



IEC/TC OR SC:	SECRETARIAT:	DATE:
TC 96	Germany	2019-08-19

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A. STATE TITLE AND SCOPE OF TC

Background and History

TC 96 was constituted in 1993 from the previous SC 14D itself constituted in 1975 in order to prepare safety requirements for transformers and reactors for general use and for transformers and reactors for specific use.

Title

Transformers, reactors, power supply units and combinations thereof

Scope

Standardization in the field of safety, EMC, EMF, energy efficiency and environmental aspects of transformers, reactors, power supply units, and combinations thereof.

The standardization does not cover transformers, reactors and power supply units intended to be a part of distribution networks (covered by TC 14).

TC 96 has group safety function in accordance with IEC Guide 104 for transformers other than those intended to supply distribution networks, in particular transformers and power supply units intended to allow the application of protective measures against electric shock as defined by TC 64, with no limitation of rated output power, but in certain cases including limitation of voltage.

The general limitations for voltages are:

- rated supply voltage not exceeding 1 000 V AC;
- rated output voltage not exceeding 1 000 V AC or 1 500 V ripple free DC;

however, internal voltages may exceed 1 000 V AC or 1 500 V ripple free DC.

For high-voltage applications, other than distribution networks (covered by TC 14), the rated output voltage can exceed 1 000 V AC or 1 500 V ripple free DC but the no load output voltage shall not exceed 15 000 V AC or 15 000 V DC.

The general limitations for the rated output are:

- The maximum rated output depends on the type of transformer or linear power supply unit does in most cases not exceed 25 kVA for single-phase products and 40 kVA for three phase products;
- the maximum rated output does not exceed 1 kVA for both single-phase and three phase Switch Mode Power Supplies;
- the general limitations for the rated core power are 25 kVA for single-phase auto transformers and 40 kVA for three phase auto transformers;
- the general limitations for the rated power are 50 kvar for single-phase reactors and 80 kvar for three phase reactors.

For special transformers, reactors and power supply units and combinations thereof there are no limitation of rated output, rated core power, rated power and frequency.

B. MANAGEMENT STRUCTURE OF THE TC

Organisation of TC 96

A maintenance team (MT 1) is established by TC 96 in order to control the work of the maintenance teams (MT), working groups (WG) and the project teams (PT).

The maintenance teams are dealing with the work of preparing the revision of existing parts of the IEC 61558 series and IEC 62041 and coordinate the work.

The project teams are responsible for the development of new standards.

The working groups, maintenance teams, project teams and as well the project leaders and convenors are generally appointed by TC 96.

Current maintenance teams, working groups and project teams

Maintenance teams:

Currently 20 members participate in MT 1 and perform the coordination for appropriate maintenance of the IEC 61558 series.

Working groups:

IEC/TC 96 has no working groups at the moment.

Project teams:

The PT 1 deals with all subjects regarding to symbols and the communication with IEC/SC 3C and contains 3 Members at the moment.

It is recognized that there is only a limited number of experts available, which have limited time to travel and to meet. Therefore as far as possible project meetings will be combined with TC 96 / MT 1 and plenary meetings. In addition TC 96 will try to use electronic communication methods to minimize the amount of face to face meetings for developing new standards.

C. BUSINESS ENVIRONMENT

General

In view of the ever increasing use of transformers in industrial applications and in application for commercial and residential field, the necessity to maintain a high safety level has become more and more important.

As a consequence IEC/TC 96 has group safety function in accordance with IEC Guide 104 for transformers other than those intended to supply distribution networks, in particular transformers and power supply units intended to allow the application of protective measures against electric shock as defined by TC 64, but in certain cases including limitation of voltage and horizontal safety function for SELV according to IEC 60364-4-41 of IEC/TC 64.

The group safety function (GSF) is necessary because of responsibility e.g. for safety extra-low voltage (SELV) according to IEC 61140:2016 Clause 5.2.6 and IEC 60364-4-41:2017 Clause 414.3.1 or control circuits according to IEC 60204-1: 2016 Clause 7.2.4.

The reason of the needed group safety function for each part of IEC 61558-2 is that different standards of the IEC 61558 series can be combined in one construction but in certain cases with no limitation of rated output power.

For example an autotransformer according to IEC 61558-2-13 can be designed with a separate SELV-circuit according to the particular requirements for IEC 61558-2-6 relating to the general requirements of IEC 61558-1.

The market is affected by a lot of mostly small manufacturers. The pressure on the price is very high and the need for clear technical requirements is undoubtedly high.

