to or less than the CRITERIA.
7.4.9 Greyscale chromaticity evaluation	Tolerance of greyscale chromaticity	TG18-LN-01 to 18, BN-01 to 18	Chromaticity amongst greyscales. With only the measurements corresponding to recorded LUMINANCE values higher than or equal to 5 cd/m^2, the distances in the u'-v' space with respect to the measurement at full white are computed as: $\Delta u_i' v_i' = ((u_i'-u_{18}')^2 + (v_i'-v_{18}')^2)^{1/2}$ Confirm this value is equal to or less than the CRITERIA.

Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021

Table 3 – Tests and TEST ITEMs for visual evaluation

IEC 62563-1 and IEC 62563-1:2009/ AMD1:2016	TEST ITEM	TEST PATTERN	Description
7.3.2 Overall image quality evaluation	Visual check of line-pair (high)	TG18-QC or OIQ	Make sure that the high contrast line-pair patterns at the centre and four corners are all detectable.
	Visual check of line-pair (low/2pixel)		Make sure that the 2-pixel width low-contrast line-pair patterns at the centre and four corners are all detectable.
	Visual check of 5 % and 95 % patches		Make sure that that 5 % and 95 % patches are clearly detectable.
	Visual check of characters		Detect all designated characters in the designated areas.
	Visual check of white-black		Borders are clearly visible (and no trailing observed) both white-to-black and black-to-white transitions.
	Visual check of 16 LUMINANCE patches		All 16 LUMINANCE patches are clearly distinguishable.
	Visual check of greyscale		Make sure that the ramp bars are continuous and monotonic.
	Visual check of borders/straight		Make sure that all borders are visible and lines are straight in the ACTIVE AREA OF IMAGE DISPLAY DEVICE.
	Visual check of centring		Make sure that the pattern is centred in the ACTIVE AREA OF IMAGE DISPLAY DEVICE.
	Visual check of FLICKER		Evaluate the overall appearance of the TEST PATTERN, and confirm no FLICKER affecting diagnosis or referencing observed.
	Visual check of noise		Evaluate the overall appearance of the TEST PATTERN, and confirm no noise affecting diagnosis or referencing observed.
	Visual check of video artefacts		Evaluate the overall appearance of the TEST PATTERN and confirm no video artefacts affecting diagnosis or referencing observed.
7.3.3 Greyscale resolution evaluation	Visual check of greyscale resolution	TG18-MP	Confirm sufficient grayscale resolution based on 8- and 10-bit markers.
7.3.5 LUMINANCE uniformity evaluation	Visual check of LUMINANCE uniformity	TG18-UN80	Confirm the display does not have LUMINANCE non-uniformities that affects diagnosis or referencing.
7.3.6 Chromaticity evaluation	Visual check of colour uniformity	TG18-UN80	Confirm there are no significant colour differences within an IMAGE DISPLAY DEVICE that affects diagnosis or referencing.
	Visual check of colour uniformity amongst multiple displays	TG18-UN80	Confirm there are no significant colour differences that affects diagnosis or referencing, amongst multiple IMAGE DISPLAY DEVICES of the same type associated with a particular IMAGE DISPLAY SYSTEM.
7.3.7 Pixel faults evaluation	Counting pixel faults (type A)	TG18-UN10	Confirm the number of type A pixel faults are equal or less than CRITERIA. The CRITERIA are described as a number per 1 M pixels (per 1 024 × 1 024 rounded to an integer).
7.3.11 Clinical evaluation	Clinical image efficacy	CLINICAL REFERENCE IMAGES	Show specified CLINICAL REFERENCE IMAGE(S) and confirm there are no problems for diagnosis. This CLINICAL REFERENCE IMAGE can be specified in a facility or can be used ones specified by authorities. Examples of evaluation CRITERIA of CLINICAL REFERENCE IMAGES are provided in Annex C.

