



## Purpose:

The e-learning module is designed for theoretical training of engineers in accordance with Chapter III of the STCW Convention in the part concerning operate and maintain power systems in excess of 1,000 volts.

## What is an e-learning module?

E-learning module is the electronic textbook on one or more sections. Theoretical materials can be accompanied by drawings, diagrams, photos, animations and videos. There is a test for assessment of knowledge gained at the end of each section.

## Contents:

- Introduction
- Definitions
- Description of ship high-voltage systems
- Dangers when working with high voltage equipment
- Emergency response
- Risk mitigation procedures when working with high voltage equipment
- The composition of the ship's high-voltage system
- Safe placement of marine high-voltage equipment
- Safety rules when working with high-voltage equipment
- Safety measures when working with ship high-voltage equipment
- Application of protective equipment used in high-voltage installations

## Target groups

Engine - Management  
Engine - Operational

## Ship types

Generic



## Regulations

### Table A-III/6 STCW Code

Competence: Operate and maintain power systems in excess of 1,000 volts

### Table A-III/1 STCW Code

Competence: Operate electrical, electronic and control systems

### Table A-III/2 STCW Code

Competence: Manage operation of electrical and electronic control equipment




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Section 6: Risk mitigation procedures when working with high-voltage equipment

### Section 6. Risk mitigation procedures when working with high voltage equipment

No person should be engaged in any work activity where **technical knowledge or experience** is necessary to prevent danger or where appropriate, injury, unless they possess such knowledge or experience, or are under such a degree of supervision as may be appropriate having regard to the nature of the work.




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Section 6: Risk mitigation procedures when working with high-voltage equipment

**Circuit earthing** - an incoming or outgoing feeder cable is connected by a heavy earth connection from earth to all three conductors after the circuit breaker has been racked out. This is done at the circuit breaker using a special key. This key is then locked in the key safe. The circuit breaker cannot be racked in until the circuit earth has been removed.



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Section 9: Safety rules when working with high-voltage equipment

### General rules

On completion of work and on clearance and cancellation of the relevant permit to work, a switching plan should be developed for the removal of earthing and isolations leading to connecting to the high-voltage supply.

It should be noted that a reversal of the plan used to isolate the equipment may lead to a dangerous or unsafe situation and it is always best practice to develop a plan for this considering the dead equipment or network as a starting point.



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Section 7: The comparison of the single high-voltage system

### Step-down Voltage transformers

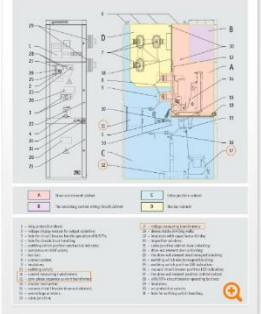
Step down transformers are designed to reduce electrical voltage:

- HV/LV step down transformers to provide LV consumers;
- HV/HV (typically 6.6kV/2.9kV) step down transformers supplying propulsion converters and motors.

### Transformer protection

Transformers shall be fitted with circuit protection. If the primary side of transformers is protected for short circuit only, overcurrent protection shall be arranged on the secondary side.

High voltage distribution transformers and high voltage propulsion transformers shall be equipped with temperature monitors and high temperature alarms.



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Section 8: Risk mitigation procedures when working with high-voltage equipment

### Lock out, tag out (LOTO)

A safety procedure to ensure that energy and power sources are properly isolated, shut off, locked and tags applied, to notify others that energy or power systems are being worked on and the restarting of these energy and power sources is prohibited, whilst locks and tags are in place.

The isolated power sources are then locked and a tag is placed on the safety lock identifying the worker who placed it. The key should then be held securely in the Key safe, to prevent accidental start-up, ensuring that the lock is only removed once work is completed and has been tested for recommissioning purposes.



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TEST 0396

**COMMENT**

As voltage levels increase, the effects of electric shock escalate.

**Question text:**

As voltage levels increase, the effects of electric shock ...

Choose the correct answer

does not change.

escalate.

de-escalate.

Attempt: 1

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