

17 Miscellaneous

17.1 DIN VDE specifications and IEC publications for substation design

The VDE catalogue of (primarily technical safety) specifications for the entire field of electrical engineering in Germany is among the most important tasks of the VDE Verband der Elektrotechnik Elektronik Informationstechnik e.V. (VDE Association for Electrical Electronic & Information Technologies). The content, design, development and legal significance of the VDE catalogue of specifications are described in detail in VDE specification 0022 (latest edition: September 1994). Selected extracts of a fundamental nature are quoted below:

“The stipulations contained in the VDE catalogue are drawn up by the Deutsche Elektrotechnische Kommission (DKE) of DIN and VDE.

The DKE is the German national organization for compiling national and international standards and VDE specifications in the entire field of electrical engineering in the Federal Republic.”

“Results of international work are to be adopted as far as possible without alteration into the VDE standards catalogue and simultaneously into the DIN catalogue of standards.

In the interests of European and worldwide harmonization, the rules of CENELEC (European Committee for Electrotechnical Standardization) impose an obligation to adopt certain standards of the International Electrotechnical Commission (IEC) and also European standards (EN) and harmonization documents (HD) issued by CENELEC.”

The component parts of the VDE standards catalogue are:

- the rules and other rules relating thereto,
- VDE specifications,
- VDE guidelines,
- attachments to rules, VDE specifications and VDE guidelines.

“The results of the DKE's work on electrotechnical standardization, which include safety regulations where appropriate, are registered as DIN standards, with additional identification as VDE specification or VDE guideline, in the VDE standards catalogue. The results of this work also include draft standards, amendments and the draft standards of the VDE:”

Standardization work for the field of electrical engineering is conducted almost entirely on an international level. DKE is actively involved with the appointment of specialists to the working groups, committees and other bodies of the international organizations and submits position papers on drafts and other queries and approves the acceptance of regulations. The position papers are prepared by the relevant DKE committee.

Agreements between IEC and CENELEC on one hand and between CENELEC and DKE on the other regulate the incorporation of international standards into national standards. The national committee and the relevant DKE advisers section share the responsibility for the publication schedule of the international standard translated into German – without deviations or with only minor, clearly defined deviations – as a German standard.

VDE regulations, guidelines and the associated supplements have an identification number combined from a DIN numbering system and a VDE classification number. The DIN numbering system also includes information on the origins of the content of the standard, while the VDE classification makes it much easier to find. The following scheme is used:

- DIN EN 6 (VDE 0 ...) – European standard (EN), formed by using an IEC standard word by word (1st number = 6) *)
- DIN EN 5 (VDE 0 ...) – European standard (EN) of other origin (1st number = 5)
- DIN IEC 6 (VDE 0 ...) – IEC standard incorporated word for word but is not EN
- DIN VDE 0 (VDE 0 ...) – IEC standard incorporated with deviations
 - CENELEC (HD) harmonization document that is not equivalent to an IEC standard
 - national standard

In comprehensive standards comprising several parts the part numbers are preceded by a hyphen or in the case of the VDE classification by the word "Part".

Because the new identification system has only been defined since 1993, at present a whole series of VDE regulations is still valid whose DIN reference number was specified under a different system. They are to be adapted to the new system during the next technical revision.

Existing working results of the former type such as VDE guidelines, VDE standards, VDE codes of practice, VDE directives, VDE regulations, VDE publications are also being adapted to the above components of the VDE catalogue, when they are revised.

*) The number of the DIN numbering system corresponds to the new 5-digit numbering system, which is currently in the process of introduction by the International Electrotechnical Commission (IEC). It also begins with 6 in the first position followed by the former 2, 3 or 4-digit IEC reference number and zeros in the vacant positions.

The legal significance of the specifications of the VDE catalogue is clarified by the following citations from VDE 0022.

"At the time of their publication VDE specifications are the basis for correct engineering practice."

"According to § 1 of the 2nd implementing regulation effective 1 January 1987 to the energy supply act (2nd DVO to the EnWG, BGBl. (federal gazette) 1987 I, p. 146), the generally accepted rules of engineering must be observed for the erection and maintenance of installations for the generation, transmission and supply of electricity. Where installations must meet the state of safety engineering set in the community on the basis of European Community regulations, these regulations are mandatory."

The VDE specifications must always be observed if one does not wish to be accused of not meeting the duty of care in the manufacture and maintenance of electrical installations and devices.

The following list shows an overview of the most important VDE specifications for switchgear engineering. They are listed with their full numbering as at the end of 2000 and the month in which they became effective. Because of the extent of the current DIN VDE catalogue of specifications, this list cannot be considered complete. For example, later amendments, draft standards, supplements and drafts have generally not been included. The majority of listed DIN VDE standards also have corresponding IEC or EN standards. Where this is not the case, international standards are given if possible.

For improved clarity and to save space, some titles of standards are slightly abbreviated. In standard series the general header has not been repeated in the list of standards immediately following.

Group 1 Power installations

DIN 57100-100	(VDE 0100 Part 100) Erection of power installations with rated voltages up to 1000 V – Scope; general requirements	1982-05
DIN VDE 0100-200	(VDE 0100 Part 200) Electrical installations of buildings – Terms and definitions	1998-06
DIN VDE 0100-300	(VDE 0100 Part 300) Erection of power installations with nominal voltages up to 1000 V – Assessment of general characteristics of installations IEC 60364-3, HD 384.3 S2	1996-01
DIN VDE 0100-410	(VDE 0100 Part 410) – Protection against electric shock IEC 60364-4-41, HD 384.4.41 S2	1997-01
DIN VDE 0100-420	(VDE 0100 Part 420) – Protection against thermal effects	1991-11
DIN VDE 0100-430	(VDE 0100 Part 430) – Protection of cables and cords against overcurrent	1991-11
DIN VDE 0100-442	(VDE 0100 Part 442) Electrical installations of buildings – Protection of low-voltage installations against faults between high-voltage systems and earth, HD 384.4.442 S1	1997-11

further parts: 450, 460, 470, 482, 510, 520, 530, 537, 540, 550, 551, 559, 560, 610, 620, 704, 705, 706, 707, 708 etc.

DIN VDE 0100-729	(VDE 0100 Part 729) Erection of power installations with nominal voltages up to 1000 V – Installation and connection of switchgear and control gear and distribution boards	1986-11
DIN 57100-736	(VDE 0100 Part 736) – Low-voltage circuits in high-voltage switchboards	1983-11
DIN VDE 0100-737	(VDE 0100 Part 737) – Humid and wet areas and locations; Outdoor installations	1990-11
DIN VDE 0100-739	(VDE 0100 Part 739) – Additional protection in case of direct contact in dwellings by residual current devices in TN and TT systems.	1989-06
DIN VDE 0101	(VDE 0101) Power installations exceeding AC 1 kV replaces DIN VDE 0101: 1989-05 and, partly, DIN VDE 0141: 1989-07, HD 637 S1: 1999	2000-01
DIN VDE 0102	(VDE 0102) Short-circuit current calculation in three-phase AC systems	1990-01
DIN 57102-2	(VDE 0102 Part 2) VDE recommendation to the calculation of short-circuit currents in three-phase AC systems up to 1000 V	1975-11
DIN IEC 60909-3	(VDE 0102 Part 3) Short-circuit currents Calculation of currents in three-phase AC systems – currents during two separate simultaneous single phase line-to-earth short-circuits and partial short-circuit currents flowing through earth	1997-06
DIN EN 60865-1	(VDE 0103) Short-circuit currents – Calculation of effects, definitions and calculation methods	1994-11
DIN EN 50110-1	(VDE 0105 Part 1) Operation of electrical installations	1997-10
DIN VDE 0105-100	(VDE 0105 Part 100) Operation of electrical installations	2000-06
DIN VDE 0105-103	(VDE 0105 Part 103) – Particular requirements for railways	1999-06
DIN VDE 0105-111	(VDE 0105 Part 111) – Particular requirements for underground mines	2000-09
DIN VDE 0105-7	(VDE 0105 Part 7) – Supplementary requirements for atmospheres endangered by potentially explosive material	1987-12

DIN VDE 0105-9	(VDE 0105 Part 9) – Supplementary requirements for potentially explosive atmospheres	1986-05
DIN 57106-1	(VDE 0106 Part 1) Protection against electric shock – Classification of electrical and electronic equipment	1982-05
further parts: 100, 101, 102		
DIN VDE 0107	(VDE 0107) Electrical installations in hospitals and locations for medical use outside hospitals	1994-10
DIN VDE 0108-1	(VDE 0108 Part 1) Power installations and safety power supply in communal facilities – General	1989-10
further parts: 2, 3, 4, 5, 6, 7 and 8		
E DIN VDE 0109-13	(VDE 0109 Part 13) Insulation coordination in low-voltage systems – voltage testing of clearances, currently indraft IEC 60664	1990-09
further parts: 16, 19, 21, 22, 23, 24 (currently all in draft)		
DIN VDE 0110-1	(VDE 0110 Part 1) Insulation coordination for electrical equipment within low-voltage systems – Principles, requirements, tests IEC 60664-1, HD 625.1 S1	1997-04
further parts: 3, 20		
DIN EN 60071-1	(VDE 0111 Part 1) Insulation coordination – Definitions, principles and rules	1996-07
DIN EN 60071-2	(VDE 0111 Part 2) – Application guide	1997-09
DIN EN 60204-1	(VDE 0113 Part 1) Safety of machinery – Electrical equipment of machines – General requirements	1998-11
numerous further parts		
DIN EN 50163	(VDE 0115 Part 102) Railway applications – Supply voltages of traction systems	1996-05
DIN EN 50153	(VDE 0115 Part 2) – Rolling stock – Protective provisions relating to electrical hazards	1996-12