D. MARKET DEMAND

IEC/TC 96 is responsible for the IEC 61558 series and IEC 62041. The manufacturers are broadly represented in the TC, which also includes other interest's groups.

Today the transformer market requires the reference to a standard, to guarantee safety and quality. IEC 61558 and IEC 62041 are recognized by the customers in the world as giving these guarantees. As a consequence, these standards have paid their contribution to eliminate the barriers of trade.

The safety requirements of these IEC standards, being more stringent than those in most of the replaced national standards, may have increased the costs in certain cases. However, the standard being used internationally and being used to a wide selection of products, contains a wide range of technically equivalent solutions, which can help to save costs.

The safety standard IEC 61558-1 Edition 3 for general requirements and tests considers several new requirements:

- a. Fully insulated winding wires (FIW), new tables and aging tests for FIW constructions,
- b. Overvoltage categories 1, 2, 3 and 4 for clearances and dielectric strength tests new tables are included
- c. Development of new symbols for the different overvoltage categories. If there is no overvoltage category marked, the overvoltage category 2 applies (IEC 60417-6348 to IEC 60417-6351)
- d. Symbol for maximum altitudes, if higher than 2.000 m (IEC 60417-6343)
- e. Symbol for plug in power supply units, if the pins are damaged (tumbling barrel test) (IEC 60417-6352)
- f. minimum temperature (even during transportation and storage)
- g. Alternative temperature measurement, simulated load and back to back method according to IEC 60076-11
- h. Short circuit and overload protection, simulated load and back to back method according to IEC 60076-11
- i. Adjustment of temperatures according to CENELEC Guide 29 (IEC Guide 117)
- j. Establishing partial discharge test above 750 V for FIW constructions
- k. Requirements for toroidal core constructions, division for basic and for supplementary isolation
- l. Modification of protection indexes for enclosures (IP-code)
- m. Dimensioning of rectangular cross section connectors for transformers
- n. Repetition test, 80% of required dielectric strength test voltage of table 14
- o. Vibration test for vehicles and railway applications
- p. Two Y1 Capacitors for working voltages above 250 V and not exceeding 500 V with overvoltage category 3

A very important market demand is the use of fully insulated winding wires (FIW), which avoids expensive manual work and leads to new transformer constructions with more simple arrangements of windings and cores

This fully insulated winding wires (FIW) also allow the construction of simple and cheap power supplies with transformers and integrated electronics for simple consumer products.

E. TRENDS IN TECHNOLOGY AND IN THE MARKET

Trends in technology

The aim of TC 96 is to have one set of standards, based on the same basic safety principle as the transformers, for which it has safety group function, and which are adaptive for all relevant product committees.

Transformers for particular purpose and transformers for unique purpose are originated from transformers for general purpose, i.e. the basic types, and only have additional or restrictive requirements in order to be used for specified appliances or circuits respectively to supply specific appliances or equipment.

Transformers for unique purposes, normally used in products of user committees such as SC 22E, SC 34C, TC 61, TC 62, TC 66, TC 97 and TC 108.

New trends in technology considered with high priority.

Higher internal frequencies will lead to new material for cores and windings and result in smaller sizes of transformers and SMPS.

A new semiconductor technology called „*Wide Band Gap*“ with materials like silicium carbide or gallium nitride will lead to very high switching frequencies with steeply switching flanks.

These conditions will produce much more stress for the winding wires of transformers and reactors. The standard IEC 61558-2-16 already considers these high frequency requirements.

Market trends

One of the important challenges of the future will be the efficiency (losses of the transformers) which possibly will lead to new material and technologies. Future standards of the IEC 61558 series will pay attention to that fact.

In future there will be a higher demand for combinations of transformers, reactors and power supply units which may be combined with electronic circuits, fuses, switches, temperature sensitive devices, control devices and more within the same product. This will lead to more complicated measures in insulation. Future standards of the IEC 61558 series will contain additional requirements in order to assure a high level of safety.

Furthermore there will be the need to minimize the material usage which may be in contradiction to the efficiency.

For the future TC 96 will also have to monitor the standardisation for e-mobility, smart grid and smart meters as these standards will involve the TC 96 standards.

F. SYSTEMS APPROACH ASPECTS (REFERENCE - AC/33/2013)

TC 96 has an interface to several other IEC committees. There are three different groups of committees: committees where TC 96 has a customer function, committees where TC 96 has a supplier function and committees with service/pilot function for TC 96.

