# The History of the VDE

## A Development from a German Technical Society to an Association Acting as an All-Inclusive Platform for Electrotechnology

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*Abstract* - **In 1879, Werner Siemens and Heinrich Stephan, chief administrator of the postal, telephone and telegraphy system, initiated the foundation of the 'Electro-technical Society' [1] ('ETV) in Berlin, Germany. At that time, the society considered itself as a center for those who dealt with electrotechnology on a professional, scientific or private basis, or at least taught it. Finally VDE, the 'Society of German Electrotechnologists' [2] was founded as an umbrella organization covering several regional ETVs all over Germany in 1893. At present, the organization of the VDE comprises a setup in the field of electrotechnology which is unique worldwide.**

*Technical Society, Electrotechnology, Association, VDE, Committees, History, Siemens, Standardization, Germany, Berlin, Frankfurt am Main*

### I. The Beginning

#### *A. Werner Siemens – one of the VDE initiators and inventor of 'electrotechnology'*

Beginning in 1879, the number of inventions in the field of electrotechnology seemed to reach such a critical mass that coordination, communication and standardization, means for electrical safety, but also boosting the electrotechnology as a field of science became a necessary consequence. Werner Siemens, the famous industrialist and inventor wrote: "…we see all-around a wild race on the field of electrotechnology, a restless striving to grant the electricity a relevant place in the old branches of industry and to establish new ones based on it."

Werner Siemens and Heinrich Stephan, chief administrator of the German postal, telephone and telegraphy system (PTT), initiated the foundation of the 'Electro-technical Society' (ETV) in Berlin, the capital of Germany. Siemens also was its first chairman. At that time, ETV considered itself as a center for those who dealt with electrotechnology on a professional, scientific or private basis, or at least taught it. Shortly after that, several ETVs followed in different regions of Germany.

1879 was also the year when the term 'electrotechnology' first appeared in the German-speaking part of Europe, as applied in a letter by Werner Siemens. Herein electrotechnology was not only considered as the application of electricity but also something that represented a main characteristic of creativity in engineering. From the very beginning it was also made clear that electrotechnology comprised both the field of high power applications such as energy generation, transmission and consumption, as well as the field of communication technology utilized by electrical energy. From Siemens' point of view, a technical society for telegraphy alone would not have had the critical mass and it is interesting to say that telegraphy was considered as the more conservative disciplines in electrotechnology where less progress could be expected than in others.

The meaning of this young and trend-setting scientific branch was clearly recognized by Siemens who called with the help of ETV-Berlin in 1881 to establish scientific chairs at all technical universities in Germany.

Furthermore, not only the standardization in electrotechnology but also the more basic harmonization of physical units in Germany was driven by Siemens. By the time of 1887, he participated at the foundation of the 'Technical and Physical Institute' [3] (PTR later PTB) also in Berlin, a governmental facility.

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[1] 'Elektrotechnischer Verein'

[2] 'Verein Deutscher Elektrotechniker'

[3] 'Physikalisch Technische Reichsanstalt' (PTR), 'Physikalisch Technische Bundesanstalt (PTB)'


Figure 1. A stamp from 1992 '100th year of death' showing Werner von Siemens

### *B. Berlin – the 'Electropolis'*

The industrial revolution changed Berlin to a wide extent. The rather unassuming little city in Prussia suddenly found itself becoming a modern industrial metropolis.

Berlin started out making mostly machines, but around 1895 the Electro-technical industry began to assume the leading role in the city's economy. Creative inventors, ambitious engineers, and powerful investors developed and supported Electro-technical innovations for the German and international markets. The world's first electrical railways and streetcars, the beginning of electrical street lighting in Germany and the first rotary current motor are just a few of the milestones in this time of rapid technological developments. In Berlin, pictures first learned how to move in Germany, Germany's first underground train traveled, and the first metropolitan telephone center in Europe was located. Companies like 'Siemens & Halske', 'AEG', 'Telefunken' and 'Osram', all headquartered in Berlin, forever changed the economic climate of the city. From here, their Electro-technical products started off into the rest of the world – (products such as radios, power plant installations, generators, vehicles of all kinds, and many more creations.)

At the beginning of the 20th century, 50% of the products produced by the world's electro industry originated in Germany. And a good half of those came from Berlin. A hundred years ago, Berlin was the focal point of the modern electro industry in Germany – a veritable 'Electropolis' in the heart of Europe.

This meant that Berlin provided an excellent environment for establishing a technical Society for Electrotechnology and in turn such a society could contribute well to the technical progress in this field.

### *C. Foundation of the VDE*

1893 finally, the VDE, the 'Society of German Electrotechnologists' [4] was founded as an umbrella organization covering several regional societies (ETVs) all over Germany. The foundation assembly was chaired by Adolf Slaby – one of Germany's great pioneers in wireless communication – in January 1893 in Berlin. The assembly had to be postponed from an earlier date than planned, because meanwhile, Werner von Siemens passed away. Slaby became the first chairman of the new central society. Still today, honorable people from academia or industry, for example executive board members of the companies of 'Siemens' or 'ABB', hold the VDE presidency for a two year duration.


Figure 2. A stamp '125th year of birth' from 1974 showing Adolf Slaby

While the mission of the regional ETVs was to foster the technical applications of electricity and technical sciences and assemble the stakeholders of electrotechnology, the motivation for founding an umbrella organization went further. The mission of the VDE was to create a central organization for technical, standardization and professional issues on the legislative and especial industry policy basis.

Still today, those principles have stayed nearly the same, but of course the VDE is subject to external national and international conditions and is therefore a continuously changing and growing organization.

Under the responsibility of the ETV-Berlin the 'Electro-technical Journal' [5] (ETZ) was published for the first time in 1880. In 1894, it became the official press organ of the VDE and it is still issued nowadays every two weeks. The archive of the ETZ is therefore one of the basic sources of German history of electrotechnology.

## II. Activity and Organization Now – the 'All-Inclusive Platform'

To date, the VDE always has kept the same three letter acronym, but has been renamed meanwhile as the 'Association for Electrical, Electronic & Information Technologies' [6]. It is one of the largest technical and scientific associations in Europe and has more than 34,000 members.

The organization of the VDE comprises a setup in the field of electrotechnology which is unique worldwide and which is based on three main pillars:

- Standardization
- Testing and Certification
- The association Section: Science & profession comprising technical and scientific societies, professional and political activities.

