Annual Report **2016**

International
Electrotechnical
Commission

Fact

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More than 1 800 IEC International Standards help moving cities to greater smartness

Message by the IEC General Secretary & CEO

> The large majority of all electrical and electronic goods are impacted by IEC International Standards

We live in a global world. Most electrical and electronic products cross many borders before they are assembled and then consumed somewhere. Today, electrical and electronic devices are the largest category of goods traded in the world, representing around 20% of total trade value. IEC International Standards impact the large majority of them.

Many of the 170 countries that participate in the IEC adopt IEC International Standards nationally. For example, 71% of European standards are identical to IEC International Standards and a further 7% are based on them. An electron is an electron no matter where and there are no good reasons for artificial differences. The signing of the Frankfurt Agreement during the IEC General Meeting in October 2016 represents an important step towards even greater harmonization in the future.

In January 2016 we started the revision of the IEC Masterplan. Through a highly inclusive consultation process, we gathered the views of IEC Members, technical committees and management boards, as well as relevant companies and organizations. This feedback now serves to draft the new IEC Masterplan throughout 2017 with an aim to seek approval from the Council before the next IEC General Meeting in Vladivostok in October 2017. The IEC Masterplan identifies the mission, vision and long-term goals of the IEC and helps identify necessary structures, processes and activities to ensure the continued relevance of the Commission.

Over the past months we have put in place new technical committees to satisfy market requirements. IEC TC 123: Standardization of the management of assets in power systems, will prepare important Standards on this topic. IEC TC 124: Wearable electronic devices and technologies, will be the focal point for broad activity around these always-on devices that will span many technical committees. ISO/IEC JTC 1/SC 41: Internet of Things (IoT) and related technologies, will ensure the safety, security and interoperability of the Internet of Things. The IEC provides the administrative support. In the context of the IEC systems approach, new systems evaluation groups and systems committees have been established.

The newest of the IEC Conformity Assessment (CA) Systems, IECRE, which is dedicated to the testing and certification of renewable energy generation systems, issued its first certificate in October 2016. The other three IEC CA Systems – IECEE, IECEx and IECQ – continue to grow and expand their service offerings, number of members and users.

The future belongs to those who cooperate. The speed of innovation has accelerated to a point where individual companies are no longer able to develop everything alone. We are living in a society where companies are more competitive than ever but have to collaborate with others way beyond national borders more than ever before to deliver solutions for increasingly complex systems. This also requires a new approach to standardization.

> We have presented IEC work more broadly than ever before.

Faced with these realities, we have put in place a systems approach that includes interaction across groups within and outside the IEC and benefits several important work areas including Active Assisted Living, Smart Cities, Smart Energy, smart manufacturing, microgrids and Low Voltage Direct Current (LVDC). The World Smart City Forum 2016, which was organized by the IEC in partnership with ISO and ITU, and which included also IEEE, CEN, CENELEC and ETSI, was a tangible demonstration of our philosophy to reach out and include expertise beyond traditional borders.

We are a hands-on organization, where doing often comes before talking. As a result, our work remains often invisible in the background. To change this, we have reached out to many new organizations and have presented IEC work more broadly than ever before. Our IEC Ambassadors programme allows us to spread the word about our work for sustainable energy and universal electricity access, disaster mitigation and recovery, and improve our interaction with regulators and academia.

At the 2016 IEC General Meeting, the IEC Market Strategy Board (MSB), which brings together CTOs of major international companies, published two new White Papers. The first is focused on the safety of IoT platforms and the other on the potential to interconnect grids around the world to overcome energy scarcity.

IEC AFRC, the new regional centre for Africa, has reached its cruising speed and has visited 27 countries in 2016.

The IEC Affiliate Country Programme is helping developing countries grow their understanding of standardization and conformity assessment. Since its launch, more than 6 000 IEC International Standards where adopted nationally in 50 countries. Its Mentoring Programme allows 15 developing countries to learn and benefit from the expertise of IEC Members. 14 Affiliates have signed the ACAS pledge, which allows them to receive training to better understand and use the IEC CA Systems.

The IEC Young Professionals Programme is working to increase participation of the next generation of IEC experts and leaders in the technical and management work of the IEC. So far, 406 Young Professionals from 49 countries have participated in the Programme.

As we embark into 2017, I would like to thank the many experts that participate in IEC work for their expertise and commitment, and our IEC Members and officers for their ongoing, valued support.

Frans Vreeswijk
IEC General Secretary & CEO

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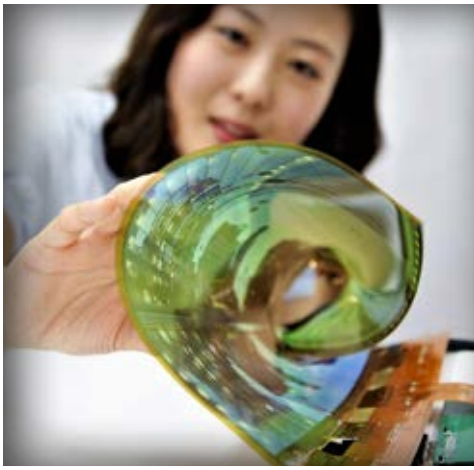
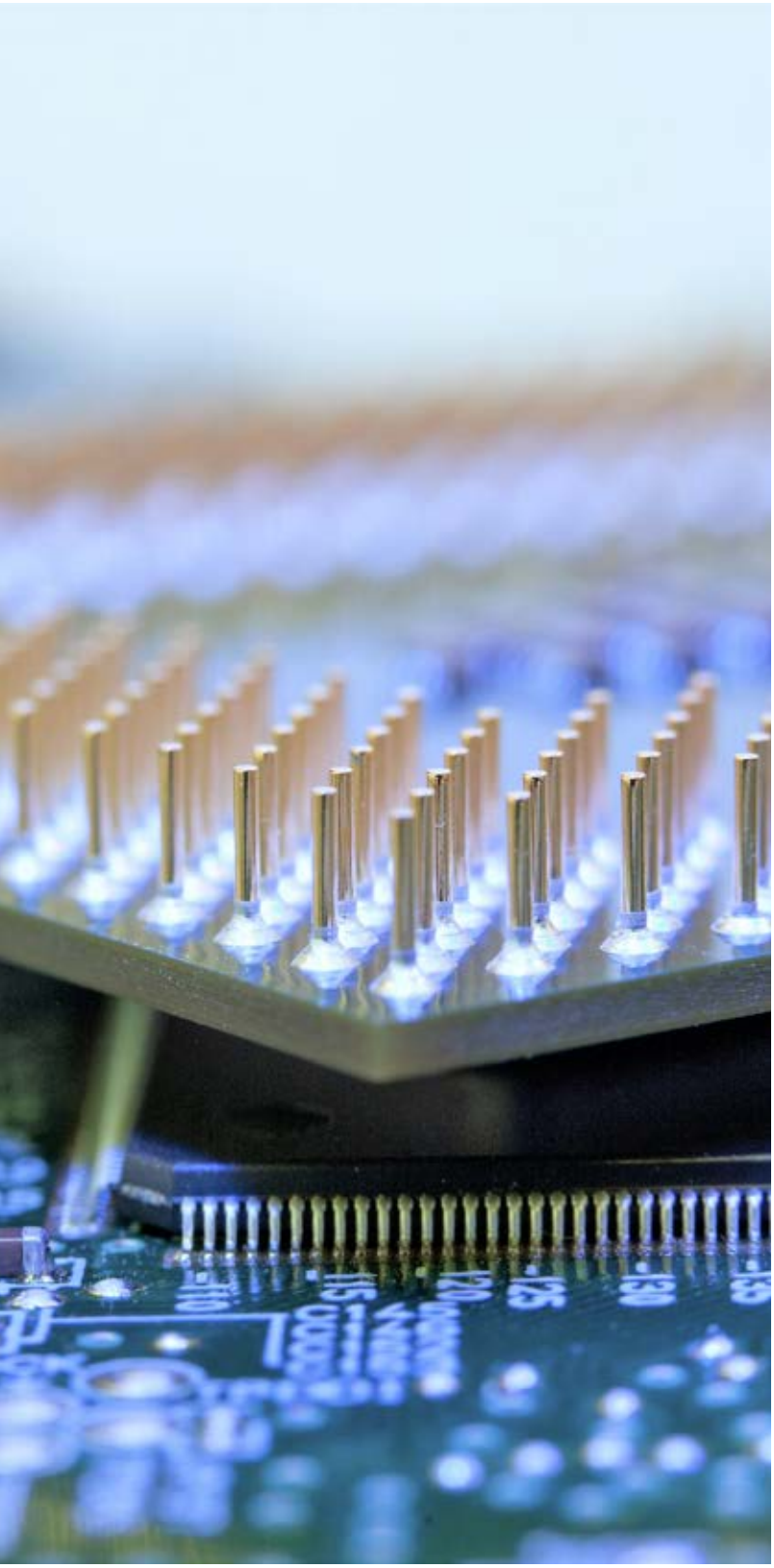
Our work



Overview

This is the IEC



The IEC is the world's leading publisher of around 10 000 International Standards for electrical and electronic technologies and a global, independent, not-for-profit, membership organization (funded by membership fees and sales). It includes 170 countries that represent 99,1% of world population and 99,2% of world energy generation.

The IEC provides a worldwide, neutral and independent platform where 20 000 experts from the private and public sectors cooperate to develop state-of-the-art, globally relevant IEC International Standards. These form the basis for testing and certification, and support economic development, protecting people and the environment.

IEC work impacts around 20% of global trade (in value) and looks at aspects such as safety, interoperability, performance and other essential requirements for a vast range of technology areas, including energy, manufacturing, transportation, healthcare, homes, buildings or cities.

The IEC administers four Conformity Assessment Systems and provides the only globally standardized approach to the testing and certification of components, products, systems, as well as the competence of persons.

The IEC has agreements with close to 200 organizations and cooperates with all relevant standards bodies, consortia, fora and other groups.

IEC work is essential for safety, quality and risk management. It helps make cities smarter, supports universal energy access and improves energy efficiency of devices and systems. It allows industry to consistently build better products; helps governments and critical asset owners ensure the safety and long-term viability of infrastructure investments and reassures investors and insurers.

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Every type of electronic and electrical component, device and system

Facts about the IEC

170 countries

83 Members & 87 Affiliates

Offices on 5 continents

9 855 International Standards

Agreements with close to 200 organizations

1906
Year founded

Global reach

99,1% world population

99,2% electricity generation

20% global trade

Committees & working groups

203 technical committees & subcommittees

1 405 working groups

20 000 experts

Conformity assessment

>20 separate schemes & programmes

>1 million certificates issued

4 global systems

Safety, reliability, interoperability

In 2016 the IEC had 9 855 publications in its library. Of those, the IEC Central Office (IEC CO) issued 7 148 publications and 2 707 were published outside of IEC CO.

IEC International Standards and IEC Conformity Assessment Systems are important for global trade and form the basis for testing and certification, ensuring that devices and systems work as promised.

Quality and risk management

Consistent quality and risk management are impossible to achieve without Standards, testing and verification. They provide reassurance to customers, investors, insurers or regulators, that state-of-the-art, industry-wide accepted criteria have been applied. They help limit liability risks and demonstrate that products are reasonably safe in their use and for the environment.

Safety and security

Electricity is dangerous.

Whenever electricity is involved, there is no room for trial and error because every error can be fatal. At every stage, from manufacturing to operation and repair, safety precautions need to be taken around electricity. Electrical and mechanical safety considerations are an integral part of all IEC International Standards. Together with testing and certification they help protect humans, animals and property.

Using IEC International Standards in the design and manufacturing process of electrical devices and during testing and certification provides powerful evidence that a product is reasonably safe and demonstrates that state-of-the-art expertise was applied. This in turn can help reduce liability risks.

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Access control and safety

In addition to developing safety related IEC International Standards and Conformity Assessment Services under IECEx, IECEE, IECQ or IECRE, the IEC also organized several seminars and workshops on the topic of safety in different parts of the world.

