

A3

BGV/GUV-V A3 E

Accident prevention regulation

Electrical installations and equipment

April 1979

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issued October 1996

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Instructions for implementation principally state how the objectives of protection standardized in the accident prevention regulations can be attained. They do not exclude other solutions of at least equal safety, which may also have been formulated in the technical rules of other member states of the European Union or other signatory states to the Agreement on the European Economic Area. Instructions for implementation also contain further explanatory information on accident prevention regulations.

Test reports issued by test laboratories notified in other member states of the European Union or in other signatory states to the Agreement on the European Economic Area are treated in the same way as German test reports when the tests, test methods and design requirements upon which these test bodies' test reports are based are equivalent to those of the German test body. Such bodies are in particular those satisfying the requirements set out in the EN 45 000 series of standards.

The obligation deriving from Directive 98/34/EC of the European Parliament and of the Council of 22 June 1998 laying down a procedure for the provision of information in the field of technical standards and regulations and of rules on Information Society services (OJ EC No. L 204 p. 37), amended by Directive 98/48/EC of the European Parliament and the Council of 20 July 1998 (OJ EC No. L 217 p. 18), has been observed.

Scope

Section 1

- (1) The present accident prevention regulation applies to electrical installations and equipment.
- (2) The present accident prevention regulation also applies to non-electrical work performed in the vicinity of electrical installations and equipment.

Instruction for implementation for Section 1 (2):

Examples of non-electrical work include the erection of structures in the vicinity of overhead lines and cable installations, and approach of the latter during other work such as construction, assembly, transport, coating and repair work.

Definitions

Section 2

- (1) Electrical equipment in the context of the present accident prevention regulation encompasses all items which in whole or part have the purpose of applying electrical energy (such as items for its generation, conduction, distribution, storage, measurement, conversion and consumption) or for the transmission, distribution and processing of information (such as items employed in telecommunications and information technology). Protective and auxiliary equipment is deemed equivalent to electrical equipment in this context where it is subject to requirements concerning its electrical safety. Electrical installations are formed by the combination of electrical equipment.
- (2) Electrical rules in the sense of the present accident prevention regulation are generally recognized good electrical practice as formulated in VDE provisions, to which the statutory accident insurance institution has made reference on its information sheet. An electrical rule shall be deemed observed when any equally effective measure is taken; evidence shall be furnished upon request to the statutory accident insurance institution that the measure is equally effective.
- (3) An electrically skilled person in the sense of the present accident prevention regulation is any person possessing specialist training, knowledge, experience, and knowledge on the relevant provisions to carry out the required work safely.

Instructions for implementation for Section 2 (2):

On its information sheet, the institution for statutory accident insurance refers to the applicable version of the electrical rules listed in Annex 3.

For Section 2 (3):

Specialist qualification as a electrically skilled person shall generally be demonstrated by successful completion of a course of training, for example as an electrical engineer, electrical technician, master electrician or journeyman electrician. Qualification may also be demonstrated by a period of several years' activity together with theoretical and practical training and following examination by a electrically skilled person. Evidence of qualification shall be documented.

Should staff who do not satisfy the above criteria be employed for defined tasks, for example in accordance with Section 5 of the German ordinance on trades and crafts (Handwerksordnung), relating to the commissioning and maintenance of electrical equipment, they may qualify by suitable training as a "electrically skilled person for defined tasks". This qualification does not constitute demonstration under Section 7a of the ordinance on trades and crafts of the knowledge and skills required for licensing to conduct a craft or trade.

Defined tasks are repeated work of the same form performed on equipment and which are described by the employer in a work instruction. An “electrically skilled person for defined tasks” may perform only defined tasks for which evidence of training has been furnished.

These defined tasks may be performed only on installations with rated voltages of up to 1 000 V AC or 1 500 V DC, and only under absence of voltage. Troubleshooting and verification of safe isolation from the supply are permitted in the live state.

The training must encompass both theory and practice. The theoretical training may take place within the company or externally in agreement with the employer. The theoretical training must communicate the knowledge of electrical technology required for safe and proper performance of the defined tasks, and be geared to the defined tasks in question.

The practical training must be conducted on the equipment concerned. It must communicate the skills by means of which the knowledge acquired in the theoretical training can be applied reliably for the defined tasks.

The training must be of adequate duration. Depending upon the scope of the defined tasks, training extending over several months may be necessary.

The training does not absolve the employer of his management responsibility. He must examine in all cases whether the knowledge and skills acquired in the training measure described above are sufficient for the defined tasks.