DIN EN 50122-1	(VDE 0115 Part 3) – Fixed installations – Protective provisions relating to electrical safety and earthing	1997-12
numerous further parts		
DIN VDE 0118-1	(VDE 0118 Part 1) Erection of electrical installations in mines – General requirements	1990-09
DIN VDE 0118-2	(VDE 0118 Part 2) – Supplementary requirements for power installations	1990-09
DIN VDE 0132	(VDE 0132) Measures to be taken in the case of fire in or near electrical installations	1989-11
DIN VDE 0141	(VDE 0141) Earthing systems for special power installations with nominal voltages above 1 kV replaces DIN VDE 0141: 1989-07 and see DIN VDE 0101: 2000-01	2000-01
DIN EN 50186-1	(VDE 0143 Part 1) Live-line washing systems for power installations with rated voltages above 1 kV – General requirements	1999-01
DIN 57150	(VDE 0150) Protection against corrosion due to stray currents of DC installation	1983-04
DIN VDE 0151	(VDE 0151) Material and size requirements for earth electrodes from the corrosion point of view.	1986-06
DIN EN 50178	(VDE 0160) Electronic equipment for use in power installations	1998-04
DIN EN 60079-14	(VDE 0165 Part 1) Electrical apparatus for explosive gas atmospheres – Electrical installations in hazardous areas (other than mines)	1998-08
see also parts 1, 10, 101 and VDE 0166.		
DIN VDE 0168	(VDE 0168) Erection of electrical installations in open-cast mines, quarries and similar plants	1992-01
DIN EN 50014	(VDE 0170/0171 Part 1) Electrical apparatus for potentially explosive atmospheres – General requirements	2000-02
numerous further parts		

DIN 57185-1	(VDE 0185 Part 1) Lightning protection system – General with regard to installation	1982-11
further parts: 100, 103, 105, 110, 2, 201.		
DIN EN 60446	(VDE 0198) Basic and safety principles for man-machine interface – Identification of conductors by colours or numerals	1999-10
DIN EN 60073	(VDE 0199) – Coding principles for indication devices and actuators	1997-09

Group 2 Power guides

DIN 40500 ¹⁾	Copper for electrical engineering, technical terms of delivery	
Parts 1-3	Sheets, tubes, sections	
Part 4	Wire	
Part 5	Tinned wire	
DIN 40501 ¹⁾	Aluminium for electrical engineering, technical terms of delivery	
Parts 1-3	Sheets, tubes, sections	
Part 4	Wire	
DIN EN 1715 ¹⁾	Aluminium, continuous-cast wire rod	
DIN VDE 0207-2	(VDE 0207 Part 2) Insulating and sheathing compounds for cables and flexible cords – Polyethylene insulating compounds	1999-02
further parts: 20, 21, 22, 23, 24, 3, 4, 5, 6, 7.		
DIN VDE 0210	(VDE 0210) Planning and design of overhead power lines with rated voltages above 1 kV	1985-12
DIN EN 61773	(VDE 0210 Part 20) Overhead lines – Testing of foundations for structures	1997-08
DIN VDE 0211	(VDE 0211) Planning and design of overhead power lines with rated voltages up to 1000 V	1985-12
DIN EN 61284	(VDE 0212 Part 1) Overhead lines – Requirements and tests for fittings	1998-05
further parts: 2, 3, 51, 54, 55.		

¹⁾ DIN standard, not part of the DIN-VDE Group 2.

DIN VDE 0220-1	(VDE 0220 Part 1) Specifications for detachable cable clamps to be used in power cable installations up to 1000 V	1971-11
DIN VDE 0220-2	(VDE 0220 Part 2) Specifications for pressed connectors to be used in power cable installations	1971-11
DIN VDE 57220-3	(VDE 0220 Part 3) Single and multiple cable clamps with insulating parts in power cable installations up to 1000 V	1977-10
DIN VDE 0228-1	(VDE 0228 Part 1) Proceedings in the case of interference on telecommunication installations by electric power installations – General	1987-12
DIN VDE 0228-2	(VDE 0228 Part 2) – Interference by three-phase installations	1987-12
further parts: 3, 4, 5, 6.		
DIN 57250-1	(VDE 0250 Part 1) Cables, wires and flexible cords for power installation – General	1981-10
further parts: 102, 106, 201, 203, 204, 205, 206, 209, 210, 212, 213, 214, 407, 502, 602, 603, 802, 806, 809, 811, 812, 813, 814, 815, 816		
DIN VDE 0262	(VDE 0262) XLPE insulated and PVC sheathed installation cables with nominal voltages 0.6/1 kV	1995-12
DIN VDE 0265	(VDE 0265) Cables with plastic-insulated lead-sheath for power installation	1995-12
DIN VDE 0266	(VDE 0266) Power cables with improved characteristics in the case of fire; nominal voltages 0.6 /1 kV	1997-11
DIN VDE 0271	(VDE 0271) PVC-insulated cables and sheathed power cables for rated voltages up to and including 3.6/6 (7.2) kV	1997-06
DIN VDE 0276-1000	(VDE 0276 Part 1000) Power cables – Current-carrying capacity, general, conversion factors	1995-06
DIN VDE 0276-603	(VDE 0276 Part 603) – Distribution cables of nominal voltages 0.6/1 kV, HD 603 S1	2000-05
DIN VDE 0276-604	(VDE 0276 Part 604) – Power cables of nominal voltages 0.6/1 kV with special fire performance for use in power stations, HD 604 S1	1995-10

DIN VDE 0276-620	(VDE 0276 Part 620) – Power distribution cables with extruded insulation for nominal voltages from 3.6 kV to 20.8/36 kV, HD 620 S1	1996-12
DIN VDE 0276-621	(VDE 0276 Part 621) – Power distribution cable with impregnated paper insulation for medium voltage, HD 621 S1	1997-05
DIN VDE 0276-622	(VDE 0276 Part 622) – Power cable of rated voltages from 3.6/6 (7.2) kV up to 20.8/36 (42) kV with special fire performance for use in power stations, HD 622/S1	1997-02
DIN VDE 0276-626	(VDE 0276 Part 626) – Overhead distribution cables of rated voltage 0.6/1 (1.2) kV, HD 626 S1	1997-01
DIN VDE 0276-632	(VDE 0276 Part 632) Power cables with extruded insulation and their accessories – Rated voltages above 36 kV up to 150 kV, HD 632 S1	1999-05
DIN VDE 0276-633	(VDE 0276 Part 633) Tests on oil-filled, paper- or polypropylene paper laminate-insulated, metal-sheathed cables and accessories – Alternating voltages up to and including 400 kV, HD 633 S1	1999-05
DIN VDE 0276-634	(VDE 0276 Part 634) Tests on internal gas-pressure cables and accessories – Alternating voltages up to and including 275 kV, HD 634 S1	1999-05
DIN VDE 0276-635	(VDE 0276 Part 635) Tests on external gas-pressure cables and accessories – Alternating voltages up to and including 275 kV, HD 635 S1	1999-05
DIN VDE 0278-623	(VDE 0278 Part 623) Power cable accessories with rated voltages up to 30 kV (36 kV) – Specifications for joints, stop ends and outdoor terminations for distribution cables of rated voltage 0.6/1 kV, HD 623 S1	1997-01
DIN VDE 0278-628	(VDE 0278 Part 628) – Test methods for accessories for power cables, with rated voltages from 3.6/6 (7.2) kV up to and including 20.8/36 (42) kV, HD 628 S1	1997-11
DIN VDE 0278-629-1	(VDE 0278 Part 629-1) – Test requirements on accessories for use on power cables of rated voltage from 3.6/6 (7.2) kV up to 20.8/36 (42)kV – Cables with extruded solid insulation. HD 629.1 S1	1997-11
DIN VDE 0278-629-2	(VDE 0278 Part 629-2) – Cables with impregnated paper insulation, HD 629.2 S1	1998-06

DIN VDE 0281-1	(VDE 0281 Part 1) Polyvinyl chloride insulated cables of rated voltages up to and including 450/750 V – General requirements, IEC 60227-1, HD 21.1 S3	1999-01
DIN VDE 0281-2	(VDE 0281 Part 2) – Test methods, IEC 60227-2, HD 21.2 S3	1999-01
further parts: 3, 5, 7, 9.		
DIN VDE 0282-1	(VDE 0282 Part 1) Rubber insulated cables of rated voltages up to and including 450/750 V – General requirements, IEC 60245-1, HD 22.1 S3	1999-01
further parts: 10, 11, 12, 13, 14, 2, 4, 6, 7, 9.		
DIN VDE 0289-1	(VDE 0289 Part 1) Definitions for cables, wires and flexible cords for power installation – General definitions	1988-03
further parts: 2, 3, 4, 5, 6, 7, 8.		
DIN VDE 0291-1	(VDE 0291 Part 1) Regulations for sealing compounds for cable components – Hot-application sealing compounds, cold-press casting compounds, cold-moulding compounds and compounds applied with hot water	1972-02
DIN 57291-2	(VDE 0291 Part 2) Casting compounds for use in cable fittings, cast resin compounds and moulding materials.	1979-11
DIN VDE 0293	(VDE 0293) Identification of cores in cables and flexible cords used in power installations with nominal voltages up to 1000 V	1990-01
DIN VDE 0295	(VDE 0295) Conductors of cables, wires and flexible cords for power installation	1992-06
DIN 57298-3	(VDE 0298 Part 3) Application of cables and flexible cords in power installations – General for cables	1983-08
DIN VDE 0298-4	(VDE 0298 Part 4) – Recommended current-carrying capacity for sheathed and non-sheathed cables for fixed wiring in buildings and of flexible cables and cords	1998-11
DIN VDE 0298-100	(VDE 0298 Part 100) – Economic optimization of cable size, IEC 61059, HD 558 S1	1992-12

