

Ship focus: European connection standards for power connectors in the inland navigation sector

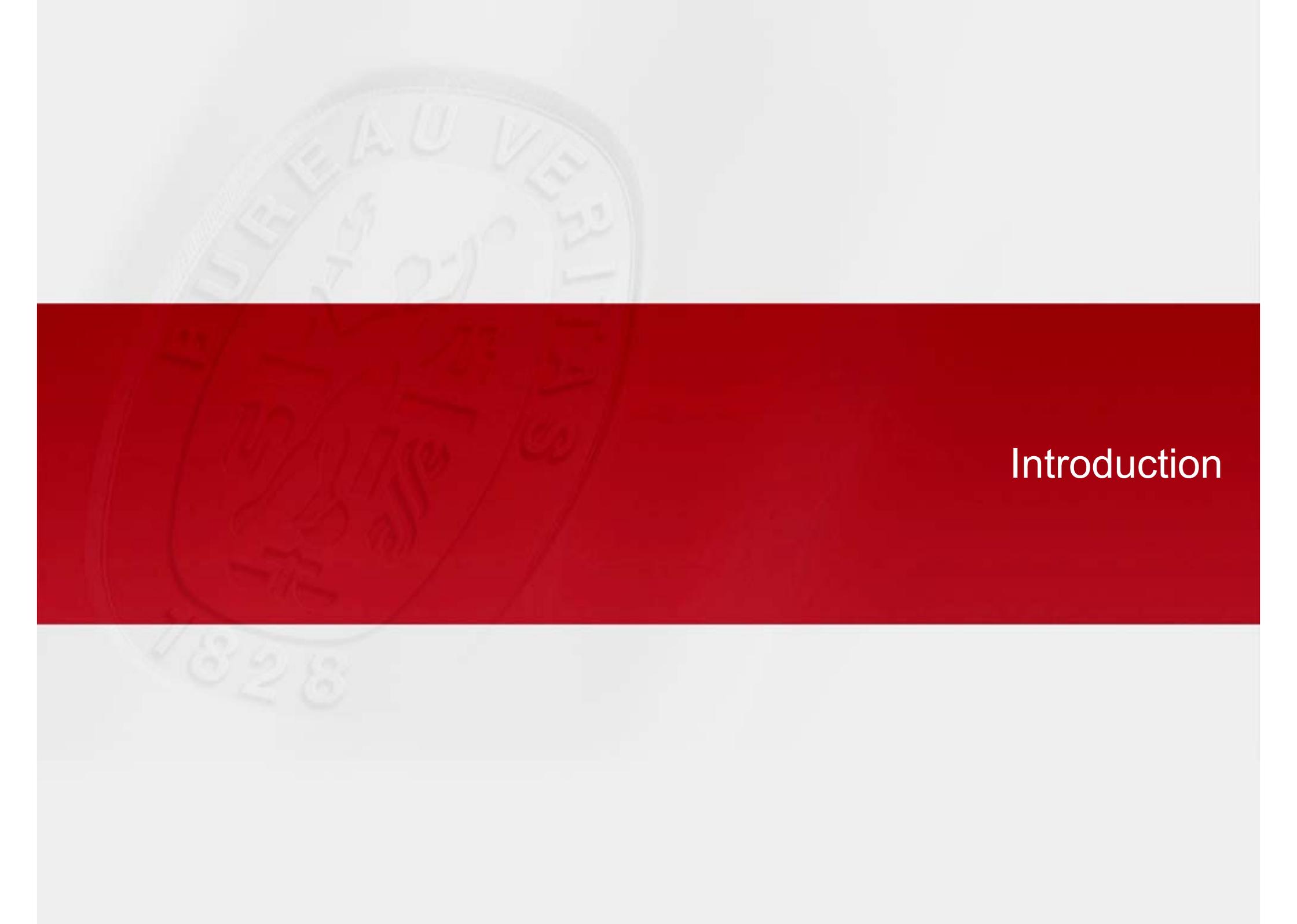
CCNR & Viadonau online workshop – Shore power at berths – Feb 3rd, 2022