AVA Documents
Document Sharing Hub

Table 4 – Quantitative acceptance and CONSTANCY TESTS

TEST ITEM [a]	Category I-A (GSDF)	Category I-B (GSDF)	Category II (GSDF)	Category III (Other than GSDF)	Acceptance (A)/ Constancy (C)
Minimum r'	≥ 350	≥ 250	≥ 100	≥ 100	A and C
L_{amb}/L'_{min} (a) relationship [b]	≤ 0,6	≤ 0,6	-	-	A and C
L'_{max} (cd/m^2) [c]	≥ 450	≥ 350	≥ 150	≥ 150	A and C
LUMINANCE response conformance	GSDF tolerance ≤ ±10 %	GSDF tolerance ≤ ±10 %	GSDF tolerance ≤ ±20 %	[e]	A and C
Tolerance of multiple displays (LUMINANCE) (%)	≤ 10	≤ 10	≤ 20	≤ 20	A and C
Tolerance of chromaticity uniformity $\Delta(u', v')$	≤ 0,010	≤ 0,010	- [d]	- [d]	A
Tolerance of multiple displays chromaticity $\Delta(u', v')$	≤ 0,010	≤ 0,010	- [d]	- [d]	A
Tolerance of LUMINANCE uniformity (%)	≤ 20	≤ 20	≤ 30	≤ 30	A
Tolerance of greyscale chromaticity $\Delta(u', v')$	≤ 0,010	≤ 0,010	- [d]	- [d]	A

Key

- Not required.

[a] See Table 2 for descriptions.

[b] If the room illumination conditions are stable and the ambient contribution to the display LUMINANCE is considered in the LUMINANCE response calibration, then the safety factor is not mandatory. An $L_{min} \geq 0{,}5$ cd/m^2 is recommended. For reference: $L_{min} \geq L_{amb}(1/a - 1)$ or $L_{amb} \leq L_{min}(a/(1 - a))$. See Annex B for more details about ambient light control.

[c] If the clinical institution specifies a target L'_{max}, then the deviation from the specified L'_{max} shall be 10 % or less.

[d] Chromaticity shall be evaluated if diagnostic activities would be exercised on that IMAGE DISPLAY DEVICE. In that case, ≤ 0,015 shall be appropriate.

[e] Refer to the manufacturer's QC protocol.

Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021

Table 5 – Visual acceptance and CONSTANCY TESTS

TEST ITEM [a]	Category I-A	Category I-B	Category II	Category III
Visual check of line-pair (high)	☑	☑	☑	☑
Visual check of line-pair (low/2pixel)	☑	☑	-	-
Visual check of 5 % and 95 % patches	☑	☑	☑	☑ [b]
Visual check of characters	White/grey/black: QUALITY CONTROL	White/grey: QUALITY CONTROL Black: QUALITY CONTRO	White/grey: QUALITY CONTROL Black: QUALITY CONT	☑ [b]
Visual check of white-black	☑	☑	☑	☑
Visual check of 16 LUMINANCE patches	☑	☑	☑	☑ [b]
Visual check of greyscale	☑	☑	☑	☑ [b]
Visual check of borders/straight	☑	☑	☑	☑
Visual check of centring	☑	☑	☑	☑
Visual check of FLICKER	☑	☑	☑	☑
Visual check of noise	☑	☑	☑	☑
Visual check of video artefacts	☑	☑	☑	☑
Visual check of greyscale resolution	☑ [c]	☑ [c]	☑ [c]	☑ [c]
Visual check of LUMINANCE uniformity	☑ [d]	☑ [d]	☑ [d]	☑ [d]
Visual check of colour uniformity	☑ [d]	☑ [d]	- [d e]	- [d e]
Visual check of colour uniformity on multiple displays	☑ [d]	☑ [d]	- [d e]	- [d e]
Counting pixel faults (type A) per million pixels	≤ 1	≤ 3	-	-
Clinical image efficacy	[f]	[f]	[f]	[f]

Key

☑ Perform and pass test.

- Not required.

[a] See Table 3 for descriptions.

[b] Refer to the manufacturer's QC protocol.