Functional safety

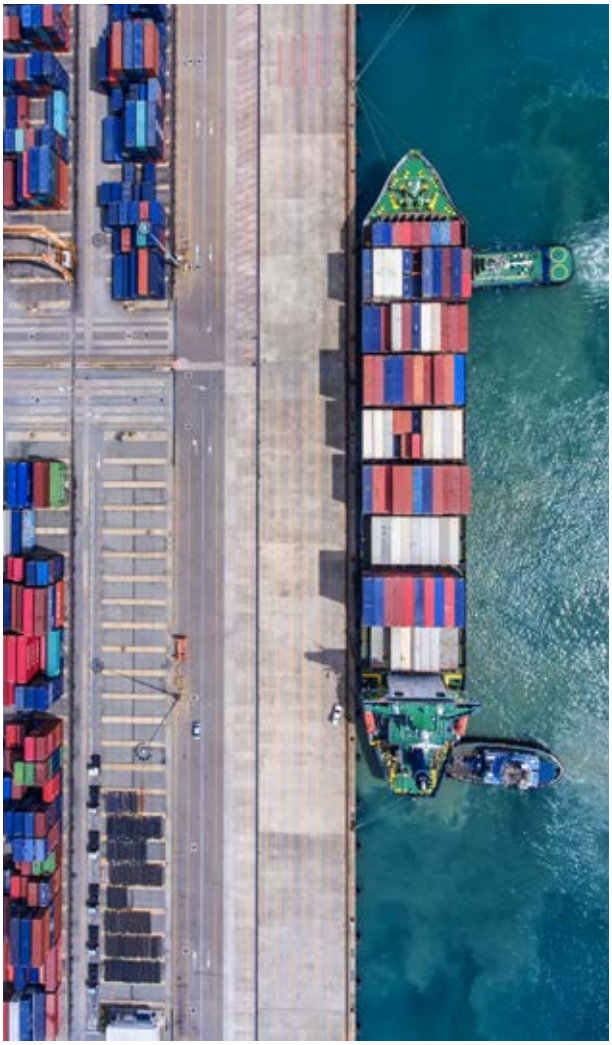
While absolute safety is an unattainable goal, there are many areas where the detection of dangerous conditions activates automatic protection mechanisms. For example, the detection of smoke by a sensor will trigger the activation of a water sprinkler system; an overflow valve will be automatically closed when a certain liquid or pressure level has been reached. In countless situations IEC work helps protect critical infrastructure, economies, people and the environment. More information on IEC work for functional safety can be found in the brochure *Functional safety: essential to overall safety.*

Counterfeit avoidance

Counterfeit electrical and electronic products now occupy second place after pharmaceuticals. When counterfeit electrical devices, components and spare parts enter

manufacturing supply chains, they can cause fires, shocks and explosions that can kill workers, cause serious property damage and lead to unpredictable financial liability. One fake component can void guarantees for entire systems and installations and engage the responsibility of installers and operators.

The infiltration of counterfeit parts into supply chains can often be avoided through improved inventory management, procurement and inspection protocols. More information on IEC work in counterfeit avoidance can be found in the brochure *Piracy in electrical and electronic products*. IECQ Counterfeit Avoidance Programme (CAP) allows manufacturers to ensure that their component supply chain is protected from counterfeit parts.



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Efficiency of ports and ships

Hazardous substances

Arsenic, cadmium, lead and mercury are all poisonous heavy metals, and just a few of the hazardous substances that have been used in electronic components and assemblies in the past, and are still used in some electronic products today. To protect people and the environment, the IEC has helped set Standards for hazardous substances that are also used in regulations. IECQ Hazardous Substance Process Management (HSPM) Scheme is a tool for electronic product manufacturers to ensure that their own processes and those of their suppliers meet these Standards.

Development and trade

Participation in global value chains

Today, electrical and electronic products are no longer made in a single country; they are made in the world, with components and parts that are manufactured in many different countries in value chains that span the globe. Parts and subassemblies cross many borders before they are built somewhere, then shipped and consumed anywhere in the world.

Components represent nearly 60% of the total volume of all merchandise traded, according to the World Trade Organization (WTO). Finished electronic and electrical devices represent close to 20% of global trade (in value). Whether a country and its industry is able to efficiently participate in these global value chains is largely dependent on whether or not they use the harmonized, globally agreed technical rules that are embodied in IEC International Standards.

> Many policy makers use IEC International Standards as a state-of-the-art tool for their laws and regulations.

WTO is an important partner of the IEC. The 164 WTO central government members recognize through their Technical Barriers to Trade (TBT) Agreement that International Standards together with conformity assessment play a critical role in improving industrial efficiency and help encourage trade. This is why the IEC has an observer status at the WTO and regularly attends the WTO TBT Committee meetings.

Supporting policy makers

State-of-the-art regulations

Many policy makers use IEC International Standards as a state-of-the-art tool for their laws and regulations.
IEC International Standards contain solutions that have international buy-in and meet the obligations of WTO in terms of reducing technical barriers to trade. With them regulations stay up-to-date longer because IEC International Standards are regularly reviewed and revised when needed.
The following resources help policy makers achieve the many benefits of International Standards:
www.iec.ch/perspectives/government/benefits
www.iec.ch/perspectives/government/resources

Verifying conformity

The IEC administers four Conformity Assessment (CA) Systems that provide confidence among sellers and purchasers as well as assurance to regulators and policy makers that their requirements for safety and reliability of electrical and electronic products entering their national markets have been thoroughly met.

The IEC CA Systems achieve this through independent testing and certification according to International Standards:
www.iec.ch/about/brochures/conformity_assessment.htm

Our work in standardization

Overview of some of the most important areas covered by IEC International Standards

Energy

IEC work in standardization and conformity assessment provides the detailed technical guidance for all facets of energy generation (off-grid and on-grid) both from renewable and traditional power sources, as well as electricity distribution and use. This includes among others the Smart Grid, Smart Cities, smart buildings, smart manufacturing, transportation including e-mobility, energy efficiency and billions of electric and battery operated devices as well as electronics in both developed and developing countries. The IEC also ensures that critical infrastructure such as nuclear power plants remain safe from cyber attacks.

Renewables

IEC International Standards and IEC CA Systems provide the foundation for the efficient and safe integration of renewable energy sources and technologies such as wind energy; solar PV; solar thermal power; hydro power in dams, rivers and estuaries; marine wave and tidal power; geothermal; biogas and others.

IECRE, the new IEC CA System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications helps verify the safety and performance of renewable energy systems. It issued its first certificate in 2016.

Energy efficiency

Increasing the efficiency in which we use energy allows for the reduction of greenhouse gas emissions, increased energy security, better health and positively impacts public budgets and disposable income. IEC International Standards provide a well-defined set of criteria, calculation methods and metrics that help establish the energy efficiency baseline of electric and electronic devices and systems. They ensure reliable, consistent, comparable and reproducible outcomes.

The IEC CA Systems help verify that manufacturers' claims about energy efficiency are based on reality. The IEC System for Conformity Assessment Schemes for Electrotechnical Equipment and Components (IECEE) Members provide testing and certification services for energy efficiency for a large variety of appliances and equipment, including refrigerators, washing machines, tumble dryers, vacuum cleaners, motors, and many more.

IEC work allows to define, measure and improve efficiency levels and supports energy audits, energy labelling and efficiency classification.

Low voltage direct current (LVDC)

The broad spread of distributed energy generation; LED lighting, electronics and battery operated devices; as well as a renewed focus on energy efficiency and sustainability in power generation is preparing the path for a profound disruption of the traditional electricity model based on alternating current (AC).

Without realizing it, we are living in a direct current (DC) world: the majority of our everyday devices intrinsically use DC power, which is today generally converted from AC. Data centres, electric vehicles, IT equipment, mobile phones, etc. use DC that is converted from AC. No conversion process is 100% efficient; every conversion wastes energy. The best way to stop this waste is to avoid unnecessary conversions.

The IEC is leading the global efforts to make LVDC technology safe for use in rural electrification or homes, data centres, hospitals, office buildings and other areas where a lot of energy could be used directly without losses in energy conversion. DC offers many advantages over AC in terms of energy efficiency and power quality. IEC LVDC International Standards also provide the technical foundation for manufacturers who wish to build safe DC products and guide installers. A large number of Standards already exist and many AC Standards are currently being adapted to fit DC needs.

Internet of Things (IoT) and smart manufacturing

The physical world at large is now becoming an information system. Billions of devices and systems are “sensorized” and connected to the Internet to collect and share data generated by systems, users or their environment, often in real-time. Many of these systems work and communicate without the intervention of any human being.

As with most disruptive technologies, IoT solutions are developed by a wide range of providers promoting their proprietary approaches, which can severely impact interconnectivity. Broad International Standards are needed among other things to establish terminology (ISO/IEC 20924, *Definition and vocabulary for the Internet of Things*) or architectures. Many different IEC technical committees support the IoT, including two new ones that were established in 2016: IEC TC 124 on wearable smart devices, and ISO/IEC JTC 1/SC 41 on IoT. Their work covers a broad range of technologies, including sensors, processors, displays, printed electronics, but also functional safety, automation, cyber security, cloud computing, fibre optics and all surrounding hardware that enables the IoT.

But IoT goes well beyond consumer devices, wearables and applications on smart phones. Even before the term IoT was coined, it had penetrated factories, energy (Smart Grid), healthcare, buildings and homes to name but a few. More details on IoT can be found in the brochure *IEC role in the IoT.*

> Big Data opens many new market opportunities but it also generates new risks.

Cyber security

Big Data opens many new market opportunities but it also generates new risks and questions around the ownership of information as well as that of privacy.

Experts feel that the biggest problem facing the Internet of Things will not be the communication between devices or the collection and ability to share data but rather the safe-keeping of data.

Security grows exponentially in importance as devices that were once isolated become interconnected and more and more information is collected. The exploitation of cyber vulnerabilities of infrastructure systems is becoming an increasing threat to business and society's overall security.

The White Paper *IoT 2020: Smart and secure IoT platform* provides an overview of key requirements in the area of security, interoperability and scalability. It was prepared in cooperation with the Fraunhofer Institute for Applied and Integrated Security as well as SAP.

The IEC has published over 200 International Standards that very directly address cyber security and privacy of health, business and critical infrastructure systems.

The IEC CA Systems are also active in this area, especially IECEE in industrial automation.

Sustainable Development Goals

IEC work directly impacts 12 of the 17 United Nations Sustainable Development Goals (SDGs). It provides the technical foundation for the whole energy chain and all equipment that is driven by electricity. IEC work positively impacts on poverty and hunger reduction efforts, good health, education and learning, water and sanitation, responsible consumption and production, and climate change action. It improves the safety of devices, workers and populations, enables energy efficiency gains and increases the resilience and long-term viability of infrastructure, including for cities and communities, while reducing cost. More information on IEC impact on SDGs can be found in the brochure: *The IEC and the Sustainable Development Goals*.

SDG 7 Universal energy access

An estimated 1,2 billion people have no electricity connection, and another 2,7 billion have only limited access to electricity. Together they represent 53% of the world's population. Basic, affordable technical solutions can bring electricity to populations who would otherwise have to wait possibly many years or even decades for a grid connection. The IEC provides the technical foundation that facilitates the building of safe and affordable off-grid infrastructure that can later on be connected and expanded. Relevant IEC International Standards guide the design and installation and enable the bench-marking and comparison of such infrastructure investment. The IEC is a partner of IRENA, UN SE4ALL, ARE, AFSEC, and many other organizations. The brochure *Rural electrification for universal electricity access* provides a detailed overview of IEC work in this area.

There is always sun shining or wind blowing somewhere on the globe. This power could be harnessed and distributed through an electric grid that spans the world and bring energy to millions who don't have it. The White Paper *Global energy interconnection* assesses the worldwide needs, benefits, policies and precondition for the global interconnection of energy networks. It was developed in collaboration with the International Energy Agency (IEA) and major contributions by State Grid Corporation of China (SGCC).

Smarter cities and communities

Cities are giant systems with countless subsystems. All of them depend on electricity, electrical and electronic hardware and billions of sensors to move people and things, collect data and exchange information. Without electricity, modern city management, the Internet of Things and all resulting city services remain wishful thinking.

No electricity = no Smart City.

In July 2016, the IEC organized the first World Smart City Forum, in partnership with ISO and ITU. The Forum focused on top "pain points" that hold back city and community development in four areas: mobility, water, energy and cyber security/privacy. In this context the IEC also initiated an online community for city stakeholders www.worldsmartcity.org which is endorsed by many city and standards organizations. The IEC proposes over 1 800 International Standards that ensure that infrastructure in homes, buildings, public administration, transportation, healthcare, water, waste or energy management are safe, interoperable and efficient. More information can be found in the Smart City zone on the IEC website.

The IEC also contributed an article on Smart Cities to the G7 Climate Change edition that was distributed to G7 participants in May 2016 in Ise-Shima, Japan, world leaders at the COP22 Summit in Marrakesh, Morocco, as well as the World Bank, IMF, CEOs of major corporations and mayors of the biggest cities globally, among others.