[4] 'Verein Deutscher Elektrotechniker'

[5] 'Elektrotechnische Zeitung'

[6] 'Verband der Elektrotechnik, Elektronik und Informationstechnik'

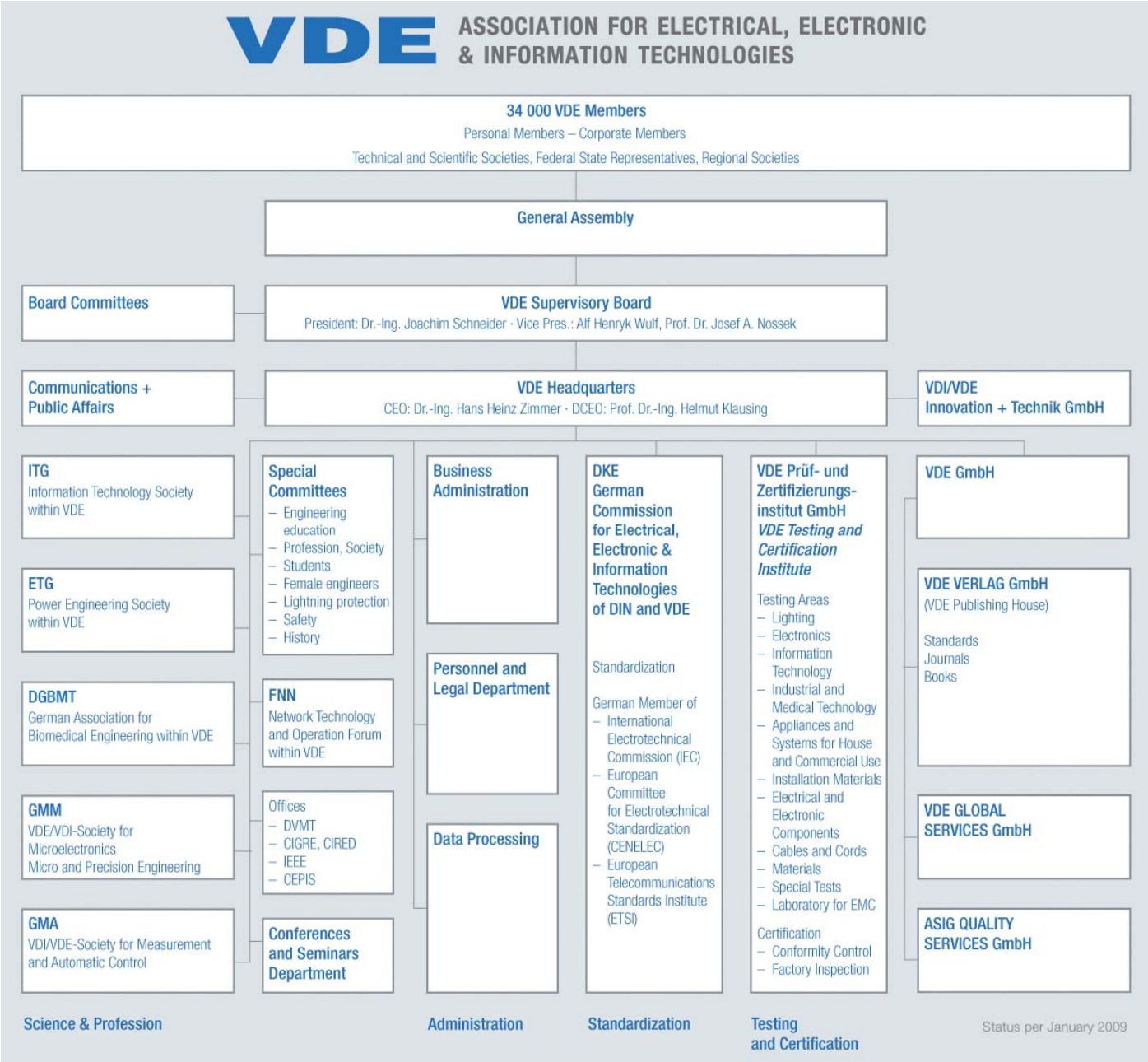


Figure 3. VDE's organization chart [1] with its three pillars Science & Profession, Standardization, Testing & Certification

Not only engineers belong to the VDE but also researchers, students, technicians and many important enterprises in the electrical, electronic and information technology industry, the electrical utilities, federal authorities and institutions. The Association is represented throughout Germany on a regional basis by 29 regional societies.

The responsibilities of the Association include continued development of electrotechnology, electronics, information technology and technologies based on these; support of the use of electrotechnology in other disciplines; promotion of knowledge transfer; further education and career development by a varied programme of congresses, technical symposia and seminars; participation in political decision-making on education and research; promotion of scientific knowledge and training.

At the same time, VDE works to improve the general public's understanding – and acceptance – of technology in the belief that innovation is one of the strongest assets of German industry – and the one factor that can secure our global competitiveness however tough the markets may be.

And on the practical side – the side that the public most frequently sees – VDE makes sure that the Electrotechnical products sold in Germany and worldwide are safe, and guarantee this with strict testing certified with the famous VDE mark. Today, more than 200,000 types of products worldwide carry VDE certification marks.

The VDE works on a number of levels to pursue its aims and its organization comprises amongst others technical and scientific societies:

- ITG Information Technology Society [7],
- ETG Power Engineering Society [8],
- DGBMT German Society of Biomedical Engineering [9],
- GMM Society of Microelectronics, Micro and Precision Engineering [10],
- GMA Society of Measurement and Automation Engineering [11],

an Electro-technical standardization department, a testing and certification institute, a publishing house, a symposium service and several standing committees.

## III. Standardization

Today, as a joint organization of both VDE and 'German Institute of Standardization' [12] (DIN) the standards committee 'German Commission for Electrical, Electronic & Information Technologies' [13] (DKE) is responsible for the elaboration of standards and safety specifications covering the areas of electrical engineering, electronic and information technologies.

The DKE is the German member of 'International Electro-technical Commission' (IEC), Geneva, and 'European Committee for Electro-technical Standardization' (CENELEC), Brussels. Furthermore, it is the responsible national standards organization (NSO) for Germany of the 'European Telecommunications Standards Institute' (ETSI), Sophia Antipolis.

### *A. Legal Impacts of VDE Standards*

Standards are a measure for proper technical behaviour especially regarding safety, compatibility and quality, but also a tool for the transfer of innovations to the global market. The application of standards is generally voluntary, however, application may be mandatory on the basis of legal or administrative requirements, and on the basis of contracts or for other legal reasons. On the other hand, if a manufacturer does *not* employ standards in his products, he carries necessarily the burden of proof in a judicial dispute.