DIN VDE 0298-300	(VDE 0298 Part 300)	1999-04
Guide to use of low-voltage harmonized cables, HD 516 S2		

Group 3 Insulating materials

DIN VDE 0302-1	(VDE 0302 Part 1) Insulation systems of electrical equipment – Evaluation and identification, IEC 60505	1986-09
DIN VDE 0302-2	(VDE 0302 Part 2) – Functional evaluation; aging mechanisms and diagnostic procedures, IEC 60610	1986-09
DIN VDE 0302-3	(VDE 0302 Part 3) – Thermal endurance, fundamentals for test procedures, IEC 60611	1986-09
further parts: 4, 5, 6, 7, 8.		
DIN IEC 60112	(VDE 0303 Part 1) Method for determining the comparative and the proof-tracking indices of solid insulating materials under moist conditions	1984-06
further parts: 4, 5, 6, 8, 10, 11, 12.		
DIN EN 60243-1	(VDE 0303 Part 21) Electric strength of insulation materials, test methods – Testing at power frequencies.	1999-03
further parts: 22, 23, 30, 31, 32 etc.		
DIN VDE 0304-1	(VDE 0304 Part 1) Testing of solid insulation materials for assessment of their thermal stability – Determination of thermal properties of solid insulating materials	1959-07
further parts: 3, 21, 22, 23, 23-3-2, 24.		
DIN 57370-1	(VDE 0370 Part 1) Insulating oils – New insulating oils for transformers and switchgear, IEC 60296	1978-12
DIN 57370-2	(VDE 0370 Part 2) – Insulating oils in service in transformers and switchgear	1978-12
DIN IEC 60475	(VDE 0370 Part 3) – Method for sampling of liquid dielectrics	1980-02
DIN EN 60156	(VDE 0370 Part 5) – Determination of the breakdown voltage at power frequency, test method	1996-03

further parts: 6, 8, 9, 11, 12, 13, 14, 16, 20.

DIN IEC 60376	(VDE 0373 Part 1) Requirements and acceptance of new sulfur hexafluoride (SF ₆)	1980-04
DIN IEC 60480	(VDE 0373 Part 2) Guideline to the checking of sulfur hexafluoride (SF ₆) taken from electrical equipment	1980-04

Group 4 Measurement, control, testing

DIN EN 61010-1	(VDE 0411 Part 1) Safety requirements for electrical equipment for measurement, control and laboratory use – General requirements	1994-03
DIN EN 61557-1	(VDE 0413 Part 1) Equipment for testing, measuring or monitoring of protective measures – General requirements	1998-05
DIN EN 61557-2	(VDE 0413 Part 2) – Insulation resistance	1998-05
DIN EN 61557-3	(VDE 0413 Part 3) – Loop impedance	1998-05
DIN EN 61557-4	(VDE 0413 Part 4) – Resistance of earth connections and equipotential bonding	1998-05
DIN EN 61557-5	(VDE 0413 Part 5) – Resistance to earth	1998-05
DIN EN 61557-6	(VDE 0413 Part 6) – Residual current devices (RCD) in TT, TN and IT systems	1999-05
DIN EN 61557-7	(VDE 0413 Part 7) – Phase sequence	1998-05
DIN EN 61557-8	(VDE 0413 Part 8) – Insulation monitoring devices for IT systems	2000-04
DIN EN 60044-1	(VDE 0414 Part 1) Instrument transformers – Current transformers	1994-01
DIN VDE 0414-10	(VDE 0414 Part 10) – Partial-discharge measurement, IEC 60044-4	1985-05
DIN EN 60044-2	(VDE 0414 Part 2) – Inductive voltage transformers	1999-12

DIN IEC 60044-3	(VDE 0414 Part 5) – Combined transformers, HD 548.3 S1	1994-04
DIN VDE 0414-6	(VDE 0414 Part 6) – Three-phase voltage transformers for voltage levels up to 52 kV, HD 587 S1	1995-04
DIN EN 60044-6	(VDE 0414 Part 7) – Requirements for protective current transformers for transient performance	1999-10
DIN EN 60521	(VDE 0418 Part 12) Classes 0.5, 1 and 2 a.c. watt-hour meters	1995-07
DIN VDE 0418-2	(VDE 0418 Part 2) Electric integrating meters – Var-hour (reactive energy) meters	1966-03
DIN EN 61268	(DE 0418 Part 20) Alternating current static var-hour meters for reactive energy (classes 2 and 3)	1996-11
DIN VDE 0418-3	(VDE 0418 Part 3) Electric integrating meters – Direct-current meters	1965-03
DIN VDE 0418-4	(VDE 0418 Part 4) – Maximum demand indicators	1967-07
DIN VDE 0418-5	(VDE 0418 Part 5) – Telemetry devices	1973-04
DIN EN 60514	(VDE 0418 Part 6) Acceptance inspection of class 2 alternating current watt-hour meters	1995-07
DIN EN 61358	(VDE 0418 Part 60) Acceptance inspection for direct-connected alternating current static watt-hour meters for active energy	1996-11
DIN EN 61036	(VDE 0418 Part 7) Alternating current electronic watt-hour meters for active energy (classes 1 and 2)	1997-05
DIN EN 60687	(VDE 0418 Part 8) Alternating current static watt-hour meters for active energy (classes 0.2 S and 0.5 S)	1994-02
DIN EN 62053-31	(VDE 0418 Part 3-31) Electricity metering equipment (AC) – Particular requirements – Pulse output devices for electromechanic and electronic meters (only two-wire systems)	1999-04

DIN EN 62053-61	(VDE 0418 Part 3-61) – Power consumption and voltage requirements	1999-04
DIN EN 61038	(VDE 0419 Part 1) Time switches for tariff and load control	1994-03
DIN EN 61037	(VDE 0420 Part 1) Electronic ripple-control receivers for tariff and load control	1994-01
DIN IEC 60060-1	(VDE 0432 Part 1) High-voltage test techniques – General specifications and test requirements, HD 588.1 S1	1994-06
DIN EN 61180-1	(VDE 0432 Part 10) High-voltage test techniques for low-voltage equipment – Definitions, test and procedure requirements, EN 61180-1	1995-05
DIN EN 61180-2	(VDE 0432 Part 11) – Test equipment	1995-05
DIN EN 60060-2	(VDE 0432 Part 2) High-voltage test techniques – Measuring systems	1996-03
DIN VDE 0432-5	(VDE 0432 Part 5) – Oscilloscope and peak voltmeters for impulse test	1987-03
DIN EN 61083-1	(VDE 0432 Part 7) – Digital recorders for measurements in high-voltage impulse tests – Requirements for digital recorders	1994-04
DIN EN 61083-2	(VDE 0432 Part 8) – Evaluation of software used for the determination of the parameters of impulse waveforms	1998-01
DIN 57434	(VDE 0434) High-voltage test techniques – Measurement of partial discharges	1983-05
Appendix 1 to DIN VDE 0435	(VDE 0435) Electrical relays – Synopsis, List of standards of the DIN VDE 0435 series	1999-01
DIN VDE 0435-110	(VDE 0435 Part 110) – Terms and definitions	1989-04
DIN EN 61810-1	(VDE 0435 Part 201) Electromechanical non-specified time all-or-nothing electrical relays – General requirements	1999-04

DIN IEC 60255-18	(VDE 0435 Part 2011) Electrical relays – Dimensions for general purpose all-or-nothing relays	1984-05
DIN EN 61812-1	(VDE 0435 Part 2021) Relays with specified time response (time relays) for industrial application – Requirements and testing	1999-08
DIN EN 60255-8	(VDE 0435 Part 3011) Electrical relays – Thermal electrical relays	1998-06
DIN EN 60255-3	(VDE 0435 Part 3013) – Single input energizing quantity measuring relays with dependent or independent time	1998-07
DIN EN 60255-22-2	(VDE 0435 Part 3022) – Electrical disturbance test for measuring relays and protection devices – Electrostatic discharge tests	1997-05
E DIN VDE 0435-303	(VDE 0435 Part 303) – Static measuring relays (SMR), draft	1998-01
DIN VDE 0441-1	(VDE 0441 Part 1) Tests on insulators of organic material for systems with nominal alternating voltages greater than 1000 V – Tests on materials	1985-07
DIN 57441-2	(VDE 0441 Part 2) – Tests on outdoor composite insulators with fibre-glass core	1982-10
DIN IEC 60660	(VDE 0441 Part 3) Tests on indoor post insulators of organic materials for systems with nominal voltages greater than 1 kV but not including	1984-06
DIN EN 61466-1	(VDE 0441 Part 4) Composite string insulator units for overhead lines above 1000 V – Standard strength classes and end fittings	1997-10
DIN EN 61466-2	(VDE 0441 Part 5) – Dimensional and electrical characteristics	1999-05
DIN EN 60383-1	(VDE 0446 Part 1) Insulators for overhead lines with a nominal voltage above 1 kV – Ceramic and glass insulator units for AC systems – Terms, test methods, acceptance criteria	1997-05
DIN VDE 0446-2	(VDE 0446 Part 2) Requirements for insulators for power overhead lines and contact wires up to 1000 V and for overhead telecommunications lines	1971-03

