



K-SIM ENGINE

HIGH VOLTAGE TRAINING SOLUTION

The International Maritime Organisation (IMO) has mandated High Voltage Breaker training to improve safety in shipping, meaning that engineers and maritime officers must complete STCW based courses to retain their Certificate of Competence. The purpose is to make seafarers more versatile and to introduce more competency that will lead to fewer high voltage related incidents on board. The revised STCW regulations require that all seafarers working with or around high voltage systems have practical training in handling the equipment. KONGSBERG's world leading K-Sim Engine simulators are the perfect choice to meet these new training requirements. Integrated with a real high voltage circuit breaker, K-Sim Engine enables safe, realistic and efficient training of electrical engineer students and crews, fully meeting the STCW requirements.

KONGSBERG's K-Sim Engine models with high voltage functionality are designed to meet the training requirements in section A-III/1, A-III/2, A-III/6 and B-III/2 in the STCW Code 2010.

The high voltage training solutions enable courses and the completion of training objectives both for operational and management levels.

Operational level:

- Hazards associated with high voltage systems
- Functional, operational and safety requirements for a marine high voltage system
- Basic arrangement of high voltage systems and their protective devices
- Immediate actions to be taken under fault conditions
- Safety procedures related to disconnection, isolation and removal of a real circuit breaker

- Practical procedures and maintenance
- Use of trapped key system in high voltage systems.

Management level:

- Functional, operational and safety requirements for a marine high voltage system
- Assignment of suitably qualified personnel to carry out maintenance and repair of high voltage switchgear of various types
- Taking remedial action necessary during faults in a high voltage system
- Producing a switching strategy for isolating components of a high voltage system
- Selecting suitable apparatus for isolation and testing of high voltage equipment
- Carrying out a switching and isolation procedure on a marine high voltage system, complete with safety documentation.

HIGH VOLTAGE TRAINING SOLUTION

Several K-Sim Engine simulator models are available with a simulated high voltage switchboard and interface to a real high voltage breaker. K-Sim Engine models with the high voltage feature, meet new STCW requirements for practical high voltage training and enable electrical engineers to understand HV systems, practice and develop high voltage safety procedures in a safe training environment.

A common high voltage training solution consists:

- 1 student station with a K-Sim Engine model incl. HV functionality
- 1 instructor station with K-Sim Engine model incl. HV functionality
- 1 real high voltage breaker

The optimal approach to ensure realism in high voltage operational training is achieved through the integration of high fidelity simulators and real HV circuit breaker. K-Sim Engine models can be easily integrated with a real circuit breaker enabling more realistic training scenarios identical to on board operations.

While the circuit breaker enables physical operation like isolation and earth down equipment, the simulator offers process understanding. Since the real circuit breaker is fully integrated, any operation of the circuit breaker will be reflected in the simulated electric power plant and vice versa. The instructor can generate malfunctions and assess performance during and after the exercise.

High Voltage mimics

A mimic diagram represents the high voltage plant which enables normal operational training and safety procedure training connected to isolation and earth down of equipment. The synchronising panel and all circuit breakers are available from pop-up panels. The operator must then follow a real operational procedure on the equipment in order to perform service.

Trapped Key System

Trapped key interlocks are widely used to ensure safe access to potentially live equipment in a real high voltage system. The main principle is as follows; any switchgear that may cause live parts in areas to be accessed must be isolated, earthed and locked without any possibility for re-connection as long as that particular area is accessible for maintenance. An example of a possible training scenario is to access a transformer or a converter due to a malfunction. The key lock system forces the users in such cases to isolate and earth down the equipment.

Integrated Automation System

All K-Sim Engine models features an Integrated Automation System (IAS) that covers the user interface for important remote control and monitoring functions, such as:

- Power Management
- Auxiliary machinery control
- Ballast/bunker monitoring and control
- Cargo monitoring and control
- Alarm handling
- Trend systems

When performing operations on the real high voltage breaker, this will reflect status and alarms in the IAS as on board an actual ship.

Photo below: screen dump of the mimic diagram presenting the high voltage switchboard