The application of standards does not release anyone from the responsibility of his actions. In this respect, everyone is acting at his own risk. In the case of safety provisions in 'DIN VDE standards', there is a factual presumption of law that the standards are drawn up in a proper and workmanlike manner, i.e. that they are 'acknowledged rules of technology'. The content of standards shall be oriented in accordance with the requirements of the public. Therefore, it is necessary that standards take into account the present state of the art.

### *B. Standardization Activities*

Two months after the foundation of the VDE in 1893, the first general assembly of the VDE took place in Cologne. At this assembly the board members of the association constituted as permanent commission to devise standards for operating electrical installations. Due to the participation of all stakeholders in working on the standards, a high level of objectivity was considered. Thus, they were accepted by most of the German federal states in 1896 and were given the authorities as a technical guideline.

One of the first outcomes of VDE was the 'safety rules for electrical high voltage installations' released in 1895. This was the predecessor of today's fundamental standard DIN VDE 0100. This was followed by safety and installation rules for theatres, warehouses, railway constructions, and even 1899 a guideline for first aid in case of accidents in electrical factories. Later, in 1935 VDE standards received the status of 'acknowledged rules of technology' in the German legal framework.

VDE participated in the foundation of the IEC in 1906. The IEC included 24 member states at that time.

After the Second World War, VDE fully participated from 1952 in the international standardization organizations again. In 1970, the DKE was founded as an organ of the VDE and also subordinated to DIN. The motivation was to concentrate all standardization activities of electrotechnology and furthermore to be the German representative in international standardization. In order to harmonize national standards of electrotechnology on a European basis, CENELEC was founded as a replacement of the former organizations CENELCOM and CENEL in 1972. One year later, for the first time the principle of reference to harmonized standards was applied in an directive for the Common European Market by the ‘Low Voltage Directive’ (73/23/EWG).

With the standards agreement of 1975 in Germany, the government and DIN agreed not only to use DIN standards in administration and tender specifications, but also referring to DIN standards in legal regulations. VDE standards do not only disburden the Federal Government of Germany. The Government has recently expressed the decisive role of standards for the growth and benefit of the German and the European economy as well.

As a result of a study about German national economy the use of standardization was estimated in 2000. The overall benefit constitutes 21 Bln. US$ per year. The importance of standardization is still recognized as it was from the beginning and the time of foundation of the VDE. Due to globalization as well as rapid changes in technology, in 2004 a 'German Strategy for Standardization' was published which should guide the activities in the future.

## IV. Testing and Certification

With the increasing utilization of VDE specifications there was a need to mark appliances in conformity with these specifications. For this reason, a testing and certification agency was founded in 1920 in Berlin with the task to test and certify Electro-technical products (Installation materials, appliances, cables and cords etc.) for conformity with VDE standards and beyond that to

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7 Informationstechnische Gesellschaft im VDE

8 Energietechnische Gesellschaft im VDE

9 'Deutsche Gesellschaft für Biomedizinische Technik im VDE'

10 'VDE/VDI-Gesellschaft für Mikroelektronik, Mikro- und Feinwerktechnik'

11 'VDI/VDE-Gesellschaft für Mess- und Automatisierungstechnik'

12 'Deutsches Institut für Normung'

13 'Deutsche Kommission Elektrotechnik Elektronik Informationstechnik im DIN und VDE '

undertake preparatory steps for the solution of technical tasks of the VDE.


Figure 4. A stamp '100th anniversary of VDE' from 1993 depicts VDE test for electrical safety and the VDE certification mark (top left)

After the Second World War, the activities of the new 'VDE Testing and Certification Institute' [14] were started in 1948 in Wuppertal. By the middle of the year 1949, a number of 487 applications for testing had been received, among them 35% of thermal appliances and 43% installation materials. The institute moved to Frankfurt in May 1950 after establishing VDE headquarters in Frankfurt. On 20 February 1961 the VDE House is officially inaugurated. The VDE Testing and Certification Institute was accommodated in the same building on a surface area of 2,000 m². In 1968, the Institute started its operations in Offenbach am Main near Frankfurt am Main. Laboratories and administration building comprised a surface area of around 4,300 m² on a terrain of 17,000 m². After completion of the first extension in 1983 and the second extension in December 1988 the surface area was increased to 17,000 m².

Today, its scope of testing and certification comprises nearly the entire range of Electro-technical products. The independent VDE institute with its 450 employees and with accreditations on national and international level contributes greatly to safety and quality of Electro-technical products and systems. Testing and certification together with factory and market surveillance are corner stones for safe products on the market. Therefore, they describe a socio-political task for the benefit of consumer safety.

The main testing areas are now:

- Lighting, Electronics, Information Technology, Industrial and Medical Technology
- Appliances and Systems for House and Commercial Use
- Installation Materials, Electrical and Electronic Components
- Cables and Cords, Special Testing
- EMC Testing

## V. Association, Committees, and Technical and Scientific Societies

VDE belongs mainly to the group of technical and scientific associations. Namely, they represent the interests of technology. In case of the VDE, this means in turn not only the electrotechnology and information technology as sciences but also people and companies who are involved and even the whole community in technology matters. The technical and scientific societies and the number of standing committees represent the non-profit section of the VDE – the association. Societies mainly are keeping up the knowledge transfer in their respective technical field in several kinds of ways. Both, technical societies and committees have to provide information to support VDE's political activities, for example position papers and (corresponding) studies. Deploying this setup, VDE is well accepted as a competent and neutral dialog partner.

### *A. Information Technology Society in VDE [15] (ITG)*

At the beginning of the 1950s, communication engineers had with about 15% only a minor part of the VDE membership. In order to maintain the VDE as an association that embraces all fields of electrotechnology and to avoid separation of this field, it was finally decided in 1954 to establish the 'Communication Technology Society' [16] (NTG). The NTG was the first technical and scientific society of the VDE which covered a special field of electrotechnology. One of the supporters was Karl Küpfmüller – the famous German pioneer of information and systems theory – who moderated this foundation.

Due to the convergence process of communication technology, computer science, and accordant microelectronic applications to information technology, the 'Communication Technology Society' adopted as 'Information Technology Society' in 1985.

The structure and organization of the ITG served as a model for the foundation of other technical and scientific societies in VDE; for example the power engineering society.

The 'Information Technology Society' deals with all aspects of information technology in industry, administration, teaching, research and science. Its primary aim is to promote the scientific and technical development of information technology and its practical application. Today it has around 11,000 members, with 1,400 volunteer experts working in various bodies.