DIN VDE 0446-3	(VDE 0446 Part 3) – Requirements for accessories and fittings permanently connected to the insulating body	1973-05
DIN EN 60383-2	(VDE 0446 Part 4) Insulators for overhead lines above 1000 V – Insulator strings and insulator sets for alternating voltage systems – Terms and definitions, test methods, acceptance criteria	1995-08
DIN EN 61325	(VDE 0446 Part 5) – Ceramic or glass insulator units for DC systems – Terms and definitions, test methods, acceptance criteria	1996-04
DIN EN 60305	(VDE 0446 Part 6) – Ceramic and glass insulators for AC systems – Characteristics of insulator units of the cap-and-pin type	1996-10
DIN EN 60433	(VDE 0446 Part 7) – Ceramic insulators for AC systems – Characteristics of insulators in long-rod design	1996-10
DIN EN 60507	(VDE 0448 Part 1) Artificial pollution tests on high voltage insulators for AC systems	1994-04
DIN EN 60529	(VDE 0470 Part 1) Degrees of protection provided by enclosures (IP Code)	2000-09
DIN EN 50102	(VDE 0470 Part 100) Degrees of protection provided by enclosures for electrical equipment against external mechanical impacts (IK Code)	1997-09
DIN EN 61032	(VDE 0470 Part 2) Test probes for verification of protection of persons provided by enclosure	1998-10
DIN EN 60695-1-1	(VDE 0471 Part 1-1) Fire hazard testing Guidance for assessing the fire hazard of electrotechnical products – General guidelines	2000-10

numerous further parts

Group 5 Machines, transducers

DIN 57510	(VDE 0510) VDE Specifications for electric storage batteries and battery plants	1977-01
DIN VDE 0510-2	(VDE 0510 Part 2) Safety requirements for secondary batteries and battery installations – Stationary batteries	1997-10
DIN EN 60034-1	(VDE 0530 Part 1) Rotating electrical machines – Rating and performance	2000-09
further parts: 12, 14, 15, 16, 18-1, 18-21, 18-31, 2, 22, 3, 33, 4, 5, 6, 7, 8, 9.		
DIN 57532-10	(VDE 0532 Part 10) Transformers and reactors – Application of transformers IEC 60606	1982-03
DIN EN 60076-1	(VDE 0532 Part 101) Power transformers – General	1997-12
DIN EN 60076-2	(VDE 0532 Part 102) – Temperature rise	1997-12
DIN 57532-13	(VDE 0532 Part 13) Transformers and reactors – Lightning and switching-impulse testing of transformers and reactors	1984-07
DIN VDE 0532-14	(VDE 0532 Part 14) – External clearances and protective spark gaps on bushings	1991-03
DIN EN 60289	(VDE 0532 Part 20) Reactors	1994-05
DIN VDE 0532-222	(VDE 0532 Part 222) Three-phase oil-distribution transformer – Distribution transformers with cable boxes, on the high-voltage and/or low voltage side HD 428.2.2 S1	1997-12
DIN VDE 0532-23	(VDE 0532 Part 23) Transformers and reactors – Stationary transformers in traction systems	1994-08
DIN VDE 0532-3	(VDE 0532 Part 3) – Insulation levels and dielectric tests	1987-07

DIN EN 60214	(VDE 0532 Part 30) On-load tap-changers	1998-06
DIN VDE 0532-31	(VDE 0532 Part 31) Transformers and reactors – Selection and application of on-load tap-changers	1993-04
DIN 57532-5	(VDE 0532 Part 5) – Ability to withstand short-circuit	1984-05
DIN VDE 0532-6	(VDE 0532 Part 6) – Dry-type power transformers	1994-01
DIN EN 60551	(VDE 0532 Part 7) Determination of transformer and reactor sound levels	1993-11
DIN VDE 0558-1	(VDE 0558 Part 1) Semiconductor converters – General specifications and particular specifications for line-commutated convertors, IEC 60119	1987-07
DIN EN 60146-1-1	(VDE 0558 Part 11) – General requirements and line-commutated converters – Specification of the basic requirements	1994-03
DIN 57558-2	(VDE 0558 Part 2) – Particular requirements for self-commutated converters	1977-08
DIN 57558-3	(VDE 0558 Part 3) – Particular requirements for DC convertors (DC chopper convertors)	1977-08
DIN 57558-5	(VDE 0558 Part 5) – Uninterruptible power systems (UPS), IEC 60146-4	1988-09
DIN EN 50091-1-1	(VDE 0558 Part 511) Uninterruptible power systems (UPS) – General requirements and safety requirements for UPS used in operator access areas	1997-07
DIN EN 50091-1-2	(VDE 0558 Part 512) – General requirements and safety requirements for UPS used in restricted access locations	1999-05
DIN EN 50091-2	(VDE 0558 Part 520) – EMC requirements	1996-05
DIN VDE 0558-6	VDE 0558 Part 6) – Switches for UPS, IEC 60146-5	1992-04
DIN EN 60146-1-3	(VDE 0558 Part 8) – General requirements and line-commutated converter – Transformers and reactors	1994-03

DIN VDE 0560-1	(VDE 0560 Part 1) Specification for capacitors – General requirements	1969-12
further parts: 10, 11, 120, 121, 15, 16, 2, 3.		
DIN EN 60871-1	(VDE 0560 Part 410) Shunt capacitors for power systems over 1 kV – General, design, testing and rating, safety requirements, instructions for installation and operation	1998-09
DIN IEC 60871-2	(VDE 0560 Part 420) – Endurance testing	1993-04
DIN EN 60871-4	(VDE 0560 Part 440) – Internal fuses	1997-08
DIN EN 60143-1	(VDE 0560 Part 42) Series capacitors for power systems – General, performance, testing and rating, safety requirements, guidelines for erection	1995-01
DIN EN 60143-2	(VDE 0560 Part 43) – Protection devices for batteries of series capacitors	1995-12
DIN EN 60143-3	(VDE 0560 Part 44) – Internal fuses	1999-03
DIN EN 60381-1	(VDE 0560 Part 46) Self-restoring shunt power capacitors up to 1000 V – General, performance, testing and rating, safety requirements, instructions for installation and operation	1997-12
DIN EN 60381-2	(VDE 0560 Part 47) – Aging test, self-healing test and destruction test	1997-09
DIN EN 60931-1	(VDE 0560 Part 48) Non-self-restoring shunt power capacitors up to 1 kV – General, requirements, testing and rating, safety requirements, instructions for installation and operation	1997-12
DIN EN 60931-2	(VDE 0560 Part 49) – Aging test and destruction test	1997-08
DIN EN 60252	(VDE 0560 Part 8) Motor capacitors	1994-11
further parts: 430, 800, 810, 811.		

Group 6 Installation material, switchgear

DIN VDE 0603-1	(VDE 0603 Part 1) Consumer units and meter panels AC 400 V – Consumer units and meter panels	1991-10
DIN VDE 0603-2	(VDE 0603 Part 2) – Main line branch terminals	1998-03
DIN EN 50085-1	(VDE 0604 Part 1) Cable trunking systems and cable ducting systems for electrical installations – General requirements	1998-04
DIN VDE 0604-2	(VDE 0604 Part 2) – Trunking for appliances	1986-05
DIN VDE 0604-3	(VDE 0604 Part 3) – Skirting board ducts	1986-05
DIN EN 50086-1	(VDE 0605 Part 1) Conduit systems for electrical installations – General requirements	1994-05
DIN EN 50086-2-1	(VDE 0605 Part 2-1) – Rigid conduit systems	1995-12
DIN EN 50086-2-2	(VDE 0605 Part 2-2) – Pliable conduit systems	1995-12
DIN EN 50086-2-3	(VDE 0605 Part 2-3) – Flexible conduit systems	1995-12
DIN EN 50086-2-4	(VDE 0605 Part 2-4) – Underground buried conduit systems	1994-09
DIN VDE 0606-1	(VDE 0606 Part 1) Connecting materials up to 690 V – Installation boxes for accommodation of equipment and/or connecting terminals	2000-10
DIN EN 60999-1	(VDE 0609 Part 1) Connecting devices - Electrical copper conductors – Safety requirements for screw-type and screwless-type clamping units	2000-12
DIN EN 60947-7-1	(VDE 0611 Part 1) Low-voltage switchgear and controlgear – Ancillary equipment Section 1: Terminal blocks for copper conductors	2000-05

further parts: 20, 3, 4

DIN VDE 0618-1	(VDE 0618 Part 1) Equipment for equipotential bonding	1989-08
DIN EN 50262	(VDE 0619) Metric cable glands for electrical installations	1999-04
DIN VDE 0620	(VDE 0620) Plugs and socket-outlets up to 400 V, 25 A	1992-05
further parts: 101, 300.		
DIN EN 60309-1	(VDE 0623 Part 1) Plugs and socket-outlets and couplers for industrial purposes, general requirements	2000-05
further parts: 20, 4, 100.		
DIN EN 61058-1	(VDE 0630 Part 1) Switches for appliances – General requirements	1993-05
DIN VDE 0630-12	(VDE 0630 Part 12) Switches for appliances for a rated voltage not exceeding 500 V and a rated current not exceeding 63 A, – Electronic switches	1988-09
DIN EN 60669-1	(VDE 0632 Part 1) Switches for household and similar fixed electrical installations – General requirements	1996-04
and further parts.		
DIN VDE 0633-1	(VDE 0633 Part 1) Time switches – General requirements	1989-01
DIN VDE 0633-2	(VDE 0633 Part 2) – Electronic time switches	1986-02
DIN VDE 0634-1	(VDE 0634 Part 1) Underfloor electrical installation – Service units	1987-09
and Part 2.		
DIN 57635	(VDE 0635) Low-voltage fuses – D-fuses 16 up to 25 A, 500 V, – D-fuses up to 100 A, 750 V, – D-fuses up to 100 A, 500 V.	1984-02
DIN EN 60269-1	(VDE 0636 Part 10) – General requirements	1999-11
DIN EN 60269-2	(VDE 0636 Part 20) – Fuses for use by authorized persons	1995-12

