

INTERNATIONAL STANDARD



**Liquid crystal display devices –
Part 30-3: Measuring methods for liquid crystal display modules – Motion
artefact measurement of active matrix liquid crystal display modules**



THIS PUBLICATION IS COPYRIGHT PROTECTED

Copyright © 2019 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.

IEC Central Office
3, rue de Varembe
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 It also gives information on projects, replaced and withdrawn publications.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.

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 16 additional languages. Also known as the International Electrotechnical Vocabulary (IEV) online.

IEC Glossary - std.iec.ch/glossary

67 000 electrotechnical terminology entries in English and French extracted from the Terms and Definitions clause of IEC publications issued since 2002. Some entries have been collected from earlier publications of IEC TC 37, 77, 86 and CISPR.

INTERNATIONAL STANDARD



**Liquid crystal display devices –
Part 30-3: Measuring methods for liquid crystal display modules – Motion
artefact measurement of active matrix liquid crystal display modules**

INTERNATIONAL
ELECTROTECHNICAL
COMMISSION

ICS 31.120

ISBN 978-2-8322-7262-6

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 and abbreviated terms	6
3.1 Terms and definitions.....	6
3.2 Abbreviated terms.....	7
4 Standard measuring conditions.....	8
5 Standard motion blur measuring methods.....	8
5.1 General.....	8
5.2 Direct measurement method	8
5.2.1 Standard measuring process	8
5.2.2 Analysis method	12
5.3 Indirect measurement method.....	15
5.3.1 Temporal step response	15
5.3.2 High speed camera.....	17
6 Test report.....	18
6.1 General.....	18
6.2 Items to be reported.....	18
Annex A (informative) Subjective test method	20
Annex B (informative) Motion contrast degradation	21
B.1 General.....	21
B.2 Direct measurement.....	21
B.3 Indirect measurement	22
Annex C (informative) Dynamic modulation transfer function.....	23
Bibliography.....	25
Figure 1 – Examples of edge blur test pattern.....	8
Figure 2 – Example of a pivoting pursuit camera system.....	9
Figure 3 – Example of a linear pursuit camera system	9
Figure 4 – Measurement regions for landscape orientation	10
Figure 5 – Measurement regions for portrait orientation	11
Figure 6 – Example of luminance cross-section profile of blurred edge time.....	12
Figure 7 – Example of luminance cross-section profile of extended blurred edge time	13
Figure 8 – PBET calculation.....	13
Figure 9 – Set-up to measure the temporal step response	15
Figure 10 – Example of an LC response time measurement.....	16
Figure 11 – Example of a motion picture response curve derived from the response measurement presented in Figure 10 and a convolution with a one-frame-wide window function.....	17
Figure 12 – Example of measurement data reporting	19
Figure B.1 – Example of motion contrast degradation test pattern.....	21

Figure B.2 – Example of motion contrast degradation due to line spreading 22

Figure C.1 – Example of motion contrast degradation 23

Figure C.2 – Example of DMTF properties for different motion speeds (V) 24

Table 1 – Step response data for different luminance transitions 11

INTERNATIONAL ELECTROTECHNICAL COMMISSION

LIQUID CRYSTAL DISPLAY DEVICES –

**Part 30-3: Measuring methods for liquid crystal display modules –
Motion artefact measurement of
active matrix liquid crystal display modules**

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 61747-30-3 has been prepared by IEC technical committee 110: Electronic displays.

This first edition cancels and replaces the first edition of IEC 61747-6-3 published in 2011. This edition constitutes a technical revision.

This edition includes the following significant technical changes with respect to the previous edition:

- a) added test positions and areas;
- b) revised standard measuring conditions;
- c) added calculation of the standard deviation of the line-spread function of the eye;
- d) added requirements for high speed camera;

e) changed “LCDs” to “transmissive TFT LCDs” in Clause 1.

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

FDIS	Report on voting
110/1103/FDIS	110/1130/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.

A list of all parts in the IEC 61747 series, published under the general title *Liquid crystal display devices*, can be found on the IEC website.

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

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.

LIQUID CRYSTAL DISPLAY DEVICES –

Part 30-3: Measuring methods for liquid crystal display modules – Motion artefact measurement of active matrix liquid crystal display modules

1 Scope

This part of IEC 61747 applies to transmissive type active matrix liquid crystal displays.

This document defines general procedures for quality evaluation related to the motion performance of transmissive thin film transistor (TFT) LCDs. It defines artefacts in the moving image and methods for motion artefact measurement.

NOTE Motion blur measurement methods and analysis methods introduced in this document are not universal tools for all the different LCD motion enhancement technologies due to their complexity. Users' attention is drawn to this fact.

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 61747-30-1, *Liquid crystal display devices – Part 30-1: Measuring methods for liquid crystal display modules – Transmissive type*

ISO 11664-4, *Colourimetry – Part 4: CIE 1976 L*a*b* Colour space*

3 Terms, definitions and abbreviated terms

3.1 Terms and definitions

For the purposes of this document, the following terms and definitions apply.

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

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

NOTE In this document, the term “pixel” is adopted as the unit of the signal resolution. That is, the horizontal and vertical pixel pitch (size) of the DUT is determined based on the spatial distance displayed (scrolled) on the screen corresponding to the inputted signal pixel regardless of the display pixel types.

3.1.1

motion picture response curve

curve representing the convolution of the temporal step response with a moving window function one-frame wide

Note 1 to entry: It shows how the luminance is integrated over time during smooth pursuit eye tracking and combines the effects of the LCD response time and the hold-type characteristics of the device under test.