Principles

Section 3

- (1) The employer shall ensure that electrical installations and equipment are erected, modified and maintained only by a electrically skilled person or under the responsibility and supervision of a electrically skilled person, and in accordance with the electrical rules. The employer shall further ensure that the electrical installations and equipment are operated in accordance with the electrical rules.
- (2) Should a defect be observed on an electrical installation or on electrical equipment, i.e. should the installation or equipment not comply or cease to comply with the electrical rules, the employer shall ensure that the defect is corrected without delay and, should an imminent hazard exist in the meantime, ensure that the electrical installation or the electrical equipment is not used in its defective condition.

Instructions for implementation for Section 3 (1):

The responsibility of and supervision by a electrically skilled person encompasses all tasks required to ensure that persons who do not possess the knowledge and experience of a electrically skilled person and who perform work on electrical installations and equipment do so in a safe and proper manner.

The requirement “under the responsibility of and supervision by a electrically skilled person” means the assumption of management and technical responsibility, in particular:

- the supervision of proper erection, modification and maintenance of electrical installations and equipment;*
- the arranging, performance and inspection of the safety measures required for the work in question, including the provision of safety equipment;*
- the provision of information to instructed persons;*
- the provision of instruction to electrical lay persons on safe behaviour, and the provision of information where required;*
- the monitoring and if necessary supervision of the work and those performing it, for example of non-electrical work performed in the vicinity of live parts.*

Operation encompasses all tasks on and in electrical installations and on and with electrical equipment, i.e. their operation and work on and with them. Maintenance (see DIN 31 051) includes inspection, preventive maintenance and corrective maintenance.

For Section 3 (2):

The imposition of new requirements upon new installations or equipment by the appearance of new electrical rules does not generally constitute a defect.

On its information sheet, the statutory accident insurance institution refers to the description in Annex 1 of the adaptations of existing electrical installations and equipment to electrical rules.

Principles applicable in the absence of electrical rules

Section 4

- (1) Where electrical rules for the avoidance of new or hitherto unobserved hazards on particular electrical installations and equipment do not exist or are inadequate, the employer must ensure that the provisions of the paragraphs below are observed.
- (2) Electrical installations and equipment must be in a safe condition and be maintained in this condition.
- (3) Electrical installations and equipment may be used only if they satisfy the safety requirements applicable locally and for the company in consideration of their type and the ambient influences.
- (4) Live parts of electrical installations and equipment must be protected against direct contact by insulation, position, arrangement or permanently installed equipment commensurate with their voltage, frequency, form of use and location of operation.
- (5) Electrical installations and equipment must be engineered such that during work and operations for which, for compelling reasons, the protection against direct contact in accordance with Section 4 must be suspended or disabled:
 - the live parts can be placed in a de-energized state and this state safeguarded;
or
 - the live parts can be protected against direct contact by means of additional measures commensurate with the voltage, frequency, form of use and location of operation.
- (6) Where electrical equipment must be operated in areas in which complete protection against direct contact is not generally required or possible, adjacent live parts must exhibit at least partial protection against direct contact.
- (7) The performance of measures in accordance with Section 5 must be possible without hazard, for example of electric shock or arcing.
- (8) Electrical installations and equipment must exhibit protection commensurate with their voltage, frequency, form of use and location of operation such that in the event of a fault in the electrical installation or the electrical equipment, protection against hazardous touch voltages continues to exist.

Instructions for implementation for Section 4 (2):

The safe state is present when electrical installations and equipment are engineered such that during proper operation and in their intended use, they are able to give rise neither to a direct hazard (such as a hazardous touch voltage) nor to an indirect hazard (for example due to radiation, explosion or noise) for human beings.

The required safe state also encompasses the necessary protection against anticipated external influences (such as mechanical effects, damp, penetration by foreign objects).

For Section 4 (3):

Ambient influences (such as dust, moisture, heat, mechanical stress) may have a negative impact upon the function and safety of electrical installations and equipment. Both the individual items of equipment and the installation as a whole must therefore be selected and engineered such that adequate protection is assured against these effects over the normally anticipated life of the installations or equipment. This includes selection of the ingress protection, the protection class, the insulation class, and the creepage distances and clearances. Consideration must be given in all cases to the particular conditions of use, for example on construction sites or in adverse environments.

For Section 4 (5):

Covering or fencing are examples of additional measures to be applied when the operational protection against direct contact is suspended.

For Section 4 (6):

Full protection against direct contact is frequently the simplest and always the most effective protective measure. This particularly applies to equipment which must be operated for operational processes, but also on and in the vicinity of equipment accessible only to electrically skilled persons and instructed persons.

In areas accessible only to instructed persons, equipment which is operated not for operational purposes, but only for restoration of the desired condition (for example for the setting or resetting of a relay, replacement of warning lamps or screw-in fuse links), partial protection against direct contact, such as covering to EN 50 274/VDE 0660 Part 514 (Low-voltage switchgear and controlgear assemblies – Protection against electric shock – Protection against unintentional direct contact with hazardous live parts) is sufficient at rated voltages of up to 1000 V. Such covering satisfies its purpose when it is secure against inadvertent displacement or removal or can be removed only by means of tools or keys.