DIN EN 60269-3	(VDE 0636 Part 30) – Fuses for use by unskilled persons	1995-12
DIN EN 60269-4	(VDE 0636 Part 40) – Fuse links for protection of semiconductor elements	1997-04
DIN VDE 0636-201	(VDE 0636 Part 201) Low-voltage fuses (HRC) – Fuses for use by authorized persons, IEC 60269-2-1, HD 630.2.1 S2	1998-06
DIN VDE 0636-2011	(VDE 0636 Part 2011) – National supplement to VDE 0636 Part 201: protection of special electrical systems	1999-05
DIN VDE 0636-301	(VDE 0636 Part 301) Low-voltage fuses (D type), – Fuses for use by unskilled persons, IEC 60269-3-1, HD 630.3.1 S2	1998-01
DIN VDE 0636-3011	(VDE 0636 Part 3011) – National supplement to VDE 0636 Part 301	1999-05
DIN 57638	(VDE 0638) Low-voltage switchgear – Fuse-switch units, DO system	1981-09
DIN VDE 0641-11	(VDE 0641 Part 11) Circuit-breakers for overcurrent protection for domestic use IEC 60898, EN 60898	1992-08
DIN 57641-2	(VDE 0641 Part 2) Miniature circuit-breakers up to 63 A and up to 440 V direct voltage	1984-04
DIN 57641-3	(VDE 0641 Part 3) Miniature circuit-breakers up to 63 A and up to 415 V alternating voltage and up to 440 V direct voltage	1984-04
DIN EN 60934	(VDE 0642) Circuit breakers for equipment (CBE)	1995-04
DIN EN 60947-1	(VDE 0660 Part 100) Low-voltage switchgear and control gear – General rules	1999-12
DIN EN 60947-2	(VDE 0660 Part 101) – Circuit breakers	1997-02
DIN VDE 0660-102	(VDE 0660 Part 102) – Electromechanical contactors and motor-starters IEC 60947-4-1, EN 60947-4-1	1992-07

DIN 57660-103	(VDE 0660 Part 103) Switchgear – High-voltage alternating current contactors above 1000 V up to 12000 V	1984-03
DIN 57660-105	(VDE 0660 Part 105) – High-voltage motor starters, Direct-on-Line (full voltage) AC starters	1984-03
DIN EN 60941-3	(VDE 0660 Part 107) Low-voltage switchgear and control gear – Switches, disconnectors, switch disconnectors and fuse-combination units	2000-02
DIN VDE 0660-109	(VDE 0660 Part 109) – AC semiconductor controllers and contactors for non-motor loads, IEC60158-2	2000-09
DIN VDE 0660-112	(VDE 0660 Part 112) – Direct current air-break switches, air-break disconnectors and air-break switch-disconnectors over 1200 V up to 3000 V	1987-02
DIN VDE 0660-114	(VDE 0660 Part 114) – Automatic transfer switching equipment IEC 60947-6-1, EN 60947-6-1	1992-07
DIN EN 60947-6-2	(VDE 0660 Part 115) – Control and protective switching devices (CPS)	1993-09
DIN EN 60947-4-2	(VDE 0660 Part 117) – AC semiconductor-motor controllers and starters	2000-09
DIN EN 60947-5-1	(VDE 0660 Part 200) – Electromechanical control circuit devices	2000-08
DIN EN 60947-5-2	(VDE 0660 Part 208) – Proximity switches	2000-08
DIN VDE 0660-209	(VDE 0660 Part 209) – Proximity position switches for safety functions	1988-01
DIN EN 60947-5-5	(VDE 0660 Part 210) – Control circuit devices and switching elements – Electrical emergency stop devices with mechanical latching function	1998-01
DIN VDE 0660-302	(VDE 0660 Part 302) Thermal rotating machines protection – Thermal detectors and control units	1987-02
DIN VDE 0660-303	(VDE 0660 Part 303) – PTC thermal detectors and control units	1987-02

DIN EN 60439-1	(VDE 0660 Part 500) Low-voltage switchgear and controlgear assemblies – Type-tested and partially type-tested assemblies	2000-08
Appendix 2 to DIN EN 60439-1	(VDE 0660 Part 500) – Guide for testing under arc fault conditions IEC61641	1997-10
DIN EN 60439-4	(VDE 0660 Part 501) – Assemblies for construction sites (ACS)	1992-02
DIN EN 60439-2	(VDE 0660 Part 502) – Busbar trunking systems (busways)	1993-07
DIN EN 60439-5	(VDE 0660 Part 503) – Assemblies intended to be installed outdoors in public places, cable distribution cabinets (CDCs)	1997-02
DIN VDE 0660-504	(VDE 0660 Part 504) – Low voltage switchgear and controlgear assemblies for use by unskilled persons and installation in public places, distribution boards IEC 60439-3, EN 60439-3	1992-04
DIN VDE 0660-505	(VDE 0660 Part 505) – House connection boxes and fuseboxes	1998-10
DIN VDE 0660-506	(VDE 0660 Part 506) – Slotted trunking, requirements, tests	1989-10
DIN VDE 0660-507	(VDE 0660 Part 507) – Assessing of the temperature rise of partially type-tested assemblies (PTTA) by extrapolation IEC 60890/A1, HD 528S2	1997-11
DIN IEC 61117	(VDE 0660 Part 509) – Assessing of the short-circuit current capability of partially type-tested assemblies (PTTA)	1993-09
DIN EN 50298	(VDE 0660 Part 511) Empty enclosures for low-voltage switchgear and control gear assemblies – General requirements	1999-06
DIN EN 62020	(VDE 0663) Residual current monitors for household and similar uses (RCMs)	1999-07
DIN EN 61008-1	(VDE 0664 Part 10) Residual current-operated circuit breakers without integral overcurrent protection for household and similar uses (RCCBs)	1999-12

DIN EN 61009-2	(VDE 0664 Part 20) Residual current-operated circuit breakers with integral overcurrent protection for household and similar uses (RCBOs)	2000-09
DIN VDE 0664-3	(VDE 0664 Part 3) – Residual current-operated protective devices for alternating voltage over 500 V and over 63 A	1988-10
DIN VDE 0670-101	(VDE 0670 Part 101) AC switchgear and control gear for voltages above 1 kV High-voltage alternating current circuit-breakers – General, terms and definitions IEC60056-1	1992-12
DIN VDE 0670-102	(VDE 0670 Part 102) – Rating IEC60056-2	1992-12
DIN VDE 0670-103	(VDE 0670 Part 103) – Design and construction IEC60056-3	1992-10
DIN VDE 0670-104	(VDE 0670 Part 104) – Type-tests and routine tests	1992-10
DIN VDE 0670-105	(VDE 0670 Part 105) – Selecting circuit-breakers for service IEC60056-5	1992-10
DIN VDE 0670-106	(VDE 0670 Part 106) – Information in enquiries, tenders and orders and rules for transport, storage, erection and maintenance IEC60056-6	1992-10
DIN 57670-107	(VDE 0670 Part 107) – Testing under out-of-phase conditions IEC60056-7	1980-07
DIN EN 60427	(VDE 0670 Part 108) – Synthetic testing of high-voltage alternating current circuit-breakers	1996-03
DIN EN 61166	(VDE 0670 Part 111) – Guide for seismic qualification of high-voltage alternating current circuit-breakers	1994-08
DIN EN 60129	(VDE 0670 Part 2) Alternating current disconnectors and grounding switches	1998-03

DIN EN 61129	(VDE 0670 Part 212) – Alternating current grounding switches, induced current switching	1995-02
DIN EN 61259	(VDE 0670 Part 213) Gas-insulated metal-enclosed switchgear for rated voltages of 72.5 kV and above – Requirements for switching bus charging currents by disconnectors	1996-06
DIN EN 60265-1	(VDE 0670 Part 301) High-voltage. switches – High-voltage switches over 1 kV and below 52 kV	1999-05
DIN EN 60265-2	(VDE 0670 Part 302) – High-voltage switches for rated voltages of 52 kV and above	1998-09
DIN EN 60420	(VDE 0670 Part 303) – High-voltage alternating current switch-fuse combinations	1994-09
DIN EN 60282-1	(VDE 0670 Part 4) High-voltage fuses – Current-limiting fuses	1998-02
DIN EN 60644	(VDE 0670 Part 401) – High voltage fuse – links for motor circuit applications	1997-03
DIN VDE 0670-402	(VDE 0670 Part 402) – Selection of fuse-links for transformer circuits	1988-05
DIN EN 60298	(VDE 0670 Part 6) AC metal-enclosed switchgear and control gear for rated voltages above 1 kV and up to and including 52 kV	1998-05
DIN EN 61330	(VDE 0670 Part 611) High-voltage/low-voltage prefabricated substations	1997-08
DIN EN 60517	(VDE 0670 Part 8) Gas-insulated metal-enclosed high-voltage switchgear and controlgear for rated voltages of 72.5 kV and above	1998-10
DIN VDE 0670-801	(VDE 0670 Part 801) Alternating-current switchgear for voltages above 1 kV – Cast aluminium alloy enclosures for gas-filled high-voltage switchgear and controlgear EN 50052	1987-04
DIN VDE 0670-803	(VDE 0670 Part 803) – Wrought-aluminium and aluminium alloy enclosures for gas-filled high-voltage switchgear and controlgear EN 50064	1991-05