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1st World Smart City Forum, 13 July 2016

Transportation by land, air and sea

With rapid urbanization the need for clean transportation solutions is increasing exponentially. The IEC has published the International Standards for alternate and direct current, normal and fast charging for electric vehicles including the charging infrastructure. Electric cars directly impact and are impacted by electricity grids and IEC work covers both. If there is a desire for the electric car to become a mass market product, the use of International Standards for infrastructure, electricity supply and for the vehicle itself are essential. They provide the basis for investment security to regulatory, infrastructure suppliers and consumers alike.

However, far beyond the electric car, there is a growing opportunity and need for the electrification of all sorts of vehicles that are used in manufacturing plants, warehouses, at airports, underground, in mines or for public transportation. No matter how successful the private electric car will ultimately become, a more sustainable approach to mobility is a must, especially in developing countries. Western models of urban transport designed around the private automobile will be of limited value to meet the transportation needs in developing country megacities. Public transportation from buses, to light rails, subways, clean ferries or even cable cars will be needed and they will have to be electric or fuel-cell driven. IEC work supports the safety, interoperability and efficiency of a wide array of public and private transportation systems.

People are living longer, everywhere.

Accessibility

People are living longer, everywhere. According to the World Health Organization (WHO), for the first time in history, most people can expect to live into their sixties and beyond. While the shift towards older age groups began in high-income countries, it is bound to expand and affect low and middle-income countries as well.

In parallel to the aging of society, the burden on social and healthcare systems is growing. Active Assisted Living (AAL) offers intelligent systems of assistance that can allow people to stay in their preferred living environment for longer. AAL will play a central role in enabling independence and home care of an increasing number elderly citizens. Seniors and people with disabilities can benefit from new technologies, including for example robotics, exoskeletons that help them remain as independent, active and healthy as possible. AAL is also essential for those living in remote areas. With the establishment of the IEC Systems Committee (SyC) on AAL, the IEC has taken a leading role globally in the development of International Standards in this field.

The scope of SyC AAL is to create a vision of systems, services, products and components to enhance the quality of life and enable independent living through the use of information and communication technology (ICT). IEC work ensures the usability, accessibility, interoperability, security, privacy and safety of devices for all users including care-givers. More information about AAL can be found in the brochure *IEC work for AAL*.

Health care

Healthcare services and with it medical electrotechnical equipment, healthcare software and IT networks are growing rapidly. Several IEC technical committees cover a vast field of product categories, including hearing aids and hearing instruments, ultrasonic equipment for diagnostic and therapeutic purposes, equipment for laboratory use, diagnostic imaging, radiotherapy, anaesthesia, critical care, surgery, artificial respiration or paediatrics, to name but a few.

IEC International Standards address performance as well as safety of equipment, patients and caregivers; electromagnetic interference; risk management, etc.

These Standards are foundational for the testing and verification of electrical and electronic medical equipment and are covered under the IECEE CA System for those entities looking for independent, so-called 3rd party certification.

> The IECQ LED Scheme provides a platform that helps ensure the quality and performance of LED lighting products.

Safe, affordable, efficient lighting

IEC work in the area of lighting and optical technologies covers product and systems specifications, safety, performance, interoperability, impact on the environment (both during production and until disposal) and everything in between. Lamps, indicators and luminaires are built, wired and connected based on IEC International Standards.

These Standards apply for optical applications in science, research and health and lighting equipment for households, gardens and pools; public and private transportation; industrial complexes; hospitals, stadiums and urban environments; zoos and aquariums; film, photo and theatre production; and much more. The IECQ LED Scheme provides a platform that helps ensure the quality and performance of LED lighting products.

Other areas that are covered by IEC work include:

- Colour Management
- Electromagnetic compatibility (EMC)
- Hazardous substances
- SI - International System of Units
- Terminology (Electropedia) and graphical symbols
- Alarm systems
- Audio, video, multimedia
- Automotive
- Dependability
- Display devices
- Electrical installations
- Electronics and ICT hardware
- Electric motors
- Elevators, escalators, conveyor belts
- Explosive environments
- Fibre optics
- Fire hazard testing
- Fluids for electrotechnical applications
- Disaster preparedness and recovery
- Heating and cooling systems
- Household appliances
- Lightning protection
- Live working
- Nanotechnology
- Piezoelectrics
- Plugs, sockets, switches
- Radio interference
- Superconductivity
- Virtual and alternate reality
- Water management

Highlights

The IEC has now around 10 000 International Standards in its library.

In 2016 the IEC issued 782 new publications, including 476 IEC International Standards, 56 Technical Specifications, 52 Technical Reports, 8 Publicly Available Specifications, as well as 190 publications that were developed outside of the IEC.

Within the four IEC CA Systems, 160 individually approved Certification Bodies from 60 countries issued around 110 000 certificates covering a large number of different technologies, products, services and the competence of persons undertaking maintenance and repairs.

> The IEC has now around 10 000 International Standards in its library.

Hereafter a brief selection of some of the technology areas that were addressed by the IEC in 2016:

- **LVDC:** universal energy access; rural electrification: safety and power quality – IEC 60947-2, IEC 61204-7, IEC 60269-2 and IEC 60269-4
- **Human body communication** (HBC) – IEC 62779 series
- **Universal smart charging** solution for all consumer devices – IEC 62680 series, IEC 63002
- **Cyber and data security** – ISO/IEC 27000
- **Nanotechnology** in electronics: risk management – IEC TS 62844
- **Wireless charging:** power transfer to several devices – IEC 62827-3
- **Cyber security for nuclear power plants** – IEC 62859
- **Electric vehicles:** protection from shocks – IEC 62752
- **Hazardous areas:** risk management (HAZOP) – IEC 61882
- **Fibre optic sensors** – IEC 61757-1-1, IEC 61757-2-2
- **Explosion and disaster prevention:** gas detectors, combustible dust, non-electrical equipment – IEC 60079-29-1, ISO/IEC 80079-20-2, ISO 80079-36, ISO 80079-37
- **Electrostatic discharge** containment: protection of parts, assemblies and devices – IEC 61340-5-1
- **OLED displays:** optical and electro-optical parameters – IEC 62341-6-1
- **Plugs and connectors:** reliability and safety – IEC 61586
- **Batteries:** safety of Li-ion batteries during transport – IEC 62281
- **Terminology and mathematical expressions** – IEC 60050-614, IEC 60050-192
- **Solar power generation:** photovoltaics – IEC 61215 series
- **Reliability of large systems:** reliability block diagrams (RBD) – IEC 61078
- **Battery chargers:** IEC 60335-2-29
- **Prevention of fires:** fire hazard testing – IEC 60695-1-10
- **Power management:** IEC TR 62357-1

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Energy efficient data centres

A more efficient way to generate and consume energy

Most of our electronic and battery operated devices, as well as LED, smartphones, television sets or PCs are able to use direct current (DC). And while electricity is now mostly delivered in the form of alternating current (AC), in the not so distant future all our devices, including washing machines, ventilators and the like will run on LVDC. Using solar, wind or water power directly, without conversion is more efficient and will help reduce e-waste in the form of adaptors that will no longer be needed. LVDC might also hold the key to the global standardization of plugs and sockets.

Many different technical committees are working to build new Standards for LVDC and adapt existing AC Standards for use with DC devices and systems to make this technology safe to use.

LVDC: keeping people and machines safe

Circuit breakers and fuses represent key elements to ensure the safety of LVDC. A circuit breaker has an internal switch mechanism that trips when there is an unsafe level of electricity. It helps protect electrical installations from damage due to excess current by interrupting the flow of power. A fuse is another way of interrupting the flow of power, but since it is made up of a piece of metal that melts when overheated it needs to be replaced after each event. The circuit breaker can simply be reset.

Subcommittee (SC) 121A: Low voltage switchgear and controlgear, publishes International Standards for circuit breakers, including IEC 60947-2. This Standard addresses critical overload and short-circuit protections for low voltage

The rapid growth in physiological sensors, low-power integrated circuits, and wireless communication has enabled a new generation of wireless sensor networks.

installations and includes new applications for example in photovoltaic installations. SC 32B: Low voltage fuses, has published two important IEC International Standards IEC 60269-2 and IEC 60269-4 dedicated to this topic. They apply to a large variety of environments, including batteries, power generation, industrial control equipment, lighting or electric vehicles, for example.

Just the right level of power

Different devices require different levels of power. For example programmable controllers in electrical cabinets need a low level of power while an electric car will need a much higher level. Power converters are there to deliver electricity exactly at the levels it is needed. IEC 61204-7, *Low voltage switch mode power supplies - Safety requirements,* helps reduce risks of fire, electric shock, thermal, energy and mechanical hazards in convertors. It can be used both for AC and DC. The Standard was published by SC 22E: Stabilized power supplies. This is another important Standard for LVDC.

Human body communication

The rapid growth in physiological sensors, low-power integrated circuits, and wireless communication has enabled a new generation of wireless sensor networks. One potential application are wireless body area networks (WBAN) which could allow for inexpensive and continuous health monitoring with real-time updates of medical information since electrical signals easily travel through the human body. So-called human body communication (HBC) is an emerging technology. Small biosensors, which don't impair normal activities, can be placed on or implanted in the human body and transmit a signal wirelessly through the human body. They can provide for continuous monitoring of human physiological parameters like heart rate, blood pressure, body temperature, and others.

TC 47: Semiconductor devices, published in 2016 three parts of the IEC 62779 series, which deal with semiconductor interface for human body communication. Part 1 gives the general requirements; part 2 gives the characterization of interfacing performances and part 3 gives the functional type and its operational conditions. The aim is to secure compatibility between various devices using HBC. These Standards are also relevant and applicable to the new TC 124: Wearable electronic devices and technologies.

> The IEC is enabling a smart charging solution that allows any kind of smart charger to be used with any kind of portable device

Universal smart charging solution for multiple portable consumer devices

The IEC is enabling a smart charging solution that allows any kind of smart charger to be used with any kind of portable device, ranging from smartphones to notebook computers. The solution provides broad interoperability by automatically identifying required power levels and charging devices safely and efficiently.

The USB Type-C™ IEC 62680-1-3 and USB Power Delivery IEC 62680-1-2 International Standards provide flexible, bi-directional power capabilities that enable faster charging with power levels of up to 100 W. The Standards define the fundamental technologies for delivering power across a common interface between different power sources and devices.

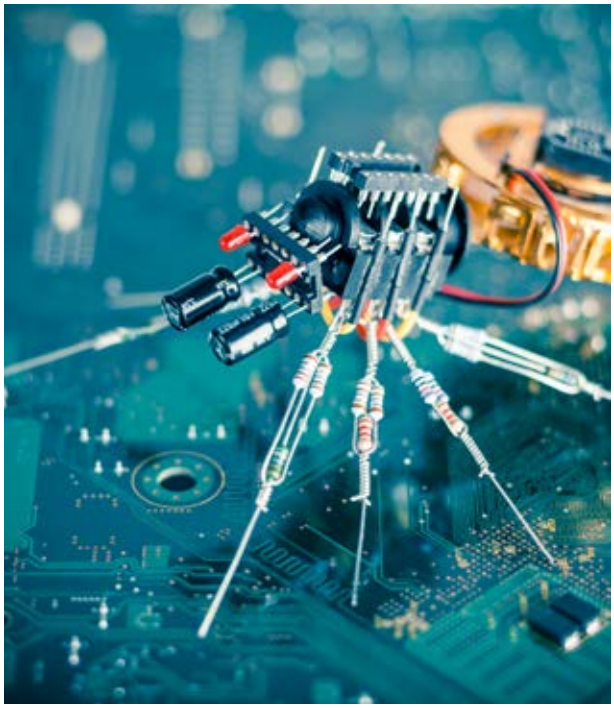
IEC 63002, *Identification and communication interoperability method for external power supplies used with portable computing devices*, defines interoperability guidelines for chargers and devices that implement these latest USB technologies. In particular, it defines the data parameters for communicating power adapter characteristics and capabilities that support the global implementation of interoperable power adapters.

Together the three International Standards form the basis for a smart charging interface that is supported by global industry as the best approach to enable broad re-usability of different chargers with different products. This common interface ensures a consistent end-user experience for charging various devices while providing industry with the flexibility needed for future innovations.

Cyber security: protecting data

All information held and processed by an organization is subject to the risks of attack, error and natural disaster as well as other vulnerabilities inherent to its use. Information security is therefore at the heart of an organization's activities. It focuses on information that requires appropriate protection against loss or breaches. The IEC and ISO family of Standards on information security management systems (ISMS) lets organizations develop and implement a robust framework for managing the security of their information assets, including financial data, intellectual property, employee details, and information otherwise entrusted to them by customers or third parties.

