

See-Berufsgenossenschaft
Hamburg

I 10 Guidelines for the design of Medium Voltage Installations of up to 17,5 kV on board of seagoing vessels

I. Design

1. General

Medium voltage installations shall comply with the Accident Prevention Regulations (UVV See) and the requirements of a recognized classification society.

As far as the rules of the classification societies have no special requirements for the safety of electrical equipment, the relevant publications of the International Electro-technical Commission (IEC publications) shall apply.

Furthermore the following requirements shall be observed.

2. Medium Voltage Switchboards

2.1 Arrangement, Operation and Maintenance Spaces

Switchboards with no access behind shall be arranged that all maintenance work can be carried out from the front side without any danger to the operators.

According to § 138 of the Accident Prevention Regulations (UVV See) the operation and maintenance spaces shall have a clear width of 0,90 m and 2,00 m height in front of the switchboard and 0,60 m width and 2,00 m height behind the switchboard if access is provided.

Operation and maintenance spaces behind switchboards shall have two entries; for switchboards with a length of up to 4,00 m one entry may be sufficient. Medium voltage installations should be separated from other frequent working areas as engine control rooms or engine rooms as far as practicable.

2.2 Required space for medium voltage installations

The necessary space for the main switchboard shall be observed already during the project phase, especially with regard to the width of the operation and maintenance spaces. A high of 2200 up to 2800 mm and a width of 1200 up to 1800 mm shall be taken into consideration.

Medium voltage installations of a high capacity may have even bigger dimensions especially with regard to the width. Information can be obtained from the manufacturers of such installations. For main switchboards arranged with sections in 90° angles additional space of at least 1 m² for each angle should be taken into consideration compared to the in line arrangement.

3. Safety Devices of Medium Voltage Installations

3.1 General

Medium voltage installations shall be build and installed according to the IEC publications 60092-503 (Electrical installations in ships. Part 503: Special features - A.C. supply systems with voltages in the range above 1 kV up to 11 kV) and IEC 60298 (A.C. metal-enclosed switchgear and controlgear for rated voltages above 1 kV and up to 52 kV). Note: According to the classification rules of the Germanischer Lloyd in Germany the max. voltage is 17,5 kV.

3.2 Ingress protection of medium voltage installations

Switchboards for medium voltage shall have metal clad enclosures which are fully partitioned and closed on all sides. Low voltage sections shall be separated from the high voltage area so that the touching of equipment under life is impossible.

If electrical installations or components of open designed medium voltage installations are installed in closed working areas (e.g. transformers for substations, protection class IP 00) the entrance doors have to be locked mechanically or electrically so that they can only be opened after shut off and earthen of the supply circuit.

If lock up of persons is possible in these areas, it must be possible to open the doors mechanically from inside (lock up securing mechanism).

3.3 Operation of Switchboards

The operation and maintenance of the medium voltage switchboards shall be possible with closed front doors. With suitable mechanical or electrical locking devices any operational mistakes shall be prevented effectively.

A sufficient number of separating-, earth- and short circuit devices shall be installed to allow maintenance work at sections of the medium voltage switchboard if the whole system cannot be shut off for operational reasons.

3.4 Maintenance at medium voltage installations

The maintenance of switching devices must be possible without danger even when the main bus bar is under life.

If switching devices like circuit breakers, generator breakers and disconnectors are removable, it has to be ensured with automatic flaps that parts under current after the removal are covered safely against touching.

The removable switching devices must be lockable in the working position. With a mechanical locking device it has to be ensured that a removal of that device is only possible if the device is switched off and the output is earthed.

The mechanical locking devices shall be activated in the working position as well as in the shut off position. For maintenance work a key lock is acceptable.

3.5 Safety Devices against over current and arcs

Over currents shall be monitored by suitable safety devices to avoid damages at the medium voltage installation.

An internal overpressure in case of an accidental arc shall be reduced by suitable safety flaps installed in the upper enclosure of the switchboard or behind to lead the overpressure into a safe area. The minimum installation space according to the manufacturers instructions shall be taken into consideration.