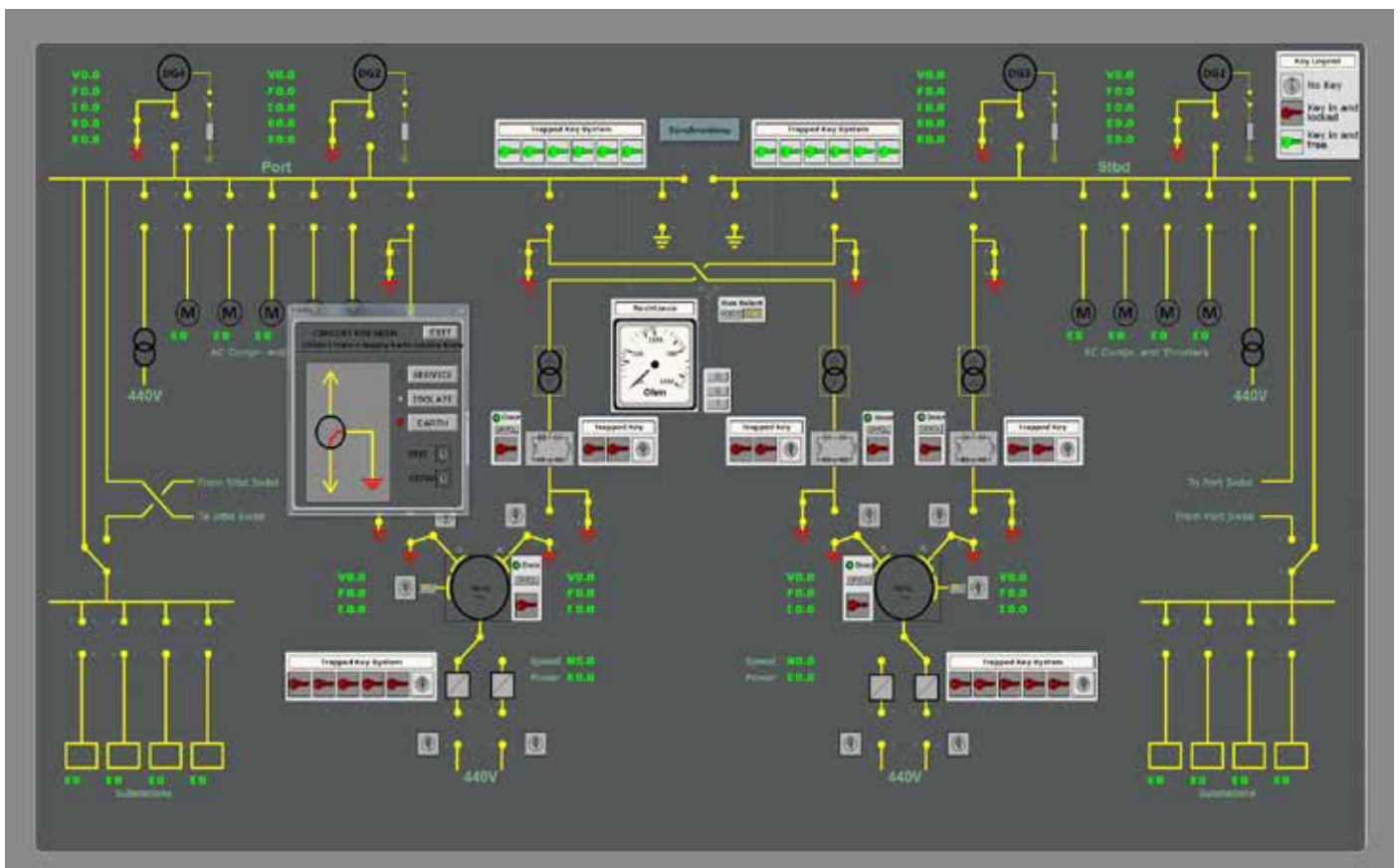


ABB HIGH VOLTAGE CIRCUIT BREAKER

Maritime training centres providing high voltage training courses by using real high voltage switchboards and distribution systems are limited to perform hands on hardware operation based on well prepared scenarios. When using simulators during the high voltage courses in combination with a real hardware circuit breaker, more realistic operational scenarios can be performed.

Real switchboard equipment such as a high voltage circuit breaker from ABB, can be integrated with a K-Sim Engine model to perform training scenarios identical to onboard operations. By using a simulator the operation will have an impact on the entire ship since the entire process onboard is affected.

Circuit breaker type vacuum:

Rated Voltage:	12 kV
Rated Frequency:	60 Hz
Rated Busbar Current:	630 A
Rated Short Circuit Current:	16 kA
Peak Current:	40 kA
Local Control Voltage:	24 VDC
Weight:	630 kg

A service trolley is included with the delivery.



K-SIM ENGINE SIMULATOR MODELS FOR HIGH VOLTAGE TRAINING

KONGSBERG has an extensive and expanding library of K-Sim Engine simulator models with various high voltage system configurations. All KONGSBERG models with high voltage systems can be connected to a real high voltage circuit breaker.

Available KONGSBERG K-Sim Engine models for HV training:

Diesel Electric engine models:

- ERS DE-DF LNG carrier
- ERS DE22-III cruise ship
- ERS DE32 landing helicopter dock
- ERS DE66 drill ship
- ERS DE88 semi-submersible drilling rig
- ERS DE-DF LNG cruise ferry (New 2017)
- ERS DE42 landing ship dock (New 2017)

Power management models:

- PMT DE66 drill ship
- PMT DE88 semi-submersible drilling rig

"We are extremely pleased with the HV solution delivered by Kongsberg Digital. The system enables us to offer courses for Engineers who need to upgrade their certificates according to the new STCW 2010 requirements.

The course we provide is customised and comprises 50 hours of theory and practice at our school, in addition to 20 hours of self-study on electricity safety prior to this. The courses have become very popular and we are running HV courses every other week now"

- Lars Hellevik, Instructor at Bergen Maritime Vocational School, Norway