Bruno Delannoy / Ghimar Merhy



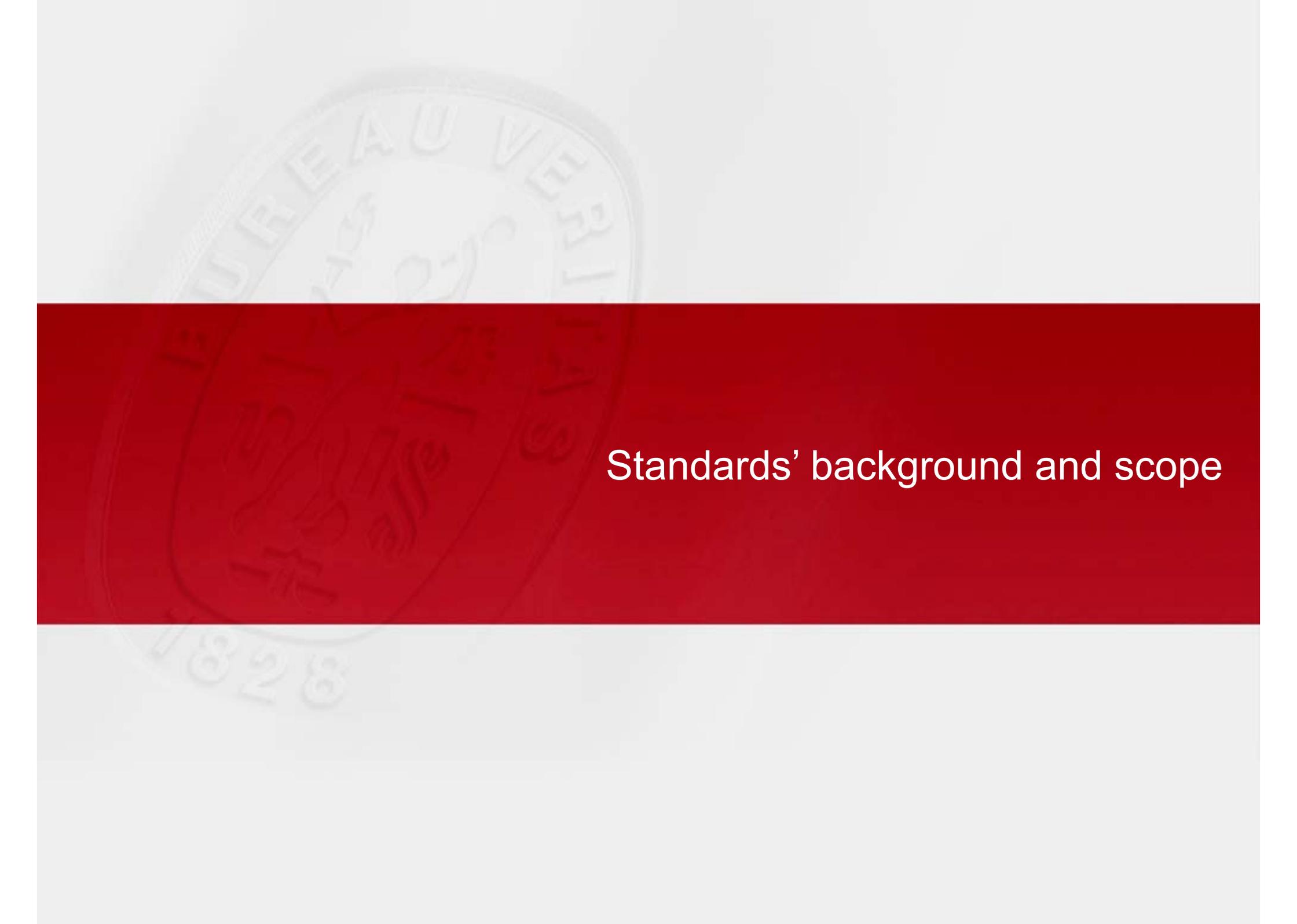
Move Forward with Confidence

- ▶ Introduction
- ▶ Standards' background and scope
- ▶ EN 15869-2019: Electrical shore connection, 3 ϕ , 400 V, 50 Hz, up to 125 A
- ▶ EN 16840-2017: Electrical shore connection, 3 ϕ , 400 V, 50 Hz, at least 250 A
- ▶ Bureau Veritas Inland Navigation Rules on shore connection