ITG aims to promote information and communications technology research, generate new ideas for the information society, and coordinate ICT developments on an international level.

ITG activities:

- Exchange and evaluation scientific findings, information, etc.
- Organizing discussions, workshops, seminars and conferences to debate the latest developments in ICT
- Publication of position papers, technical journals, conference reports, brochures, periodicals, etc.
- Collaboration with national and international associations
- Participation in research projects
- Providing terminology for IT standardization

[14] 'VDE Prüf- und Zertifizierungsinstitut'

[15] 'Informationstechnische Gesellschaft im VDE'

[16] 'Nachrichtentechnische Gesellschaft'

- Influencing and advising on education and training issues
- Prizes and awards to honor outstanding academic achievements of upcoming ICT engineers and scientists

The ITG fields are represented by nine specialist divisions containing over 100 bodies covering the entire spectrum of information and communication technology:

- Information Society and Focus Projects
- Services and Applications
- Broadcasting, Film and Electronic Media
- Audio Communication Technology and Systems
- Computer Science and Technical Computer Science
- Microelectronics
- Shared Concepts and Components
- International collaboration

The origin of the ITG's press organ was the 'Journal of Telegraphy' [17] (FTZ) published by an external publishing house, but was adopted as 'Journal of Communication Technology' [18] (NTZ) shortly after the foundation of the ITG. In 1967, the publisher of NTZ passed over to 'VDE-Verlag', the VDE's own publishing house.

Several changes and processes leaded to an adaption of the work and the structure of ITG during the past 50 years. One of them is the switch from analog to more and more digital technology in data transmission and processing. Another shift of paradigm is the growing part of software in IT Systems instead of pure hardware. Furthermore, there is the unstoppable trend of the pervasion of information technology through all kinds of sciences and technologies as well as peoples life. The continuing disappearance of telecommunication industry in Germany will be a challenge for the future work of the ITG.

### *B. Power Engineering Society in VDE [19] (ETG)*

The field of power engineering is one of the most traditional in electrotechnology. Nevertheless it is one of the most important in the presence – not only induced by climate change.

The ETG was founded in 1974 and followed the model of the ITG as a technical and scientific society. It has currently around 12,500 members and is the biggest society in Germany in the field of power engineering. The society promotes ongoing developments in the generation, transmission, distribution and use of electrical power. Its aims are to spread information about new technological developments, support the internationalization of power supplies, and find viable compromises between society's needs and technically feasible solutions. Especially by carrying out extensive studies on energy issues, the ETG is presently leading an intensive dialogue with German government.

ETG focuses:

- The development of power engineering
- New ways of generating, transmitting and distributing electricity
- Primary energy conservation measures
- The use of regenerative power sources (sun, wind, water), fuel cells
- The improvement of drive systems
- New power storage methods
- The use of new materials like superconductors
- New developments in power electronics and microelectronics
- Power systems, including computer-based and automation technology
- Trends in electric railways and vehicles
- New developments in the field of electro heating

The ETG organizes technical and scientific conferences and workshops like the ETG Congress every two years. This forum gives members the opportunity to present as-yet unpublished technical and scientific papers to an expert audience. ETG makes also a major contribution to CIRED, the international conference on electrical distributions grids.

The ETG is organized into the following specialist divisions:

- Power Supply
- Electrical Power Generation
- Power Transmission and Distribution
- Power Economy
- Application of Electrical Energy
- Electrical Machines and Drives
- Railways and Vehicles with Electrical Drives
- Electro heat
- General Technologies
- Power Electronics
- Materials, Electrical Insulations and Diagnostics
- Contact Behavior and Switching

The ETG is responsible for the ETZ issued by the VDE publishing house. It also publishes the 'European Transactions on Electrical Power Engineering' (ETEP) as well as various ETG circulars.

The ETZ has been published since 1880 and is the oldest professional journal of electrotechnology in Germany and is still issued twice a month. From 1929, the ETZ has been published in its own publishing house, the 'ETZ-Verlag'. Later on, the 'VDE-Verlag' was adopted, which is now VDE's publishing house for standards, technical and scientific papers, and books.

### *C. The VDE/VDI Society of Microelectronics, Micro and Precision Engineering [20] (GMM)*

GMM is one of two joint technical and scientific societies of the VDE *and* the VDI. It was founded in 1996,

[17] 'Fernmeldetechnische Zeitschrift'

[18] 'Nachrichtentechnische Zeitung'

[19] 'Energietechnische Gesellschaft im VDE'

[20] 'VDE/VDI-Gesellschaft für Mikroelektronik, Mikro- und Feinwerktechnik'

originating from 'VDE/VDI-Society Microelectronics' [21] (GME) and 'VDI/VDE-Society Micro- and Precision Engineering' [22] (GMF). Both again were joint societies of VDE and VDI.

The Microelectronics Society GME was sited at VDE and established in 1984.The predecessor of the GMF is the 'VDI Working Group Precision Engineering' [23] founded in 1948 and adopted in the corresponding society in 1976. The origin of precision engineering is located 1893 in a paper 'The Mechanic' [24] where fine mechanical issues appeared for the first time. Later, in 1923 it was merged with another paper and was entitled 'Journal of Fine Mechanics and Precision' [25].

GMM is now structured with 7 departments containing all in all about 50 active committees. The total number of members is about 8.000; amongst them 3.000 from VDE and 5.000 from VDI.

The technological areas covered by the GMM – microelectronics, precision engineering, microsystems and nanotechnology – increasingly overlap and complement one another and are mutually dependent in a wide variety of applications. Precision engineers, for instance, use elements of mechanical, optical and electrical engineering to find solutions. The rapid development of microelectronics and the ability to produce and integrate micromechanical and micro-optic components is leading to the growing merger of microelectronics, precision engineering, micromechanics, microsystems and nanotechnology. The GMM contributes to the 'Journal of Mechatronics'[26] as its press organ. The predecessor was the 'Journal of Precision Engineering' [27] and before that it was called the named above 'Journal of Fine Mechanics and Precision'.

GMM activities:

- Ongoing dialogue between manufacturers and users
- Organization of specialist conferences, workshops and seminars
- Analysis of the effects of microelectronics and microtechnology on engineering and the economy
- Provide regular information through the specialist publication F&M and others

GMM fields:

- Micro and nanoelectronics - manufacture
- Micro and nanoelectronics - applications
- Precision engineering and mechatronics
- Microsystem technology and nanotechnology

The initial goal of GMM was to establish microelectronics in Germany, with Siemens as a leading player. Later, another focus was brought in which was to maintain Dresden as the major location of microelectronics in Europe. The efforts of GMM are mainly in spotlighting the importance of microelectronics technology for the German export industry.