ISO/IEC 27000, *Information technology - Security techniques - Information security management systems - Overview and vocabulary,* gives a comprehensive view of information security management systems covered by the ISMS family of Standards, and defines related terms and definitions.
The IEC has published over 200 Standards that very directly address cyber security and privacy of health, business and critical infrastructure systems.



Making nano safe

Nanotechnology in electronics holds some answers for how to further increase processing speeds while reducing weight and power consumption. IEC TS 62844, *Guidelines for quality and risk assessment for nano-enabled electrotechnical products* is a high-level reference document that provides an important framework for the risk management of nanomaterials and devices with regard to quality, environmental considerations, health and safety.

Wireless charging multiple devices

Wireless power transfer is a dream that has come true for many small devices, including mobile phones. Transferring electricity without wires eliminates the need for users to carry around cables and connectors. The technology, which is based on magnetic resonance, allows consumers to place one or several power-receiving devices within a short distance from the power source in order to charge a battery, without removing it from any of the devices.

IEC 62827-3, *Wireless power transfer - Management - Multiple source control management*, was developed by TC 100: Audio, video and multimedia systems and equipment, technical area (TA) 15: Wireless power transfer. It specifies the methods and procedures that are needed for multiple power sources to provide power transfer to multiple devices.

Cyber security for nuclear power plants

IEC 62859, *Nuclear power plants - Instrumentation and control systems - Requirements for coordinating safety and cyber security*, published by SC 45A: Instrumentation, control and electrical systems of nuclear facilities, is the first Standard ever to be published that coordinates safety and cyber security in the field of nuclear power plants.

Managing and reducing risks

Risk management is an integral part of IEC work. In hazardous areas such as chemical or nuclear power plants taking risks can translate into severe consequences for humans and the environment. Hazard and operability (HAZOP) studies provide a structured and systematic approach to risk analysis in complex areas. IEC 61882, *Hazard and operability studies (HAZOP studies) - Application guide*, published by TC 56: Dependability, compares the intent of the designer with possible deviations in operation, for example as the basis of a safety analysis.

IEC TR 63039, *Probabilistic risk analysis of technological systems - Estimation of final event rate at a given initial state*, by TC 56 provides guidance for probabilistic risk analysis of complex systems, estimating the event rate needed for event tree analysis (ETA), fault tree analysis (FTA) and Markov techniques.

Sensing everything

Sensors make systems smart. Without them there would be no Internet of Things (IoT) no smart manufacturing, no Smart Grid and no Smart Cities.

Among the sensor family, fibre optic sensors take a very special place. One of their major advantages is that they are able to reach places that would otherwise be inaccessible, are able to sense and transmit information over long distances and can work in areas with high magnetic fields or high temperatures, where semiconductor-based sensors would not be able to function. Like other sensors, they can be used to measure strain, temperature or pressure as well as vibration, rotation, displacement, velocity, acceleration, torque or temperature. SC 86C publishes IEC Standard for fibre optic sensors. In 2016 it published two important Standards: IEC 61757-1-1, *Fibre optic sensors - Strain measurement - Strain sensors based on fibre Bragg gratings*, and IEC 61757-2-2, *Fibre optic sensors - Temperature measurement - Distributed sensing.*

EVs without shocks

If you plug in your electric vehicle (EV) using an extension cord or an adaptor, it can happen that residual current could damage the charging equipment or the EV. SC 23E

> To prevent explosions, both electrical and non-electrical equipment needs to be taken into consideration in a systems approach.

published IEC 62752 which covers the in-cable control and protective device (IC-CPD). This Standard addresses different types of products used during the charging of an electrical vehicle. It provides supplementary protection for the circuit downstream of the IC-CPD, helps verify supply conditions and prevents charging in case of supply faults. The publication outlines standard conditions for service operation, including minimum and maximum temperature ranges, humidity levels, or altitude, for example.

Preventing explosions and disasters

IEC TC 31 and IECEx, the IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres, are key players in protecting hazardous areas from explosions that are caused by flammable gases and liquids as well as combustible dusts. They also cooperate with ISO to develop a range of safety Standards related to explosion risks. In 2016 several important Standards were published by TC 31 or its subcommittees.

Pockets of gases in mines or conduits underground, for example in cities, can trigger explosions. Special gas detectors are needed to identify the presence of such flammable gases. IEC 60079-29-1, *Explosive atmospheres - Gas detectors - Performance requirements of detectors for flammable gases*, specifies general requirements for the construction, testing and performance of such detectors, and describes the test methods that apply to portable, transportable and fixed equipment that is used to detect and measure the concentrations of flammable gas or vapour in the air.

Combustible dusts can be as dangerous as flammable gases. They are present in a large number of areas, including sugar refineries, flour or textile mills and wood processing plants, to name but a few. ISO/IEC 80079-20-2, *Explosive atmospheres - Material characteristics - Combustible dusts*, describes test methods for the assessment of hazards from combustible dusts.

To prevent explosions, both electrical and non-electrical, equipment needs to be taken into consideration in a systems approach. IEC and ISO worked closely to prepare ISO 80079-36 and ISO 80079-37, *Explosive atmospheres - Non-electrical equipment for explosive atmospheres*. The Standards provide methods and requirements for the design, construction, testing and marking of non-electrical Ex equipment, Ex components, protective systems, devices and assemblies that are used in explosive atmospheres. In 2016, IECEx commenced issuing certificates according to the ISO 80079-36 and-37 Standards.

Tiny burst of energy

Static electricity has been a serious industrial problem for centuries. As early as the 1400s, European and Caribbean forts were using static control procedures and devices to prevent electrostatic discharge ignition of black powder stores. In the 20th century, it became increasingly important to protect electronic components and assemblies from electrostatic discharge (ESD). Today, as devices have become faster and smaller, their sensitivity to ESD has increased. IEC 61340-5-1 covers all necessary considerations to protect electronic parts, assemblies and devices from ESD.

The Standard is published by TC 101: Electrostatics, and provides an ESD control programme that addresses the manufacturing, assembly, installation, packaging, labelling, service, testing, inspection, transportation and all other activities where electrical or electronic parts are exposed to potential damage by electrostatic discharges. This Standard is also used by the IEC Quality Assessment System for Electronic Components (IECQ)

Always well connected

The large majority of electric or electronic devices have some sort of connector. Without it devices can't be plugged in and simply wouldn't work. Connectors are such a normal part of our lives that we don't even pay them much attention.

Wherever there is a connector, there is the risk of disconnection. IEC 61586 which is published by TC 48: Electrical connectors and mechanical structures for electrical and electronic equipment, deals with the reliability and safety of connectors. It covers everything from design to production and includes a testing programme that is essential to verifying the safety and reliability of a wide array of connectors both in and on devices. It makes certain that devices stay well connected.

Brilliant flexible displays

Organic light emitting diode (OLED) displays can provide high contrast ratio, fast-response time, wide colour gamut, and a wide viewing angle while operating with low power consumption. OLED displays can be made very thin, transparent and some are even bendable. They are not only used in television sets, but also in a variety of other electronic devices, such as mobile phones. IEC TC 110 recently published IEC 62341-6-1 which specifies the measurement conditions and methods for determining optical and electro-optical parameters of OLED display panels. Among other things, it helps define how display luminance is affected by the amount of content on the screen. The publication gives

> Renewables in general and solar photovoltaics (PV) in particular play an increasingly important role in power generation.

details of standard measuring equipment and testing set-up conditions.

Harnessing the power of the sun

Renewables in general and solar photovoltaics (PV) in particular play an increasingly important role in power generation, both on-grid and off-grid. The new IEC 61215 series of Standards dedicated to PV will greatly facilitate future revisions, or additions of new types of PV modules.

So that your batteries can fly with you

Nowadays, batteries are essential for many of our devices. Their safety is of utmost importance and nowhere more than during transport, for example in air planes. IEC 62281 is a group safety Standard that harmonizes the tests and requirements for all types of lithium cells and batteries, including those that can be recharged, to ensure safety during transport.

Providing clarity

Carefully defined terminology allows people from a particular industry to communicate clearly. When experts have a common understanding of what a term encompasses, they are able to work together and exchange ideas without the need for lengthy explanations. This helps reduce the risk of misunderstandings and saves a lot of time. IEC TC 1: Terminology, prepares all relevant terminology Standards in the field of electrotechnology. In 2016 it published IEC 60050-614, *Generation, transmission and distribution of electricity - Operation,* which provides the terminology needed in that field.

Similarly, IEC 61703, *Mathematical expressions for reliability, availability, maintainability and maintenance support terms*, provides standardized mathematical symbols and expressions used in IEC 60050-192. Such standardized terms save time, ensure a level playing field, and reduce risks as well as transaction costs in connection with contracts. IEC 60050-192 is prepared by TC 56: Dependability, and published by IEC TC 1.

Identifying the weakest link in a system

Reliability block diagrams (RBD) is a graphic method that demonstrates the reliability of individual components and how they contribute to the success or failure of a complex system. RDB is used in the early phases of large system projects to structure hardware and software. It allows designers to identify critical elements and how each of them contributes to reliability, availability and maintainability of the system. RBD often forms the basis for failure modes and effects analysis (FMEA) which is a step-by-step approach for identifying all possible failures in a design, manufacturing or assembly process, or a product or service. IEC 61078, *Reliability block diagrams,* is published by TC 56: Dependability.

The portable power revolution

Batteries drive the majority of our modern entertainment devices and appliances that are increasingly found in household, do-it-yourself or gardening tools. All these batteries need electricity and many use battery chargers. IEC TC 61 has published IEC 60335-2-29, *Household and similar electrical appliances - Safety - Particular requirements for battery chargers*, which ensures the safety of such chargers.

Avoiding fire hazard

Fire and electricity are sometimes closely related. For this reason electrical equipment, components and circuits need to use materials and be designed in such a way as to reduce the risk of fire to a tolerable level even in the event of (mis)use, malfunction or failure. IEC 60695-1-10, *Fire hazard testing - Guidance for assessing the fire hazard of electrotechnical products - General guidelines*, published by TC 89 provides guidance for assessing the fire hazard of electrotechnical products.

Anticipating power needs

Electricity grids and energy markets are facing new challenges and need to integrate an increasing variety of digital computing and communication technologies, electrical architectures, processes and services. IEC TR 62357-1, *Power systems management and associated information exchange - Reference architecture*, forms the basis of the entire work of TC 57.

The IEC systems approach

Increasingly complex systems and the convergence of technologies require that more stakeholders collaborate. This also asks for a different approach to standardization, one that also includes a top-down perspective to appropriately address challenges. To produce so-called Systems Standards, the IEC has put in place new structures that allow experts from inside and outside to share their expertise. These new collaborative platforms are expanding the reach of the IEC to new domains and help engage experts and organizations that have never before been involved with IEC work.

Systems evaluation groups (SEGs) are completely open and welcome all interested parties. Their task is to define the boundaries of the system, define the general architecture and identify all stakeholders that are impacted.

Systems committees (SyCs) help bridge and coordinate the work of traditional IEC technical committees to develop Systems Standards.

Fact

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Energy access makes life easier

> By 2050, close to 70% of the world's population will be living in cities.

Overview of SEGs and SyCs

SEG LVDC

The SEG for low voltage direct current (LVDC) is doing essential work to improve energy access in developing countries and increase energy efficiency in developed countries. It has been approved to become a SyC.

SyC AAL

With changing demographics and "super aged" societies, there is a need to enhance the autonomy and quality of life of elderly people. In this context, SyC Active Assisted Living (AAL) aims to develop the necessary Systems Standards for products and services, taking into account safety, security and privacy aspects.

SyC Smart Cities

By 2050, close to 70% of the world's population will be living in cities. Cities are complex systems and all of them require a steady supply of sustainable electricity and millions of pieces of electrical and electronic hardware. SyC Smart Cities is tasked with coordinating the electrotechnical Systems Standards that are needed for moving cities to greater smartness.

Cities require a sustainable supply of electricity, the necessary electrotechnical hardware, relevant data and information exchange as well as management standards to move to greater smartness. No single organization will be able to deliver all of this alone. Collaboration is unavoidable.

The IEC brought together on 14 July 2016, immediately following the World Smart City Forum in Singapore, the most important global, international and regional standard developing organizations. The aim was to increase respectful collaboration and limit duplication. A follow-up event will take place in Barcelona in November 2017, co-organized by the IEC, ISO and ITU, this time under ISO leadership.

