

Electrical measuring instruments — X-t recorders —

Part 1: Definitions and requirements

The European Standard EN 61143-1:1994 with the incorporation of amendment A1:1997 has the status of a British Standard

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Committees responsible for this British Standard

The preparation of this British Standard was entrusted by the Power Electrical Engineering Standards Policy Committee (PEL/-) to Technical Committee PEL/13, upon which the following bodies were represented:

- Association of Consulting Engineers
- Department of Energy (Electricity Division)
- Department of Trade and Industry (National Physics Laboratory)
- Electricity Association
- The Association for the Instrumentation, Control and Automation Industry
GAMBICA (BEAMA Ltd.)
- Institution of Electrical Engineers
- Institution of Incorporated Executive Engineers

This British Standard, having been prepared under the direction of the Power Electrical Engineering Standards Policy Committee, was published under the authority of the Standards Board and comes into effect on 15 October 1992

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National foreword

This British Standard has been prepared by Technical Committee PEL/85 (formerly PEL/13) and is the English language version of EN 61143-1:1994 including amendment A1:1997. It is identical with IEC 1143-1:1992 including amendment 1:1997.

It is envisaged that Part 2 which specifies test methods will be published at a later date and an identical British Standard will follow.

Cross-references

International standard Corresponding British Standard

	BS 89 <i>Direct acting indicating analogue electrical measuring instruments and their accessories</i>
IEC 51-1:1984	Part 1:1990 <i>Specification for definitions and general requirements common to all Parts</i> (Identical)
IEC 51-2:1984	Part 2:1990 <i>Specification for special requirements for ammeters and voltmeters</i> (Identical)
IEC 51-3:1984	Part 3:1990 <i>Specification for special requirements for wattmeters and varmeters</i> (Identical)
IEC 51-4:1984	Part 4:1990 <i>Specification for special requirements for frequency meters</i> (Identical)
IEC 51-5:1985	Part 5:1990 <i>Specification for special requirements for phase meters, power factor meters and synchrosopes</i> (Identical)
IEC 51-6:1984	Part 6:1990 <i>Specification for special requirements for ohmmeters (impedance meters) and conductance meters</i> (Identical)
IEC 51-7:1984	Part 7:1990 <i>Specification for special requirements for multi-function instruments</i> (Identical)
IEC 51-8:1984	Part 8:1990 <i>Specification for special requirements for accessories</i> (Identical)
IEC 51-9:1988	BS 89-9:1990 <i>Recommended test methods</i> (Identical)
	BS 2011 <i>Environmental testing</i>
IEC 68-2-6:1982	Part 2.1Fc: 1983 <i>Test Fc. Vibration (sinusoidal)</i> (Identical)
IEC 68-2-27:1987	Part 2.1Ea: 1988 <i>Test Ea. Shock</i> (Identical)
IEC 414:1973	BS 5458:1977 <i>Specification for safety requirements for indicating and recording electrical measuring instruments and their accessories</i> (Identical)
IEC 617-2:1983	BS 3939 <i>Graphical symbols for electrical power, telecommunications and electronics diagrams</i> Part 2:1985 <i>Symbol elements, qualifying symbols and other symbols having general application</i> (Identical)

The Technical Committee has reviewed the provisions of IEC 27, IEC 417, IEC 473 and IEC 1010 to which normative reference is made in the text, and has decided that they are acceptable for use in conjunction with this standard.

A related British Standard to IEC 417:1973 is BS 5817-8:1990 *Specification for audiovisual, video and television equipment and systems — Part 8: Symbols and identification*.

A British Standard does not purport to include all the necessary provisions of a contract. Users of British Standards are responsible for their correct application.

Compliance with a British Standard does not of itself confer immunity from legal obligations.

Summary of pages

This document comprises a front cover, an inside front cover, pages i to iv, the EN title page, pages 2 to 26, an inside back cover and a back cover.

This standard has been updated (see copyright date) and may have had amendments incorporated. This will be indicated in the amendment table on the inside front cover.

Descriptors: Measuring instrument, electrical measurement, recorder, X-t recorder

English version

Electrical measuring instruments — X-t recorders Part 1: Definitions and requirements

(Includes amendment A1:1997)
(IEC 1143:1992 + A1:1997)

Appareils électriques de mesure —
Enregistreurs X-t
Partie 1: Définitions et prescriptions
(inclut l'amendement A1:1997)
(CEI 1143:1992 + A1:1997)

Elektrische Meßgeräte — X-t-Schreiber
Teil 1: Begriffe und Anforderungen
(Enthält Änderung A1:1997)
(IEC 1143:1992 + A1:1997)

This European Standard was approved by CENELEC on 1994-03-08; amendment A1 was approved by CENELEC on 1997-10-01. CENELEC members are bound to comply with the CEN/CENELEC Internal Regulations which stipulate the conditions for giving this European Standard the status of a national standard without any alteration.

