

INTERNATIONAL STANDARD

NORME INTERNATIONALE

LCD backlight unit –
Part 1-1: Generic specification

STANDARD PREVIEW
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Écran LCD à rétro-éclairage –
Partie 1-1: Spécification générique

IEC 62595-1-1:2013

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

Tel.: +41 22 919 02 11
Fax: +41 22 919 03 00
info@iec.ch
www.iec.ch

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LCD BACKLIGHT UNIT –

Part 1-1: Generic specification

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The text of this standard is based on the following documents:

CDV	Report on voting
110/387/CDV	110/440/RVC

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

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

A list of all the parts in the IEC 62595 series, under the general title *LCD backlight unit*, can be found on the IEC website.

The committee has decided that the contents of this publication will remain unchanged until the stability date indicated on the IEC web site under "<http://webstore.iec.ch>" in the data related to the specific publication. At this date, the publication will be

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LCD BACKLIGHT UNIT –

Part 1-1: Generic specification

1 Scope

This part of IEC 62595 is a generic specification for backlight unit (BLU) for liquid crystal displays. It defines general procedures for quality assessment and gives general rules for the measuring methods of electrical and optical characteristics, rules for climatic and mechanical tests, and rules for endurance tests.

2 Normative references

The following documents, in whole or in part, are normatively referenced in this document and are indispensable for its application. For dated references, only the edition cited applies. For undated references, the latest edition of the referenced document (including any amendments) applies.

IEC 60027 (all parts), *Letter symbols to be used in electrical technology*

IEC 60410:1973, *Sampling plans and procedures for inspection by attributes*

IEC 60617 (all parts), *Graphical symbols for diagrams*

IEC 60747-1:2006, *Semiconductor devices – Part 1: General*

IEC 60747-10:1991, *Semiconductor devices – Part 10: Generic specification for discrete devices and integrated circuits*

IEC 61747-10-2, *Liquid crystal display devices – Part 10-2: Environmental, endurance and mechanical test methods – Environmental and endurance¹*

IEC 62595-1-2:2012, *LCD backlight unit – Part 1-2: Terminology and letter symbols*

IEC 62595-2, *LCD backlight unit – Part 2: Electro-optical measurement methods of LED backlight unit*

IECQ QC 001002-2:1998, *IEC Quality Assessment System for Electronic Components (IECQ System) – Rules of Procedure – Part 2: Documentation*

IECQ QC 001002-3:2005, *IEC Quality Assessment System for Electronic Components (IECQ System) – Rules of Procedure – Part 3: Approval procedures*

ISO 80000-1:2009, *Quantities and units – Part 1: General*

¹ To be published

3 Technical aspects

3.1 Order of precedence

Where there are conflicting requirements, documents shall rank in the following order of authority:

- a) the detail specification;
- b) the blank detail specification;
- c) the family specification, if any;
- d) the sectional specification;
- e) the generic specification;
- f) the basic specification;
- g) any other international (e.g. IEC) documents to which reference is made;
- h) a national document.

The same order of precedence shall apply to equivalent national documents.

3.2 Terminology, units and symbols

For the purposes of this document, the terms, definitions, units, and symbols given in IEC 62595-1-2 apply.

Units, graphical and letter symbols shall, wherever possible, be taken from IEC 60027, IEC 60617 and ISO 80000-1.

Any other units, symbols or terminology peculiar to some parts of the BLU covered by this generic specification shall be taken from the relevant IEC or ISO standards or derived in accordance with the principles of the standards listed above.

3.3 Preferred values of temperature, humidity and pressure

Preferred values of temperature, humidity and pressure for the measurement of characteristics for tests and for operating conditions will be given in the detail specification.

3.4 Marking

3.4.1 BLU identification

The marking on the BLU shall enable clear identification of the BLU.

3.4.2 BLU traceability

The BLU shall be provided with a traceability code which enables back-tracing of the BLU to a certain production or inspection lot.

3.4.3 Packing

Marking on the packing shall state:

- a) the BLU identification code;
- b) the traceability code(s) of the enclosed BLU;
- c) the number of enclosed BLUs;
- d) the required precautions, if any.

This marking shall be in accordance with custom regulations.

NOTE Additional requirements can be specified in the relevant detail specification.