For Section 4 (7):

This requirement is satisfied when for example:

- *the installation or sections can be disconnected from the power supply;*
 - *the auxiliary equipment and facilities required for prevention of reclosure and a prohibition sign stating “Do not switch” and if necessary the supplementary statement “Work in progress/location.../ sign may be removed only by...”, or equivalent facilities in the case of remote-controlled installations, are available and can be put in place;*
 - *the absence of voltage may verified;*
 - *the parts of the installation are equipped, where required, with facilities for earthing and short-circuiting, such as earthing switches, earthing trucks, terminal points; or facilities for earthing and short-circuiting such as cables or bars of adequate cross-section are present and can be fitted;*
- and*
- *auxiliary equipment for covering and fencing such as flexible insulating blankets or barriers is present.*

Installations with rated voltages in excess of 1 kV shall enable the necessary clearances to be created for isolation. Facilities for the prevention of reclosure include switches which permit the fitting of one or more padlocks, switch shrouds, push-on caps for switches, removable switch handles, dummy screw-in fuse links, shut-off and pressure-relief facilities for pneumatic systems, means of disabling spring force, means of interrupting the control voltage.

In remote-controlled installations, markings, information and instructions must be selected such that the isolated/non-isolated status of the installation and the responsibilities and scope for switching, e.g. from the central remote-control panel, are clearly visible.

Push-in insulating barriers generally require guide rails in order to be held securely.

Tests

Section 5

- (1) The employer shall ensure that the proper condition of electrical installations and equipment is tested:
 1. prior to commissioning, and prior to restarting following modification or repair, by a electrically skilled person or under the responsibility and supervision of a electrically skilled person;
and
 2. at specific intervals.
The intervals shall be selected such that defects which are to be anticipated are detected in good time.
- (2) The electrical rules relating to testing shall be observed during testing.
- (3) A test log in which specific entries are made shall be maintained where so required by the statutory accident insurance institution.
- (4) Testing prior to commissioning in accordance with Paragraph 1 need not be performed should the employer have obtained confirmation from the manufacturer or erector that the electrical installations and equipment are engineered in compliance with the provisions of the present accident prevention regulation.

Instructions for implementation for Section 5 (1) 1:

Electrical installations and equipment may be operated only in a proper condition, and must be maintained in this condition.

This requirement is met when, for example, prior to commissioning and following modification or repair, compliance with the requirements of the electrical rules is verified (original inspection). For this purpose, tests must be conducted of the form and on the scale of measures specified in the electrical rules. Only under certain conditions need original inspection of electrical installations and equipment not be performed (refer to the instructions for implementation for Section 5 (4)).

For Section 5 (1) 2:

Electrical installations and equipment must be subjected to repeated tests in order for them to be maintained in the proper state.

Test intervals can be defined with reference to the following tables when the electrical installations and equipment are subject to normal exposure to ambient temperatures, dust, moisture, etc. A distinction is drawn here between mobile and stationary electrical equipment, and between permanent and temporary installations.

Mobile electrical equipment is equipment which is moved during operation or which can be moved easily from one location to another whilst connected to the supply circuit (see also Sections 2.7.4 and 2.7.5 of DIN VDE 0100 Part 200).

***Stationary electrical equipment** is electrical equipment of fixed installation, or equipment without facility for carrying and of mass so great that it cannot easily be moved. This includes electrical equipment that is installed temporarily in a fixed arrangement and powered over flexible cables (see also Sections 2.7.6 and 2.7.7 of DIN VDE 0100 Part 200).*

***Permanent installations** are installations installed in a fixed manner within their environment, such as installations in buildings, site trailers, containers and vehicles.*

***Temporary installations** are installations which are disassembled (dismantled) following use and erected (reconnected) again at a new location, this constituting their proper use. These include installations on construction and erection sites, and also temporary structures.*

Responsibility for the proper performance of testing lies with a electrically skilled person.

Where suitable test and measurement equipment is available for test and measurement tasks, testing may also be performed under the responsibility and supervision of a electrically skilled person by instructed persons.

Stationary electrical installations and equipment

The requirements governing the test interval and tester are satisfied for stationary electrical installations and equipment when the provisions stated in Table 1A are observed.

| Installation/equipment | Test interval | Form of testing | Tester |
|--|------------------------------|---|---|
| Electrical installations and stationary equipment | 4 years | For proper condition | Electrically skilled person |
| Electrical installations and stationary electrical equipment in commercial premises, rooms and installations of special kinds (in the sense of DIN VDE 0100 Group 700) | 1 year | | |
| Protective measures involving earth-leakage protection equipment in temporary installations | 1 month | For effectiveness | Electrically skilled person; if suitable measuring and test equipment is used, also by an instructed person |
| Earth-leakage (residual-current, voltage-operated) circuit-breaker – in permanent installations – in temporary installations | 6 months Each working day | For proper operation, by actuation of the test facility | User |

Table 1A Regular tests of stationary electrical installations and equipment

The requirements for stationary electrical installations and equipment are for example also satisfied when they are continuously monitored by an electrically skilled person.