[c] Greyscale transitions shall be confirmed on all the long horizontal markers. For "other than GSDF" and 10-bit displays, refer to manufacturer's QC protocol.

[d] If it is hard to judge whether non-uniformity in visual CONSTANCY TESTING is significant or not, perform quantitative test. Refer to Table 4 for CRITERIA respectively when quantitative test.

[e] Colour uniformity shall be evaluated if diagnostic activities is exercised on that IMAGE DISPLAY DEVICE.

[f] Whether to perform this test or not, including its CRITERIA, shall be decided by a user.

6.4 ACCEPTANCE TEST result

Each test result shall be recorded, stored and kept available. If the test fails, test conditions shall be evaluated including ambient light and configurations for the IMAGE DISPLAY SYSTEM, and then perform the test again. If the test continues to fail, contact the system vendor or manufacturer. Annex A shows a sample ACCEPTANCE TEST report.

AVA Documents Document Sharing Hub

Full document details: IEC 62563-2-2021

7 CONSTANCY TEST

7.1 General

Based on the category decided by physicians or medical institution, IMAGE DISPLAY SYSTEM or IMAGE DISPLAY DEVICES tests shall be performed in accordance with this document. The tests shall be performed in the actually-used environment, including placement and ambient lighting. Follow instructions on test preparations according to Clause 4, Clause 5 and Clause 6 of IEC 62563-1:2009.

7.2 Frequency of CONSTANCY TEST

Depending on the technology, the IMAGE DISPLAY DEVICE might degrade over time including variations in LUMINANCE, chromaticity and uniformity. To ensure consistent performance, CONSTANCY TEST shall be performed periodically. Based on the category, the following quantitative tests shall be performed:

- minimum r';
- L_{amb}/L'_{min} (a) relationship;
- L'_{max} (cd/m^2);
- LUMINANCE response conformance;
- tolerance of multiple displays (LUMINANCE) (%).

Quantitative CONSTANCY TESTING shall be performed with a frequency of at least semi-annually for category I-A and I-B and at least annually for category II and III.

Qualitative (visual) CONSTANCY TESTS in Table 5 shall be performed semi-annually for category I-A and I-B and annually for category II and III. The designated frequencies can be adjusted if strong and documented evidence can be produced by the RESPONSIBLE ORGANIZATION in support of the modified frequency. If the display device performance is suspect to vary rapidly (over days), then a daily visual CONSTANCY TEST shall be performed.

The designated frequencies are minimum frequencies; the tests can be performed more frequently. When the IMAGE DISPLAY DEVICE does not have a LUMINANCE STABILIZER or if its product warranty has expired, CONSTANCY TESTING shall be performed more frequently.

7.3 Evaluation items and CRITERIA

Table 4 and Table 5 list the TEST ITEMS and CRITERIA for CONSTANCY TESTING. Evaluation methods are defined in IEC 62563-1:2009.

7.4 CONSTANCY TEST result

Each CONSTANCY TEST result shall be recorded, stored and kept available. If the test fails, test conditions shall be evaluated including ambient light and configurations for the IMAGE DISPLAY SYSTEM, and then perform the test again. If the test continues to fail, contact the system vendor or manufacturer. Annex A shows a sample CONSTANCY TEST report. It is optimal to manage systems properly not to fail the tests. An analysis of test results might warrant more frequent tests.

Medical institutions shall consider appropriate actions according to test results. Test reports shall be kept while the medical IMAGE DISPLAY DEVICE is installed. It is recommended to keep a test history for all tests. While document format (on paper or electronically) of the report is not defined in this document, identifiers of IMAGE DISPLAY DEVICE, tester, test date, results and conclusion are mandatory. See Annex A for an example. If the test results did not meet the CRITERIA, immediate response such as service, re-calibration, or replacement of IMAGE DISPLAY DEVICE(S) shall be performed. Even if test results are satisfactory, it is recommended to have them carefully reviewed. If the results approach the performance CRITERIA, it can be appropriate to initiate a service consultation with the system vendor or manufacturer.