3.5 Categories of assessed quality

This generic specification provides three categories of assessed quality. The BLUs are grouped in an identified and date-coded inspection lot, which is tested to the specified quality categories. The AQLs or LTPDs associated with the same inspection group may vary for each category and shall be as specified in the detail specification or in the assessed quality which is negotiated with a customer.

The minimum requirements of the categories are as follows:

- Category I The type meets the requirements of qualification approval of categories II or III. Each lot meets the inspection requirements of group A which includes functional tests. Every three months, one lot meets the inspection requirements for interconnection ability. Annually, one lot meets the group B and group C inspection requirements (see 4.8.1).
- Category II The lot meets the inspection requirements of group A and group B on a lot-by-lot basis, and of group C on a periodic basis.
- Category III The lot is 100 % screened and meets the inspection requirements of group A and group B on a lot-by-lot basis, and of group C on a periodic basis.

3.6 Screening

A screening is an examination or test applied to all BLUs in a lot.

When required by the detail specification, all BLUs in the lot shall be screened by submitting them to one of the sequences given in the relevant table of the sectional or blank detail specification, and all defectives removed. Other sequences not specified in this standard are applicable only where the above sequences are not correlated or are in contradiction with recognized failure mechanisms. When a part of the screening process as given in the relevant table of the sectional or blank detail specification forms a part of the manufacturing process in the prescribed sequence, these procedures need not to be repeated. For the purpose of this specification, burn-in is defined as electrical stress applied to all BLUs in a lot for a specified period of time for the purpose of detecting and removing potential early failures.

3.7 Handling

See IEC 60747-1:2006, Clause 8.

Adequate warning shall be displayed in the case of harmful products.

4 Quality assessment procedures

4.1 General

Quality assessment comprises the procedure for obtaining qualification approval as defined in 4.7, followed by quality conformance inspection on a lot-by-lot basis (including screening if required) and on a periodic basis as qualified in the detail specification. The quality assessment tests are subdivided into group A, B and C tests; these are performed lot by lot or periodically, as defined in 4.8.1. In some cases, group D tests may also be specified, for example, for qualification approval.

4.2 Eligibility for qualification approval

A type of BLU becomes eligible for qualification approval when the rules of procedure of IECQ QC 001002-3:2005, are satisfied.

4.3 Primary stage of manufacture

The primary stage of manufacture is defined in the sectional or blank detail specification.

4.4 Commercially confidential information

If any part of the manufacturing process is commercially confidential, this shall be suitably identified, and the designated management representative (DMR) shall demonstrate to the satisfaction of the National Supervising Inspectorate (NSI) that the requirements of the rules of procedure given in 2.3.1 of IECQ QC 001002-3:2005, have been complied with.

4.5 Formation of inspection lots

See the rules of procedure given in 3.3.1 of IECQ QC 001002-3:2005.

4.6 Structurally similar devices

See the rules of procedure given in 3.3.2 of IECQ QC 001002-3:2005.

Details concerning grouping are given in the relevant sectional or blank detail specifications.

4.7 Granting of qualification approval

See the rules of procedure given in 3.1.5 of IECQ QC 001002-3:2005.

Method a) or b) of the rules of procedure may be used at the manufacturer's discretion in accordance with the inspection requirements given in the sectional or blank detail specifications. Samples may be composed of appropriate structurally similar devices. In some cases, group D tests are required for qualification approval. All variables measurements called for as post-test end-points in the detail specification shall be recorded as variables data. The qualification report shall include a summary of all the test results for each group and subgroup, including number of devices tested and number of devices failed. This summary shall be derived from variables and/or attributes data. The manufacturer shall retain all data for submission to the NSI on demand.

4.8 Quality conformance inspection

4.8.1 General

Quality conformance inspection shall consist of the examinations and tests of groups A, B, C and D, as specified.

For groups B and C inspection, samples may be composed of structurally similar devices. Samples for periodic tests shall be drawn from one or more lots which have passed groups A and B inspection. Individual BLUs shall have passed the group A measurements called for in the detail specification.

4.8.2 Division into groups and subgroups

4.8.2.1 General

The following guidelines shall be used in the preparation of detail specifications.

4.8.2.2 Group A inspection (lot-by-lot)

This group prescribes the visual inspection and the electrical measurements to be made on a lot-by-lot basis to assess the principal properties of BLUs. Unless otherwise specified, structural similarity groupings are not permitted. Group A inspection is divided into appropriate subgroups as follows:

Subgroup A1: This subgroup comprises a visual examination as specified in 5.2.1.

