INTERNATIONAL STANDARD

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Instrument transformers –

Part 8:
Electronic current transformers

Transformateurs de mesure –

Partie 8:
Transformateurs de courant électroniques

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INTERNATIONAL ELECTROTECHNICAL COMMISSION

INSTRUMENT TRANSFORMERS –

Part 8: Electronic current transformers

FOREWORD

1) The IEC (International Electrotechnical Commission) is a worldwide organization for standardization comprising all national electrotechnical committees (IEC National Committees). The object of the 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, the IEC publishes International Standards. 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. The IEC collaborates closely with the International Organization for Standardization (ISO) in accordance with conditions determined by agreement between the two organizations.
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International Standard IEC 60044-8 has been prepared by IEC technical committee 38: Instrument transformers.

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

FDIS	Report on voting
38/280/FDIS	38/282/RVD

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.

Annexes A, B, C and E are for information only.

Annex D forms an integral part of this standard.

The committee has decided that the contents of this publication will remain unchanged until 2005. At this date, the publication will be

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- withdrawn;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

INSTRUMENT TRANSFORMERS –

Part 8: Electronic current transformers

1 Scope

1.1 General

This part of IEC 60044 applies to newly manufactured electronic current transformers having an analogue voltage output or a digital output, for use with electrical measuring instruments and electrical protective devices at nominal frequencies from 15 Hz to 100 Hz.

NOTE Additional requirements due to the bandwidth are considered. The accuracy requirements on harmonics are given in annex D.

Clause 12 covers the accuracy requirements that are necessary for electronic current transformers for use with electrical measuring instruments.

Clause 13 covers the accuracy requirements that are necessary for electronic current transformers for use with electrical protective relays, and particularly for forms of protection in which the prime requirement is to maintain the accuracy up to several times the rated current. If required, the transient accuracy of an electronic current transformer during fault is also given in this clause.

Electronic current transformers intended for both measurement and protection should comply with all the clauses of this standard and are called multipurpose electronic current transformers.

The transformer technology can be based on optical arrangements equipped with electrical components, on air-core coils (with or without a built-in integrator), or on iron-core coils with integrated shunt used as a current-to-voltage converter, alone or equipped with electronic components.

For analogue output, the electronic current transformer may include the secondary signal cable. Examples of electronic current transformer technologies using air-core coils and iron-core coils with integrated shunt are given in annex C.

For digital output, this standard takes into account a point-to-point connection from the electronic transformer to electrical measuring instruments and electrical devices (see annex B).

Some information has been added in order to ensure the compatibility of this point-to-point link with the overall system of communication in the substation, thus allowing data exchange between all kinds of substation devices. This information builds what is called the mapping of the link layer of the point-to-point serial link. Processbus communication is under consideration.

This mapping allows interoperability between devices from different manufacturers.