Stationary electrical installations and equipment are deemed to be continuously monitored when they are continually:

- *maintained by electrically skilled persons;*
- and*
- *tested by means of instrumentation measures in the course of operation (such as by monitoring of the insulation impedance).*

The substitution of regular tests by continuous monitoring does not apply to the electrical equipment in Tables 1B and 1C.

Mobile electrical equipment

Table 1B contains guide values for test intervals. The observed incidence of equipment exhibiting deviations from the limit values as revealed by tests in certain areas of operations (error rate) is a valid indicator of whether test intervals are sufficiently short. Should the error rate not exceed 2 %, the test interval can be regarded as adequate.

Responsibility for proper performance of the testing of mobile electrical equipment may also be assumed by instructed persons, provided suitable measuring and test equipment is employed.

| Installation/equipment | Test interval Guide and maximum values | Form of testing | Tester |
|---|---|----------------------|--|
| Mobile electrical equipment (where used) Equipment connecting cables and extension cables, with connectors | Guide value: 6 months, 3 months on construction sites ¹⁾ . Should an error rate of < 2 % be attained in the tests, the test interval can be extended accordingly. | For proper condition | Electrically skilled persons; if suitable measuring and test equipment is used, also by instructed persons |
| Connecting cables with plug Flexible conductors with plug and non-detachable connection | Maximum values: On construction sites, in production facilities and workshops or under similar conditions: one year In offices or under similar conditions: two years. | | |

Table 1B Regular tests of mobile electrical equipment

Protective and auxiliary equipment

The test intervals for protective and auxiliary equipment for safe work in electrical installations and for personal protective equipment are stated in Table 1C.

¹⁾ For details, see BG Information concerning the selection and operation of electrical installations and equipment on construction sites (BGI 608).

| Item under test | Test interval | Form of testing | Tester |
|--|---|--|-----------------------------|
| Insulating protective clothing (where used) | Each time before use | For obvious defects | User |
| | 12 months For insulating gloves: 6 months | For observance of the limit values specified in the electrical rules | Electrically skilled person |
| Insulated tools, cable cutters; insulating protective equipment; operating and earthing sticks | Each time before use | For externally visible damage and defects | User |
| Voltage testers, phase comparators | | For proper operation | |
| Voltage testers, phase comparators and voltage test systems (capacitive systems with display) for rated voltages over 1 kV | 6 years | For observance of the limit values specified in the electrical rules | Electrically skilled person |

Table 1C Tests for protective and auxiliary equipment

For Section 5 (4):

Confirmation by the manufacturer or erector refers to turnkey or connected installations or equipment. It can generally be issued only by the erector, since he alone is familiar with the ambient conditions and the conditions of use relevant to safe use of the installation.

The confirmation required in this context must be distinguished from the confirmation of delivery issued by the manufacturer or supplier at delivery of factory-assembled electrical equipment. For such confirmation of delivery, it is sufficient for the manufacturer or supplier to verify upon request that the supplied item satisfies the ordinances pursuant to the German equipment and product safety act (Geräte- und Produktsicherheitsgesetz), for example by a declaration of conformity in which observance of the relevant electrical rules is confirmed.

Work on live parts

Section 6

- (1) Work on live live parts of electrical installations and equipment is not permissible, except in accordance with the provisions of Section 8.
- (2) Before work is carried out on live parts of electrical installations and equipment, they must be placed in the isolated state and this state assured for the duration of the work.
- (3) Paragraph 2 also applies to adjacent live parts of the electrical installation or the electrical equipment when they:
 - are not protected against direct contact;
 - or
 - have not been protected against direct contact for the duration of the work by covering or fencing in consideration of the voltage, frequency, form of use and location of operation.
- (4) Paragraph 2 also applies to the operation of electrical equipment adjacent to live live parts when the latter are not protected against direct contact.

Instructions for implementation for Section 6 (1):

During work on live parts of electrical installations the isolated state of which is not brought about and assured for the duration of the work, i.e. during live working, and during work in the vicinity of live live parts in accordance with Section 7, the work may constitute hazardous work in the sense of Section 8 of the BGV A1 accident prevention regulation concerning principles of prevention and of Section 22 (1) 3 of the German child labour act (Jugendarbeitsschutzgesetz).