In the field of mechanics the focus changed from precision engineering towards microsystem technology. In the last years the GMM built up the leading national conference event – the 'Microsystem Technology Conference' – with more than 1000 conference attendees. The goal of this event is to draw attention to a key technology which is represented by SMEs, having a widespread influence on many other branches of industry.

### *D. The VDI/VDE Society for Measurement and Automatic Control [28] (GMA)*

One of the basic requirements that lead Germany from zero to today's affluent society was automated production and services. Therefore, this field of technology has a tradition in being organized by technical societies.

Before the 'VDI/VDE Society for Measurement and Automatic Control' (GMA), a joint organization of the VDE and the VDI was renamed in 1986, it existed as the 'VDI/VDE Society for Measurement and Control Engineering' [29] since 1973.

There were two predecessor groups organized at VDI, the 'Measurement Working Group' [30] since 1928 and the 'Control Working Group' [31] since 1938. The first joint committee of VDE and VDI for control was established in 1953. The International conference 'Control Engineering – Modern Theories and their Usability' in 1956 was the birth of the International Federation of Automatic Control (IFAC).

The GMA gives users orientation about the current trends in automation being supported by innovations in information technology, microelectronics, optics and sensorics.

The GMA's activities are:

- Promote the exchange of information between industry, public authorities and scientific institutions
- Organize congresses, conferences, symposiums, etc. to promote the flow of information concerning new processes and developments
- Prepare publications, recommendations, guidelines, etc. to improve understanding
- Scientific preparation for standardization
- National and international representation in the field of measurement and automation controls
- Publication and promotion of technical and scientific literature
- Support to education and post-graduate training

The GMA's fields are

21 'VDE/VDI-Gesellschaft für Mikroelektronik'
22 'VDI/VDE-Gesellschaft für Mikro- und Feinwerktechnik'
23 'VDI/VDE-Fachgruppe Feinwerktechnik'
24 'Der Mechaniker'
25 'Zeitschrift für Feinmechanik und Präzision'
26 'Mechatronik'
27 'FM Feinmechanik'
28 'VDI/VDE-Gesellschaft für Mess- und Automatisierungstechnik'
29 'VDI/VDE-Gesellschaft Meß- und Regeltechnik'
30 'VDI/VDE-Fachgruppe Meßtechnik'
31 'VDI/VDE-Fachgruppe Regelungstechnik'

- Sensors and measurement systems in process technology
- Sensors and measurement systems in manufacturing technology
- Actuators and servo systems, mechatronics and robotics
- Computational intelligence, information processing, communication and visualization
- Automation systems, engineering, operation, diagnoses and training
- Applications of control and automation technology

The GMA has been faced several changes in technologies since the last 20 years: Industrial Communication becomes more and more important for automation (web services for automation, remote control, high speed control loops, diagnosis of devices and industrial plants). There is also a trend for more detailed status information of devices and industrial plants to ease decisions of users and control systems. Furthermore, human Machine Interfaces became more important for right decisions of the user. Today, the GMA considers automation as the key for safety of humans and industrial plants and that automated methods are necessary to enable efficient engineering. GMA emphasizes the growing importance of wireless technologies (required for mobile systems) and embedded systems as well.

### *E. The German Society of Biomedical Engineering in VDE [32] (DGBMT)*

The first organizational link of the VDE to medical technology became the participation in founding the 'Umbrella Association of Medical Technology' [33] (DVMT) in 1992. The DVMT office was then organized in the VDE headquarter. Later, in 2001 VDE and the 'German Society of Biomedical Engineering' (DGBMT) merged and the DGBMT therefore became the youngest and is still the smallest technical and scientific society of the VDE.

The DGBMT works to promote the development and application of innovative medical technologies in the country's healthcare system to help patients, heal people, and prevent disease. The composition of active members differs from other VDE technical societies: physicians, medical scientists and engineers work closely together in the DGBMT to facilitate the cost-effective use of advanced technologies for diagnostics and therapy. The technical and scientific society closely follows trends in the integration of information and communication technology and medical engineering, and networks its members to ensure an exchange and evaluation of scientific findings in fields as diverse as gene technology, sensorics and data processing in disease management, imaging technology, cardiac pacemakers, operation room robotics, stents, ultrasound, microparticles, minimal invasive technologies, and microsystems.

The DGBMT organizes initiatives, projects, events and forum to support promising activities like micro- and nanotechnologies in medicine and life sciences. It works with the German Ministry for Education and Research, the Fraunhofer Institute for Biomedical Technology and other prominent institutions on a number of key projects in medical technology.

The DGBMT's fields are:

- Ultrasound
- Endoscopy
- Biomagnetism and magnetic stimulation
- Medical IT
- Biomaterials
- Biomechanics
- High-frequency technology, laser technology
- Functional stimulation
- Methods of patient monitoring
- Microsystems technology
- Medical engineering in hospitals
- Automation technology in medicine
- Telemedicine
- Cell and tissue technology

### *F. Committee for Lightning Protection and Lightning Research [34] (ABB)*

Still today, the lightning phenomenon is not totally understood by scientists. Moreover, the damage caused by lightning can often be considerable. So it was naturally that VDE dealt with this issue from the early beginning. Already in 1885, there was a group called 'Subcommittee for Analysis of Lightning Danger' [35] established by the regional ETV of Berlin. Werner Siemens, Paul Kirchhoff, and Hermann v. Helmholtz were among the foundation members. Under the Umbrella of the VDE, it was established as 'Committee for Lightning Conductor Construction' [36] by 1917. Since it became more and more relevant for insurances, authorities, and the industry, the committee changed itself to a society independent from the VDE in 1924. Not before 1984, it was reintegrated again in the VDE and finally called 'Committee for Lightning Protection and Lightning Research' (ABB).

There is no perfect lightning protection even today. In 1989, there was a study that estimated the damage caused by lightning only in electronic devices by 350,000 US$ per year. At present, the ABB generates and publishes information brochures about lightning damage and lightning protection in different environments. The committee offers seminars for being a 'Professional for Inner and Outer Lightning Protection' [37] . The development of this seminars result from a manual which was developed by the committee in 1998.