AVA Documents
Document Sharing Hub

Annex A
(informative)

Sample test reports

A.1 General

Annex A provides two sample test reports:

– ACCEPTANCE TEST sample report of a category I-A diagnostic display, shown in Clause A.2;
– CONSTANCY TEST sample report of a category I-A diagnostic display, shown in Clause A.3.

A.2 ACCEPTANCE TEST sample report of a category I-A diagnostic display

A.2.1 General information

Date of test: Jan 23, 2007

Test performed by: John

Facility: St. John's facility, Jonathan Street 55, John's City, John's Country

Location: Radiology, Reading Room 4

Workstation: Mammo4

A.2.2 Displays

Category: I-A

Application: mammography diagnostic

	Display 1	Display 2
Type	LCD	LCD
Model	5MP model	5MP model
Serial number	123	124
Pixel array size	2 048 × 2 560	2 048 × 2 560

A.2.3 Test results

Basic LUMINANCE

	Display 1	Display 2
L_{amb} (cd/m^2)	0,5	0,5
L_{min} (cd/m^2)	0,5	0,5
L'_{min} (cd/m^2)	1,0	1,0
L_{max} (cd/m^2)	499,5	500,5
L'_{max} (≥ 450 cd/m^2)	500 ✔	501 ✔
r' (≥ 350)	500 ✔	501 ✔
a (≤ 0,6)	0,5 ✔	0,5 ✔

AVA Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

LUMINANCE response conformance

LUMINANCE response: DICOM GSDF

	Display 1	Display 2
L'(LN01) (cd/m^2)	1,0	1,0
L'(LN02) (cd/m^2)	2,16	2,15
L'(LN03) (cd/m^2)	4,02	4,03
L'(LN04) (cd/m^2)	6,70	6,71
L'(LN05) (cd/m^2)	10,45	10,46
L'(LN06) (cd/m^2)	15,57	15,58
L'(LN07) (cd/m^2)	22,42	22,44
L'(LN08) (cd/m^2)	31,47	31,50
L'(LN09) (cd/m^2)	43,32	43,37
L'(LN10) (cd/m^2)	58,73	58,81
L'(LN11) (cd/m^2)	78,65	78,76
L'(LN12) (cd/m^2)	104,29	104,44
L'(LN13) (cd/m^2)	137,19	137,40
L'(LN14) (cd/m^2)	179,28	179,57
L'(LN15) (cd/m^2)	233,04	233,43
L'(LN16) (cd/m^2)	301,58	302,12
L'(LN17) (cd/m^2)	388,89	389,63
L'(LN18) (cd/m^2)	500	501
Maximum deviation (≤ ±10 %)	1,7 ✔	2,4 ✔

LUMINANCE uniformity

	Display 1	Display 2
Top left *L* (cd/m^2)	223,0	223,0
Top right *L* (cd/m^2)	224,0	224,0
Centre *L* (cd/m^2)	225,0	225,5
Bottom right *L* (cd/m^2)	227,0	227,0
Bottom left *L* (cd/m^2)	228,0	228,0
Maximum deviation (≤ 20 %)	2,2 ✔	2,2 ✔

LUMINANCE evaluation between multiple displays

Maximum deviation (≤ 10 %): 0,2 % ✔

AVA Documents
Document Sharing Hub

Full document details: IEC 62563-2-2021

Chromaticity uniformity

	Display 1	Display 2
Top left (*u'*,*v'*)	0,202 5, 0,469 9	0,202 5, 0,469 9
Top right (*u'*,*v'*)	0,205 1, 0,468 8	0,205 1, 0,468 8
Centre (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
Bottom right (*u'*,*v'*)	0,205 2, 0,469 5	0,205 2, 0,469 5
Bottom left (*u'*,*v'*)	0,200 9, 0,470 6	0,200 9, 0,470 6
Maximum deviation ($\Delta u'v' \leq 0{,}010$)	0,004 6 ✔	0,004 6 ✔