Section 22 of the German child labour act states:

(excerpt, unofficial translation)

“§ 22 Hazardous work

(1) Young people may not be employed

1. ... ,

2. ... ,

3. in work associated with an accident risk which young people, owing to their poor safety awareness or lack of experience, may be assumed to be unable to recognize or avoid;

4. ... ,

5. ... ,

6. ... ,

7.

- (2) Section 1 (3 to 7) does not apply to the employment of young people provided
1. this is necessary for the purpose of their training,
 2. their safety is assured by supervision by a skilled person

and

3.

(3) ... ”

For Section 6 (2)

A criterion for live work is that the affected parts of the installation be defined and that the employees' attention be drawn accordingly to the permissible working area. This includes marking of the place of work/working area and, if necessary, the route to the place of work within the electrical installation.

The isolated state must be brought about prior to the commencement of work and safeguarded at the place of work for the duration of the work in observance of the following five safety rules, application of which must be the norm:

1. Disconnect from the power supply
2. Take the necessary means to prevent reclosing of the isolating switches
3. Test absence of voltage by approved means
4. Ensure earthing and short-circuiting by approved means
5. Protect adjacent live parts by covers and barriers and fit a suitable warning notice

The measures to be taken in particular consideration of the conditions in the plant and on site, for example the presence of high-voltage or low-voltage overhead lines, cables or switchgear, are set out in detail in the electrical rules (see Annex 3).

During work with cable spiking guns or cable cutters, particularly unfavourable circumstances may result in the device being live following spiking or cutting. This voltage often cannot be detected by conventional voltage testers rated for the rated voltage of the installation. Suitable organizational measures, such as consultation of the grid management body, should therefore be taken before clearance is given for commencement of the work, in order to ascertain as clearly as possible whether the cable-spiking gun or cable cutter may become live.

For Section 6 (3)

Should parts of the installation in the vicinity of the place of work not be isolated, the same safety measures must be taken prior to commencement of work as for work in the vicinity of live parts (refer to the instructions for implementation for Section 7).

Work in the vicinity of live parts

Section 7

With the exception of the provisions formulated in Section 8, work may be performed in the vicinity of live parts of electrical installations and equipment which are not protected against direct contact only if:

- they have been disconnected from the power supply and reclosing is prevented for the duration of the work;
or
- the live parts have been protected for the duration of the work by covering or fencing, in particular consideration of the voltage, location of operation, form of work and work materials used;
or
- where the above measures are not applied, the permissible approach distance is not violated.

Instruction for implementation for Section 7:

Work performed in the vicinity of live parts encompasses tasks of any kind in which a person may violate, with parts of the body or with objects, the working clearances indicated in Table 4 from live parts not fully protected against direct contact, without touching live parts or, in the case of rated voltages above 1 kV, without reaching the danger zone. The requirement concerning protection by covering or fencing is met:

- *at rated voltages up to 1 000 V when live parts are shrouded or enclosed such as to be isolated with the effect that at least partial protection is provided against direct contact;*
- *at rated voltages over 1 kV when live parts are shrouded or fenced. It must be ensured that the boundary of the danger zone D_L stated in Table 2 cannot be reached. The boundary of the danger zone is the minimum clearance in air. Reaching of the outer boundary of the danger zone shall be deemed equivalent to contact with the live part.*

| Rated system voltage U_n (rms value) kV | Outer boundary of the danger zone D_{L2} (clearance in air) mm | | Rated switching impulse withstand voltage U_{imp} (crest value) kV |
|---|--|----------------------|---|
| | Indoor installation | Outdoor installation | |
| < 1 | No contact | | 4 |
| 3 | 60 | 120 | 40 |
| 6 | 90 | 120 | 60 |
| 10 | 120 | 150 | 75 |
| 15 | 160 | | 95 |
| 20 | 220 | | 125 |
| 30 | 320 | | 170 |
| 36 | 380 | | 200 |
| 45 | 480 | | 250 |
| 66 | 630 | | 325 |
| 70 | 750 | | 380 |
| 110 | 1 100 | | 550 |
| 132 | 1 300 | | 650 |
| 150 | 1 500 | | 750 |
| 220 | 2 100 | | 1 050 |
| 275 | 2 400 | | 850 |
| 380 | 2 900/3 400 | | 950/1 050 |
| 480 | 4 100 | | 1 175 |
| 700 | 6 400 | | 1 550 |

¹⁾ The values stated for D_L apply to the maximum rated switching impulse withstand voltage; for other values for lower rated voltages, see DIN VDE 0101

Table 2 Danger zone D_L , depending upon the rated voltage (DIN VDE 0105 Part 100)

The mechanical strength of protective equipment must be adequately dimensioned. Where the danger zone is constrained by protective equipment (e.g. partitions, insulating barriers), the electric strength must be observed.

