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SMB/5556/SBP

2015-03-27

**INTERNATIONAL ELECTROTECHNICAL COMMISSION**

**STANDARDIZATION MANAGEMENT BOARD**

**SUBJECT**

**SMB meeting 153, Geneva**

Strategic Business Plan (SBP) following the meeting of IEC TC 2, *Rotating machinery*, held in Helsinki, Finland, on 2014-09-17/18

**BACKGROUND**

As pointed out in the TC 2 report to the SMB (document SMB/5462/R), the SBP attached has been developed by the TC 2 Chairman. This is in agreement with the delegations attending the TC 2 meeting in Helsinki, in 2014-09. The SBP is herewith submitted to the SMB for approval.

**ACTION**

The SMB is invited to comment on this document in view of approving the SBP.

Comments should be submitted using the technical server **before 2015-04-24**.



## STRATEGIC BUSINESS PLAN (SBP)

IEC/TC or SC 2	Secretariat United Kingdom	Date March 2015
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Please ensure this form is annexed to the Report to the Standardization Management Board if it has been prepared during a meeting, or sent to the Central Office promptly after its contents have been agreed by the committee.

Title of TC  
Rotating Machinery

### A Background

TC 2 was the first product committee of IEC. Initially named 'Advisory Committee No.2 – Specification of electrical machines', it covered both rotating machines and transformers. In 1939, the Committee of Action (now the SMB) agreed to the proposal that Section B of Advisory Committee 2, which dealt with transformers, should be known as Advisory Committee 14 and Advisory Committee 2 from that date was limited to rotating machines.

TC 2's standards portfolio is both, large and mature, with approximately 50 publications. Much of the current work programme is devoted to the maintenance of these publications. The portfolio includes those standards, which originally were developed by the former sub-committees of TC 2. The present scope of TC 2 is to prepare International Standards and Technical Specifications for rotating electrical machines without limitations of voltage, output or dimensions with the exception of the following:

- Traction motors within the scope of TC 9: Electric railway equipment;
- Motors and generators within the scope of TC 69: Electric road vehicles and electric industrial trucks;
- Motors and generators for use in cars and commercial vehicles;
- Motors and generators for use in aeronautics or space applications.

Formal liaisons exist within IEC with SC22G, SC121A, TC31, TC65 and TC112.

Formal liaisons exist within ISO with TC108/SC2 and TC108/SC5.

TC2 decided in its plenary meeting in September 2014 to establish a new liaison with ISO TC115 (Pumps) and to delete the liaisons with TC25 and ISO TC70 as they were felt to be obsolete.

### B Business Environment

#### B.1 General

Rotating electrical machines are the subject of International trade, which relies on a comprehensive portfolio of International Standards against which machines can be purchased, manufactured, tested and inspected. The low failure rate of machines in service provides objective evidence of the success of TC 2 in this area.

#### B.2 Market demand

As more than 95% of all electricity worldwide is generated by rotating electrical machines and more than 50% of all electricity worldwide is converted back into mechanical energy by electrical motors, there is, seen in the medium term, a continuously high market demand for both, motors and generators. Especially during recent years, the demand for rotating electrical machines has grown at approximately 10% per annum except for a steep decrease in the last financial and economic crisis and a steep increase in the years 2010 and 2011 back and exceeding the values prior to the

crisis. The increasing emphasis on using energy more efficiently leads to laws, regulations and a market demand for electrical motors with premium efficiency and to an increasing percentage of variable speed applications for electrical machines.

### **B.3 Trends in technology**

The market for DC motors continues to shrink slightly because many have been replaced by converter fed AC motors. The fast moving technology of converter drives is reflected in the latest edition of IEC TS 60034-25 (2014-10) dealing with machines supplied from frequency converters. The effect of repetitive voltage spikes of short rise-time generated by converters on insulation systems is dealt with by MT 10, who have just finished the latest edition of IEC 60034-18-41 (2014-03) for insulation systems with random wound windings, revised as an IS rather than a TS, and is now revising IEC TS 60034-18-42 for insulation systems with form-wound windings as an IS.

### **B.4 Market trends**

As mentioned above, the most significant market trend is driven by the economic or legal need to save energy. Developed in 2009, IEC 60034-30 defines efficiency classes for three-phase induction motors, thus harmonising the national definitions that had developed in the past. The revision of this publication, which has just been published as IEC 60034-30-1, includes now all types of line operated single speed A.C. machines for low voltage supply into its scope and extends the IE code to IE4. The IE code scheme, which was developed in the first edition of IEC 60034-30, has found wide resonance and is planned to be adapted for example by TC 22 for frequency converters and complete Power Drive Systems (PDS) as well. WG 31 is currently working on an additional new standard IEC 60034-30-2, which will extend the IE class system to converter-fed A.C. motors.

As a consequence of the physical interrelation that increasing the efficiency class usually requires an increase in the size of a motor and consequently also of the locked-rotor apparent power, WG12 is currently working on a revision of IEC 60034-12 that defines the starting performance of three-phase cage induction motors. As the starting performance is highly interrelated to the specifications of low-voltage switch gear, this work is done in close liaison with SC121A (former SC17B) and also at the WG level.

