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CLIENT STATUS

1 ☐ Accepted
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3 ☐ Not accepted revise and resubmit
4 ☐ For information

Date: ____________

____
Signature

HVSC 16MVA – GAR-H001

Supplier Document No.	Area	System
229741-5284-E-KA-0005		

Tag No.	PO No.

Supplier Logo

PSW POWER & AUTOMATION

Customer logo/Name

HAVNE KRAFT

Document title

Compatibility assessment HVSC GAR-H001

Installation:	Total No. of sheets:	PSW Document Number:
GAR-H001	10	229741-5284-E-KA-0005

CUSTOMER: HAVNEKRAFT AS	PO no. 229741	Project no. 5284	Date: 31.05.23

PROJECT: GAR-H001 – 16MVA HVSC	PSW Project no. 229741/5284	Doc No: 229741-5284-E-KA-0005

Contents

1. DOCUMENT PURPOSE

A step-by-step procedure for a compatibility assessment to verify compatibility between ship and the High Voltage Shore Connection (HVSC) system, according to IEC 80005-1 section 4.3.

This assessment is only needed the very first time before a ship connects to the HVSC system or if the ship or HVSC has changed.

2. SHORT DESCRIPTION

The HVSC system is designed to convert electric power to desired voltage level and frequency to a cruise vessel. 6.6kV / 11kV and 50/60 Hz. The system is made from four converter units that combined can power 16 MVA. For a short timeframe, the system can deliver 150% (2 sec.) and 125% (2min). The connection point to the system is one of the three shore cabinets. Only two of the three shore cabinets can be supplied at a time.

Nominal ratings at 11 kV: 16 MVA Nominal rating at 6.6 kV: 12 MVA

3. PERSONS IN CHARGE

In this section the persons in charge from both ship and shore signs that the below procedure is followed, and all relevant boxes are checked. If a step is excluded a comment must be made next to the line or in section 5.1.

From Ship

- Name: ______________________
- Company: ______________________
- Date: ______________________
- Signature: ______________________

From Shore

- Name: Odd Arild Lokna
- Company: Havnekraft AS
- Date: ______________________
- Signature: ______________________

Ship Information

- Ship's name: ______________________
- Ships IMO no.: ______________________
- Date: ______________________

4. COMPATIBILITY ASSESSMENT PROCEDURE

4.1. Compliance

Are the HVSC and the ship in compliance with IEC 80005-1 and what deviations from its recommendations might there be:

☒ HVSC in compliance ☐ HVSC not in compliance

☐ Ship in compliance ☐ Ship not in compliance

Deviations from IEC 80005-1 recommendations:

____

____

____

____

____

____

4.2. Short-circuit current

What is the minimum and maximum prospective short-circuit current calculations (see IEC 61363-1) for the
HVSC and ship installations:

HVSC prospective short-circuit current: Max 1366 A Min 1183 A

Ship prospective short-circuit current: Max ______ A Min ______ A

System prospective short-circuit current limits shall be within 25 kA RMS.

4.3. Inrush current

Do the ship have means to prevent large loads from starting if they would trigger a failure and/or do the system reduce inrush current:

☐ Inrush limiting ☐ Start prevention

What are the ship limits of the inrush and/or start prevention:

Max inrush current: ______ A

Max start prevention current: ______ A

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4.4. Nominal voltage ratings

4.4.1. Nominal voltage

HVSC nominal voltage: ☒ 6,6 kV ☒ 11 kV

Ship nominal voltage: ☐ 6,6 kV ☐ 11 kV

Nominal voltage output from the HVSC system can be changed to match the ship.

4.4.2. Frequency

HVSC operating frequency: ☒ 60 Hz ☒ 50 Hz

Ship operating frequency: ☐ 60 Hz ☐ 50 Hz

Frequency of the HVSC system can be changed to match the ship.

4.4.3. Phase sequence

HVSC phase sequence: Counterclockwise (L1 – L2 – L3), (A – B – C).

4.5. Voltage variations, current inrush, and overloads

The HVSC system will adjust the delivered voltage and deliver the same voltage at full load and no load. Maximum variations are ±9% for 2s, and ±20% for 0,05s. If the variations exceed these limits, the system will shut down the power.

The HVSC system can handle 50% overload for 2 seconds, and 25% overload for 2 minutes. Exceeding this will result in a failure and trip the system. Ship must show consideration and avoid larger in-rush currents and overloads that could result in failure/trip.