Introduction

- ▶ Diesel on-board generators: continuous supply of electrical power → during navigation and in port if no suitable land-based electrical power.
- ▶ Severe noise pollution: for the crew on their own vessel, for other vessels lying alongside, and for residents ashore.
- ▶ Damaging impact on the environment of exhaust gases.
- ▶ Electrical shore connections → power supply to the ships while berthed + eliminate noise and exhaust pollution.



Standards' background and scope

► ES-TRIN (ed. 2021/1):

Article 10.08

Connection to the shore or other external networks

1. The feed-in unit, that is the entire onboard equipment for transferring electrical power to the craft, must be designed as follows:
 - a) Transfer from shoreside power supply systems:
 - aa) For currents up to 125 A, the requirements of European Standards **EN 15869-1 : 2019** and **EN 15869-3 : 2019** are to be complied with.
 - bb) For currents greater than 250 A, the requirements of European Standards **EN16840 : 2017** are to be complied with.
 - b) In all other cases, the requirements of (2) to (9) shall apply. The requirements specified shall be deemed to have been complied with if the Standards referred to in (a) are adhered to for the use in question.

Standards' background and scope

▶ EN 15869-1: 2019

Inland navigation vessels – Electrical shore connection, three-phase current, 400V, 50Hz, up to 125 A – Part 1: General requirements.

▶ EN 15869-3: 2019

Inland navigation vessels – Electrical shore connection, three-phase current, 400V, 50Hz, up to 125 A – Part 3: On-board unit, additional requirements.

▶ EN 16840: 2017

Inland navigation vessels – Electrical shore connection, three-phase current, 400V, 50Hz, at least 250A.

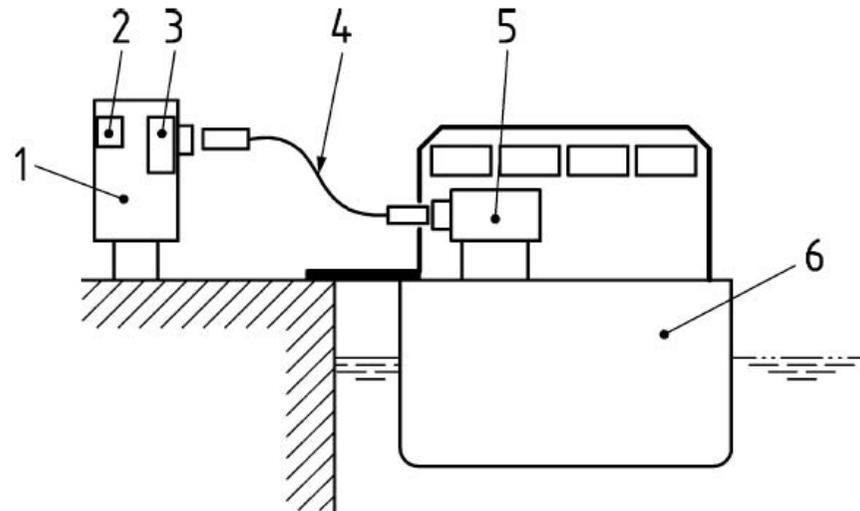


EN 15869

Electrical shore connection
3 ϕ , 400 V, 50 Hz, up to 125 A

- Electrical shore connection components:

Schematic representation of an electrical shore connection



Key

- 1 power supply station
- 2 operating instructions
- 3 shore connection unit
- 4 shore connection cable
- 5 feeding unit Type B
- 6 inland navigation vessel

