Procedure for high voltage connection for cruise ships in Bergen

The structure of the facility

The shore power system on land side is built according to the international standard for High voltage shore power IEC 80005-1.

The system consists of 3 converter systems that can deliver up to 16 MVA of 11kV and 9.6 MVA of 6.6 kV, both voltages can deliver 50 and 60 Hz.

The shore power system at Skolten south HS 03 and Bontelabo HS 01 is independent of each other and has separate switch systems for operation and separate cabinets on the quay that are used to connect the cable handling system that delivers the cables on board the individual ship.

The shore power system at Skolten north and Jekteviken is operated by the same converter system and can supply voltage to 3 different cabinets, one at Skolten north HS 02-01 and two in Jekteviken HS 02-02 and HS 02-03. The system is designed to only supply voltage to one of the cabinets at the time. During operation, only the cabinet used for shore power will be energized and the other two cabinets will be earthed and cannot be energized.

Generally

All personnel who are to perform connection of ships at Plug's facilities must be pre-approved for this and must carry out training of the facility. In addition to this routine, the Switching Supervisor and the Safety Supervisor must know Plugs instructions for the roles of the Switching Supervisor and the Safety Supervisor.

Working method

All connections of ships must be carried out according to the working method “work on disconnected systems”. This work is considered a standard type of work, and based on this, this routine has been established.

A separate risk assessment has been made of this work.

Definitions

Temporary earthing for work

Fully dimensioned earthing and short circuiting of installation parts where work is being conducted.

Terminal earthing

Fully dimensioned earthing and short-circuiting of all isolation points from which an installation may be energised.

Switching Supervisor

Nominated person in control of switching operations who is responsible for ensuring that switching of high voltage installations is conducted in a safe manner.

Safety Supervisor

Nominated person in control of the work activity who is responsible for safety at the work site.

Responsible for grounding

Plugs Supervisor is responsible for establishing all groundings on the land side, and the ship personal is responsible for establishing all groundings on board the ship.

Responsibilities / boundaries

The boundary between Plug's shore power system and the ship, is in the ship's hatch for shore power connection.

Plug has a Safety Supervisor for the system on land and is responsible for voltage testing and earthing on land. Plug also has a Switching Supervisor at the facility on land.

At Plug's facility, the Switching Supervisor and the Safety Supervisor will be the same person (Plug's supervisor), giving the ship`s Safety Supervisor one person to relate to.

The ship is responsible for ensuring that a Safety Supervisor is appointed who takes care of safety on board the ship, and that this person has all communication with Plug's supervisor.

Before cables are delivered on board, contact must be established between the Safety Supervisor on the ship and Plug's supervisor at the facility.

Use of the facility

Before first use, the ship's personnel must know this procedure and shall in addition receive information about the facility to report that the ship's facility is compatible with Plug's facility.

Before connection to the system, tests must be carried out in accordance with IEC 80005-3 paragraph «10 Verification and testing»

At the first connection in Bergen, or with new crews, a tour of the facility also can be carried out if you like.

Preparation and connection

Before the ship arrives at the quay, personnel from Plug will prepare the system for connection.

This means that the system must be earthed and secured against connection, and cables to be laid out on the quay, ready to be delivered on board the ship.

When the ship's arrival, the Safety Supervisor for the high voltage system on the ship must contact Plug's Supervisor to establish contact and know who to relate to.

When relation is established, Plug's Supervisor must review the safety measures that have been carried out at the facility on land, together with the person who is responsible for safety on the ship, before starting the work of delivering the cables on board and connect them to the ship.

If the Safety Supervisor from the ship wants to hang his own padlock on earth switches on the land side, there is the possibility of this. At the cabinet it is possible to see that the cables are earthed and without voltage.

When the cables are connected to the ships and the established safety measures to energize the facility has been removed, the safety manager on the ship informs Plug's Supervisor that they consider the facility on board as under voltage and gives a ready signal that the safety measures on land can be removed. If the person in charge of security on the ship has hung on his own padlock on the land side, this must now be removed.

Plug's Supervisor on land then remove his safety measures, and after this is done, the ship logs on to the system and selects voltage and frequency enabling the system to receive voltage. Here is it possible for personal from the ship also check that the measurement of power consumption starts at zero. The measurement will always start at zero every time a new ship logs on.

When the ship is ready to receive voltage on board, and the ship's system has given "permission to close", the safety officer on the ship asks to have the system energized from shoreside. Plug's Supervisor will then energize the system.