SyC Smart Energy

The work of SyC Smart Energy will be crucial to provide Systems Standards for the Smart Grid, including interaction in the areas of heat and gas.

In 2016 the SyC Smart Energy put in place processes to support the TCs to better serve industry and to understand the global needs for Smart Energy by hosting a TC forum and a regional organizations coordination forum.

SEG Non-conventional Distribution Networks/ Microgrids

This SEG assesses all aspects of non-conventional distribution networks, including for rural and developing markets (notably in Asia and Africa), where microgrids may be connected in the future to traditional/interconnected grids. The same is true for facility or campus grids which are capable of operating in an isolated mode as well as grid-connected. It closely collaborates with SyC Smart Energy and SyC LVDC as well as other microgrid related activities in the IEC.

New SEG Smart Manufacturing

This SEG will provide an inventory of existing Standards and new standardization projects under the management of IEC, ISO and other standards organizations. It will invite the cooperation of consortia, IEEE and other organizations to map smart manufacturing activities and establish a roadmap, architecture and identify standardization and conformity assessment projects.

New SEG Communication Technology and Architectures

This SEG is tasked with monitoring new market trends and evaluating the standardization needs in the field of communication technologies and architectures, and in particular interfaces, data models and behaviour in the context of the IEC. It will help coordinate the active participation of experts from within and outside of the IEC and act as liaison to ITU-R for all spectrum management related issues.

New SEG Smart Home/Office Building Systems

This SEG is to evaluate technology and market evolution trends and review the inventory of existing Standards and projects internal and external to the IEC as well as identify standardization gaps in the area of smart homes, offices and buildings.

New IEC White Papers

The IEC Market Strategy Board (MSB) helps identify future technologies and trends. It brings together CTOs of major global companies and helps the IEC address broad issues in electrotechnology. The MSB publishes White Papers that help assess global needs and provide recommendations to all relevant stakeholders.

In 2016, the MSB published two White Papers:

All IEC White Papers can be downloaded from the IEC website: www.iec.ch/whitepaper

IoT 2020: Smart and Secure IoT Platform

IoT 2020: Smart and Secure IoT Platform provides an overview of today's IoT, including its limitations and deficiencies in the area of security, interoperability and scalability. It also discusses next generation platform-level technologies and provides important recommendations to IoT stakeholders and for IoT standardization work.

The White Paper was prepared in cooperation with the Fraunhofer Institute for Applied and Integrated Security (AISEC) as well as SAP.

Global energy interconnection

Global energy interconnection assesses the worldwide needs, benefits, policies and precondition for the global interconnection of energy networks. It examines the readiness of potential markets and identifies technical and business trends as well as hurdles. It analyzes and compares several global transmission scenarios and evaluates their impact on energy supply, the environment, technologies, policies as well as Standards development.

The White Paper was developed in collaboration with the International Energy Agency (IEA) and major contributions by State Grid Corporation of China (SGCC).

Testing, verification, certification

EC work supports all types of testing and verification.

The IEC is the only organization in the world that provides an international standardized form of testing, verification and certification, running four Conformity Assessment (CA) Systems, each of which operates schemes and programmes based on third-party conformity assessment, also known as certification. They establish that a product is in conformance with the applicable Standard(s) and meets expectations in terms of performance, safety, efficiency, reliability, durability, and other criteria according to the Standard listed on the certificate.

The IEC CA Systems represent the largest and most successful multilateral recognition agreements in the world. Their success is based on a proven operational model that ensures harmonized interpretations of Standards, a common set of rules and operational procedures for all certifiers and test houses to follow and a common format for test reports and certificates.

Thousands of testing laboratories participate in the CA Systems. They accept the certificates and conformity assessment reports of other members of a CA System. Certificates are widely accepted, well beyond member countries.

The IEC CA Systems help remove significant delays and expense for multiple testing and approvals. This allows industry to reduce cost and enter markets faster with its products.

Building blocks for future services

The IEC Conformity Assessment Board (CAB) is gearing up for the anticipated further expansion of global demand for CA services by developing building blocks that will allow it accelerate the establishment of new services.

Cyber security

The CAB has set up a working group to investigate the market need and time frame for CA services (global certification schemes) for products, services, personnel and integrated systems in the domain of cyber security. Meanwhile, the IECEE provides certification solutions related to cyber security within the industrial automation arena.

IEC work supports all types of testing and verification.

International partners

The IEC has a tripartite Memorandum of Understanding with ILAC and IAF with an aim to ensure common understanding and interpretation of the relevant test laboratory and certification body Standards, and to put in place a unified assessment process with the accreditation body, which then relies on IEC CA Systems experts. However testing and certification in electrotechnology requires special expertise and equipment. The IEC laboratory assessment process goes well beyond and covers also the relevant expertise of personnel, verifying their ability to run the complex electrotechnical test programmes that are a part of IEC International Standards and full compliance with the rules of the applicable CA System.

The IEC CA Systems

IECEE

The IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components provides testing and certification for home, office, health facilities, manufacturing, lighting, components, switches, EVs, Smart Grid, etc.

IECEx

The IEC System for Certification to Standards Relating to Equipment for Use in Explosive Atmospheres covers all needs of the Ex industry.

IECQ

The IEC Quality Assessment System for Electronic Components offers a quality and supply-chain management tool for the electronics industry.

IECRE

The IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications covers solar PV, wind, marine energy technologies and systems.

IECEE

IECEE, the IEC System of Conformity Assessment Schemes for Electrotechnical Equipment and Components, administers third-party conformity testing and certification Schemes that address the safety, quality, efficiency and overall performance of components and goods for the home, office, manufacturing or health facilities. Members of the CA System issue test reports and certificates that are mutually accepted by other members of the CA System. This eliminates duplicate testing and saves time and money.

New Task Forces

Two new Task Forces were established in 2016 addressing new conformity assessment services.

When functional safety is maintained properly, the electronics and software that relate to the function of a device or system will work correctly in response to commands it receives. Under the Certification Management Committee (CMC), the Task Force for Functional Safety was set up to define market relevant solutions and services related to functional safety.

As we become more connected to the Internet of Things (IoT), it is increasingly important for personal safety and privacy to ensure measures are in place to tackle the numerous cyber threats we face. The Task Force for Cyber security was created to cover conformity assessment elements pertaining to industrial automation cyber security in conjunction with the IEC 62443 series of International Standards.

www.iecee.org

Fact

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Standardizating and testing lighting in all its forms

54	member bodies
77	National Certification Bodies (NCBs)
468	Testing Laboratories (TLs)
2 333	client testing facilities
96 898	Test certificates issued in 2016

IECEx

IECEx, the IEC System for Certification to Standards relating to Equipment for use in Explosive Atmospheres, provides certification for areas where there is a risk of fire and/or explosions due to flammable gases, liquids and dusts (Ex areas). The CA System provides the following certification schemes as part of a life cycle approach to ensuring safety via compliance with Standards:

- → IECEx Certified Equipment Scheme
- → IECEx Certified Service Facilities Scheme
- → IECEx Scheme for Certification of Personnel Competence (for Explosive Atmospheres)

Fact

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↗ Protection from dust explosions

While the Certified Equipment Scheme covers the testing and certification of newly manufactured Ex electrical and non-electrical equipment, the Certified Service Facilities Scheme addresses inspection (location and other), installation, maintenance and repair of equipment and systems. The Scheme for Certification of Personnel Competence, as the name suggests, certifies a person's ability to competently apply the suite of International Standards as prepared by IEC TC 31: Equipment for explosive atmospheres.

Non-electrical equipment

Following the publication in 2016 of five ISO and ISO/IEC International Standards developed by IEC SC 31M: Non-electrical equipment and protective systems for explosive atmospheres, IECEx issued the first three certificates for non-electrical equipment used in Ex areas. This new service meets an urgent need of industry to ensure that not only the electric motor is tested and certified but also the mechanical devices it is connected to. Non-electrical equipment may include dosing pumps, cabinet coolers, sensing devices, couplings, pumps, gearboxes, brakes, hydraulic and pneumatic motors and any combination of devices that are part of machinery, fans, engines, compressors, assemblies, etc.

UN endorsement

IECEx maintains endorsement by the United Nations via the UNECE as THE certification system for the assessment of conformity in Ex areas. Since the UNECE *Common Regulatory Framework for Equipment Used in Environments with an Explosive Atmosphere* was issued in 2011, several regulators are aligning with the Common Regulatory Objectives listed in the publication; for instance, the US Coast Guard use IECEx for equipment on foreign-flagged ships within their jurisdiction.

IECEx operates the only global online certificate system dedicated to the Ex sector, allowing instant verification of claims of compliance of certificates issued by more than 80 IECEx Certification Bodies.

Events and news

Throughout 2016, the IECEx Executive Secretary and his team participated in key industry events of the Petroleum and Chemical Industry Committee (PCIC) in Europe, North America and the Middle East.

The Trainor/IECEx Secretariat Korean *Shipbuilding Industry Roadshow* was held in April 2016 and in June the IECEx Industry Symposium took place in Singapore.

Regular news articles were published in HazardEx prepared by IECEx experts including Thorsten Arnhold, Ron Sinclair, Jim Munro and others.

www.iecex.com

33	countries are members of the IECEx Management Committee
83	IECEx Certification Bodies (+ Applicants)
59	IECEx Test Laboratories
9 768	certificates and reports issued in 2016
>70 000	certificates and reports in total

IECQ

IECQ, the IEC Quality Assessment System for Electronic Components, is a worldwide approval and certification system that covers the supply, assembly, associated materials and processes of a large variety of electronic components that are used in millions of devices and systems. The IECQ Certification System provides manufacturers with independent verification that IEC International Standards and other specifications were met by suppliers who hold an IECQ certification.

Fact

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Reliable LED lighting

The CA System provides the following core certification schemes and programmes which serve as an effective supply chain management tool for industry in verifying compliance with component specifications and Standards:

- IECQ AP (Approved Process)
  - IECQ AP-CAP (Counterfeit Avoidance Programme)
- IECQ AC (Approved Component)
  - IECQ AC-TC (Technology Certification)
  - IECQ AC-AQP (Automotive Qualification Programme
  - IECQ Scheme for LED Lighting (LED components, assemblies and systems)
- IECQ Avionics
- IECQ HSPM (Hazardous Substances Process Management)
- IECQ ITL (Independent Testing Laboratory)

New services

The IECQ Scheme for LED Lighting, established under the umbrella of the generic IECQ AC Scheme, can be applied to certify manufacturers and suppliers of electronic components, modules and assemblies used in the production of LED packages, engines, lamps, luminaires and associated LED ballasts/drivers. It provides a standardized approach for evaluating suppliers and is used as a powerful supply chain management tool when assessing and monitoring the various tier-level suppliers.

First certificate for LED lighting

In September 2016, IECQ issued the first certificate under its IECQ Scheme for LED Lighting. It is worth noting the very short time – two years – between the launch of the LED Initiative in autumn 2014, the establishment of the IECQ Scheme for LED Lighting a year later, and the issuing of the first certificate in 2016. It was made possible because IECQ already had all the mechanisms in place under the umbrella of the IECQ AC Scheme.

Fact

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Verifying electronics in aeronautics

Events

During the year, IECQ participated in many international events, conferences, trade fairs and exhibitions, mainly in Asia.

www.iecq.org

12	member countries
25	Certification Bodies
>50	Certification Body branches
1479	certificates issued in 2016
>7 000	certificates in total

IECRE

Fact

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First wind turbine certificates issued

IECRE issues first wind energy certificates

IECRE, the IEC System for Certification to Standards Relating to Equipment for Use in Renewable Energy Applications, aims to facilitate international trade in equipment and services for use in renewable energy (RE) sectors while maintaining the required level of safety.

Recognizing that the ever-increasing demand for electricity and the desire to reduce the share of fossil fuels in power generation have led to rapid development and growth of the renewable energy sector, IECRE provides a framework within which to test, inspect and certify that solar PV technology, wind, and marine energy conversion systems fulfil the requirements of IEC International Standards. This covers products, services and personnel.

2016 was a busy year for IECRE, which reached a significant milestone, issuing its first two wind energy certificates in the last quarter for two different wind turbine OEMs by two different RECBs. Additionally, it promoted its work at international events, including the International Renewable Energy Agency (IRENA) Innovation Week.