Component committees (TC 96 role of customer)	IEC/TC 51	Magnetic components, ferrite and magnetic powder materials
	IEC/TC 55	Winding wires
	IEC/TC 112	Evaluation and qualification of electrical insulating materials and systems
Product and System committees (TC 96 role of supplier)	IEC/TC 22	Power electronic systems and equipment
	IEC/SC 22E	Stabilized power supplies
	IEC/SC 34C	Auxiliaries for lamps
	IEC /TC 61	Safety of household and similar electrical appliances
	IEC/TC 62	Electrical equipment in medical practice
	IEC/SC 62A	Common aspects of electrical equipment used in medical practice
	IEC/TC 64	Electrical installations and protection against electric shock
	IEC/TC 66	Measuring, control and laboratory equipment
	IEC/TC 97	Electrical installations for lighting and beaconing of aerodromes
	IEC/TC 108	Safety of electronic equipment within the field of audio/video, information technology and communication technology
Other committees (These have service or pilot function for TC 96)	IEC/SC 3C	Graphical symbols for use on equipment
	IEC/TC 14	Power transformers
	IEC/TC 77	Electromagnetic compatibility
	IEC/SC 77A	Low frequency phenomena
	IEC/TC 106	Methods for the assessment of electric, magnetic and electromagnetic fields associated with human exposure
	IEC/TC 109	Insulation co-ordination for low-voltage equipment
	IEC/TC 111	Environmental standardization

G. CONFORMITY ASSESSMENT

The standards of TC 96, especially IEC 61558-1, include test specifications, reproducible test requirements, and test methods. Our publications are in line with the requirements related to conformity assessment aspects, but there are no likely to be special conformity assessment requirements generated by any standards projects.

H. HORIZONTAL ISSUES

Safety aspects

TC 96 observes the publications of the Advisory Committee on Safety (ACOS) e.g. IEC Guide 104, ISO/IEC Guide 51, ISO/IEC Guide 50 and IEC Guide 116.

Additionally TC 96 follows basic safety standards like IEC 61140 or the IEC 60664 series of TC 64 or product safety standards as IEC 62368-1 of TC 108.

Ecological environment

Life cycle aspects of the products covered by the scope related to the protection of the environment will be considered in the light of the "*environmental aspects*" IEC Guide 109 and ISO 14000. A contact is established with ACEA in order to find support for dealing with this matter.

The outcome of the environmental committee TC 111 will be followed in case of environmentally conscious design for electrical and electronic products, for instance which materials or rare earth metals are used, the quantity of energy consumed to make them, as well as their rate of recyclability and reduction of toxic substances.

Another big challenge could be the increase of extreme environments, such as temperature, harmful gases, air pressure and moisture, which may lead to additional requirements.

For the future it may also be necessary to deal with energy efficiency for our products.

Energy efficiency

The reduction of energy consumption will be a prioritised issue for future standards and TC 96 follows the instructions of the Advisory Committee on Energy Efficiency (ACEE) like IEC Guide 118.

I. 3-5 YEAR PROJECTED STRATEGIC OBJECTIVES, ACTIONS, TARGET DATES

STRATEGIC OBJECTIVES 3-5 YEARS	ACTIONS TO SUPPORT THE STRATEGIC OBJECTIVES	TARGET DATE(S) TO COMPLETE THE ACTIONS
CDV of IEC 61558-2-1 Edition 3	Revision of IEC 61558-2-1 Edition 2 for particular requirements for separating transformers for general use	2020-03 published
CDV of IEC 61558-2-4 Edition 3	Revision of IEC 61558-2-4 Edition 2 for particular requirements for isolating transformers for general use	2020-03 published
CDV of IEC 61558-2-6 Edition 3	Revision of IEC 61558-2-6 Edition 2 for particular requirements for safety isolating transformers for general use	2020-03 published
DC of IEC 61558-2-14 Edition 2	Revision of IEC 61558-2-14 Edition 1 for particular requirements for variable transformers	
DC of IEC 61558-2-15 Edition 3	Revision of IEC 61558-2-15 Edition 2 for isolating transformers for the supply of medical locations	
CDV of IEC 61558-2-16 Edition 3	Revision of IEC 61558-2-16 Edition 1 for particular requirements for switch mode power supplies and transformers for switch mode power supplies	2020-03 published
All parts 2 of IEC 61558 series	Will successively be revised after IEC 61558-1 is valid	Foreseen publication date: 2024 for the whole IEC 61558 series.

Note: The progress on the actions should be reported in the RSMB.