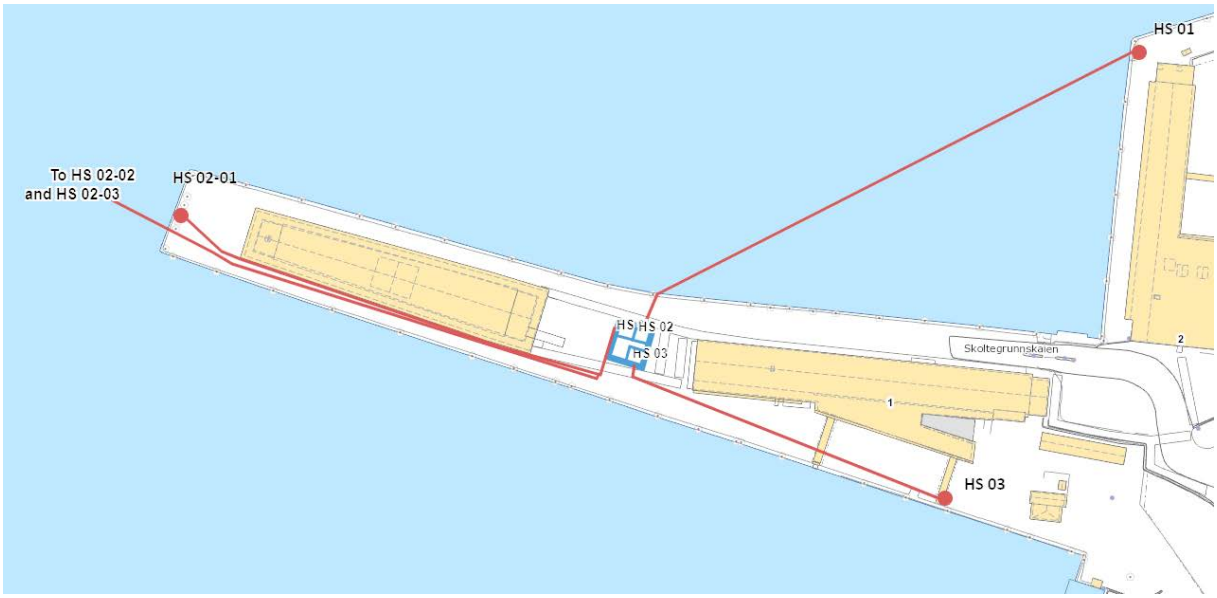
Disconnection

After the ship has transferred to its own generators and have taken over current from land asks to disconnect the shore power, the ship’s Safety Supervisor contacts Plug's Supervisor and asks to have the system disconnected. If the ship wants to read the consumption, this can be done when still logged on to the system, in the picture where voltage and frequency were selected, before disconnecting the voltage on the system.

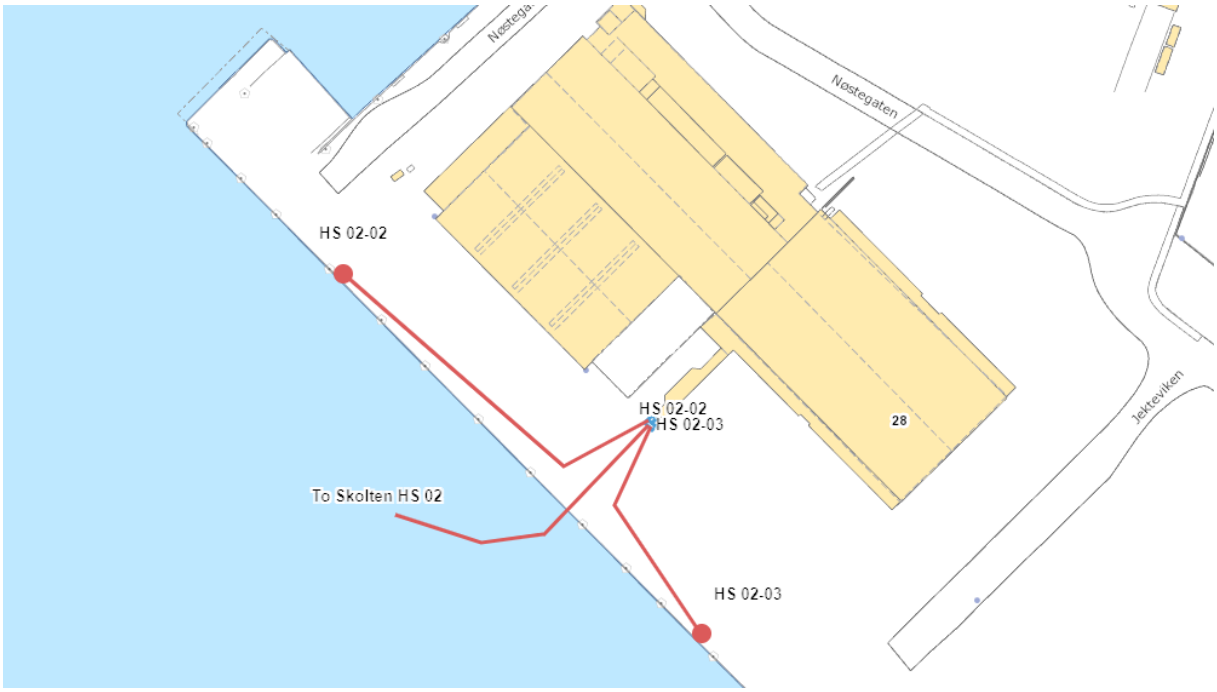
After the system is disconnected, Plug's Supervisor establishes safety measures on the land side and reports to the safety officer on the ship that they have been established and cables can be disconnected.