The Renewables 2016 Global Status Report affirms the importance of RE contribution to global energy and thus the work of IECRE. In 2014 renewable energy provided an estimated 19,2% of global final energy consumption, while 2015 saw the largest ever annual increase in renewable power capacity of an estimated 147 gigawatts.

www.iecre.org

16	member bodies
7	Certification Bodies (RECBs)
14	Testing Laboratories (RETLs)
1	Inspection Body (REIB)
2	wind energy certificates in 2016 – Wind turbines

Encouraging development

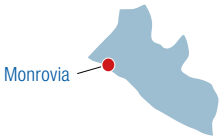
The IEC family comprises many developing countries both among its Members and Affiliates. To encourage economic development, help increase the resilience of infrastructure, facilitate access to investment, and better ensure the safety of populations, the IEC supports these countries in multiple ways, including with a globally unique Programme.

A globally unique Programme

With the Affiliate Country Programme the IEC has brought the advantages of its work to those developing countries who don't feel ready to enter into a membership in the IEC. The Programme was founded over 10 years ago and helps 86 developing countries to reinforce their national quality infrastructure and encourages them to protect citizens from low-quality products and dangerous electrical installations.

In 2016 the Syrian Arab Republic (July 2016) and Liberia (November 2016) joined the Programme.

Syrian Arab Republic
(July 2016)



Liberia
(November 2016)

Participation in the IEC Affiliate Country Programme is completely free of charge and allows developing countries to select up to 200 IEC International Standards for national adoption and up to 400 once they have established a

National Electrotechnical Committee (NEC) and declared the national adoption of 50 IEC International Standards.

In 2016, 15 Affiliate Countries continued to adopt IEC International Standards at the national level: Bangladesh, Bhutan, Botswana, Cambodia, Dominican Republic, DR Congo, Ecuador, Ghana, Guyana, Mongolia, Senegal, Sudan, Uruguay, Zambia and Zimbabwe. Furthermore four countries declared their very first adoptions - Burkina Faso, Gambia, Guinea and Namibia.

With six new NECs – Benin, Madagascar, Mauritania, Syrian Arab Republic, Tanzania, Togo – 61,6% of IEC Affiliates now have a NEC with representatives from the public and private sectors. More than half of Affiliate NECs have been granted the Affiliate Plus status, giving them priority for mentoring and doubling their quota of free IEC International Standards for adoption (400 instead of 200). Over the period in question, Benin, Cambodia, Guinea, Namibia, Senegal reached Affiliate Plus status.

Mentoring

The IEC has also put in place a mentoring programme that allows developing countries to benefit from the expertise and experience of IEC Members:

Afghanistan – Malaysia
Bhutan – Sweden
Côte d'Ivoire – France
DR Congo – France
Ecuador – Mexico
Ethiopia – Germany
Gambia – Netherlands
Mongolia – Germany
Peru – Mexico
Rwanda – Austria
Uruguay – Norway
Zambia – Austria

> So far, 14 IEC Affiliate countries have signed the Affiliate Conformity Assessment Status (ACAS).

During the 2016 IEC General Meeting in Frankfurt, bilateral face-to-face meetings between a number of mentors and Affiliate countries took place:

Bhutan – Sweden
Côte D'Ivoire – France
DR Congo – France
Ecuador – Mexico

Mentees and their mentors were able to review progress made so far and establish action plans for the year to come.

Grow understanding of conformity assessment

So far, 14 IEC Affiliate countries have signed the Affiliate Conformity Assessment Status (ACAS) pledge, which allows them to access training tools and to increase their participation in the IEC CA Systems, including participation as observers at management meetings. In 2016 Ecuador was the latest country to obtain the ACAS.

As part of ACAS, the IEC now provides e-learning modules to further the Affiliate Country participants' understanding of and involvement in IEC CA activities. Three sets of ACAS e-learning modules are available online. They deal with IECEE and its CB Scheme, IECEx and IECRE. They explain how the CA Systems operate, and how developing countries can get involved.

The e-learning modules are available for IEC Members too and can be accessed free-of-charge:
www.iec.ch/affiliates/acas/e-learning

In the context of ACAS, the IEC held on 20 and 21 April 2016 a regional seminar together with the Euroasian Interstate Council (EASC) in Baku, Azerbaijan. Around 30 delegates from Azerbaijan, Belarus, Kazakhstan, Moldova, Russian Federation, Uzbekistan and Ukraine, with a background in certification and conformity assessment testing participated in the seminar.

On 23-25 November 2016 in San José, Costa Rica, the IEC held an ACAS regional seminar in collaboration with the Pan American Standards Commission (COPANT), and the German National Metrology Institute (Physikalisch-Technische Bundesanstalt, PTB). An international audience composed of regulators and national standards body members attended, including delegates from Barbados, Bolivia, Colombia, Costa Rica, Dominica, Ecuador, Guatemala, Haiti, Honduras, Peru, Saint Lucia, and Trinidad and Tobago.

Events and partnerships

RNF: Collaboration with the standardization network for French speaking countries

In January 2016, the standardization network for French speaking countries (RNF, the Réseau Normalisation et Francophonie) and the IEC – through its Affiliate Country Programme – signed a Collaboration pledge.

PTB–IEC workshop, Tashkent, Uzbekistan, 26-27 January 2016

IEC joined PTB, the National Metrology Institute of Germany, in the organization of a workshop on quality infrastructure and its link to energy management in Tashkent. The event brought together some 100 participants from business sectors interested in energy management, the Uzbek National Standards Body (UZSTANDARD), public utility companies and other institutions.

WTO National Workshop, Bolivia, February 2016

This WTO National Workshop held in Bolivia focussed on Technical Barriers to Trade and the importance of International Standards, regional organizations and technical regulations for international trade.

Second Africa Smart Grid Forum and 5th AFSEC GA, Cairo, Egypt, 5-7 March 2016

The IEC participated actively in the Second Smart Grid

Forum for Africa held in Cairo. Several IEC international experts shared their expertise, including the convenor of the IEC SyC Smart Energy and the convenor of the IEC SEG on Microgrids.

DCMAS Network annual meeting, Paris, France, 10-11 March 2016

The IEC met with its partners of the DCMAS Network in Paris in order to exchange experiences and collaborative action in assisting developing countries to reinforce their national quality infrastructure, including metrology, standardization, conformity assessment and accreditation aspects.

SADC 30th GA, Kinshasa, DR Congo, 16-20 March 2016

The IEC spoke at the 30th General Assembly of the Southern African Development Community (SADC).

ARE Forum, Amsterdam, Netherlands, 12 April 2016

The IEC participated on a panel of the Alliance for Rural Electrification and the Africa-European Union Renewable Energy Cooperation Programme (ARE-RECP) Off-Grid Investment Forum 2016, which was held in Amsterdam, back to back with the ARE General Assembly. ARE is also a partner of the SE4ALL initiative.

AIDMO 46th HCCS meeting, Rabat, Morocco, 21-22 April 2016

The IEC attended the Arab Industrial Development and Mining Organization (AIDMO) 46th meeting of the High Consultative Committee for Standardization (HCCS) held in Rabat, Morocco.

WTO national workshop, Harare, Zimbabwe, 10-12 May 2016

The WTO held a national workshop in Zimbabwe on the main provisions of the Technical Barriers to Trade (TBT) Agreement, including transparency and notifications, the work of the TBT Committee and International Standards and systems for conformity assessment. On the request of Zimbabwe, an IEC Affiliate Country, the WTO invited the IEC to share its expertise in international standardization and conformity assessment.

IRENA Innovation Week, Bonn, Germany, 12-13 May 2016

The IEC Ambassador, Vimal Mahendru represented the IEC at the International Renewable Energy Agency (IRENA) Innovation Week.

IRENA-IEC event at IOREC 2016, Nairobi, Kenya, 30 September, 1 October 2016

The IEC was invited to participate in the 3rd edition of the International Off-Grid Renewable Energy Conference and Exhibition (IOREC), organized by IRENA in partnership with the Kenya Ministry of Energy & Petroleum and the Alliance for Rural Electrification (ARE).

The IEC also held a side-event together with IRENA on the topic of *Reliable clean energy solutions for energy access: the role of standards and quality assurance*.

Workshop for Industrializing Countries (WIC), PTB Braunschweig, Germany 11-12 October 2016

In the context of the 80th IEC General Meeting, the IEC held its annual Workshop for Industrializing Countries (WIC) in Braunschweig at the headquarters of the German national metrological institute PTB on the topic of *Quality infrastructure and renewable energy systems*.

AIDMO 47th HCCS meeting, Rabat, Morocco, 1-2 December 2016

The IEC attended the 47th meeting of the AIDMO HCCS.

TBT Committees, March, June and November 2016

The IEC attended the WTO TBT Committee meetings in March, June and November 2016. The Commission presented its report highlighting activities of the IEC, its Members, Affiliates and Regional Centres geared to increasing the participation of developing and industrializing countries in IEC international standardization and conformity assessment activities.

Education and training

Academia

The IEC organizes together with ISO and ITU under the auspices of the World Standards Cooperation (WSC), a yearly event destined to Academia. It took place on 12 October 2016 in Frankfurt, Germany, in the framework of the 80th IEC General Meeting. The topic was *Standardization for sustainability: the role of education*. IEC Ambassador Prof Dr Hiromichi Fujisawa gave the key note speech at the meeting and IEC Standardization Strategy Manager Jack Sheldon provided insights on *Disruptive technologies and sustainable development*. IEC Community Manager Jan-Henrik Tiedemann gave lectures at the Faculty of Innovation Economics and Management, Technical University Berlin on IEC and innovation.

Building the next generation

With an agenda that aims to mature the next generation of IEC leaders, the IEC Young Professionals Programme not only safeguards the future of the IEC but also ensures that industry continues to be able to develop the technical foundation for safe and reliable products that can be sold to many markets. The Programme, which was launched in Seattle in 2010, has brought together 406 participants from 49 countries, representing all sectors of electrotechnology.

The most recent workshop was held during the IEC General Meeting in Frankfurt. The Programme teaches participants to use standardization as a strategic and important networking tool to influence the future of their industry.

64% of former YP Programme participants increased their participation in national work. Many IEC National Committees have put in place similar programmes in their country.

Currently more than 100 YPs have active roles in the IEC, the most prominent include IEC Technical Committee Chairs, the Systems Resource Group (SRG) Convenor and Working Group Convenors among other roles. To date the Programme counts four IEC 1906 Award winners.

After the Frankfurt workshop nine YPs were elected to participate in seven different SMB and CAB groups as YP representatives giving them valuable experience and making sure the voice of the next generation is being heard.

IECEE held its first YP competition in 2016; two YPs were invited to attend the IECEE Certification Management Committee (CMC) meeting to learn more about IECEE work and network.

IEC training workshops for the IEC community

The IEC training programme continued throughout 2016 with several workshops for beginners and seasoned standardization experts in Sweden, Kenya, Ireland, the Netherlands and China (Beijing, Shenzhen). The programme received again excellent feedback. TC/SC Officers and IEC Technical Officers experienced positive outcomes from better trained convenors and experts participating in IEC working groups and project teams. Seasoned TC Secretaries underlined that they benefitted from the workshops, refreshing essentials and getting new insights.

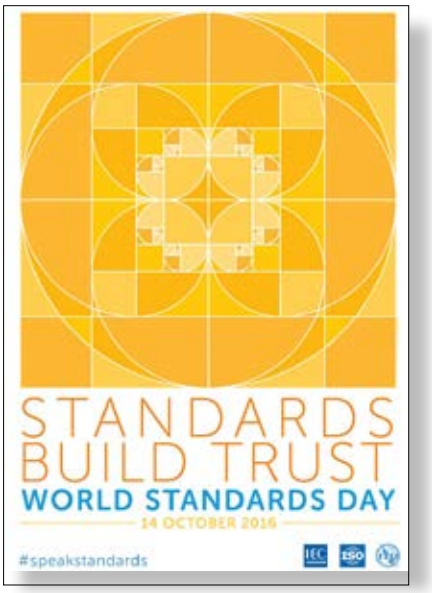
Several new TC/SC Officers and NC Secretaries received intensive training on their job by IEC staff at the IEC Central and Regional Offices.

Global partners

The IEC has agreements with close to 200 partner organizations as well as several hundred technical liaisons.

World Standards Cooperation

The World Standards Cooperation is a high-level collaboration between the IEC, the International Organization for Standardization (ISO) and the International Telecommunication Union (ITU). Under this banner, the three organizations defend their common interests in strengthening and advancing the voluntary consensus-based International Standards system.



Joint activities for 2016 included for example: Development of a brochure on the use of International Standards in bilateral/multilateral trade agreements. World Standards Day – Standards build trust, which comprised a poster and video competition.