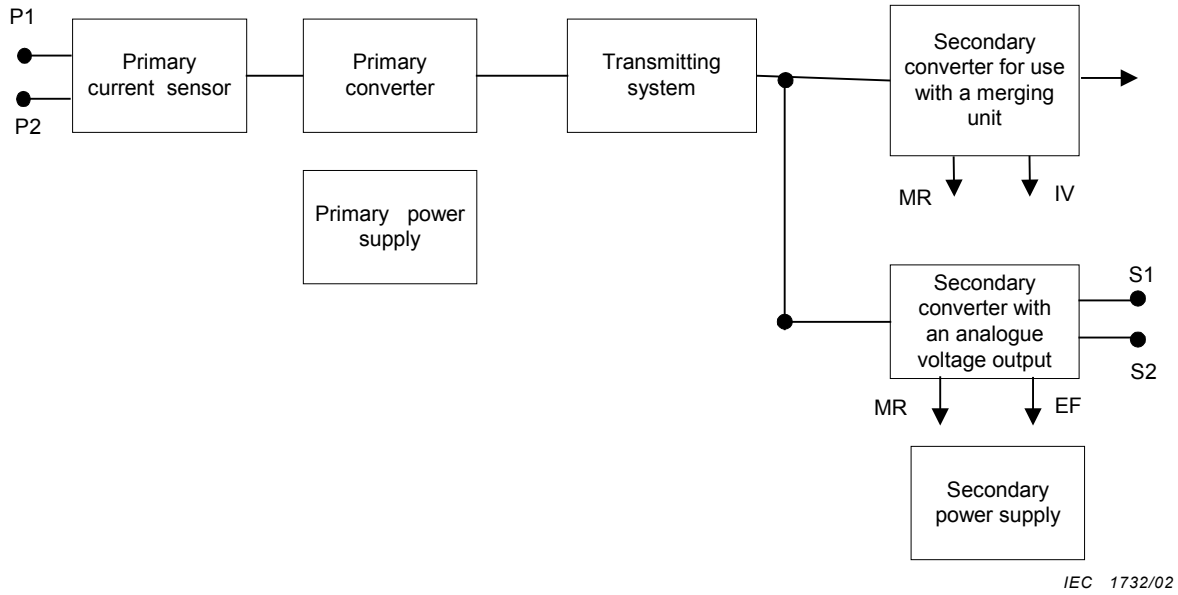
This standard does not specify individual implementations or products, nor does it constrain the implementation of entities and interfaces within a computer system. This standard specifies the externally visible functionality of implementations together with conformance requirements for such functionalities.

NOTE 1 Translation of the analogue requirements on CT and VT into digital parameters, such as the number of bits and the sampling speed, has been carried out as far as was reasonable, since the requirements on the conventional CT and VT are expressed according to the actual technologies used and their shortcomings, rather than on needs from the equipment using the information on current and voltage.

NOTE 2 The approach chosen is to concentrate on what is needed by the secondary equipment and how the performance can be calibrated. The concept is compatible with a processbus.

1.2 General block diagram of electronic current transformers

The applied technology decides which parts are necessary for the realization of an electronic current transformer, i.e. it is not absolutely necessary that all the parts described in figures 1 and 2 be included in the transformer.