If the Safety Supervisor on the ship wants to hang his own lock on earth switches on the land side, it is possible for this, in the same way as when connecting. This is removed after cables have been taken ashore.

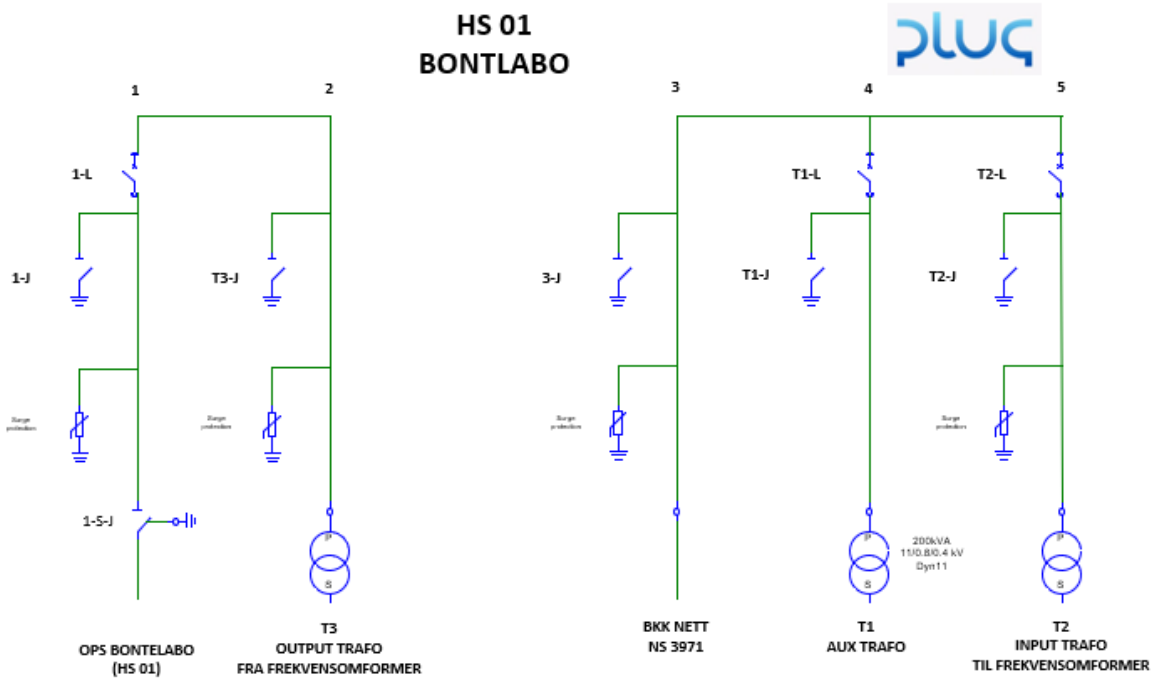