32 'Deutsche Gesellschaft für Biomedizinische Technik im VDE'

33 'Dachverband Medizinische Technik Naturwissenschaft Informatik'

34 'Ausschuss für Blitzschutz und Blitzforschung'

35 'Unterausschuß für Untersuchungen über die Blitzgefahr'

36 'Ausschuss für Blitzableiterbau'

37 'ABB-Fachkraft für äußeren bzw. inneren Blitzschutz'

### G. Committee for Electrical Safety and Accident Research [38]

In the early years of the introduction of electric machines in German industry, there was not much attention paid to electrical safety. On the other hand, the VDE standards aimed to safety since 1895. Facing the growing electrification of private homes and at work, VDE made efforts in public relation in order to create an awareness about the danger of electrical devices. In 1926, a special issue 'Electrical Accidents' of the ETZ was published by VDE.

From 1954, the number of deadly accidents was decreasing permanently. About 100 persons per year came to death by electricity in the 1990s in Germany (compare to 6,600 deadly traffic accidents). Most of deadly electrical accidents happened and still happen in private homes. The majority was caused by incorrect usage of hairdryers in bathtubs.


Figure 5. A stamp 'safety anytime' depicting the risk for accidents caused by electricity

The 'Committee for Electrical Safety and Accident Research' worked on those issues in the year of establishing in 1973. Later, in 1981 one of its first major projects was the research on deadly electrical accidents in bathtubs. By the time of 1985, the use of the Ground Fault Circuit Interrupter [39] (GFCI) became mandatory for rooms containing a certain humidity. Later, it became mandatory for all new buildings in Germany since 2007.

Today, the electrification is still increasing, but the number of deadly accidents in Germany persists at about 50 per year since 2000.

In general, the tasks of the committee are

- Observation of electrical accidents
- Research on impact of electrical current on human body
- Evaluation of protection methods
- Research on impact of electro magnetic fields on human body
- Organization of Workshops about that field
- Publishing information material
- Publishing of accident statistics and their causes

The committee works in close connection to DKE.

### H. Committees for Engineering Education and Engineering Profession [40]

VDE holds two expert groups which are connected to a certain extent in carrying out their activities. The Committee for Engineering Profession was established in 1966. In 1972, the Committee for Engineering Education was the result of a mergence between the respective Committees representing the two main types of universities in Germany.

In German engineering education system there are mainly two types of universities: Universities which are more theoretical oriented and Universities of Applied Science. The Universities of Applied Science gained an academic status in 1969 from the former Engineering Schools. Since 2009 a third type, the Dual Universities[41] was adopted from Universities of Cooperative Education[42] and gained academic status as well. The term 'Dual' means a shortened academic but instead an additional industrial education (vocational training) in parallel. Representatives of all three types of universities and also representatives from the electrical industry are members of the 'Engineering Education Committee'.

This Committee primary produces position papers on engineering education policy and academic policy. It aims to keep the academic electrical engineering education on a high level. Hence, there is a close connection to the representatives' organization of the respective departments of Electrical Engineering programmes of all universities of the both main types. For example, the representatives in the group of universities have their official address at the VDE premises.

After the German reunification in 1990, the change of status of technical oriented universities in East Germany was deeply discussed in the Committee. Since 1999, the reformation of European Universities – the so called 'Bologna Process' has kept the Committee busy and will probably do so for the next 10 years.

The activities in engineering profession differ from typical professional associations. In the past, there has been a shift of paradigm in this issue at VDE. In the first period of the existence of VDE, electrical engineers were not that socially accepted as their role in society and economy is deflected. This situation has changed: Today, engineers are one of the most accepted professional groups in Germany. Furthermore, the profession of electrical engineers is only slightly regulated in Germany. Thus, engineering profession is handled by carrying out studies, observing the labour market of engineers, and doing research on job descriptions of electrical engineers and their change. Publishing information material is an activity rather than writing position papers, which plays only a minor role in the work of the Committee for Engineering Profession.

In the 1970s and 1980s there have been organized symposia about ethics in engineering profession. At present, the gap of electrical engineers on the labour market is one of the basic issues since about 2000. In the years to come, international political work will be necessary to accompany the process of introducing a so

38 'Ausschuss für Sicherheits- und Unfallforschung'

39 FI-Schalter

40 Ausschüsse für 'Ingenieurausbildung' und 'Beruf, Gesellschaft und Technik'

41 Duale Hochschulen

42 Berufsakademien

called 'Professional Card' for engineers EU-wide. This card is planned in order to facilitate mobility of engineers according to a respective EU directive and will store academic and professional achievements.

### *I. Committee for History of Electrotechnology* [43]

Not only writing down technology's history is important for a technical association but also the way to innovations and their spread as well as their influence to society and economy. Since 1978, one of the main tasks of the 'Committee for History of Electrotechnology' is to analyse and trace back these interdependencies.

The group of members comprises historians, directors of technical museums, university representatives, and executives of big industry archives.

The committee frequently organizes symposia and contributes to the VDE book series 'History of Electrotechnology' which includes extensive versions of the papers presented at their symposia. Committee members also help to deliver relieves of historical literature to the VDE library.

Technical history in the period around 1880, at the time after the Second World War and after Germany's reunification, the change-over to information society, the rapid change of technology and its impact on society nowadays, and international aspects will provide a large pool of stories for this committee further on.

### *J. Young Members' Committee* [44] *(JMA)*

Since 1909, VDE has established a commission which dealt with matters of students of electrical engineering. This was before the decision in 1925 to accept student memberships – young members. Especially under the NSDAP regime from 1933 to 1945 the young members were paid special attention in order to subordinate them to NSDAP ideology. After the Second World War the 'Young Members' were established as a VDE organization with regular offerings for student members but also for young engineers.

The first national 'Young Members' Assembly' took place in 1980. As considered to be successful, this assembly has been changed to a standing institution and has been called 'Young Members' Committee' (JMA) from 1986. This meant the assembly as the national representation of student interests in VDE comprising representatives out of the regional VDE societies. The assembly/committee exchanges information about regional activities and plans student events on a national basis.

At the end of the 1990s, the network represented by the 'Young Members' Committee' assembly was called 'VDE YoungNet'. Today, this network has now more than 8,000 student members – mostly students of electrical engineering and related subjects. There are more than 60 university branches of young members covering most of German universities offering an electrical engineering programme. There are three standing committees: 'Team Education', 'Team Public Relations' and 'Team International Contacts'. Meanwhile, three different major student events are organized in the YoungNet by respective student project teams in a period of two years attended by several hundred student attendees each.

### *K. Committee for Women in Electrical Engineering* [45]

In 1909, it was allowed to women to study electrical engineering for the first time. Later, in 1931 the ratio of women in study programmes was not significant by being 0.4%. Even in the 1980s, there were just 2% which has slightly increased to 8% today. Anyhow, holding roughly 15% of VDE membership women take more often the advantages of membership as men.