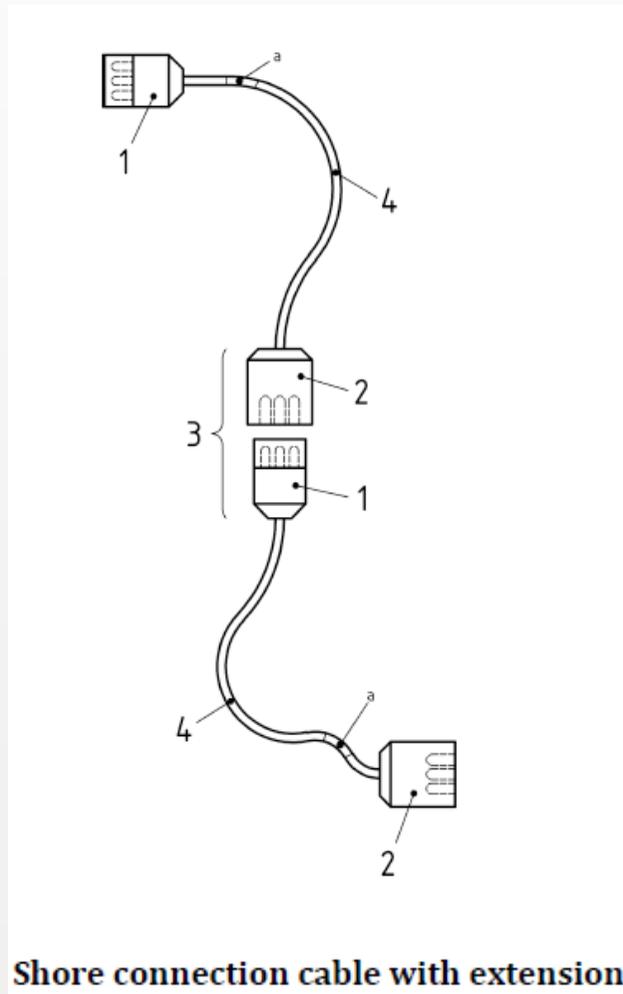
Examples of activation and consumption recording systems:

- ▶ Transponder card – prepaid card
 - Transponder cards pre-loaded with credit are sold to the user.
 - power supply station activation: transponder card → power supply station balance transfer.
 - power transmission completion: transfer of the remaining credit back to the transponder card.
- ▶ Money card
 - The amount of payment is pre-selected. Money cannot be transferred back.
- ▶ EC card (Giro card)/credit card
 - The customer's account is pre-authorized with a fixed amount before the power transmission.
- ▶ General packet radio service (GPRS) fleet cards
 - RFID-based fleet card valid throughout Europe.
 - Billing system: registration and allocation of the fleet cards to owners.
 - Unpaid invoices → owners blocked from the system.
- ▶ App / Webpage
 - Download an app or access a webpage for authorization and identification

EN 15869 - Electrical shore connection

Shore connection cable:

- permanently connected with the feeding unit on-board (Type A)
- connectable via a plug-in connection (Type B)