Regional updates

The IEC has offices on 5 continents, including Australia, which hosts the Secretariats of the IECEx and IECQ CA Systems.

IEC-AFRC

On 2 November 2015, the IEC Africa Regional Centre (IEC-AFRC) officially opened in Nairobi, Kenya. As the regional focal point for Africa, IEC-AFRC is assisting countries in the region in the adoption and use of IEC International Standards and CA Systems. It cooperates closely with the African Electrotechnical Standardization Commission (AFSEC) to promote participation in and contribution to IEC work.

The Centre is run under the joint leadership of Evah Oduor, a well-known Kenyan with extensive know-how and expertise in standardization work, who is IEC Coordinator for Africa since 2008, and François Yapo Ahoti who joined the IEC from the United Nations Industrial Development Organization (UNIDO) where he worked as a Chief Technical Adviser in Standardization and Quality.

During 2016, IEC-AFRC held training and awareness sessions on IEC work in 17 countries and hosted regional events for ACAS.

IEC-APRC

Since 2002, the Asia-Pacific Regional Centre (IEC-APRC), based in Singapore, has played a major role in raising awareness of the IEC, increasing the use of International Standards and CA Systems and maximizing participation of all countries in the region in the Commission's work. It has established communication and networks with key players from industry, businesses and governments.

IEC-APRC Regional Director Dennis Chew and his colleagues regularly participate in conferences, workshops, fora and meetings, many of those organized by regional standards and regulatory bodies such as the Pacific Area Standards Congress (PASC), the Association of Southeast Asian Nations (ASEAN) and the Asia-Pacific Economic Cooperation (APEC).

Cooperation with regional fora has been strengthened with the signing of the co-operation agreement between IEC and the South Asian Regional Standards Organization (SARSO) on 10 October 2016 in Frankfurt. Amongst others, the agreement will encourage the use and adoption of IEC International Standards as well as the use of IEC Conformity Assessment Systems in the region. The 21-member APEC economies are home to around 2,8 billion people and represent approximately 59% of world GDP and 49% of world trade (2015).

IEC-APRC provides support for 54 IEC TCs and SCs and holds the Secretariat of the Advisory Committee on Electricity Transmission and Distribution (ACTAD) and the Advisory Committee on Energy Efficiency (ACEE).

Located in a research and development hub in Singapore, IEC-APRC offers meeting facilities for IEC activities. In 2016, the APRC hosted 21 working groups, maintenance teams and related meetings.

IEC-LARC

The Latin America Regional Centre (IEC-LARC) was established in 2007 in São Paulo, Brazil, to develop promotional activities in the Latin America and Caribbean region. Its Regional Director is Amaury Santos.

IEC-LARC was set up to actively encourage the use of IEC International Standards and CA Systems and to enhance

> The IEC has offices on 5 continents, including Australia, which hosts the Secretariats of the IECEx and IECQ CA Systems.

participation of countries in the Latin America region. Since its inception, the centre has seen new countries join the list of IEC Members. IEC-LARC also works closely with the Latin American countries that participate in the IEC Affiliate Country Programme, notably countries of the Andean Community and Central America.

IEC-LARC provides support to the Forum of IEC National Committees of the Americas (FINCA) and works continuously on strengthening ties with many important standards related organizations in the region to encourage their members to participate actively in the IEC. Those include in particular the Pan American Standards Commission (COPANT), the Council for Harmonization of Electrotechnical Standards of the Nations in the Americas (CANENA) and the Caribbean Community (CARICOM) Regional Organisation for Standards and Quality (CROSQ).

IEC-LARC attends, coordinates, and organizes events that match the needs of the region. They range from training seminars on the use of IEC IT tools to workshops on specific technical areas.

IEC-ReCNA

Established in Worcester, Massachusetts, USA, in 2001, the IEC Regional Centre for North America (IEC-ReCNA) provides support for 40 IEC TCs and SCs, particularly those with secretariats located in North America, as well as multiple advisory committees. It holds the secretariat of the MSB, SyC Smart Energy, SEG 7: Smart Manufacturing, the IEC DMT, ISO/IEC JDMT, SMB ad hoc Group 74 Dual Referencing & Profiles, and the SMB Advisory Committee Applications of Robot Technology (ACART).

IEC-ReCNA also offers training sessions on its premises for TC/SC Officers and hosted several important technical meetings.

As Secretary of the MSB, Peter Lanctot coordinates the publication of all IEC White Papers.

IEC-AFRC - Africa Regional Centre

IEC-APRC - Asia-Pacific Regional Centre

IEC-LARC - Latin America Regional Centre

IEC-ReCNA - Regional Centre for North America

Financial and sales highlights

The IEC is financed by a combination of membership dues and revenues from the sales of its publications.

In the consolidated accounts total membership dues amounted to CHF 11,34 million while revenues from sales (both direct sales from IEC CO and royalties from IEC NCs as well as resellers) came to CHF 10,58 million, which along with other revenues resulted in a total net income of CHF 25,35 million.

With total expenses for the year at CHF 25,17 million, of which personnel costs represented CHF 19,61 million, the IEC produced a net surplus for 2016 of CHF 184 248.

Key indicators

IEC consolidated profit and loss account for the year ended 31 December 2016

	2016	% of total income 2016	2015	% of total income 2016
Dues	**11 339 305**	**44,73%**	**10 939 002**	**42,77%**
Group A* dues	5 197 800	20,50%	5 061 000	19,79%
Associate Members	529 000	2,09%	517 500	2,02%
CA Systems	816 005	3,22%	697 502	2,73%
Sales	**10 583 630**	**41,75%**	**10 466 202**	**40,92%**
Net sales	2 509 507	9,90%	2 315 387	9,05%
Net royalties	8 074 123	31,85%	8 150 815	31,87%
Conformity Assessment Systems operations	**2 887 848**	**11,39%**	**3 118 626**	**12,19%**
IECEE	1 019 696	4,02%	1 045 063	4,09%
IECEx	1 500 593	5,92%	1 658 916	6,48%
IECQ	321 546	1,27%	414 647	1,62%
IECRE	46 013	0,18%	-------	-------
TOTAL NET INCOME	**25 352 255**	**100%**	**25 575 559**	**100%**
Personnel costs	19 610 571	77,35%	18 067 481	70,64%
TOTAL EXPENSE	**25 168 007**	**99,27%**	**25 224 495**	**98,63%**
SURPLUS FOR THE YEAR	**184 248**	**0,73%**	**351 064**	**1,37%**

* Group A comprises the IEC National Committees of China, France, Germany, Japan, the United Kingdom and the United States of America

IEC CO Sales

Sales of IEC Standards

IEC CO gross sales were 6,1% higher in 2016 compared to 2015, for a total of CHF 5,72 million.

Improvements on the IEC Webstore

The new Webstore was launched in 2015, its responsive design make it accessible on all devices. In 2016 several improvements have been implemented, the most important ones being:

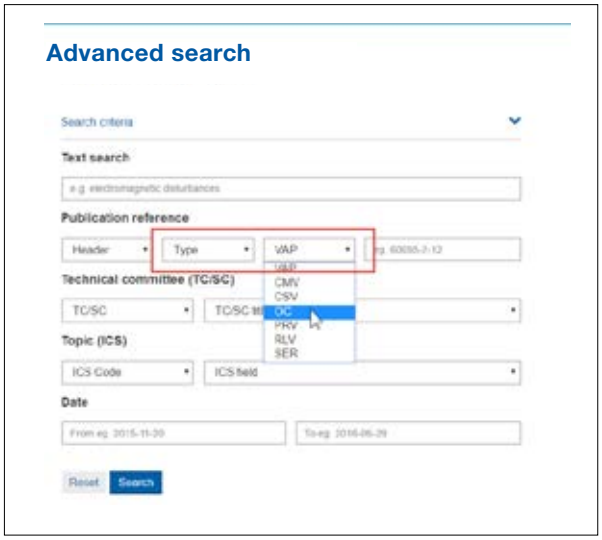
Advanced search

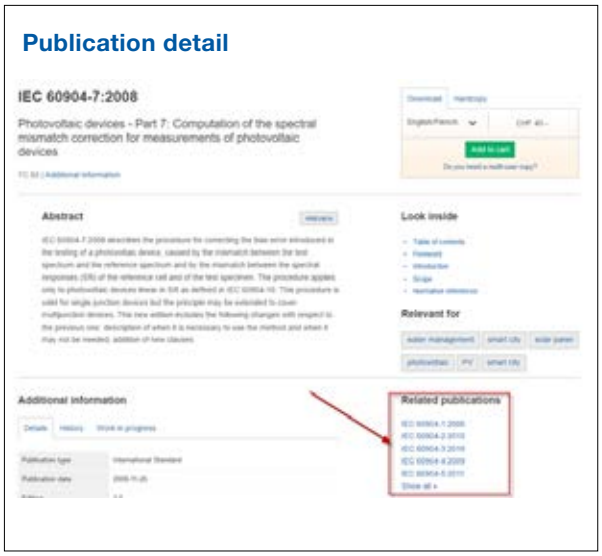
The Advanced search page has been updated, visitors can now search by Publication Type and Valuable Added Product (VAP).

Publication detail

When accessing a page giving details on a publication, visitors now have an area with direct links to related publications.

Overall we followed the «don't make me think» principles in order to improve the navigation and avoid unnecessary clicks.





IEC Members and Affiliates

84 IEC Members *(31 December 2016)*

Albania (AM)	Hungary	Norway
Algeria	Iceland (AM)	Oman
Argentina	India	Philippines, Rep. of the
Australia	Indonesia	Pakistan
Austria	Iran	Poland
Bahrain (AM)	Iraq	Portugal
Belarus	Ireland	Qatar
Belgium	Israel	Romania
Bosnia-Herzegovina (AM)	Italy	Russian Federation
Brazil	Japan	Saudi Arabia
Bulgaria	Jordan (AM)	Serbia
Canada	Kazakhstan (AM)	Singapore
Chile	Kenya (AM)	Slovakia
China	Korea, Rep. of	Slovenia
Colombia	Kuwait	South Africa
Croatia	Latvia (AM)	Spain
Cuba (AM)	Libya	Sri Lanka (AM)
Cyprus (AM)	Lithuania (AM)	Sweden
Czech Republic	Luxembourg	Switzerland
Dem. People's Rep. of Korea (AM)	Malaysia	Thailand
Denmark	Malta (AM)	The FYR of Macedonia (AM)
Egypt	Mexico	Tunisia (AM)
Estonia (AM)	Moldova (AM)	Turkey
Finland	Montenegro	Ukraine
France	Morocco (AM)	United Arab Emirates
Georgia (AM)	Netherlands	United Kingdom
Germany	New Zealand	United States of America
Greece	Nigeria (AM)	Vietnam (AM)

(AM) = Associate Members

86 IEC Affiliate countries *(31 December 2016)*

Afghanistan	Eritrea	Niger
Angola	Ethiopia	Palestine
Antigua and Barbuda	Fiji	Panama
Armenia	Gabon	Papua New Guinea
Azerbaijan	Gambia	Paraguay
Bahamas	Ghana	Peru
Bangladesh	Grenada	Rwanda
Barbados	Guatemala	Saint Kitts and Nevis
Belize	Guinea	Saint Lucia
Benin	Guinea Bissau	Saint Vincent and the Grenadines
Bhutan	Guyana	Senegal
Bolivia	Haiti	Seychelles
Botswana	Honduras	Sierra Leone
Brunei Darussalam	Jamaica	South Sudan, the Rep. of
Burkina Faso	Kyrgyzstan	Sudan
Burundi	Lao PDR	Suriname
Cambodia	Lebanon	Swaziland
Cameroon	Lesotho	Syrian Arab Republic
Central African Republic	Liberia	Tanzania
Chad	Madagascar	Togo
Comoros	Malawi	Trinidad and Tobago
Congo	Mali	Turkmenistan
Costa Rica	Mauritania	Uganda
Côte D'Ivoire	Mauritius	Uruguay
Dem. Rep. of the Congo	Mongolia	Uzbekistan
Dominica	Mozambique	Yemen
Dominican Republic	Myanmar	Zambia
Ecuador	Namibia	Zimbabwe
El Salvador	Nepal	

in blue: Affiliate Plus countries

underlined: Affiliate countries with NEC

Adoptions of IEC publications:	over 5 000
Affiliate Plus:	29
NECs:	53
Experts	150

IEC Leadership

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1.