Since 1987, there is the 'Committee for Women in Electrical Engineering'. Its main goals are to encourage young women to study electrical engineering and to support their career as an electrical engineer. There are focuses on role models and on compatibility between career and family life. Furthermore, the committee organizes political events.

## VI. Separation and Reunification

### *A. The Time During NSDAP* [46] *Regime*

Two years after the NSDAP regime was established, VDE was forced in 1935 to incorporate into the NDSAP organization 'National Socialistic Federation of German Technology ' [47] (NSBDT). The usual incorporation of NGOs by the NSDAP was called in German 'gleichschalten' which is a misused term just taken from electrotechnology and can be translated with 'to synchronize'. After that procedure, VDE did not exist any more in its classical meaning. The neutral platform and the international acting association changed into a total subordination to the NSDAP. A striking example is the intensive use and the exclusive claim of radio broadcast by the regime. Another one is the infiltration of NSDAP ideology in education of engineers and technicians in electrical engineering. VDE proceeded its work under those conditions for the next years until the end of the Second World War.

### *B. The Time After the Second World War*

The collapse of Germany in the year 1945 meant an intermediate cesura of the activities of the VDE: By order of the military command, the VDE was dissolved on 6 May 1946. On 11 May 1946, the VDE House and the regional representative VDE-Berlin was subjected to financial control.

It was possible to gradually establish a new VDE in West Germany. In Berlin, the seat of the Association at that time, the responsible British occupant force implemented a trust administration for the VDE. With the exception of the lecturing service which had to be suspended by order of the authorities, the core activities of the VDE central office could be revived gradually by a small staff of employees. Main topics were the administration of VDE standards, activities of the VDE Testing Institute, the making available of the funds of the ETZ publishing house, reformation of the FNE ('Standardization Committee') committees, the starting of

43 'Ausschuss für Geschichte der Elektrotechnik'

44 'Jungmitgliederausschuss'

45 'Ausschuss für Elektroingenieurinnen'

46 'Nationalsozialistische Deutsche Arbeiterpartei'

47 'Nationalsozialistischer Bund Deutscher Technik'

standardization work and the reestablishment of contacts to other VDE localities and dislocation centres.

The activities concerning VDE specifications and standards for electrotechnology which had been started with many efforts obtained an intermediate home in the 'German Standardization Committee' [48] on initiative of relevant circles of the Berlin electrotechnology. This organization was operable together with a newly established testing laboratory. This new VDE Testing Institute started in 1948 in Wuppertal. At that time, a Swiss economist W. Röpke wrote 'Germany is destroyed to such an extent and changed into a chaos that no one can imagine who has not seen it with his own eyes.'

On 16 May 1949, the 'VDE Association of German Electrotechnologists in the United Economic Territory' [49] with head office in Frankfurt am Main was established. The German term 'Verein' (Society) was switched to 'Verband' (Association), but the VDE brand did not change: both words start with a 'V'. The testing institute followed the VDE headquarter by moving from Wuppertal to Frankfurt am Main in 1950. In West Germany there was a discussion between Frankfurt am Main and Bonn becoming the new capital of Germany, which was finally decided to be Bonn.

After the legal situation in West Germany had changed in the sense that requirements for the establishing of organizations had been loosened, in 1950 the VDE was registered in the list of non profit organization.

In 1952, the VDE restarted its international activities in CENELEC and IEC. As the first technical and scientific society of VDE, the predecessor of the ITG started to work in 1954.

### *C. The Time After the Cold War*

By the onset of building the Berlin wall in 1961, the communication between VDE in West Germany and Electrotechnologists in East Germany was abandoned. Thus, in the meantime the separation between East and West Germany was complete and lasted until 1990. For example, in East Germany the office for metrology proceeded the work of the testing and certification institute for East Germany. In October 1990, one year after the opening of the Berlin wall, the office for metrology in East Germany suspended its activities. DIN including DKE took over the responsibility for standardization representing unified Germany.

Many traditional regional VDE organizations which were founded in the end of 19$^{th}$ or the beginning of 20$^{th}$ century were re-established at that time. VDE-Dresden for example, is one of the most successful regional VDE organizations. Meanwhile, Dresden is the biggest centre of microelectronics in Europe. Other regional VDE organizations where rapidly founded in several regions of East Germany as new societies in 1990 or 1991 so that the number of members could be raised for several years by around 4,000.

After the reunification, the status of technical oriented universities in East Germany was discussed to be adapted to the educational system in West Germany. Some Engineering Schools and even Technical Universities in East Germany became Universities of Applied Science. Other big and traditional Technical Universities, for example Dresden or Ilmenau, could maintain their status.

After Berlin replaced Bonn in 1990 and became the capital of Germany again, there was also a discussion that followed at VDE about moving from Frankfurt back to Berlin. One of the motivations to stay in Frankfurt was its excellent traffic infrastructure. The influence of this argument is high due to thousands of volunteer experts who meet at the VDE premises every year. Thus, it was decided to have at least a representative office in Berlin which was opened in 2001.

Already at the time of reunification, Germany had an excellent Electro-technical infrastructure, even compared to the international state of the art: The most reliably energy grid, the most automatized communication network and the least number of accidents per citizen caused by electricity in the world. In the field of electrotechnology (and not only there) a remarkable process went on in Germany from the collapse in 1945 until that time.

## VII. Membership Developments

Since at the end of the 19th century the profession of an electrical engineer was not well accepted, one of the main activities of the ETV-Berlin and later VDE was the struggle for social acceptance and moreover for a scientific basis in engineering education and also for a less inferior role of maths and nature science as school subjects. Today, being an engineer is well accepted in Germany and still a proper way of social advancement. But the paradigm of membership has shifted. While it was in earlier days naturally to become a VDE member as an electrical engineer, they ask today: 'What's the benefit?' Professional and ideal motivation have been mainly dissolved. Besides, it is a trend proven by social scientists that a declining number of people become members in clubs in general. The situation is even worse for passive members. As a consequence, a technical association has more to do with activities in membership marketing. The benefits of networking, advance of information, access to products, and cheaper services have clearly to be communicated.

From the 1960s to 1987 the number of members increased almost continuously. After that, a first trend of a declining number could be observed which was overlapped by the new memberships of East Germany in 1990. But when that effect faded out until 1994, the number of members began to decrease again. In 2001 VDE started to raise the activities and attractions for the student members and then the outreach to students for memberships. This effected that the number of student members reached 8,000 , this is roughly 25% of all students of electrical engineering in the second half of their study period. Since 10-15% of all electrical engineers are VDE members at the moment, the total membership will presumably be raised for years by maintaining this strategy.