4.6. Equipment impulse withstand voltage.

Ship equipment impulse withstand voltage: ________ kV

HVSC system equipment impulse withstand voltage: 75 kV

4.7. Harmonic characteristics

☒ The harmonic distortion limits for the HVSC system voltage at no-load condition are below 3 % single harmonics and 5 % for THD. Above 25^{th} harmonic limits are given in IEC 80005-1 section 5.2

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4.8. Communication and control voltages

Which communication and control voltages are available for:

HVSC: ☒ 110VDC ☒ 24VDC

Ship: ☐ 110VDC ☐ 24VDC

Other means of communication:

Which control signals are supported by the 24VDC connector:

Ship:	HVSC:		Pins:
☐	☒	Permission to close 6,6 kV **	1, 2
☐	☒	Ground relay check **	3, 4
☐	☐	Capacitor bank alarm*	5, 6
☐	☐	Capacitor bank – Stage 2 indication *	7, 8
☐	☐	Transformer temp. – Stage 1 alarm *	9, 10
☐	☐	Transformer temp. – Stage 2 alarm *	11, 12
☐	☐	Permission to start capacitor sequence *	13, 18
☐	☐	Capacitor bank – Stage 1 indication *	14, 15
☐	☒	Permission to close 11 kV **	16, 17
☐	☐	Capacitor circuit breaker position *	19, 20
☐	☐	Capacitor bank – Stage 3 indication *	21, 22
☐	☐	Ground monitoring relay *	23, 24

* Optional
** Part of safety circuit

Note: *All capacitor related control signals are not available from HVSC system.*

Which control signals are supported by the 110VDC connector:

Ship:	HVSC:		Pins:
☐	☒	Permission to close 6,6 kV **	1, 2
☐	☒	Emergency stop **	3, 4
☐	☒	Circuit breaker trip 6,6 kV **	5, 6
☐	☒	Shore ground indication	7, 8
☐	☒	Frequency setting	9, 10
☐	☒	Reduce power warning	11, 12
☐	☒	Expected shutdown warning	11, 13
☐	☒	Circuit breaker trip 11 kV **	14, 15
☐	☒	Permission to close 11 kV **	16, 17

** Part of safety circuit

Are the ship and HVSC system safety circuits compatible?

☐ Yes ☐ No

The HVSC system failsafe uses a safety PLC to manage and control all safety related input and outputs. All safety relate I/O's functions are tested and verified.

4.9. Earthing

☐ The ship is providing sufficient earthing between ship and shore with a value of ________ Ω

4.9.1. Ship earth fault

When the ship is connected to a HVSC system, is the earth fault setting different from normal settings and are there means to change settings:

☐ Yes ☐ No

Ship earth fault setting at normal and HVSC operation condition:

Normal operation: ____________ A

HVSC operation: ____________ A

4.9.2. Transformer neutral earthing

The neutral connection from the shore power is provided from a 156 kVA earthing transformer (Zig-Zag) through a 540Ω neutral earthing resistor.

4.9.3. Functioning of ship earth fault protection, monitoring and alarms when connected to a HVSC supply

Downstream current earth fault trip: 2 A
Upstream current earth fault trip: 2 A
Earth fault trip time: 1 sec

(Applies to both 11 kV and 6.6 kV nominal voltage)

4.10. Cable management

The cable length needed from shore to ship should include the maximum moveable range of the ship from the quay side:

Max: ____________ m Min: ____________ m

Are the power cables coiled up during operation:

☒ Yes ☐ No

Any derating from cable coiling:

☐ Yes ☒ No ☐ N/A

Derating from other cable management related aspects:

____

____

____

4.10.1. Cable tension monitoring

Ship and shore maximum cable tension limit:

☒ Ship must provide a cable tension monitoring system.

☐ Shore must provide a cable tension monitoring system.

Ship and/or shore must provide a cable tension monitoring system.

4.10.2. Needed Cable length onboard – from hatch to shipside sockets

Power cables ____________________

Neutral cable ____________________

Control cables ____________________

4.11. Galvanic isolation

☒ HVSC transformers ensures galvanic isolation between each connected ship. The isolation also prevents electrochemical corrosion.

☐ Ship has a galvanic isolation transformer

4.12. Bonding monitoring

The HVSC system has continuous monitoring of the bonding as part of the safety system, as required for cruise ships.

4.13. Location and construction

Each container is locked to prevent unauthorized personnel from gaining access to the HVSC equipment.

4.14. Hazardous areas

The HVSC system is permanently installed