The requirement concerning the permissible approach distance (protection by clearance) is met for example when it is ensured that:

- at rated voltages up to 1 000 V, live live parts cannot be touched;
- at rated voltages over 1 kV, the boundary of the danger zone indicated in Table 2 cannot be reached;
- during certain electrical work, the working clearances indicated in Table 3 are not violated.

| Rated mains voltage U_n (rms value) kV | Working clearance (clearance in air to exposed live parts) m |
|--|--|
| Up to 1 | 0.5 |
| $> 1 \leq 30$ | 1.5 |
| $> 30 \leq 110$ | 2.0 |
| $> 110 \leq 220$ | 3.0 |
| $> 220 \leq 380$ | 4.0 |

Table 3 Working clearances during certain electrical work according to the rated voltage in the vicinity of live parts

The working clearances indicated in Table 3 apply to the following tasks when performed by electrically skilled persons or instructed persons or under the supervision of such persons:

- the moving of ladders and bulky objects in the vicinity of overhead lines;
- the raising and lowering of tools, materials, etc., where overhead lines or lines in outdoor installations beneath a place of work must remain live;
- work on an overhead line circuit when several circuits (systems) with rated voltages in excess of 1 kV share common masts;
- coating and repair work on masts, portals, etc., of overhead lines, under particular conditions which are described in the electrical rules;
- work on outdoor installations.

Supervision is the continuous monitoring of the required safety measures during performance of the work at the site of work. The supervising person may only conduct work that does not impair his or her supervision.

Shrouds, fences and clearances must be dimensioned in particular consideration of the fact that employees must also not touch live parts in the case of voltages up to 1000 V or reach the boundary of the danger zone in accordance with Table 2 in the case of rated voltages exceeding 1 kV as a result of unintended or unconscious movements, dependent for example upon

- the nature of the work;
- the available freedom of movement;
- the site;
- the tools used;
- the auxiliary equipment and materials;

or owing to unchecked movement of tools, auxiliary equipment, materials or waste, caused for example by

- slipping;
- dropping;
- flicking away;
- bumping.

During non-electrical work, such as construction, assembly, transport, coating and repair work, during scaffolding work, or during work involving hoists, construction machinery, materials handling equipment or other devices and auxiliary construction equipment, the requirement for the permissible approach distance (protection by clearance) is for example met when the working clearances shown in Table 4 are not violated.

In exceptional cases, the working clearances shown in Table 4 may be reduced to those shown in Table 3 if the work is conducted under the supervision of electrically skilled persons or instructed persons employed by the operator of the electrical installation concerned.

Supervision must be performed continuously and exclusively: no other tasks may be performed at the same time.

| Rated mains voltage U_n (rms value) kV | Working clearance (clearance in air to exposed live parts) m |
|--|--|
| Up to 1 | 1.0 |
| $> 1 \leq 110$ | 3.0 |
| $> 110 \leq 220$ | 4.0 |
| $> 220 \leq 380$ | 5.0 |

Table 4 Working clearances for non-electrical work, according to the rated voltage

The working clearances shown in Table 4 must also be observed when loads, suspension elements and load-handling attachments deflect outwards. Consideration must also be given to the deflection of the overhead conductor.

Permissible digressions

Section 8

Digression from the requirements of Sections 6 and 7 is permissible if

1. a risk of electric shock or arcing can be excluded owing to the type of installation
or
2. for compelling reasons, the isolated state cannot be brought about, provided:
 - the auxiliary equipment or tools employed for this work are of such type that a risk of electric shock or arcing is excluded;
and
 - the employer charges only suitably technically qualified persons with the work on these live parts;
and
 - the employer specifies and implements further technical, organizational and personal safety measures which assure adequate protection against a risk of electric shock or arcing.

Instructions for implementation for Section 8 (1):

A risk of electric shock or arcing is excluded when:

- *the current flowing through the human body in the event of contact or the energy at the site of work remains below the limit values specified in the electrical rules;*
or
- *the voltage does not exceed the permissible limit values stated in the electrical rules for work on live live parts for the application and site of operation concerned.*

Where no limit values are set out in the electrical rules, live working may be performed where:

- *the short-circuit current at the site of work does not exceed 3 mA AC (rms value) or 12 mA DC;*
- *the energy at the site of work does not exceed 350 mJ;*
- *potential bridging is prevented by isolation of the site or of the live parts or by equipotential bonding;*
- *the touch voltage is lower than 50 V AC or 120 V DC;*
or
- *the values for the discharge current specified in the comparable electrical rules are not exceeded on the test equipment employed.*

For Section 8 (2):

Compelling reasons may exist when owing to the absence of the voltage:

- *a risk is presented to human life or health;*
- *considerable financial loss would be incurred by businesses;*

- during work on power supply grids, particularly during the creation of connections, line switching, or the replacement of meters, ripple control receivers or time switches, the power supply would be interrupted;
 - railway traffic would be disrupted or interrupted during work on or in the vicinity of overhead lines;
 - telecommunications installations, including information processing installations or essential parts of them, would have to be shut down owing to work on power supply systems, potentially presenting a hazard to human life or health;
- or*
- faults would be triggered in traffic signals installations which could endanger human life or health or lead to financial loss.