[48] 'Deutscher Normenausschuss'

[49] 'VDE Verband Deutscher Elektrotechniker im vereinigten Wirtschaftsgebiet'

## VIII. Today's Developments

Technical progress causes the redefinition of technical and scientific fields and disciplines after certain periods of time. Especially the developments in communication and computer technology, which converged into information technology was so considerable that VDE decided in 1998 to emphasize the meaning of information technology in its activities by giving itself a new name. From 'Association of German Electrotechnologists' to 'Association for Electrical, Electronic & Information Technologies'. On the other hand the notation is not to 100% consistent: to the understanding of German engineers, information technologies are rather a subset of electrotechnology. It was important that the VDE brand was not given up, because the level of publicity of this brand is very high (60-70%). Besides, VDE wanted to clarify that it is not a professional association alone, but it serves the technical and scientific disciplines of electrotechnology and all their stakeholders as well.

In recent years, not only the convergences of technologies but also a merging of technologies and their application could often be observed. Famous examples are automotive and medical technology. The latter was covered by the VDE by merging with the German Society of Biomedical Engineering in 2001. Another example is that VDE covers the field of 'Ambient Assisted Living' with extra workforce since 2007. In this application context, many fields of electrotechnology are playing a certain role. The combination of technology and its application is a very attractive field for the activities of a technical society. It is hard to decide whether it is handled by defining adapted structures or by distributing responsibilities over the basic technical and scientific societies. There is still no final solution in VDE policy but it will depend on circumstances and the environment.

A general trend of the last 20 years is the growing number of competitors in almost all fields where VDE is active. Activities are getting more international. In case of technical and scientific societies VDE and IEEE usually inform each other if there is a conference planned in the respective foreign country. Besides, the German office of IEEE is established at VDE premises to ensure close communication. Other competition takes place in scientific work by other national technical societies, in organization of scientific events, or in product testing. The situation is ambivalent to e certain extent. For example in the field of political dialogue, VDE is partly in competition with industry associations, professional associations, the German Academy of Technical Sciences (ACATECH, established in 2008), and several umbrella organization of representatives of academia, but also sometimes their partner.

There is also a shift in research to be observed which affects the structure of active members in the technical and scientific societies. Basic research in technology is declining at the industrial sector in Germany. On the other hand, research at non academic institutes is growing.

Especially in educational policy, two big issues kept the VDE association busy so far. First, there is the so called 'Bologna Process', a reformation of European universities. The educational system should be modified to a unified structure, quality criteria and other features. This process started in 1999 and should be finalized in 2010. But today's observations show, that there will be necessary some readjustment of the process which is assumed to last for further 10 years. At second, at least since 1990, there is a decreasing number of young people who want study an engineering discipline. This is a permanent trend in German society and apparently independent from certain cycles. Since Germany is strongly dependent on the outcomes of its engineers, the declining number of engineers will be a serious problem in the future and VDE must increase its efforts to attract young people to technology and to study engineering. In 2007, IEEE and VDE organized a successful joint conference on this issue in Munich.

VDE is not only an association but is also doing business in testing and certification to support its non profit activities. In order to prepare for future trends, VDE has established testing and certification branches and facilities in Asia in 2003 to ensure quality and safety in electrical products manufactured there. The product portfolio which can be tested has been enlarged as well as the purpose of test. In 2008, VDE took over a company which is specialized in audio/video product testing, inspection processes, and tests for usability. Also in 2008, VDE opened a new test centre for measuring EMC and acoustical product characteristics, which is the most advanced worldwide.


## Acknowledgment

As a main literature source, the book entitled 'Energy, Information, Innovation – 100 Years Association of German Electrotechnologists' [2] published in the series 'History of Electrotechnology'[50] by the VDE publishing house was deployed. Furthermore, the timetables of DKE and VDE [1] were used. Membership developments and today's developments as well as the committees on history, engineering education, and engineering profession were reported from the experiences of the principal author. The authors thank to further colleagues who manage the technical and scientific societies for their reports on the respective societies ITG, GMM, GMA, and colleagues for reports on DKE. In the ITG case, furthermore the book 'From Communication Technology to Information Technology' [3] was deployed. The present status of the technical and scientific societies was mainly seized from the descriptions in [1]. Special thanks to the PR department of the VDE who provided the research results about the situation in Berlin around 1900 in chapter I B.


[50] 'Geschichte der Elektrotechnik'

## List of Abbreviations

| | |
|---|---|
| ABB | Asea Brown Boveri |
| ABB | Committee for Lightning Protection and Lightning Research |
| ACATECH | German Academy of Technical Sciences |
| CENELEC | European Committee for Electro-technical Standardization |
| DGBMT | German Society of Biomedical Engineering |
| DIN | German Institute of Standardization |
| DKE | German Commission for Electro-technical, Electronic & Information technologies of DIN and VDE |
| EMC | Electro Magnetic Compatibility |
| ETG | Power Engineering Society |
| ETSI | European Telecommunications Standards Institute |
| ETV | Electro-technical Society (local) |
| ETZ | Electro-technical Journal |
| GMA | The Society for Measurement and Automatic Control |
| GMM | The Society of Microelectronics, Micro and Precision Engineering |
| ICT | Information and Communication Technologies |
| IEC | International Electro-technical Commission |
| ITG | Information Technology Society |
| JMA | Young Members' Committee |
| NGO | non governmental organizations |
| NSDAP | National Socialist German Workers' Party |
| NSO | National Standards Organization |
| PTR | Technical and Physical Institute |
| PTB | Federal Technical and Physical Institute |
| SME | small and medium enterprises |
| VDE | Society of German Electrotechnologists (1893-1949) |
| VDE | Association of German Electrotechnologists (1949-1998) |
| VDE | Association for Electrical, Electronic & Information Technologies (since 1998) |
| VDI | The Association of German Engineers |

## List of Regular International Relations of VDE's Technical and Scientific Societies

| | |
|---|---|
| CEPIS | The Council of European Professional Informatics Societies |
| CIGRE | Conference Internationale des Grands Reseaux Electriques à Haute Tension |
| CIRED | Congrès International des Réseaux Electriques de Distribution |
| EPE | European Conference on Power Electronics and Applications |
| EUREL | The Federation of National Electrical Engineering Organizations in Europe |
| IEEE | The Institute of Electrical and Electronics Engineers |
| ITU | The International Telecommunications Union |
| UIE | Union Internationale d'Electrothermie |

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