Junji Nomura

IEC President
(Japan)

Terms of office:
President-Elect: 1 January 2013
President: 1 January 2014 - 31 December 2016
Immediate Past President: 1 January 2017 - 31 December 2018
Past President: 1 January 2019

Recent career highlights:
From 2004 Junji Nomura was CTO of Panasonic Corporation, a global technology company employing 254 000 people around the world. He currently holds the role of Corporate Advisor, Energy Solution Business Promotion.

2.

James M. Shannon

IEC President-Elect
(United States)

Terms of office:
President-Elect: 1 January 2016
President: 1 January 2017 - 31 December 2019
Immediate Past President: 1 January 2020 - 31 December 2021
Past President: 1 January 2022

Recent career highlights:
From 2002 to 2014, James M. Shannon was President and Chief Executive Officer of the National Fire Protection Association (NFPA). Prior to that, he served as Attorney General of the Commonwealth of Massachusetts and was a Senior Partner at the law firm of Hale & Dorr in Boston, USA. He was elected to the United States House of Representatives in 1978 and served in the House until 1985. A member of the Ways and Means Committee for six years, he served on the Trade, Health, and Social Security Subcommittees.

3.

Åke Danemar

IEC Treasurer
(Sweden)

Terms of office:
First term began: 1 January 2012
Second term ends: 31 December 2017

Recent career highlights:
Prior to his mandate at the IEC, Åke Danemar was Senior Director and Department Manager at Teknikföretagen (Association of Swedish Engineering Industries) from 1999 to 2010 and held management positions at the Swedish Electrical Manufacturers' Association (ELIF) and in ABB. Until 2010, he was Chairman of Orgalime Committee for the Electrical and Electronics Industries (CEEI) and a board member on the Swedish Standards Institute, the Swedish Terminology Institute and Intertek SEMKO's Certification Committee.

4.

James E. Matthews III

IEC Vice President
Chair of the IEC Standardization Management Board (SMB)
(United States)

Terms of office:
First term began: 1 January 2011
Second term ends: 31 December 2016

Recent career highlights:
James M. Matthews is Director of worldwide standards engineering activities for multiple business divisions across Corning Incorporated, a US company which employs more than 30 000 people globally. He was President of the US National Committee until end 2010 and serves on the board of the American National Standards Institute (ANSI), which holds the US NC Secretariat.

5.

Ulrich Spindler

IEC Vice President
Chair of the IEC Conformity Assessment Board (CAB)
(Germany)

Terms of office:
First term began: 1 January 2015
First term ends: 31 December 2017

Recent career highlights:
Prior to his current function as Corporate Advisor for the Electrical Sector of Eaton Corporation, Ulrich Spindler served as Head of Coordination for Associations in EMEA. Eaton is a US based company that employs 97 000 people around the world. He also held leading positions within the German Electrotechnical Manufacturer Association ZVEI, the German Electrotechnical Commission DKE and was President of CENELEC from 2003 to 2007.

6.

Yinbiao Shu

IEC Vice President
Convenor of the IEC Market Strategy Board (MSB)
(China)

Terms of office:
First term began: 18 January 2013
Second term ends: 31 December 2018

Recent career highlights:
Yinbiao Shu is currently Chairman of State Grid Corporation of China (SGCC) which ranks second in the Global Fortune 500 list and is employer to close to two million people. He is a member of the Energy Experts Consultative Committee of the Chinese State Council, Executive Director of the Chinese Society for Electrical Engineering (CSEE) and Deputy Director of the Chinese National Energy Industry Wind Standardization Technical Committee.

7.

Frans Vreeswijk

IEC General Secretary & CEO
(Netherlands)

Frans Vreeswijk became IEC General Secretary and CEO on 1 October 2012 after having served as Deputy General Secretary since 1 March 2012. Prior to joining the IEC Central Office, he held the position of Vice President and member of the Executive Management at Philips headquarters in Eindhoven, with global responsibility for Philips standardization and intellectual property activities. He worked more than 30 years in positions of increasing responsibility for Philips in the Netherlands, Austria and the US. He was President of the Dutch National Committee of the IEC (NEC), served on the IEC Council Board (CB) and SMB, and represented the Netherlands in European standardization activities at CENELEC.

IEC Ambassadors

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The IEC Ambassadors programme was put in place to help expand the reach of the IEC.

IEC Ambassadors are individuals who have a proven track record of explaining the benefits of the IEC. Their main responsibility is to reach out to key stakeholders in industry, government or academia and to endorse the IEC. The aim is to enhance active involvement in IEC activities and help identify new areas of work. IEC Ambassadors are appointed by the Executive Committee for a two-year term, which can be renewed twice. They are independent, unpaid volunteers.

The following IEC Ambassadors are currently active:

1.

Cyrille Brisson

Vice President Marketing EMEA, Eaton Electrical

Mr Brisson has been appointed IEC Ambassador for a two-year term (2016-2017) to represent the interests of the IEC in the sector of disaster mitigation and recovery.

2.

Hiromichi Fujisawa

Visiting Professor at Waseda University in Tokyo, Japan, and Technical Advisor at inQs Co., Ltd.

Dr Fujisawa has been appointed IEC Ambassador for a two-year term (2016-2017) to reach out to regulators/governments in the area of conformity assessment and enhance the involvement of academia in IEC work.

3.

Vimal Mahendru

President of Legrand-India

Mr Mahendru has been appointed IEC Ambassador for a two-year term (2016-2017) to represent the interests of the IEC in the sector of LVDC and rural electrification.

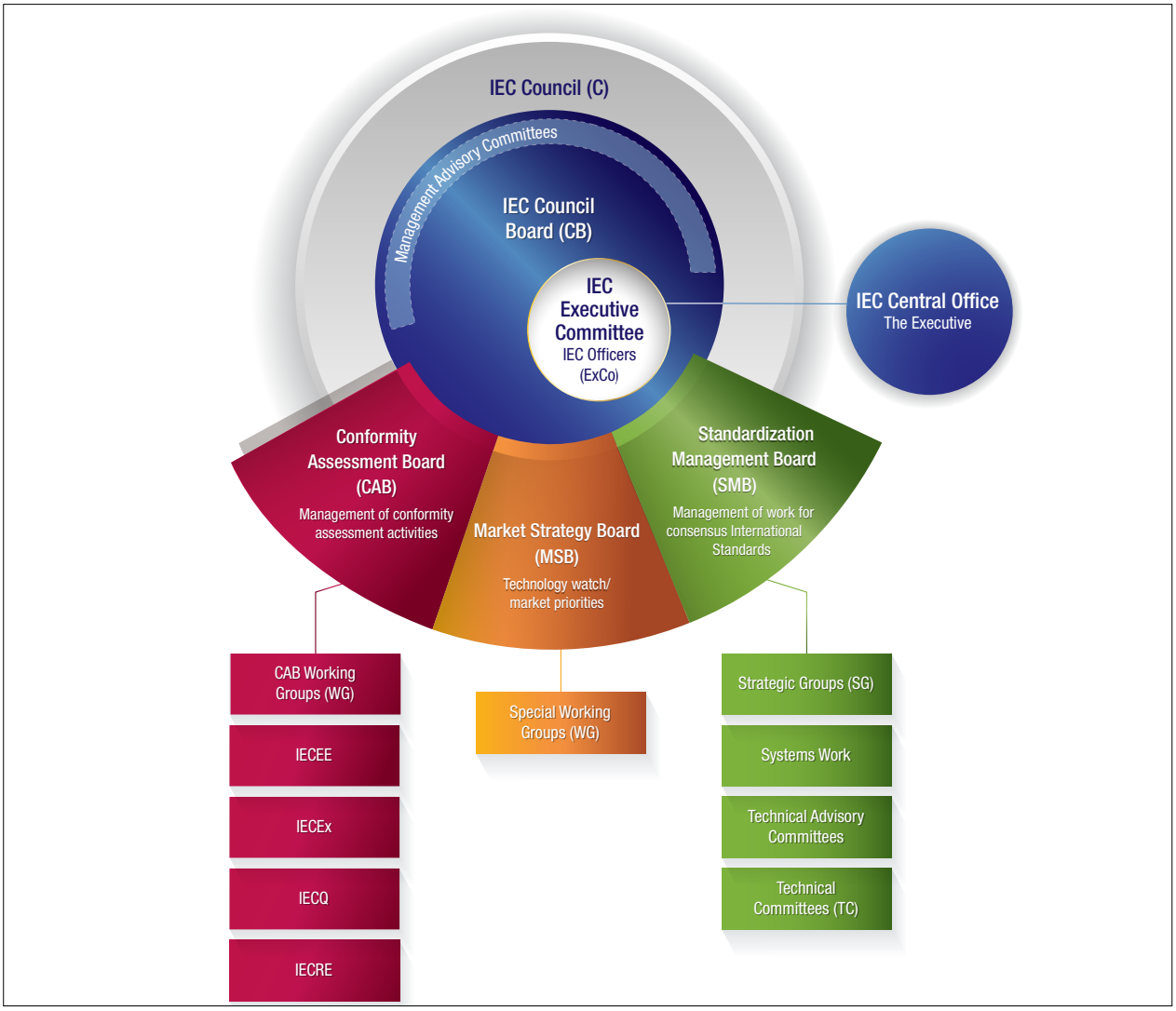
4.

Richard Schomberg

Vice-President Smart Energy Standardization at EDF (Electricité de France) Group

Mr Schomberg has been appointed IEC Ambassador for a two-year term (2016-2017) to represent the interests of the IEC in the sector of Smart Energy.

IEC Governance structure



The IEC is a global not-for-profit, non-governmental organization.

The IEC President represents the Commission and is the Chair of Council, of the Council Board, of the Executive Committee, as well as of the MSB. Prior to becoming President he/she holds the position of President-Elect for one year. After a single three year term as President, follows a two year period as Immediate Past President and then Past President.

The IEC elects two to three Vice-Presidents. These are *ex officio* also Chair of the SMB and the CAB for the duration of their term.

The General Secretary is also the Chief Executive Officer of the Commission and responsible for all day-to-day operations. The IEC Central Office is in charge of supporting IEC operations.

Each of the IEC Conformity Assessment (CA) Systems has its own separate management structure

Further information

Please visit the IEC website at www.iec.ch for further information. In the "About the IEC" section, you can contact your local IEC National Committee directly. Alternatively, please contact the IEC Central Office in Geneva, Switzerland or the nearest IEC Regional Centre.

Global

IEC – International Electrotechnical Commission
Central Office
3 rue de Varembé
PO Box 131
CH-1211 Geneva 20
Switzerland

T +41 22 919 0211
Fax +41 22 919 0300
info@iec.ch
www.iec.ch

IEC Regional Offices

Africa

IEC-AFRC – Africa Regional Centre
7th Floor, Block One, Eden Square
Chiromo Road, Westlands
PO Box 856
00606 Nairobi
Kenya

T +254 20 367 3000 /
+254 20 375 2244
M +254 73 389 7000 /
+254 70 493 7806
Fax +254 20 374 0913
eod@iec.ch
fya@iec.ch

Asia Pacific

IEC-APRC – Asia-Pacific Regional Centre
2 Bukit Merah Central #15-04/05
Singapore 159835

T +65 6377 5173
Fax +65 6278 7573
dch@iec.ch

Latin America

IEC-LARC – Latin America Regional Centre
Av. Paulista, 2300 – Pilotis Floor – Cerqueira César
São Paulo - SP - CEP 01310-300
Brazil

T +55 11 2847 4672
as@iec.ch

North America

IEC-ReCNA – Regional Centre for North America
446 Main Street, 16th Floor
Worcester, MA 01608
USA

T +1 508 755 5663
Fax +1 508 755 5669
tro@iec.ch

IEC Conformity Assessment Systems

IECEE / IECRE
c/o IEC – International Electrotechnical Commission
3 rue de Varembé
PO Box 131
CH-1211 Geneva 20
Switzerland

T +41 22 919 0211
Fax +41 22 919 0300
secretariat@iecee.org
secretariat@iecre.org
www.iecee.org
www.iecre.org

IECEx / IECQ
The Executive Centre
Australia Square, Level 33
264 George Street
Sydney NSW 2000
Australia

T +61 2 4628 4690
Fax +61 2 4627 5285
chris.agius@iecex.com
chris.agius@iecq.org
www.iecex.com
www.iecq.org

Making electrotechnology work
for you.

International
Electrotechnical
Commission

3 rue de Varembé
PO Box 131
CH-1211 Geneva 20
Switzerland

T +41 22 919 0211
Info@iec.ch

For more information visit: www.iec.ch