Besides legal requirements, the market is significantly influenced by the extremely volatile price for rare earth permanent magnets (PM). On the one hand, PM machines have by their physical principle better efficiency and torque density than electrically excited synchronous machines or induction motors. On the other hand, high efficiency values can be achieved by electrically excited synchronous machines or induction machines as well as in the case of more active material (i. e. copper and iron). The consequence is that the market price for PM material has a high impact on the economically preferable motor technology and thus the size and weight of electrical machines.

### **B.5 Ecological environment**

The design of rotating electrical machines has traditionally been one of conservatism because of the high customer expectations that the machine they have purchased will enjoy a long life in service. It is however becoming important to consider the overall design of the machine, particularly with regard to increased efficiency, reduction of noise emission and reduction of the amount of materials used. As mentioned above, these goals are partly conflicting (i. e. increased efficiency and reduced amount of material) Similarly, the effect on the environment of gases generated by impregnation and insulation materials during fabrication and refurbishing has to be considered.

The successful work of WG31 responsible for the standardization of efficiency classes and WG28 responsible for the respective testing procedures shows that ecological issues have been one of the major guidelines for the further development of TC2 standards in recent years. In order to keep

standardization in both fields in line with each other and to avoid contradictions, both WGs have met in conjunction with each other recently. This successful organizational approach will be continued.

All working groups and maintenance teams of TC 2 are asked, when drafting documents, to address relevant requirements covering the complete lifecycle of the equipment or installation including manufacturing, supply, all aspects of use within the scope, and disposal.

### C System approach aspects

As rotating electrical machines, the scope of TC2, are mainly a components to be used in systems, TC2 seeks close cooperation with bodies such as SC22G responsible for the respective systems. Standards and Technical Specifications such as IEC TS 60034-25, IEC 60034-18-41 or IEC TS 60034-18-42 reflect the influence of the PDS on the rotating electrical machines and define the requirements resulting from the PDS for the design of the machine.

TC2's relationships with other IEC and ISO committees are as follows:

Committees that use standards produced by TC2	IEC TC22/SC22G	Semiconductor power converters for adjustable speed electric drive systems
	IEC TC31	Equipment for Explosive Atmospheres
	ISO TC 115	Pumps
	ISO TC 108/SC 5	Condition monitoring and diagnostics of electrical equipment
Committees that produce standards used by TC2	IEC TC22/SC22G	Semiconductor power converters for adjustable speed electric drive systems
	IEC TC 112	Evaluation and qualification of electrical insulating materials and systems
	ISO TC 108/SC 2	Mechanical vibration and shock
Other committees that produce standards similar to TC2 to be in liaison with for technical consistency	IEC SC121A	Low-voltage switchgear and controlgear

Besides the exchange of documents, liaison officers have been appointed for those committees, who actively participate in their work and report to TC2. The very close cooperation in the most important liaison with TC22 / SC22G is underlined by the fact that the chairman of TC22 serves as expert in TC2 MT9 and liaison officer for TC2.

TC2 will actively continue to promote the establishment of liaisons to other committees. In the field of energy efficiency, especially a close link with TC65 is of increasing importance. A joint project team has been formed with the active participation of TC2 experts. In addition, a new liaison has

been established with TC31 with the aim to ease the input of TC31's requirements into the further development of TC2's standards and to avoid duplication of work.

#### **D Objectives and strategies (3 to 5 years)**

The main activity of TC2 will be the maintenance of its publication portfolio taking into consideration new developments and market trends.

Increased activities are to be expected in the field of converter supplied motors of all sizes. In particular, the interface problems between the converter and motor require further intensive research to improve understanding of the effect on the motors caused by the rapid progress of converter technology (as well as semiconductor components and control methods). This field covers problems of performance (pulsating torques, losses etc.), environmental effects (noise emission) and operational reliability (bearing currents, winding stress etc.).

In addition, the increasing importance of energy efficiency will require activities in defining methods for determining the efficiency of variable speed drive systems and efficiency classes. Even if a complex subject like this cannot be handled by TC2 alone, TC2 will provide all necessary support for related projects.

#### **E Action plan**

Most important are:

1. Establish new standard on efficiency classes for variable speed A.C. motors by WG31 (Target date 2016).
2. Finish the maintenance of IEC 60034-1, IEC 60034-12 and IEC 60034-18-42, which will address important aspects related to the increasing use of converter-fed motors and of high efficiency motors, by WG12 and MT10, respectively (Target dates: 2016)
3. Update old standards on brushes, brushholders and sliprings by the MT14 (Target date 2017)
4. Develop new standards on the measurement of insulation resistance and polarization index on winding insulation of rotating electrical machines by MT10 (Target date 2017)
5. Develop new standard for the measurement of vibrations at the winding overhang of large electric machines, especially turbo generators by WG32 (Target date 2017)

#### **F Useful links to IEC web site**

[TC 2 dashboard](#) giving access to Membership, TC/SC Officers, Scope, Liaisons, WG/MT/PT structure, Publications issued and Work and Maintenance Programmes and similar information for SCs, if any.

Name or signature of the secretary

**Nick Bradfield**