DIN EN 50068	(VDE 0670 Part 804) – Wrought steel enclosures for gas-filled high-voltage switchgear and controlgear	1993-08
DIN EN 50069	(VDE 0670 Part 805) – Welded composite enclosures of cast and wrought aluminium alloys for gas-filled high-voltage switchgear and controlgear	1993-08
DIN EN 50089	(VDE 0670 Part 806) Cast resin partitions for metal-clad gas-filled high-voltage switchgear and controlgear	1994-04
DIN EN 50187	(VDE 0670 Part 811) Gas-filled compartments for alternating-current switchgear and controlgear for rated voltages above and 1 kV up to and including 52 kV	1997-05
DIN EN 60694	(VDE 0670 Part 1000) Common specifications for high-voltage switchgear and controlgear standards	1998-10
DIN EN 60168	(VDE 0674 Part 1) Tests on indoor and outdoor post insulators of ceramic material or glass for systems with nominal voltages greater than 1 kV	1995-11
DIN IEC 60233	(VDE 0674 Part 2) Tests on hollow insulators for electrical equipment	1984-12
DIN EN 61264	(VDE 0674 Part 3) Ceramic pressurized hollow insulators for high-voltage switchgear and controlgear	1999-06
DIN IEC 60273	(VDE 0674 Part 4) – Characteristics of indoor and outdoor insulators for systems over 1000 V, HD 578 S1	1993-08
DIN EN 60137	(VDE 0674 Part 5) Insulated bushings for alternating voltages over 1000 V	1996-10
DIN EN 60099-1	(VDE 0675 Part 1) Surge arresters – Non-linear resistor type gapped surge arresters for AC systems	2000-08
DIN VDE 0675-102	(VDE 0675 Part 102) Overvoltage protection equipment – “Artificial pollution; tests of surge arresters”	1986-09
DIN 57675-3	(VDE 0675 Part 3) – Tests for protective spark gaps for AC networks	1982-11

DIN EN 60099-4	(VDE 0675 Part 4) – Metal oxide surge arresters without gaps for AC systems	1994-05
DIN EN 60099-5	(VDE 0675 Part 5) Surge arresters, selection and application recommendations	1997-08
DIN 57680-1	(VDE 0680 Part 1) Personal protective equipment, protective devices and apparatus for work on electrically energized systems up to 1000 V – Personal protective equipment and protective insulating devices	1983-01
DIN 57680-3	(VDE 0680 Part 3) – Operating rods and current-collecting devices	1977-09
DIN 57680-4	(VDE 0680 Part 4) – Fuse handles for low-voltage HRC fuses	1980-11
DIN 57680-6	(VDE 0680 Part 6) – Single-pole voltage testers up to 250 V AC	1977-04
DIN 57680-7	(VDE 0680 Part 7) – Socket spanner	1984-02
DIN VDE 0681-1	(VDE 0681 Part 1) Operating, testing and safeguarding devices for work on electrically energized systems with rated voltages exceeding 1 kV – General requirements	1986-10
DIN 57681-2	(VDE 0681 Part 2) – Operating rods	1977-03
DIN 57681-3	(VDE 0681 Part 3) – Fuse tongs	1977-03
DIN VDE 0681-5	(VDE 0681 Part 5) – Phase comparators	1985-06
DIN VDE 0681-6	(VDE 0681 Part 6) – Voltage detectors for overhead contact systems on electrical railways 15 kV, 16 ² / ₃ Hz	1985-06
DIN VDE 0681-8	(VDE 0681 Part 8) – Insulating protective shutters	1988-05
DIN EN 60900	(VDE 0682 Part 201) Hand-tools for live working up to AC 1000 V and DC 1500 V	1994-08
DIN EN 60832	(VDE 0682 Part 211) Insulating poles and universal tool attachments (fittings) for live working	1998-01

DIN EN 60903	(VDE 0682 Part 311) – Specification for gloves and mitts of insulating material for live working	1994-10
DIN EN 60984	(VDE 0682 Part 312) – Sleeves of insulating material for live working	1994-10
DIN EN 61243-3	(VDE 0682 Part 401) – Two-pole low-voltage voltage detectors	1999-09
DIN EN 61243-1	(VDE 0682 Part 411) Live working – Voltage detectors, capacitive type for alternating voltage over 1 kV	1998-05
DIN EN 61229	(VDE 0682 Part 551) Rigid protective covers for live working on AC installations	1997-01
DIN EN 61236	(VDE 0682 Part 651) Saddles, pole clamps (stick clamps) and accessories for live working	1996-11
DIN EN 61057	(VDE 0682 Part 741) Aerial devices with insulating boom for live working over AC 1 kV	1995-08
DIN EN 61230	(VDE 0683 Part 100) Live working – Portable equipment for earthing or earthing and short-circuiting	1996-11
DIN EN 61219	(VDE 0683 Part 200) – Earthing or earthing and short-circuiting equipment using lancesas short-circuiting device	1995-01

Group 8 Information technology

DIN VDE 0800-1	(VDE 0800 Part 1) Telecommunications – Requirements and tests for the safety of facilities and apparatus	1989-05
DIN VDE 0800-2	(VDE 0800 Part 2) – Earthing and equipotential bonding	1985-07
DIN VDE 0800-3	(VDE 0800 Part 3) – Telecommunication facilities with remote supply	1983-06
DIN VDE 0800-4	(VDE 0800 Part 4) – Erection of telecommunications lines	1986-03
DIN VDE 0800-5	(VDE 0800 Part 5) – Power supply	1991-01

DIN V VDE 0801	(VDE 0801) Draft standard – Principles for computers in safety-related systems	1990-01
DIN EN 41003	(VDE 0804 Part 100) Particular safety requirements for equipment to be connected to telecommunication networks	1999-08
DIN EN 60950	(VDE 0805) Safety of information technology equipment	1997-11
DIN EN 50116	(VDE 0805 Part 116) Information-technology equipment – Testing (100 %) for production	1997-06
DIN EN 50065-1	(VDE 0808 Part 1) Signaling on low-voltage electrical installations in the frequency range 3 kHz to 148.5 kHz.	1996-11
DIN VDE 0812	(VDE 0812) Telecommunications and data-processing systems – Equipment wires and stranded equipment wires with PVC insulation sheaths	1988-11
DIN VDE 0813	(VDE 0813) – Switchboard cables	1988-11 s
DIN VDE 0814	(VDE 0814) – Cords	1981-10
DIN VDE 0815	(VDE 0815) – Wiring cables and wires	1985-09
DIN VDE 0816-1	(VDE 0816 Part 1) – External cables with insulation and sheaths of polyethylene	1988-02
DIN VDE 0816-2	(VDE 0816 Part 2) – External cables, signal and measuring cables, mine cables	1988-02
DIN VDE 0816-3	(VDE 0816 Part 3) – External cables with paper insulation	1988-02
DIN VDE 0817	(VDE 0817) – Lines with stranded conductors for increased mechanical stress	1990-08
DIN 57818	(VDE 0818) Self supporting telecommunication aerial cables on overhead power lines above 1 kV	1983-02
DIN VDE 0819-1	(VDE 0819 Part 1) Multicore and symmetric pair / quad and multicore cables for digital data transmission, HD 608 S1	1994-04

DIN VDE 0819-100	(VDE 0819 Part 100) Materials used in communication cables – General, HD 624.0 S1	1998-05
DIN VDE 0819-101	(VDE 0819 Part 101) – PVC insulating compounds, HD 624.1 S1	1995-02
DIN VDE 0819-102	(VDE 0819 Part 102) – PVC sheathing compounds, HD 624.2 S1	1995-02
DIN VDE 0819-103	(VDE 0819 Part 103) – Polyethylene insulating compounds, HD 624.3 S1	1995-02
DIN VDE 0819-104	(VDE 0819 Part 104) – Polyethylene sheathing compounds, HD 624.4 S1	1997-07
DIN VDE 0819-105	(VDE 0819 Part 105) – Polypropylene insulation compounds, HD 624.5 S1	1996-02
DIN VDE 0819-106	(VDE 0819 Part 106) – Halogen-free, fire-retardant insulation compounds, HD 624.6 S1	1996-02
DIN VDE 0819-107	(VDE 0819 Part 107) – Halogen-free, fire-retardant thermoplastic sheathing compounds, HD 624.7 S1	1995-02
DIN VDE 0819-108	(VDE 0819 Part 108) – Filling compounds for filled cables, HD 624.8 S1	1996-02
DIN VDE 0819-109	(VDE 0819 Part 109) – Cross-linked PE insulation, HD 624.9 S1	1997-07
DIN EN 50167	(VDE 0819 Part 2) Sectional specification for cables for digital communications – Floor wiring cables with common overall screen	1995-08
DIN EN 50168	(VDE 0819 Part 3) – Work area wiring cables with common overall screen	1995-08
DIN EN 50169	(VDE 0819 Part 4) – Backbone cables, riser and campus with common overall screen	1995-08
DIN VDE 0819-5	(VDE 0819 Part 5) – Equipment cables for digital and analog communications, HD 609 S1	1997-11
DIN VDE 0820-1	(VDE 0820 Part 1) Miniature fuses – Terms and definitions, requirements for cartridge fuse links IEC 60127-1, EN 60127-1	1992-11
DIN EN 60127-2	(VDE 0820 Part 2) – Cartridge fuse links	1996-08

DIN EN 60127-3	(VDE 0820 Part 3) – Sub-miniature fuse links	1996-11
DIN EN 60127-4	(VDE 0820 Part 4) – Universal modular fuse links (UMF)	1997-05
DIN VDE 0820-5	(VDE 0820 Part 5) – Quality assessment of miniature fuse links IEC 60127-5, EN 60127-5	1992-11
DIN EN 60127-6	(VDE 0820 Part 6) – Fuse holders for miniture cartridge fuse-links	1996-12
DIN EN 60691	(VDE 0821) Thermal links, requirements, application guide	1996-08
DIN EN 50130-4	(VDE 0830 Part 1-4) Alarm systems – Electromagnetic compatibility (product familiy standard)	1996-11
DIN EN 50134-7	(VDE 0830 Part 4-7) – Social alarm systems, application guidelines	1996-12
DIN EN 50132-7	(VDE 0830 Part 7-7) – CCTV surveillance systems for use in security applications - Application guidelines	1997-07
DIN VDE 0833-1	(VDE 0833 Part 1) Alarm systems for fire, intrusion and hold-up – General specifications	1989-01
DIN VDE 0833-2	(VDE 0833 Part 2) – Fire alarm systems	2000-01
DIN 57833-3	(VDE 0833 Part 3) – Intruder and hold-up alarm systems	1982-08
DIN EN 60825-1	(VDE 0837 Part 1) Safety of laser products – Classification of systems, requirements and user guidelines	1997-03
DIN EN 60825-2	(VDE 0837 Part 2) – Fibre-optic communication systems	1994-07
DIN VDE 0838-1	(VDE 0838 Part 1) Disturbances in power supply systems caused by household appliances and similar electrical equipment – Definitions IEC 60555-1, EN 60555-1	1987-06
DIN EN 61000-3-2	(VDE 0838 Part 2) Electromagnetic compatibility (EMC) – Limit values for harmonic current emissions	1998-10