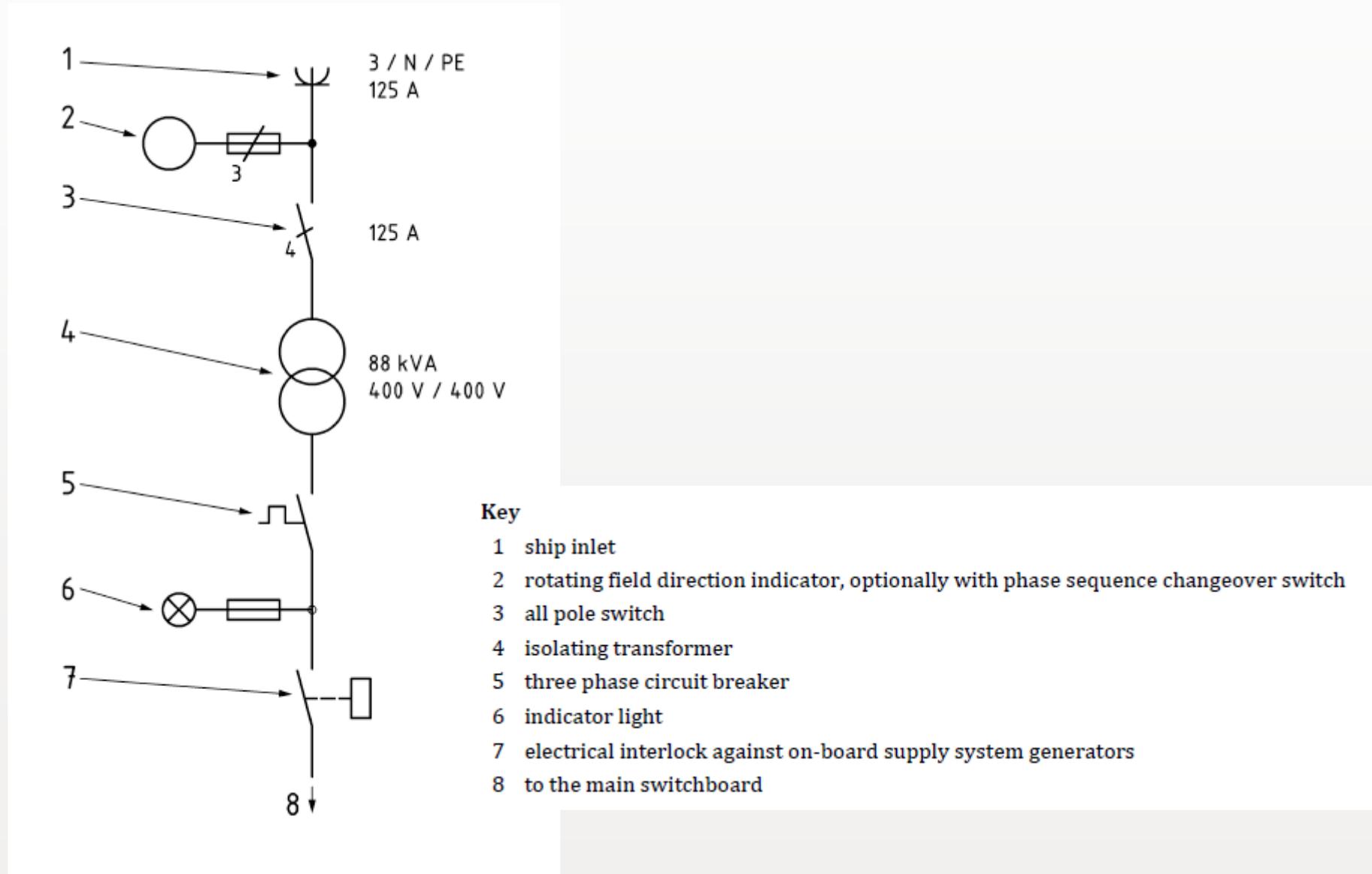


Key

- 1 plug
- 2 connector
- 3 cable coupler
- 4 flexible cable
- a field for marking

EN 15869 - Electrical shore connection

Feeding unit type B – block diagram:





EN 16840

Electrical shore connection
3 ϕ , 400 V, 50 Hz, at least 250 A

Schematic representation of an electrical shore connection

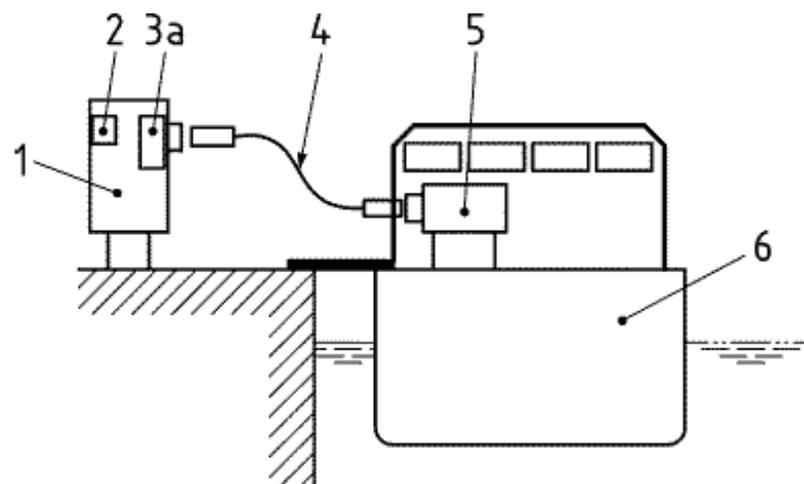
Design A:

Charging station with integrated single-core socket outlets

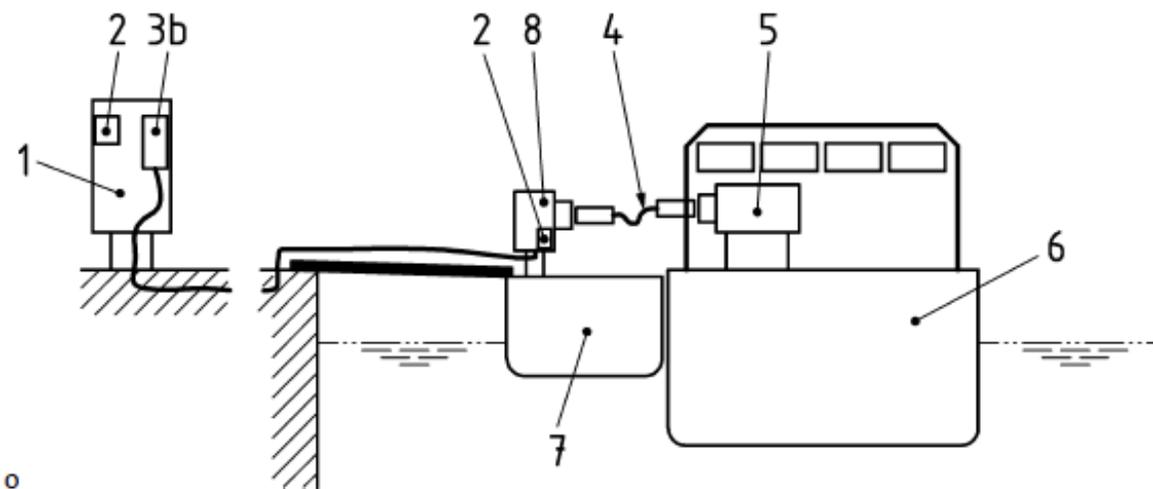
Design B:

Charging station with spatially disconnected transfer station with integrated single-core socket outlets

- | | |
|-----|---|
| 1 | Charging station |
| 2 | Operating instructions |
| 3 a | Shore connection unit with socket outlets |
| 3 b | Shore connection unit with connection cables |
| 4 | Shore connections with plugs and on-board couplings |
| 5 | On-board rectifier unit with on-board plugs |
| 6 | Inland navigation vessel |
| 7 | Floating landing stage |
| 8 | Transfer station with socket outlets |