Live work presents an elevated risk of electric shock and arcing. This gives rise to a need for particular technical and organizational measures. The residual risk (probability of occurrence and severity of injury, see DIN VDE 31 000 Part 2) must be reduced to a permissible level. This is attained when the requirements stated below are met and the electrical rules are observed.

If live working is to be performed, the employer must set out the compelling reasons for it in writing for each intended task. Consideration must be given here to the work procedure selected, the frequency of the work and the qualification of the persons charged with performing it. A work instruction shall be drawn up for performance of the work and protective and auxiliary equipment suitable for live working made available.

During removal and insertion of live fuse links in the low-voltage high-breaking-capacity (NH) system which do not feature shock-hazard protection and load-switching capability, a risk of electric shock and arcing is largely excluded when plug-in NH handles with permanently attached gauntlet are used and face protection (mask) is worn.

Isolated tools and isolating auxiliary equipment for work on live parts are suitable when marked with the isolator symbol or with a double triangle and the associated voltage or voltage range or the class.

The requirements concerning the technical suitability of personnel for work on live parts are satisfied when for example the provisions indicated in Table 5 are observed and training for the live working has been provided. The knowledge and skills must be examined at regular intervals (of approximately 1 year), and training must be repeated or supplemented if necessary.

As part of the organizational safety measures, the work must be monitored by a person trained in first-aid who is at least an instructed person (see Section 26 of the BGV A1 accident prevention regulation concerning principles of prevention).

The safety measures must be set out in writing for each individual case or for defined, regularly recurring cases, in observance of the provisions found in the electrical rules.

| Rated voltages | Work | SEP | PEI | L |
|-------------------------|---|-----|-----|---|
| ≤ 50 V AC ≤ 120 V DC | All work for which a hazard, for example of arcing, is excluded | X | X | X |
| > 50 V AC > 120 V DC | 1. Approach with test, measurement and adjustment tools, such as voltage testers, or with tools for the movement of parts requiring little force, or with actuating rods | X | X | |
| | 2. Approach with tools and auxiliary equipment for the purpose of cleaning, and the fitting of suitable shrouds and fences | X | X | |
| | 3. Use of suitable auxiliary equipment for the removal and insertion of fuse inserts not protected against direct contact, where safely possible | X | X | |
| | 4. Spraying of live parts during firefighting or for cleaning purposes | X | X | |
| | 5. Work on rechargeable batteries and photovoltaic installations in observance of suitable precautionary measures | X | X | |
| | 6. Work on test installations and in laboratories in observance of suitable precautionary measures, where necessitated by the working conditions | X | X | |
| | 7. Use of insulating rods to knock white frost clear | X | X | |
| | 8. Locating of faults in control circuits (e.g. tracking of signals in circuits, bridging of partial circuits) and function testing of devices and circuits | X | | |
| | 9. Other work, when: a) compelling reasons have been identified by the operator and b) authority to issue instructions, responsibilities, working methods and working procedure (work instruction) have been set out in writing for specially trained personnel | X | | |
| At all rated voltages | All work, when the circuits are equipped with adequate facilities for limitation of the current or energy and no particular hazards (such as explosion hazards) exist | X | X | X |
| | Work for the avoidance of major hazards, for example to human life and health or fire and explosion hazards | X | | |
| | Work on telecommunications installations with remote current supplies operating at < 10 mA AC or < 30 mA DC | X | X | X |

SEP: electrically skilled person PEI: instructed person

L: layman

Table 5 General conditions for work on live parts with regard to the selection of personnel in consideration of the rated voltage

Administrative offences

Section 9

A person who deliberately or through negligence contravenes the regulations of
Section 3

Section 5 (1 to 3)

Sections 6, 7

commits an administrative offence in the sense of the German Social Code (SGB) VII
Section 209 (1) 1.

Entry into force

Section 10

The present accident prevention regulation enters into force on 1 April 1979. At the same time, the version of the VBG 4 accident prevention regulation issued 1 March 1962 concerning electrical installations and equipment is withdrawn.

Bonn, 25 January 1979
III b 6-3816.0-(27)-3715.1

German Federal Minister of Labour and Social Affairs

(seal)

pp.
Signed: Kliesch

Approval

The above accident prevention regulation concerning electrical installations and equipment (VBG 4) is approved.