Subgroup A2: This subgroup comprises measurements of primary characteristics of the BLU.

Subgroups A3 and A4: These subgroups may not be required. They comprise measurements of secondary characteristics of the BLU. The correct requirements for each BLU category are given in the relevant sectional or blank detail specification.

The choice between subgroups A3 or A4 for given measurements is essentially governed by the desirability of performing them at a given quality level.

4.8.2.3 Group B inspection (lot-by-lot, except for category I, see 3.5)

This group prescribes the procedures to be used to assess certain additional properties of the BLU, and includes mechanical, climatic, electrical and optical endurance tests that can normally be performed in one week or as specified in the relevant sectional or blank detail specification.

4.8.2.4 Group C inspection (periodic)

This group prescribes the procedures to be used on a periodic basis to assess certain additional properties of the BLU, and includes electrical and optical measurements, mechanical, climatic and endurance tests appropriate for checking at intervals of either three months (categories II and III) or one year (category I), or as specified in the relevant sectional or blank detail specification.

4.8.2.5 Division of group B and group C into subgroups

To enable comparison and to facilitate change from group B to group C and vice versa when necessary (see 4.8.4), tests in these groups have been divided among subgroups bearing the same number for corresponding tests.

The division is as given below.

- a) Subgroups B1/C1
Comprise measurements that control dimensional interchangeability of the BLU.
- b) Subgroups B2a/C2a
Comprise measurements that assess electrical and optical properties of the BLUs of a design nature.
- c) Subgroups B2b/C2b
Comprise measurements that further assess some of the electrical and optical characteristics of the BLU already measured in group A by measurement under different voltage, current, temperature or optical conditions.
- d) Subgroups B2c/C2c
Comprise verification of ratings of the BLU, where appropriate.
- e) Subgroups B3/C3
Comprise tests intended to assess mechanical robustness of the BLU.
- f) Subgroups B4/C4
Comprise tests intended to assess interconnection ability of the BLU.
- g) Subgroups B5/C5
Comprise tests intended to assess the ability of the BLU to withstand climatic stresses, for example change of temperature, sealing.
- h) Subgroups B6/C6

Comprise tests intended to assess the ability of the BLU to withstand mechanical stresses, for example vibration, shock.

i) Subgroups B7/C7

Comprise tests intended to assess the ability of the BLU to withstand long-term humidity.

j) Subgroups B8/C8

Comprise tests intended to assess failure characteristics of the BLU under endurance testing.

k) Subgroups B9/C9

Comprise tests intended to assess electrical and optical properties of the BLU under storage conditions at extremes of temperature.

l) Subgroups B10/C10

Comprise tests intended to assess performance of the BLU during variations of air pressure.

m) Subgroups B11/C11

Comprise tests on the permanence of marking.

n) Subgroup CRRL Lists

Selection of tests and/or measurements made in the preceding subgroups, the results of which shall be presented in the Certified Record of Released Lots (CRRL).

These subgroups may not all be required.

4.8.2.6 Group D inspection

This group prescribes the procedures to be carried out at intervals of 12 months or for qualification approval only.

4.8.3 Inspection requirements

4.8.3.1 General

The statistical sampling procedures described in 4.9.1 shall be used.

4.8.3.2 Criteria for lot rejection

Lots failing to meet the quality conformance inspection of either group A or group B inspection shall not be accepted. If, during quality conformance inspection, BLUs fail a test in a subgroup which would result in the lot being rejected, the quality conformance inspection can be terminated, and the lot shall be considered a rejected lot in group A and B. If a lot is withdrawn in a state of failing to meet quality conformance requirements and is not submitted, it shall be considered a rejected lot.

4.8.3.3 Re-submitted lots

Failing lots, that have been reworked when technically possible and are resubmitted for quality conformance inspection, shall contain only BLUs that were included in the original lot and shall be re-submitted only once for each inspection group (group A and B). Re-submitted lots shall be kept separate from new lots and shall be clearly identified as re-submitted lots. Resubmitted lots shall be randomly re-sampled and inspected for all the inspection criteria of group A.

4.8.3.4 Procedure in case of test equipment failure or operator error

If any BLUs are believed to have failed as a result of faulty test equipment or operator error, the failures shall be entered in the test record (but may be excluded from the CRRL by agreement with the NSI) and shall be submitted along with a complete explanation of why the failures are believed to be invalid to the NSI.