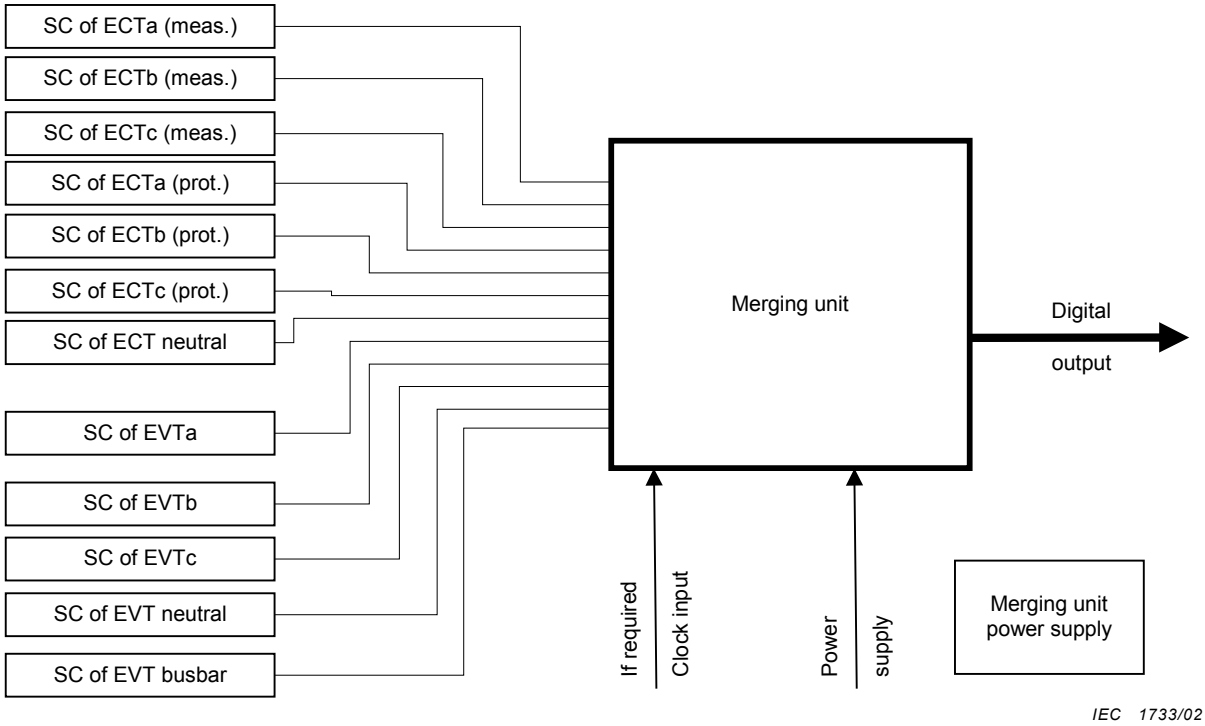


Key

IV Output invalid
EF Equipment failure
MR Maintenance request

Figure 1 – General block diagram of a single-phase electronic current transformer

1.3 General block diagram of electronic transformers with a digital output



NOTE SC of EVTa is the secondary converter of the electronic voltage transformer of phase a (see IEC 60044-7). SC of ECTa is the secondary converter of the electronic current transformer of phase a. Other data channel mappings are possible (see 6.2.3).

Figure 2 – Example of digital interface block diagram

Up to 12 secondary converter data channels are grouped together (merged) using a merging unit (MU). A data channel carries a single stream of sampled measurement values from an electronic current transformer or an electronic voltage transformer (see figure 2). Several data channels may be transmitted via one physical interface from the secondary converter to the merging unit in case of multiphase or combined units. The merging unit supplies the secondary equipment with a time-coherent set of current and voltage samples. A secondary converter can be used also for the acquisition of signals coming from conventional voltage instrument transformers or current instrument transformers and may be integrated into the merging unit.

2 Normative references

The following referenced documents are indispensable for the application 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 60028:1925, *International standard of resistance for copper*

IEC 60044-1, *Instrument transformers – Part 1: Current transformers*

IEC 60044-6, *Instrument transformers – Part 6: Requirements for protective current transformers for transient performance*

IEC 60044-7: *Instrument transformers – Part 7: Electronic voltage transformers*

IEC 60050(161):1990, *International Electrotechnical Vocabulary (IEV) – Chapter 161: Electromagnetic compatibility*

IEC 60050(321):1986, *International Electrotechnical Vocabulary – Chapter 321: Instrument transformers*

IEC 60050(601):1985, *International Electrotechnical Vocabulary (IEV) – Chapter 601: Generation, transmission and distribution of electricity – Generation*

IEC 60050(604):1987, *International Electrotechnical Vocabulary (IEV) – Chapter 604: Generation, transmission and distribution of electricity – Operation*

IEC 60056, *High voltage alternating current circuit-breakers*

IEC 60060-1:1989, *High-voltage test techniques – Part 1: General definitions and test requirements*

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IEC 60071-1:1993, *Insulation co-ordination – Part 1: Definitions, principles and rules*

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IEC 60121, *Recommendation for commercial annealed aluminium electrical conductor wire*

IEC 60255-5:2000, *Electrical relays – Part 5: Insulation coordination for measuring relays and protection equipment – Requirements and tests*

IEC 60255-22-1:1988, *Electrical relays – Part 22: Electrical disturbance tests for measuring relays and protection equipment – Section 2: Electrostatic discharge tests*

IEC 60296:1982, *Specification for unused mineral insulating oils for transformers and switchgear*

IEC 60304:1982, *Standard colours for insulation for low-frequency cables and wires*

IEC 60376:1971, *Specification and acceptance of new sulphur hexafluoride*

IEC 60376B:1974, *Specification and acceptance of new sulphur hexafluoride – Second supplement – Clause 26*