Bonn, 25 January 1979
III b 6-3816.0-(27)-3715.1

German Federal Minister of Labour and Social Affairs

(seal)

pp.
Signed: Kliesch

This version contains the following supplement:
First supplement issued 1 January 1997, approved 16 December 1996.

Annex 1

Adaptation of electrical installations and equipment to electrical rules

The formulation of different, more far-reaching requirements concerning new electrical installations and equipment in new editions of electrical rules does not of itself necessitate adaptation of the installations and equipment to these rules. The rules may however contain new provisions governing construction and equipment which, owing to particular accident risks or accidents that have actually occurred, have been adopted in VDE provisions. Adaptation of existing electrical installations to such electrical rules can then be a requirement.

Owing to avoidable particular accident risks, the following adaptations are required:

1. Implementation of partial shock-hazard protection for operating processes in accordance with DIN VDE 0106 Part 100, 3/83
By 31 December 1999
2. Assurance of protection during operation of high-voltage installations to DIN VDE 0101, 5/89 Section 4.4
By 31 October 2000
3. Adaptation of electrical installations on construction sites to BG Information concerning the selection and operation of electrical installations and equipment on construction sites (BGI 608)
By 31 December 1997
4. Assurance of supplementary protection in test installations to DIN VDE 0104, 10/89 Sections 3.2 and 3.3.
By 31 December 1997
5. Marking of mobile electrical equipment in accordance with BG Information concerning the selection and operation of mobile electrical equipment according to areas of application (BGI 600)
By 30 June 1998

The following apply in particular to the states formerly in the GDR:

6. Changeover from three-phase plug-and-socket arrangements in accordance with the former DIN 49 450/451 (flat type plug and socket) to the round type plug-and-socket system to DIN 49 462/463
By 31 December 1997
7. Adaptation of ISA 2000 indoor switchgear installations to BG Information concerning safe operation of ISA 2000 low-voltage indoor switchgear installations (BGI 755)
By 31 December 1996/31 December 1999

8. Adaptation of protective and auxiliary equipment, where subject to electrical requirements, to the electrical rules
By 31 December 1997
9. Disconnection of earthing installations in electrical distribution systems and consumer installations from water pipe systems
By 31 December 1997
10. Equipping of bulb demonstration panels with supplementary protection to DIN VDE 0100 Part 559, 3/93 Section 6
By 31 December 1997

Annex 2

Index of sources for literature

The sources for the rules and regulations listed in the instructions for implementation are provided below.

1. Acts and ordinances

Source:

Retail book trade

or

MAXDORNPRESSE GmbH & Co. KG,

Georg-Kerschensteiner-Straße 6, 63179 Obertshausen

2. BG Regulations and BG Information publications on safety and health at work

Source:

Deutsche Gesetzliche Unfallversicherung (DGUV),

Alte Heerstr. 111, 53757 Sankt Augustin

3. Standards

Source:

Beuth Verlag GmbH,

Burggrafenstraße 6, 10787 Berlin, Germany

or

VDE-Verlag GmbH,

Bismarckstraße 33, 10625 Berlin, Germany

Annex 3

Electrical rules

Where work equipment is placed on the market and first made available, it is subject to the statutory regulations transposing the relevant EU Regulations into German law in accordance with Article 95 of the EC Treaty. Work equipment encompasses machines, devices, tools and installations that are used at work. Where these statutory regulations do not apply, the other statutory regulations governing the properties of electrical equipment apply. Besides these regulations, numerous standards and other technical specifications have already been identified as recognized good practice or for description of the state of the art (refer to the successive announcements of the German Federal Ministry of Economics and Labour (BMWA) in the Federal Gazette and the Federal Labour Gazette).

These standards and specifications are also relevant to the maintenance and modification of electrical equipment, and should be regarded in this context as “electrical rules” in the sense of the BGV A3 accident prevention regulation (formerly VBG 4) concerning electrical installations and equipment.

For this reason, they are not accorded special treatment in this annex to the instructions on implementation for the BGV/GUV-V A3 accident prevention regulation (formerly VBG 4) concerning electrical installations and equipment.

The German Social Accident Insurance refers in support of the BGV/GUV-V A3 accident prevention regulation (formerly VBG 4), Section 2 (2) 1 of 1 April 1979:

1. To the relevant announcements under the above statutory regulations in the Federal Gazette and the Federal Labour Gazette
2. To the following VDE provisions governing the operation of electrical installations and equipment:
 - DIN VDE 0105-100
 - DIN VDE 0104
 - DIN VDE 0800-1

In this reprinted edition, the rules and regulations referred to have been updated and brought into line with the current state of the art in safety technology.

In addition, the identification number of this accident prevention regulation has been changed to BGV/GUV-V A3, owing to entry into force of the accident prevention regulation concerning “Occupational physicians and safety professionals”, to which the identification number DGUV 2 will be assigned.

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