Up-to-date lists and bibliographical references concerning such national standards may be obtained on application to the Central Secretariat or to any CENELEC member.

This European Standard exists in three official versions (English, French, German). A version in any other language made by translation under the responsibility of a CENELEC member into its own language and notified to the Central Secretariat has the same status as the official versions.

CENELEC members are the national electrotechnical committees of Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland and United Kingdom.

CENELEC

European Committee for Electrotechnical Standardization
Comité Européen de Normalisation Electrotechnique
Europäisches Komitee für Elektrotechnische Normung

Central Secretariat: rue de Stassart 35, B-1050 Brussels

Foreword

The CENELEC questionnaire procedure, performed for finding out whether or not the International Standard IEC 1143-1:1992 could be accepted without textual changes, has shown that no common modifications were necessary for the acceptance as European Standard.

The reference document was submitted to the CENELEC members for formal vote and was approved by CENELEC as EN 61143-1 on 8 March 1994.

This European Standard replaces HD 301 S1:1977.

The following dates were fixed:

- latest date of publication
of an identical national
standard (dop) 1995-03-15
- latest date of withdrawal
of conflicting national
standards (dow) 1995-03-15

For products which have complied with HD 301 S1:1977 before 1995-03-15, as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2000-03-15.

Annexes designated “normative” are part of the body of the standard. In this standard, Annex ZA is normative.

Foreword to amendment A1

The text of the document 85/162/FDIS, future amendment 1 to IEC 61143-1:1992, prepared by IEC TC 85, Measuring equipment for electromagnetic quantities, was submitted to the IEC-CENELEC parallel vote and was approved by CENELEC as amendment A1 to EN 61143-1:1994 on 1997-10-01.

The following dates were fixed:

- latest date by which the
amendment has to be
implemented at national
level by publication of an
identical national standard
or by endorsement (dop) 1998-07-01
- latest date by which the
national standards
conflicting with the
amendment have to be
withdrawn (dow) 1998-07-01

For products which have complied with EN 61143-1:1994 before 1998-07-01 as shown by the manufacturer or by a certification body, this previous standard may continue to apply for production until 2003-07-01.

1 Scope

This part of IEC 1143 applies to X-t recorders used for the measurement of voltage and current which measure and record analogue electrical quantities as a function of time.

It also applies to a recorder whose chart scale lines do not correspond directly to the electrical input quantity, provided that the relationship between them is known.

For the measurement of other electrical quantities, the relevant parts of IEC 51 also apply.

This part also applies to non-interchangeable accessories and accessories of limited interchangeability (e.g. shunts, impedance elements) if they are used with the recorder and the adjustments have been made for the combination. For controllers with electrical outputs and containing electrical recorders, this part applies only to the recorder and does not apply to the control circuit.

This part does not apply to special purpose recorders or to special purpose devices (when they are used as accessories) which are covered by their own IEC standards.

This part does not cover safety requirements (for reference, see IEC 1010) and does not contain either requirements for protection against environmental conditions or the relevant tests. However, when necessary, tests under conditions approaching those of use may be selected from IEC 68, to prove protection against environmental conditions.

Further, it does not contain requirements concerning the dimensions of instruments or accessories (for the former, see IEC 473).

2 Normative references

The following normative documents contain provisions which, through reference in this text, constitute provisions of this part of IEC 1143. At the time of publication of this standard, the editions indicated were valid. All normative documents are subject to revision, and parties to agreements based on this part of IEC 1143 are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. Members of IEC and ISO maintain registers of currently valid International Standards.

IEC 27, *Letter symbols to be used in electrical technology*.

IEC 51-1:1984, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 1: Definitions and general requirements common to all parts*.

IEC 51-2:1984, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 2: Special requirements for ammeters and voltmeters*.

IEC 51-3:1984, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 3: Special requirements for wattmeters and varmeters*.

IEC 51-4:1984, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 4: Special requirements for frequency meters*.

IEC 51-5:1985, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 5: Special requirements for phase meters, power factor meters and synchroscopes*.

IEC 51-6:1984, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 6: Special requirements for ohmmeters (impedance meters) and conductance meters*.

IEC 51-7:1984, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 7: Special requirements for multi-function instruments*.

IEC 51-8:1984, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 8: Special requirements for accessories*.

IEC 51-9:1988, *Direct acting indicating analogue electrical measuring instruments and their accessories — Part 9: Recommended test methods*.