Chromaticity evaluation between multiple displays

Maximum deviation ($\Delta u'v' \leq 0{,}010$): 0,002 9 ✔

Greyscale chromaticity

	Display 1	Display 2
LN01 (*u'*,*v'*)	Discarded (L < 5 cd/m^2)	Discarded (L < 5 cd/m^2)
LN02 (*u'*,*v'*)	Discarded (L < 5 cd/m^2)	Discarded (L < 5 cd/m^2)
LN03 (*u'*,*v'*)	Discarded (L < 5 cd/m^2)	Discarded (L < 5 cd/m^2)
LN04 (*u'*,*v'*)	0,200 0, 0,464 0	0,200 0, 0,464 0
LN05 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN06 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN07 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN08 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN09 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN10 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN11 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN12 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN13 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN14 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN15 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN16 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN17 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
LN18 (*u'*,*v'*)	0,202 4, 0,468 0	0,204 6, 0,469 9
Maximum deviation ($\Delta u'v' \leq 0{,}010$)	0,004 7 ✔	0,007 5 ✔

Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021

Visual test – Overall image quality

TEST PATTERN: TG18-OIQ

	Display 1	Display 2
Are the high contrast line-pair patterns at the centre and the four corners visible?	✔	✔
Are the 2-pixel width low-contrast line pair patterns at the centre and the four corners visible?	✔	✔
Are the 5 % and 95 % patches clearly visible?	✔	✔
Are the QUALITY CONTROL characters visible in white, grey and black?	✔	✔
Are the borders for white-to-black and black-to-white transitions clearly visible without trailing?	✔	✔
Are all 16 LUMINANCE patches clearly visible?	✔	✔
Are the ramp bars continuous and monotonic?	✔	✔
Are all borders visible and lines straight in the active area?	✔	✔
Is the pattern centred in the active area?	✔	✔
No FLICKERING affecting diagnosis or referencing is visible.	✔	✔
No noise affecting diagnosis or referencing is visible.	✔	✔
No video artefacts affecting diagnosis or referencing is visible.	✔	✔

Visual test – Greyscale resolution

TEST PATTERN: TG18-MP

	Display 1	Display 2
Confirm sufficient grayscale resolution based on 8- and 10-bit markers.	✔	✔

Visual test – Uniformity

TEST PATTERN: TG18-UN80

	Display 1	Display 2
Confirm the display does not have LUMINANCE non-uniformities that affect diagnosis or referencing.	✔	✔
Confirm the display does not have significant colour differences that affect diagnosis or referencing.	✔	✔
Confirm there are no significant colour differences that affect diagnosis or referencing, amongst multiple IMAGE DISPLAY DEVICES of the same type associated with a particular IMAGE DISPLAY SYSTEM.	✔	✔

Visual test – Pixel faults

TEST PATTERN: TG18-UN10

	Display 1	Display 2
Confirm the number of type A pixel faults is ≤ 5.	✔	✔

AVA Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021

A.3 CONSTANCY TEST sample report of a category I-A diagnostic display

A.3.1 General information

Date of test: Jan 23, 2007

Test performed by: John

Facility: St. John's facility, Jonathan Street 55, John's City, John's Country

Location: Radiology, Reading Room 4

Workstation: Mammo4

A.3.2 Displays

Category: I-A

Application: Mammography diagnostic

	Display 1	Display 2
Type	LCD	LCD
Model	5MP model	5MP model
Serial number	123	124
Pixel array size	2 048 × 2 560	2 048 × 2 560

A.3.3 Test results

Basic LUMINANCE

	Display 1	Display 2
L_{amb} (cd/m^2)	0,5	0,5
L_{min} (cd/m^2)	0,5	0,5
L'_{min} (cd/m^2)	1,0	1,0
L_{max} (cd/m^2)	499,5	500,5
L'_{max} (≥ 450 cd/m^2)	500 ✔	501 ✔
r' (≥ 350)	500 ✔	501 ✔
a (≤ 0,6)	0,5 ✔	0,5 ✔

Documents
Document Sharing Hub
Full document details: IEC 62563-2-2021