This shall be considered especially by the use of SF_6 (sulphur fluorine) insulated switchboards and components, as the extinguishing gas may react toxic and corrosive in case of an arc. These gases have to be lead outside so that a danger can be excluded.

3.6 Medium voltage cables

Medium voltage cables shall be clearly marked. The marking may be done by labels, marked cableways or by the use of red cables. They shall not be laid through accommodation areas and shall be separated from low voltage cables.

If medium voltage cables are installed on open cableways they shall have a passing through metallic shield or arming which is connected to the ships hull.

Medium voltage cables without a metallic shield or arming shall be laid in enclosed cableways or safety pipes which are connected to the ships hull. These cableways shall be marked red in addition.

With regard to the installation of the medium voltage installations the installation requirements of the manufacturers shall be observed.

II. Training of the Crew

1. Crew members with sufficient knowledge

According to the Accident Prevention Regulations (UVV See) crew members with sufficient expert knowledge are ship's electro-technician , ship's electrician and ship's officers with a certificate of technical proficiency as chief engineer or 2. technical engineer. These persons are trained for defined activities concerning the operation and maintenance of electrical plants and equipment.

If medium voltage installations are installed on board these people shall evidence especially that they are trained on the special arrangement of the medium voltage installations and the possible danger arising from voltages above 1000 V. This includes a training on the medium voltage system on board as well as a training course with the authorisation for switching of medium voltage installations of up to 52 kV.

2. Training on Medium Voltage Installations on board

The training on medium voltage installations can be supervised by an experienced member of the crew, which is familiar with the installed medium voltage system on board and which has the authorisation for switching medium voltage installations. Furthermore the relevant manufacturer instructions shall be observed.

3. Authorisation for Connecting and Disconnecting of Medium Voltage Installations

At least one crew member mentioned under II.1 shall have participated successfully a training course of at least 16 hours on the authorisation for switching medium voltage installations. These courses, which are offered by VDI (German Electro-technical Association) district offices or other electro-technical training centres. Similar training courses offered by maritime universities or the switchboard manufacturers can also be accepted. The aim of such training course is to get the necessary theoretical and practical knowledge to operate and maintain a medium voltage system on board safely. The training shall incorporate the following items:

- Theoretical Education

Legal aspects,

Steps to get the authorisation for switching,

Accident Prevention Regulations BGV A1 (VBG 1), BGV A2 (VBG 4) including relevant guidelines (national regulations),

BGV A 8 (VBG125), European standards, VDE standards (national regulations),

Basics of energy distribution, network designs, kinds of failures, switching devices, types of switch boards, personal protection for operators

SF_6 (sulphur fluorine) insulated switchboards

Guidelines for switching

VDE 0105, Part 100 “Operation of electrical plants” and especially part 6 “Methods of work” (e.g. the five basic safety rules) (national regulations),

Personal protective equipment, dangers effects of electric current

Explanations

Accomplishment of switching sequences, communication during switching operations

Failure analysis and prevention

- Practical Training

Performing of different exercises like switching of medium voltage devices and the installation of cables

Familiarization and practical training on different air and SF_6 (sulphur fluorine) insulated switchboards

- Example of Certificate (recommendation)

see Annex

III. Entry into force

These guidelines will enter into force on 1. April 2004.

Annex: Example of certificate (recommendation)

Bescheinigung

Certificate

*Nach UVV See § 157 a Abs.3 **

According to national Accident Prevention Regulations § 157 a (3)

Herr/Frau _____
Mr. /Mrs.

geboren am: _____ *in:* _____
born on at

hat vom _____ *bis* _____
has from to

an der Ausbildungsstätte

at the training centre/school

in _____
in

an einem von der See-Berufsgenossenschaft anerkannten Lehrgang zum Erwerb der Schaltberechtigung für Mittelspannungsanlagen bis 36 kV erfolgreich teilgenommen.

successfully attended on a training course approved by the See-Berufsgenossenschaft for the safe operation of medium voltage systems of up to 36 kV .

Ort, Datum
Place, date

Stempel und Unterschrift
Seal and signature

* Zur Zeit noch nicht in Kraft
for the time being not in force yet