



IEC 63145-22-10

Edition 1.0 2020-01

# INTERNATIONAL STANDARD



---

**Eyewear display –  
Part 22-10: Specific measurement methods for AR type – Optical properties**

INTERNATIONAL  
ELECTROTECHNICAL  
COMMISSION

---

ICS 17.180.99; 31.120

ISBN 978-2-8322-7737-9

**Warning! Make sure that you obtained this publication from an authorized distributor.**

## CONTENTS

FOREWORD.....	4
1 Scope.....	6
2 Normative references .....	6
3 Terms, definitions, abbreviated terms and letter symbols.....	6
3.1 Terms and definitions.....	6
3.2 Abbreviated terms.....	7
3.3 Letter symbols (symbols for quantities, and units).....	7
4 Standard measurement conditions.....	7
4.1 Standard environmental conditions .....	7
4.2 Power supply .....	8
4.3 Warm-up time .....	8
4.4 Dark room condition.....	8
5 Measurement systems.....	8
5.1 Standard coordinate system.....	8
5.2 Measurement equipment.....	9
5.2.1 Light measuring device (LMD) .....	9
5.2.2 Stage condition.....	11
5.2.3 Setup conditions .....	11
5.3 Test patterns.....	13
5.3.1 General .....	13
5.3.2 Checkerboard pattern .....	13
5.4 Measuring points .....	13
6 Measurement methods .....	14
6.1 Spectral directional transmittance .....	14
6.1.1 General .....	14
6.1.2 Conditions .....	14
6.1.3 Procedure.....	15
6.1.4 Calculation .....	15
6.1.5 Report .....	16
6.2 Colour difference .....	16
6.2.1 General .....	16
6.2.2 Conditions .....	16
6.2.3 Procedure.....	17
6.2.4 Calculation .....	17
6.2.5 Report .....	17
6.3 Front side stray light.....	18
6.3.1 General .....	18
6.3.2 Conditions .....	18
6.3.3 Procedure.....	19
6.3.4 Calculation .....	20
6.3.5 Report .....	20
6.4 Contrast modulation.....	20
6.4.1 General .....	20
6.4.2 Conditions .....	20
6.4.3 Procedure.....	22
6.4.4 Calculation .....	22

6.4.5 Report .....	22
Annex A (informative) See-through optical properties of AR eyewear displays .....	23
Annex B (informative) Response time of electronic dimming devices .....	24
Annex C (informative) Back side stray light.....	25
Bibliography.....	26
Figure 1 – Spherical coordinate system .....	9
Figure 2 – Three-dimensional Cartesian coordinate system .....	9
Figure 3 – Example of LMD structure .....	10
Figure 4 – Example of measuring setup for eyewear displays .....	12
Figure 5 – Example of 5 x 5 checkerboard pattern .....	13
Figure 6 – Measuring points for the centre- and multi-point measurements .....	14
Figure 7 – Setup of transmittance measurement .....	15
Figure 8 – Setup of haze measurement.....	19
Figure 9 – Example of contrast modulation test pattern.....	21
Figure 10 – Setup of contrast modulation measurement.....	22
Figure A.1 – Observed light under ambient lighting conditions .....	23
Figure B.1 – Response time of electronic dimming device (fall time) .....	24
Figure B.2 – Response time of electronic dimming device (rise time) .....	24
Table 1 – Letter symbols (quantity symbols and units) .....	7
Table 2 – Measuring conditions .....	20

## INTERNATIONAL ELECTROTECHNICAL COMMISSION

## EYEWEAR DISPLAY –

Part 22-10: Specific measurement methods for AR type –  
Optical properties

## 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.

International Standard IEC 63145-22-10 has been prepared by IEC technical committee 110: Electronic displays.

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

FDIS	Report on voting
110/1160/FDIS	110/1173/RVD

Full information on the voting for the approval of this International Standard can be found in the report on voting indicated in the above table.

This document has been drafted in accordance with the ISO/IEC Directives, Part 2.

A list of all parts in the IEC 63145 series, published under the general title *Eyewear display*, 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 "<http://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.

A bilingual version of this publication may be issued at a later date.

**IMPORTANT – The 'colour inside' logo on the cover page of this publication indicates that it contains colours which are considered to be useful for the correct understanding of its contents. Users should therefore print this document using a colour printer.**

## EYEWEAR DISPLAY –

### Part 22-10: Specific measurement methods for AR type – Optical properties

#### 1 Scope

This part of IEC 63145 specifies the standard measurement conditions and measuring methods for determining the see-through optical properties and imaging quality of augmented reality (AR) eyewear displays. This includes the transmission characteristics and ambient optical performance of the eyewear displays.

Contact lens type displays are out of the scope of this document.

NOTE The relationship between the scope and other documents (IEC 63145-20-10, IEC 63145-22-10) is shown in Annex A.

#### 2 Normative references

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

ISO/CIE 11664-5, *Colorimetry – Part 5: CIE 1976  $L^*u^*v^*$  colour space and  $u'$ ,  $v'$  uniform chromaticity scale diagram*