Overview Supply pits Skolten / Bontlabo

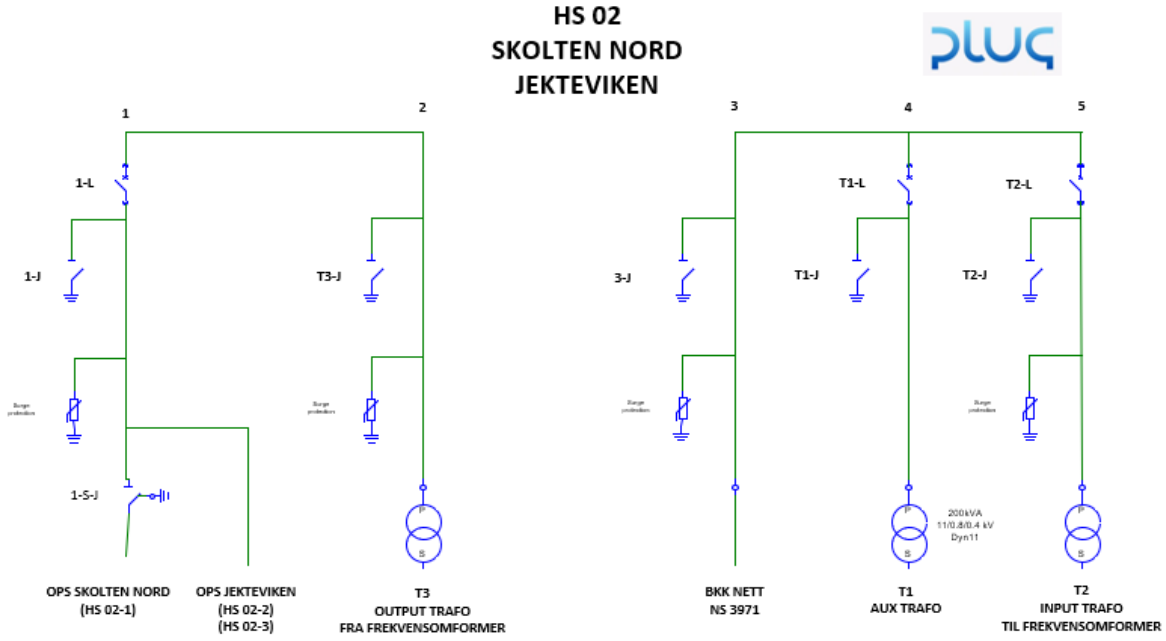


Overview Supply pits Jekteviken

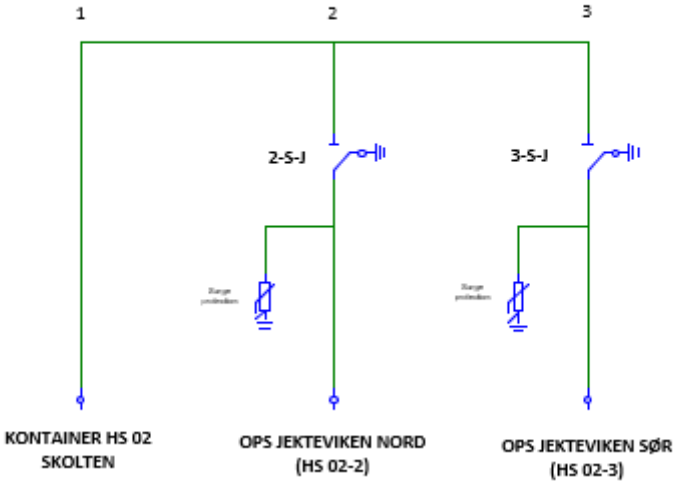


Singel-line diagram

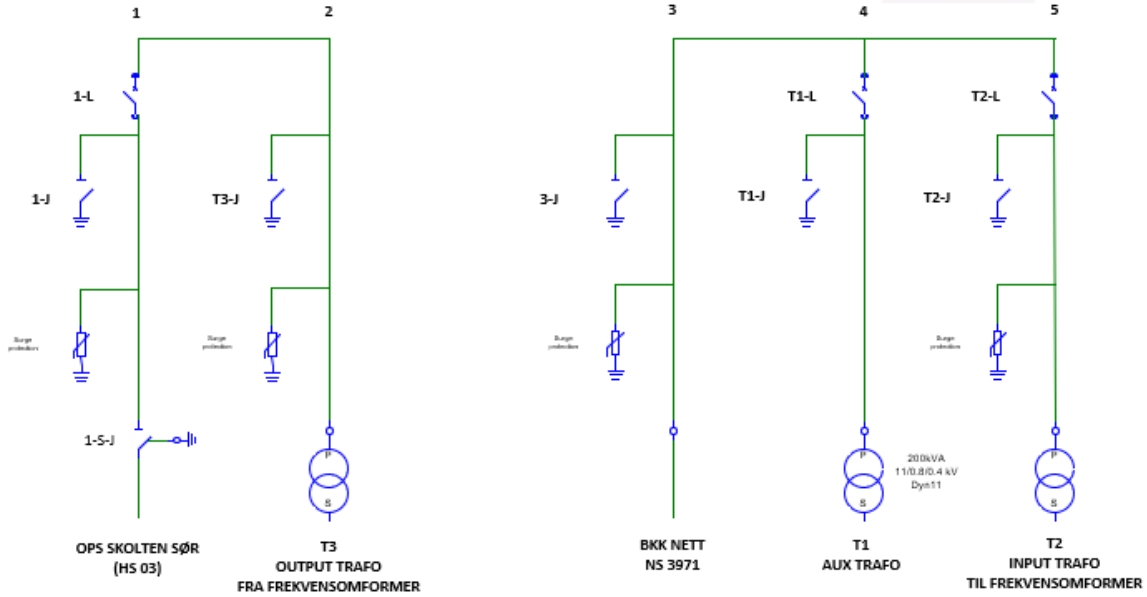