DIN EN 61000-3-3	(VDE 0838 Part 3) – Limit values for voltage fluctuations and flickers in low-voltage supply systems	1996-03
DIN V ENV 61000-2-2	(VDE 0839 Part 2-2) Draft standard – Compatibility levels for low-frequency conducted disturbances and signalling in public low-voltage power supply systems IEC 6100-2-2, EN V 6100-2-2	1994-05
DIN EN 61000-2-4	(VDE 0839 Part 2-4) – Compatibility levels for low-frequency conducted disturbances in industrial plants	1995-05
DIN EN 61000-2-9	(VDE 0839 Part 2-9) – HEMP environment, radiated disturbance – Basic EMC publication	1996-12
DIN EN 61000-2-10	(VDE 0839 Part 2-10) – Conducted disturbance	1999-10
DIN EN 50081-1	(VDE 0839 Part 81-1) – Generic emission standard, residential, commercial and light industry	1993-03
DIN EN 50081-2	(VDE 0839 Part 81-2) – Industrial environment	1994-03
DIN EN 61326-1	(VDE 0843 Part 20) Electrical equipment for control systems and laboratories, EMC requirements, general requirements	1998-01
DIN VDE 0845-1	(VDE 0845 Part 1) Protection of telecommunications systems against lightning, electrostatic discharges and overvoltages from power systems, provisions against overvoltages	1987-10
DIN EN 60868-0	(VDE 0846 Part 0) Flicker meter – Evaluation of flicker severity	1994-08
DIN VDE 0846-1	(VDE 0846 Part 1) Instrumentation for assessing electromagnetic compatibility – Measuring of harmonics of the main voltages and currents up to 2500 Hz	1985-08
DIN 57847-1	(VDE 0847 Part 1) – Method of measurements for the electromagnetic compatibility, measurement of conducted interference units	1981-11
DIN EN 61000-4-1	(VDE 0847 Part 4-1) Electromagnetic compatibility (EMC) – Testing and measuring techniques – Overview over immunity tests, basic EMC-publication	1995-09

DIN EN 61000-4-10	(VDE 0847 Part 4-10) – Damped oscillatory magnetic field immunity test, basic EMC-publication	1994-05
DIN EN 61000-4-11	(VDE 0847 Part 4-11) – Voltage dips, short interruptions and voltage variations immunity tests	1995-04
DIN EN 61000-4-12	(VDE 0847 Part 4-12) – Oscillatory waves immunity test, basic EMC-publication	1996-03
DIN EN 61000-4-2	(VDE 0847 Part 4-2) – Electrostatic discharge immunity test, basic EMC-publication	1996-03
DIN EN 61000-4-24	(VDE 0847 Part 4-24) – Test methods for protective devices for HEMP conducted disturbances, basic EMC-publication	1997-11
DIN EN 61000-4-3	(VDE 0847 Part 4-3) – Radiated radio-frequency electromagnetic field immunity tests	1999-06
DIN EN 61000-4-4	(VDE 0847 Part 4-4) – Electrical fast transient/burst immunity test, basic EMC-publication	1996-03
DIN EN 61000-4-5	(VDE 0847 Part 4-5) – Surge immunity test	1996-09
DIN EN 61000-4-6	(VDE 0847 Part 4-6) – Immunity to conducted disturbances induced by radio-frequency fields	1997-04
DIN EN 61000-4-7	(VDE 0847 Part 4-7) – Guide for measuring harmonics and interharmonics and instrumentation for power supply systems	1994-08
DIN EN 61000-4-8	(VDE 0847 Part 4-8) – Power frequency magnetic field immunity test, basic EMC-publication	1994-05
DIN EN 61000-4-9	(VDE 0847 Part 4-9) – Pulse magnetic field immunity test, basic EMC-publication	1994-05
DIN EN 61000-4-15	(VDE 0847 Part 4-15) – Flicker meter, functional and design specifications	1998-11
DIN EN 61000-4-16	(VDE 0847 Part 4-16) – Test for immunity to conducted common mode disturbances in the frequency range of 0 Hz to 150 kHz	1998-08
DIN EN 61000-5-5	(VDE 0847 Part 5-5) – Protective devices for HEMP conducted disturbance, basic EMP-publication	1997-02

DIN VDE 0848-1	(VDE 0848 Part 1) Safety in electrical, magnetic and electromagnetic fields, definitions, methods for measurement and calculation	2000-08
DIN 57850	(VDE 0850) Coupling devices for power-line carrier systems	1980-03
DIN EN 60495	(VDE 0850 Part 2) Single sideband power-line carrier terminals	1995-02
DIN VDE 0851	(VDE 0851) Line traps for power line carrier systems (PLC), IEC 60353	1993-02
DIN VDE 0852-1	(VDE 0852 Part 1) Tele-protection equipment of power systems – Performance and testing – Command systems IEC 60834-1, EN 60834-1	1993-05
DIN VDE 0852-2	(VDE 0852-2) – Analog comparison systems IEC 60843-2, HD 543.2 S1	1995-11
DIN VDE 0873	(VDE 0873) Appendix 1, 2 and 3 Radio interference characteristics of overhead power lines and high-voltage equipment	
Appendix 1	Physical phenomena, CISPR 18-1	1986-06
Appendix 2	Determining limit values, CISPR 18-2	1990-02
Appendix 3	Minimizing radio interference, CISPR 18-3	1991-01
DIN 57873-1	(VDE 0873 Part 1) Measures against radio interference from electric utility plants and electric traction systems – Radio interference from systems over 10 kV	1982-05
DIN 57873-2	(VDE 0873 Part 2) – Radio interference from systems under 10 kV and by electrical trains	1983-06
DIN EN 187000	(VDE 0888 Part 100) Generic specification: Optical fibre cables	1993-10
DIN EN 188000	(VDE 0888 Part 101) Generic specification: Optical fibres	1994-02
DIN EN 188100	(VDE 0888 Part 102) Sectional specification: Single-mode (SM) optical fibre	1996-01
DIN EN 188101	(VDE 0888 Part 103) Family specification: Dispersion unshifted single-mode optical fibre	1996-01

further parts: 104, 105, 106, 107, 108, 109, 110, 3, 4, 5, 6.

DIN VDE 0891-1	(VDE 0891 Part 1) Use of cables and insulated wires for telecommunication systems and information processing systems – General directions	1990-05
DIN VDE 0891-2	(VDE 0891 Part 2) – Special directions for equipment wires with solid or stranded conductors	1990-05
DIN VDE 0891-3	(VDE 0891 Part 3) – Special directions for switchboard cables	1990-05

further parts: 4, 5, 6, 7, 8, 9.

17.2 Application of European directives to high-voltage switchgear installations.

CE mark

The CE mark based on European Directives assists the free distribution of goods on the European market. It is directed to the national standards supervising bodies. When the manufacturer applies the CE mark, this states that the legal requirements for the commercial product have been met. The CE mark is not a quality designation, a safety designation or a designation of conformity to a standard.

The following three European Union Directives may be applicable to electrical switchgear installations:

The *Machine Directive* covers most types of machines, with the exception of certain special types that are specifically excluded. The power supply companies and the manufacturers in Europe (EURELECTRIC/UNPEDE and CAPIEL) have always been of the unanimous opinion that high-voltage equipment is not subject to the Machine Directive. The European Commission now shares this view. It should also be noted that motors, by definition, are not covered by the Machine Directive.

The *EMC Directive* is intended for application to almost all electrical equipment. However, fixed installations (which are assembled at the site of operation) have to meet the EMC protection requirements but they do not require a declaration of conformity, a CE mark nor an approval by any competent authority. This also applies to all primary and secondary devices in these installations (as components with no direct function).

The *Low Voltage Directive (LVD)* is applicable to independent low-voltage equipment which is also used in high-voltage switchgear and installations, such as control circuits, protection relays, measuring and metering devices, terminal strips, etc. This equipment must conform to the LVD and have a CE mark when purchased on the open market.

However, if control, measuring, protection and regulating equipment is a fixed component of high-voltage substations and/or switchgear, it is not covered by the Low-Voltage Directive, because by definition (as per IEC 50-441) they are considered to be high-voltage products.

In conclusion it is noted that high-voltage equipment and installations, including secondary installations, do not require a CE mark. However, they are subject to the relevant standards and regulations.

17.3 Quality in switchgear

The functional reliability of switchgear installations and hence the largely undisturbed transmission of electricity in a power network depends on the suitability and quality of the switchgear, components, systems and processes employed. Of growing importance in this regard is a forward-looking quality strategy with internationally harmonized standards and their main quality systems. The following brief review of the main international standards, terms and scope of quality assurance is intended to ease the switchgear engineer's introduction to this complex subject.

According to the definition of the standard (DIN EN ISO 8402), quality means the totality of the characteristics of a unit with reference to its ability to meet specified and predefined requirements. With regard to the customer-supplier relationship, this means that the supplier's quality meets or exceeds the customer's requirements and meets or exceeds the statutory requirements with regard to the products and the processes.

Necessary for optimizing this attribute is a quality management system, i.e. a clearly structured organization and procedures for implementing quality assurance, together with the requisite means. Quality assurance in this sense is the sum of all the activities of quality management, quality planning and quality control (see DIN 55 350-11).