The designated management representative (DMR) shall decide whether replacement BLUs from the same inspection lot may be added to the sample. Replacement BLUs shall be subjected to the same tests to which the discarded BLUs were subjected prior to failure and to any remaining specified tests to which the discarded BLUs were not subjected prior to failure.

4.8.3.5 Procedure in case of failure in periodic tests

When a group B failure occurs, the corresponding group C tests (see 4.8.2.5) are invalid. In the event of failing periodic inspection tests for causes other than faults or an operator error, see the rules of procedure given in 3.1.8 IECQ QC 001002-3:2005 with the following modifications:

3.1.8.1 – (first list item): “suspend further releases under the system of all components within the structurally similar set.”

3.1.8.4 a): “the procedure for release under the system of corrected lots shall be returned immediately after correcting the manufacturing fault”.

3.1.8.7: “If qualification approval has been withdrawn in accordance with 12.6.7 of the rules of procedure, it may be re-instated by a simplified procedure (which focuses on the tests of those features which caused the failure) at the discretion of the NSI.”

4.8.4 Supplementary procedure for reduced inspection

4.8.4.1 Group B

A special reduced inspection procedure may be used which allows the manufacturer to carry out the appropriate group B tests at normal inspection on every fourth lot with a maximum interval of three months instead of on a lot-by-lot basis for the tests in all subgroups of group B. This special procedure applies to each subgroup which has fulfilled the required conditions. The condition for this change shall be that 10 successive lots have passed group B inspection. Reversion to normal inspection in group B shall be made when a sample has failed to meet a subgroup inspection under the reduced inspection procedure.

4.8.4.2 Group C

When a three-month interval is specified for periodic tests, the test period may be extended to six months provided that three successive periodic tests have been passed at three-month intervals. Reversion to the normal three-month interval shall be made when a sample has failed to meet a subgroup inspection under the extended interval procedure (see also 4.8.3.5).

4.8.5 Sampling requirements for small lots

Where a lot size is small, the procedures shall refer to 3.6.4 of IEC 60747-10:1991 or 3.5 of IEC 60410:1973.

4.8.6 Certified records of released lots (CRRL)

See the rules of procedure given in Annex B of IECQ QC 001002-2:1998.

4.8.7 Delivery of devices subjected to destructive or non-destructive tests

Tests considered as destructive are marked (D) in the sectional or blank detail specifications. Devices subjected to destructive tests shall not be included in the lot for delivery. Devices subjected to non-destructive environmental tests may be delivered provided they are re-tested according to group A requirements and satisfy them.

4.8.8 Delayed deliveries

Before delivery of lots in store for a period and in conditions specified in the relevant sectional or blank detail specification, the lots or the quantities to be delivered shall undergo the specified group A inspection and the group B interconnection ability tests. Once this has been done for the complete lot, no further re-testing is required for another period.

4.8.9 Supplementary procedure for deliveries

The manufacturer may, at his discretion, supply BLUs that have met a more severe assessment level than that required.

4.9 Statistical sampling procedures

4.9.1 General

For group A, B and C inspections, either the AQL sampling procedure or the LTPD sampling procedure shall be used. The detail specification shall specify which of the procedures is to be used.

4.9.2 AQL sampling plans

See 4.5 of IEC 60410:1973. There are three types of sampling plans: single, double and multiple. When several types of plans are available for a given AQL and code letter, any one may be used.

4.9.3 LTPD sampling plans

See Annex B as an example.

4.10 Endurance tests

Endurance tests shall be specified in the detail specification.

4.11 Endurance tests where the failure rate is specified

4.11.1 Specification of failure rate

Failure rate as used in this standard is defined as LTPD expressed as a percentage per thousand hours.

4.11.2 General

Endurance tests shall be conducted in accordance with the procedures mentioned. Endurance tests performed on BLUs at, or within, their maximum ratings shall be considered non-destructive.

4.11.3 Selection of samples

Samples for endurance tests shall be selected at random from the inspection lot (see Annex B as an example). The sample size for a 1000-h test shall be chosen by the manufacturer from the column under the specified failure rate (see Table B.1) or the actual lot size (see Table B.2).

The acceptance number shall be the one associated with the particular sample size chosen.

4.11.4 Failure

A BLU which fails at one or more of the end-point limits specified for endurance tests at any specified reading interval shall be considered a failure and be considered as such at any