IEC 68-2-6:1982, *Environmental testing — Part 2: Tests — Test Fc and guidance: Vibration (sinusoidal)*.

IEC 68-2-27:1987, *Environmental testing — Part 2: Tests — Test Ea and guidance: Shock*.

IEC 160:1963, *Standard atmospheric conditions for test purposes*.

IEC 417:1973, *Graphical symbols for use on equipment — Index, survey and compilation of the single sheets*.

IEC 473:1974, *Dimensions for panel-mounted indicating and recording electrical measuring instruments*.
IEC 617-2:1983, *Graphical symbols for diagrams — Part 2: Symbol elements, qualifying symbols and other symbols having general application*.

IEC 1010, *Safety requirements for electrical equipment for measurement, control and laboratory use*.

3 Definitions

The values of a.c. quantities given in this part are r.m.s. values, unless otherwise stated.

For the purpose of this part, the following definitions apply.

3.1 General terms

3.1.1
electrical measuring instrument
a measuring instrument intended to measure an electrical or non-electrical quantity using electrical means

3.1.2
analogue display instrument
a measuring instrument intended to present or display the output information as a continuous function of the measured quantity

3.1.3
electronic measuring instrument
a measuring instrument intended to measure an electrical or non-electrical quantity using electronic means

3.1.4
instrument with electric screen
an instrument shielded by conductive material from the influence of an electric field of external origin

3.1.5 accessory
An element, group of elements or device associated with the measuring circuit of a recorder in order to confer specified characteristics on the recorder.

3.1.5.1
interchangeable accessory
an accessory having its own properties and accuracy, these being independent of those of the recorder with which it may be associated

NOTE An accessory is considered to be interchangeable when its rated characteristics are known and marked and are sufficient to enable its errors and variations to be determined without using the associated recorder. For example, a shunt whose adjustment takes into account the input current of the recorder and which is not negligible and which is known is considered to be interchangeable.

3.1.5.2
accessory of limited interchangeability
an accessory having its own properties and accuracy, which can be associated only with recorders for which certain characteristics are within specified limits

3.1.5.3
non-interchangeable accessory
an accessory adjusted to take into account the electrical characteristics of a specific recorder

3.1.6
shunt
a resistor connected in parallel with a measuring circuit of a recorder

NOTE A shunt is generally intended to provide a voltage proportional to the current to be measured.

3.1.7
series resistor (impedance)
a resistor (impedance) connected in series with a measuring circuit of a recorder
NOTE A series resistor (impedance) is generally intended to extend the voltage measuring range of a recorder.

3.1.8**distortion factor (total harmonic distortion factor of a quantity)**

The ratio:
$$\frac{\text{r.m.s. value of the harmonic content}}{\text{r.m.s. value of the non-sinusoidal quantity}}$$

3.1.9**ripple content of quantity**

The ratio:
$$\frac{\text{r.m.s. value of the fluctuating component}}{\text{r.m.s. value of the d.c. component}}$$

3.1.10**recorder**

a measuring instrument which records on a recording medium information corresponding to the values of the measurand

NOTE 1 Some recorders may incorporate indicating devices.

NOTE 2 Some recorders may record information corresponding to more than one measurand.

NOTE 3 Some recorders may also include interchangeable plug-in units. In this case, a recorder may have different specifications depending on the plug-in unit being used.

3.1.11**indirect acting recorder**

a recorder in which the recording device is driven by a motor or other device controlled by the measurand and using electromechanical, electrical or electronic means

3.1.12**drum chart recorder**

a recorder in which the chart is wrapped as a single turn around a cylindrical drum which is rotated by the chart driving mechanism

3.1.13**disc recorder**

a recorder in which the chart is a disc which is rotated by the chart driving mechanism

3.1.14**strip chart recorder**

a recorder in which the chart is a strip driven by the chart driving mechanism

3.1.15**pen recorder**

a recorder in which the record on the chart is made by a pen supplied with ink

3.1.16**stylus recorder**

a recorder in which the record on the chart is made by a stylus requiring no ink

3.1.17**array recorder**

a recorder in which the record is produced by energizing one or more of a series of fixed elements

NOTE For example, these may be heated elements producing dots on thermal sensitive paper.

3.1.18**dotted line recorder**

a recorder in which the record comprises a series of successive impressions which may be points, numerals, etc.

NOTE Recorders producing a series of dots which are so close to each other that they appear like a line and the dotting time is short enough to be negligible, compared with the response time of the recorder, are treated as continuous line recorders.

3.1.19**continuous line recorder**

a recorder in which the record is a continuous line