IEC 60417 (all parts), *Graphical symbols for use on equipment*

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IEC 60529, *Degrees of protection provided by enclosures (IP code)*

IEC 60664-1:1992, *Insulation co-ordination for equipment within low-voltage systems – Part 1: Principles, requirements and tests*

IEC 60694, *Common specifications for high-voltage switchgear and controlgear standards*

IEC 60707:1999, *Flammability of solid non-metallic materials when exposed to flame sources – List of test methods*

IEC 60721-3-3:1994, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 3: Stationary use at weather-protected locations*

IEC 60721-3-4:1995, *Classification of environmental conditions – Part 3: Classification of groups of environmental parameters and their severities – Section 4: Stationary use at non-weather-protected locations*

IEC 60794 (all parts), *Optical fibre cables*

IEC 60812:1985, *Analysis techniques for system reliability – Procedure for failure mode and effects analysis (FMEA)*

IEC 60815:1986, *Guide for the selection of insulators in respect of polluted conditions*

IEC 60870-5-1:1990, *Telecontrol equipment and systems – Part 5: Transmission protocols – Section One: Transmission frame formats*

IEC 61000-4-1:2000, *Electromagnetic compatibility (EMC) – Part 4-1: Testing and measurement techniques – Overview of IEC 61000-4 series*

IEC 61000-4-2: *Electromagnetic compatibility (EMC) – Part 4-2: Testing and measurement techniques – Electrostatic discharge immunity test*

IEC 61000-4-3: *Electromagnetic compatibility (EMC) – Part 4-3: Testing and measurement techniques – Radiated, radio-frequency, electromagnetic field immunity test*

IEC 61000-4-4:1995, *Electromagnetic compatibility (EMC) – Part 4: Testing and measurement techniques – Section 4: Electrical fast transient/burst immunity test – Basic EMC publication*

IEC 61000-4-5: *Electromagnetic compatibility (EMC) – Part 4-5: Testing and measurement techniques – Surge immunity test*

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IEC 61000-4-8: *Electromagnetic compatibility (EMC) – Part 4-8: Testing and measurement techniques – Power frequency magnetic field immunity test*

IEC 61000-4-9: *Electromagnetic compatibility (EMC) – Part 4-9: Testing and measurement techniques – Pulse magnetic field immunity test*

IEC 61000-4-10: *Electromagnetic compatibility (EMC) – Part 4-10: Testing and measurement techniques – Damped oscillatory magnetic field immunity test*

IEC 61000-4-11: *Electromagnetic compatibility (EMC) – Part 4-11: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations immunity tests*

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IEC 61000-4-13: *Electromagnetic compatibility (EMC) – Part 4-13: Testing and measurement techniques – Harmonics and interharmonics including mains signalling at a.c. power port, low frequency immunity tests*

IEC 61000-4-29:2000, *Electromagnetic compatibility (EMC) – Part 4-29: Testing and measurement techniques – Voltage dips, short interruptions and voltage variations on d.c. input power port immunity tests*

IEC 61025:1990, *Fault tree analysis (FTA)*

IEC 61166:1993, *High-voltage alternating circuit-breakers – Guide for seismic qualification of high-voltage alternating current*

IEC/TS 61462:1998, *Composite insulators – Hollow insulators for use in outdoor and indoor electrical equipment – Definitions, test methods, acceptance criteria and design recommendations*

IEC 61850-3: *Communication networks and systems in substations – Part 3: General requirements*

IEC 61850-9-1: *Communication networks and systems in substations – Part 9-1: Specific communication system mappings (SCSM) – Serial unidirectional multidrop point-to-point link* [1]

CISPR 11:1999, *Industrial scientific and medical (ISM) radio-frequency equipment – Electromagnetic disturbance characteristics – Limits and methods of measurement*

EIA RS-485: *Standard for electrical characteristics of generators and receivers for use in balanced digital multipoint systems*

EN 50160:2000, *Voltage characteristics of electricity supplied by public distribution system*

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1 To be published.