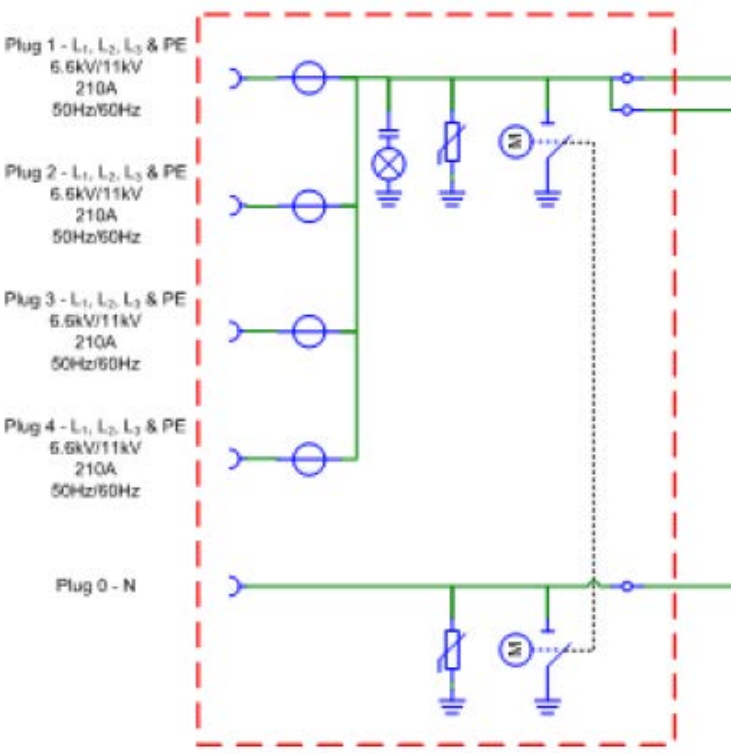
HS 02
OPS
JEKTEVIKEN



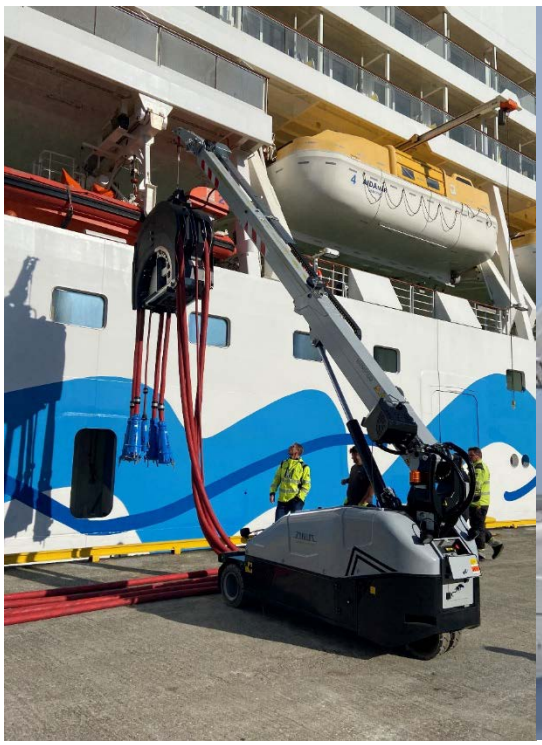
HS 03
SKOLTEN SØR



Connection cabinet



CMS system



Connection cabinet CMS on the quay

Operation of earthing knife voltage tests in quay cabinets