The CEN members are required to adopt the series of European standards ISO 9000 to ISO 9004, which concern the setting up of a quality system. This standard must be given the status of a national standard without any modifications. The series comprises:

DIN EN ISO 9000:	standards covering quality management and quality assurance/QM statement
DIN EN ISO 9001:	quality management systems, model for quality assurance/QM statement in design, development, production, assembly and maintenance
DIN EN ISO 9002:	quality management systems, model for quality assurance/QM statement in production, assembly and maintenance
DIN EN ISO 9003:	quality management systems, model for quality assurance/QM statement at final inspection
DIN EN ISO 9004:	quality management systems and quality management elements – guidelines

The goal of these standards is to assure the customer that the supplier meets specified minimum requirements for the quality management system. This can be done by supplying a quality management system statement to the customer or to an authorized third party. All planned, systematic, trust-building activities in this framework are termed quality assurance or quality management statement as per DIN EN ISO 8402 and include the

- establishment of a design and process organization,
- qualification of employees and equipment,
- specification of management, responsibility and authority,
- requirement for documentation of regulations and results,
- requirement for reporting to the highest level of management,
- management of risks and economics,
- preventive measures for avoiding quality problems.

17.4 Notable events and achievements in the history of ABB switchgear technology

1898	Three-phase transmission in Sweden
1900	Oil circuit-breaker with automatic overcurrent trip
1908	35 kV switchgear installation with partitions between the three phases
1908	Transformer station for 50 kV
1912	65 kV switchgear installation with partitioned phases
1917	110 kV indoor switchgear with outdoor busbars
1922	110/20 kV indoor switching station with recessed oil circuit breakers
1922	Sheet steel control panel with control switches and breaker position indicators incorporated in a mimic display
1923	First miniature circuit-breaker with thermal and magnetic trip
1924	High-speed breaker for rectifier systems
1926	110 kV outdoor switchgear mounted on lattice-type columns
1928	First delivery of oil-insulated current transformers for 110 kV
1928	Distance relays for selective disconnection of faulted parts of network
1930	Illuminated mimic display for a 110/20 kV transformer station with electrical safety interlocks
1930	First delivery of water-type circuit-breakers for medium voltage
1932	First delivery of minimum-oil convector-type circuit-breaker for 110 kV
1933	First delivery of airblast circuit-breakers for 10 to 30 kV and 250 to 500 MVA
1938	Commissioning of first transformer station for 220/110/10 kV with resonant grounding and reactive current compensation, convector-type and high-speed airblast circuit-breakers
1939	Direct current transmission at 50 kV using rectifier
1939	Service trials of airblast high-speed circuit-breakers with auto-reclosure
1939	First delivery of oil-insulated current transformers for 220 kV
1943	First outdoor high-speed airblast circuit-breaker for 110 kV, 2500 MVA
1947	Improved high-speed, surge-free synchronizer with synchronizing pulse controller
1948	Small-oil-volume circuit-breaker for 12 kV, 24 kV and 36 kV, LOS pumping-piston arc-quenching principle with current-dependent assisted arc-quenching medium flow (CALOR-EMAG)
1950	First delivery of outdoor high-speed airblast breakers for 220 kV, 2500 MVA with automatic reclosing
1952	Outdoor high-speed circuit-breakers, current transformers and surge arresters delivered to the world's first 380 kV network in Sweden

1954	Commissioning of the world's first 20 MW, 100 kV HVDC system for Gotland
1954	First high-current bus duct for 8 kA load current, open design, Al-C sections
1957	Outdoor airblast circuit-breakers of 12 000 MVA for Germany's first 380 kV transmission link from Rommerskirchen to Hoheneck
1957	Development of internal arc-resistant metal-enclosed switchboards with pressure relief, up to 36 kV (CALOR-EMAG)
1957	First electronic load-frequency control system
1958	First static audio-frequency transmitter using mercury-arc valves
1963	Network control centre with preselective control and mosaic-type illuminated display panel
1963	First delivery of oil-insulated current transformers for 550 kV
1965	High-speed airblast circuit-breakers, current transformers, voltage transformers and reactor coils for the world's first 735 kV transmission system in Canada
1966	First electronic busbar protection system for medium- and high-voltage systems
1966	First high-current bus duct in single-phase enclosure, Al-V sections
1967	First SF ₆ gas-insulated switchgear for 123 kV (CALOR-EMAG) in Germany and 170 kV in Switzerland
1968	Germany's first telecontrol system using integrated circuits
1969	"Combiflex" modular electronic protection relay system
1970	First 245 kV SF ₆ gas-insulated switchgear installation in Germany
1970	First delivery of 735 kV surge arresters to Canada
1972-73	Argentina's 500 kV network constructed including four turnkey outdoor switching stations and pantograph disconnectors
1972	First fully electronic ripple-control receiver
1972	World's first and biggest ripple-control system with thyristorized transmitters for a 110 kV network
1972	First power-control system with on-line state estimator program for Laufenburg, Switzerland
1973	765 kV outdoor airblast circuit-breakers and current transformers in the USA
1973	Network management / load-dispatching systems with process computer, central data processing and video terminals
1973	Airblast generator circuit-breaker for 27 kV, 160 kA and rated continuous current of 32 000 A
1974	First SF ₆ gas-insulated switchgear installations for 420 kV and 525 kV in Switzerland and Canada

1974	420 kV outdoor switching station with tubular busbars for 3000 A
1974	Introduction of the MNS metal-enclosed modular low-voltage system
1975	SLM rail-type low-voltage fused switch disconnecter
1975	420 kV SF ₆ gas-insulated switchgear installation for Germany
1975	First residual-current protection switch
1975	First telecontrol system with adaptive signal routing
1976	Airblast generator circuit-breaker 27 kV, 250 kA and rated continuous current of 36 000 A
1976	First super-fast direction comparison protection system for high- and extra-high voltage power lines
1978	"MODURES" modular electronic relay system for medium- and high-voltage installations
1979	Network control system for a sequence of run-of-river hydro generating plants
1980	World's biggest 123 kV SF ₆ gas-insulated switchgear installation for the Yanbu industrial complex in Saudi Arabia, with 57 circuit-breaker branches
1980-81	Introduction of metal-oxide surge arresters and world's first delivery to Denmark and for 735 kV to Canada
1980	World launch of the B series of modular contactors
1980	World's biggest 525 kV SF ₆ gas-insulated switchgear installation for the Itaipu hydroelectric power plant in Brazil, with 52 circuit-breaker branches
1980	Introduction of the vacuum-type circuit-breaker for voltages up to 36 kV (CALOR-EMAG)
1981	World's first digital fault locator for high-voltage power lines
1981	Delivery of 18 high-current bus ducts for the Itaipu hydro-electric plant in Brazil, service currents up to 28 kA
1982	World's first delivery of metal-oxide surge arresters for ultra-high voltage of 1600 kV to experimental facility in USA
1983	Commissioning of German Railway's first control centre for controlling traction power supply
1983	550 MW high-voltage direct-current (HVDC) coupling at Dürnrohr (Austria) connecting the grid systems of West and East Europe
1983	Isolated-phase, force-cooled generator busduct for 20.5 kV, 36 500 A, delivered to Sweden
1983	765 kV outdoor SF ₆ circuit-breakers delivered to the USA
1984	Delivery of world's largest HVDC system of 6300 MW, ± 600 kV for Itaipu, Brazil
1984	Outdoor SF ₆ circuit-breakers for 420 kV, 80 kA 4000 A
1984-89	Seven turnkey outdoor switchgear installations for the 500 kV network of Java / Indonesia

- 1984-85 Introduction of containerized modular high-current switchgear for gas turbine power plants
- 1984 Decentralized computers for transformer substations with telecontrol functions and local data processing
- 1985 Outdoor SF₆ circuit-breakers employing self-blast principle
- 1985 Introduction of gas-insulated, medium-voltage switchgear, single-phase metal-clad for up to 24 kV
- 1985 Introduction of gas-insulated, medium-voltage switchgear, triple-phase metal-clad (ZV2), for up to 36 kV (CALOR-EMAG)
- 1985 SF₆ generator circuit-breakers for 24 kV, 100 kA and rated continuous current of 12000 A
- 1985 First digital phase-comparison protection system for a high-voltage network
- 1986 Supraregional network control centres for 380 kV to 10 kV with multiple computers and complex, hierarchically structured telecontrol networks
- 1986 Introduction of hydraulic spring operating mechanisms for high-voltage circuit-breakers
- 1987 World's first 800 kV SF₆ gas-insulated switchgear installation ready for operation in South Africa
- 1987 VD4 vacuum circuit-breaker series for 12 kV and 24 kV, particularly suited for compact switchboard designs (CALOR-EMAG)
- 1989 World's first integrated protection and control system for power generation, transmission and distribution
- 1989-91 Two turnkey outdoor switchyards for Thailand's 500 kV network
- 1990 1000th GIS switchgear bay ELK-O, 123 kV, delivered to Graz, Austria
- 1990 Delivery of the first digital distance and transformer differential protection relays
- 1990 World launch of EXLIM metal-oxide surge arresters for system voltages up to 800 kV
- 1991 Delivery of the first remote-programmable ripple-control receivers with distributed intelligence, integral clock and background switching schedules
- 1992 Commissioning of the first multiterminal HVDC system of 2000 MW, ± 500 kV, between Quebec and New England
- 1995 Commissioning of UW8 transformer substation with unified digital station control system with station-level interlocking (LON) for SF₆-insulated switchbays for 110 kV and 20 kV in Mannheim
- 1995 Commissioning of the first installation of gas-insulated switchbays supplied ready for operation from the factory (ZX type) with integrated digital bay control and protection system (REF 542) and plug-in technology for cable connection and busbar connection for 10 kV
- 1997 VM1 vacuum circuit-breaker series with electromagnetic actuating system for 12 kV and 24 kV
- 1998 Supply of the 20000th hydraulic spring operating mechanism