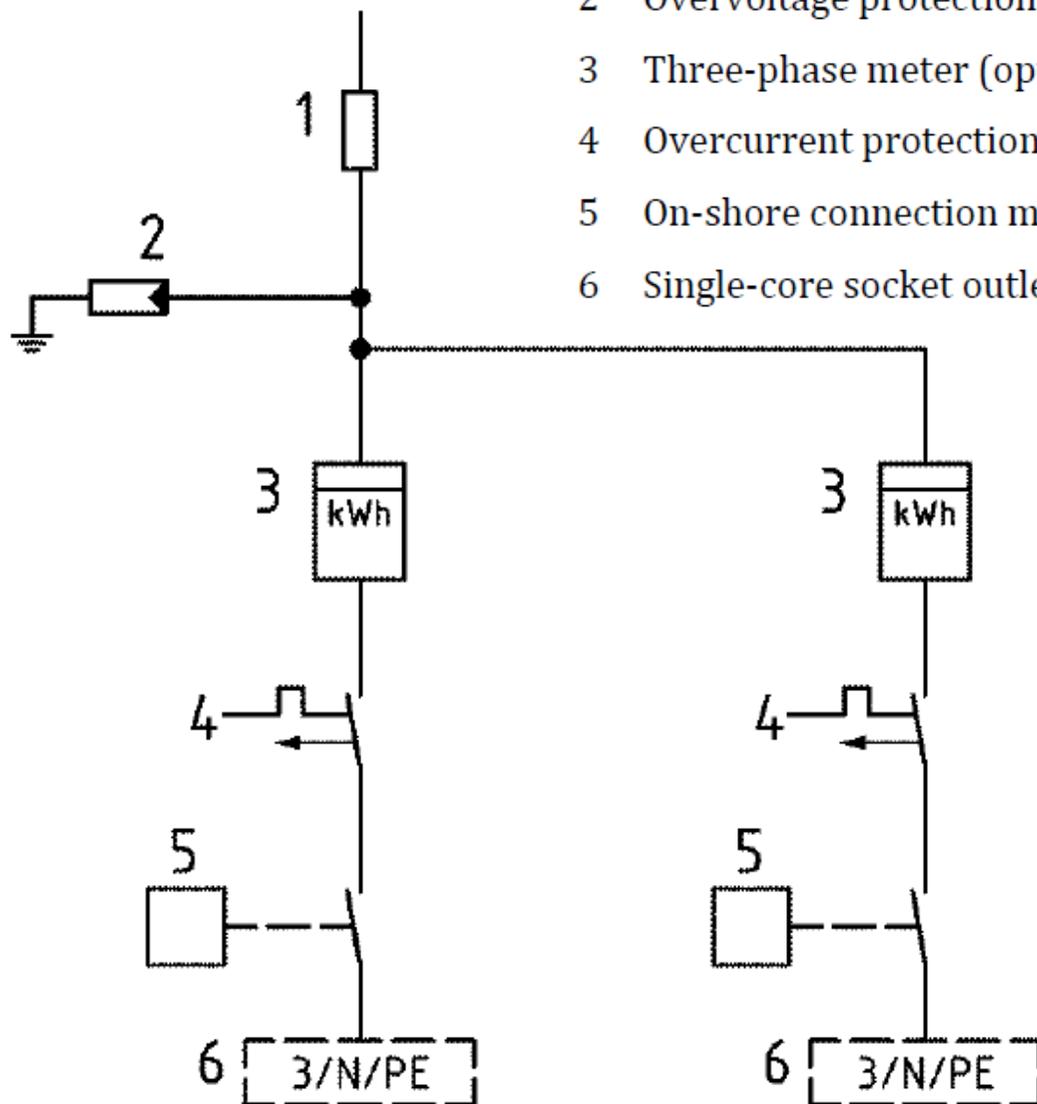


a) Charging station, schematic representation



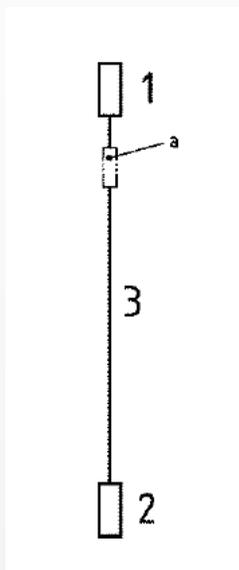
b) Charging station with transfer station, schematic representation

Charging station:



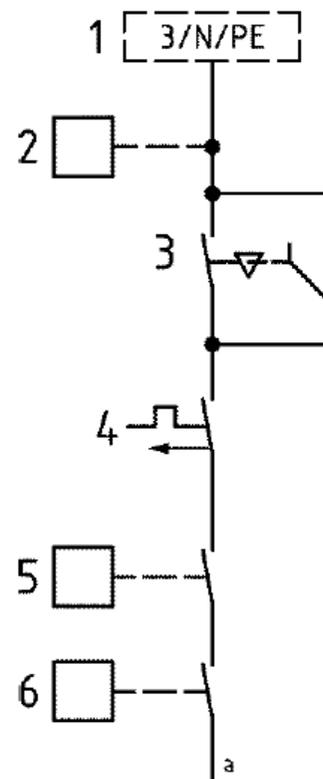
- 1 Cable protective device
- 2 Overvoltage protection (optional)
- 3 Three-phase meter (optional)
- 4 Overcurrent protection e.g. circuit breaker with undervoltage triggering
- 5 On-shore connection monitoring
- 6 Single-core socket outlets

► On-shore connecting cable

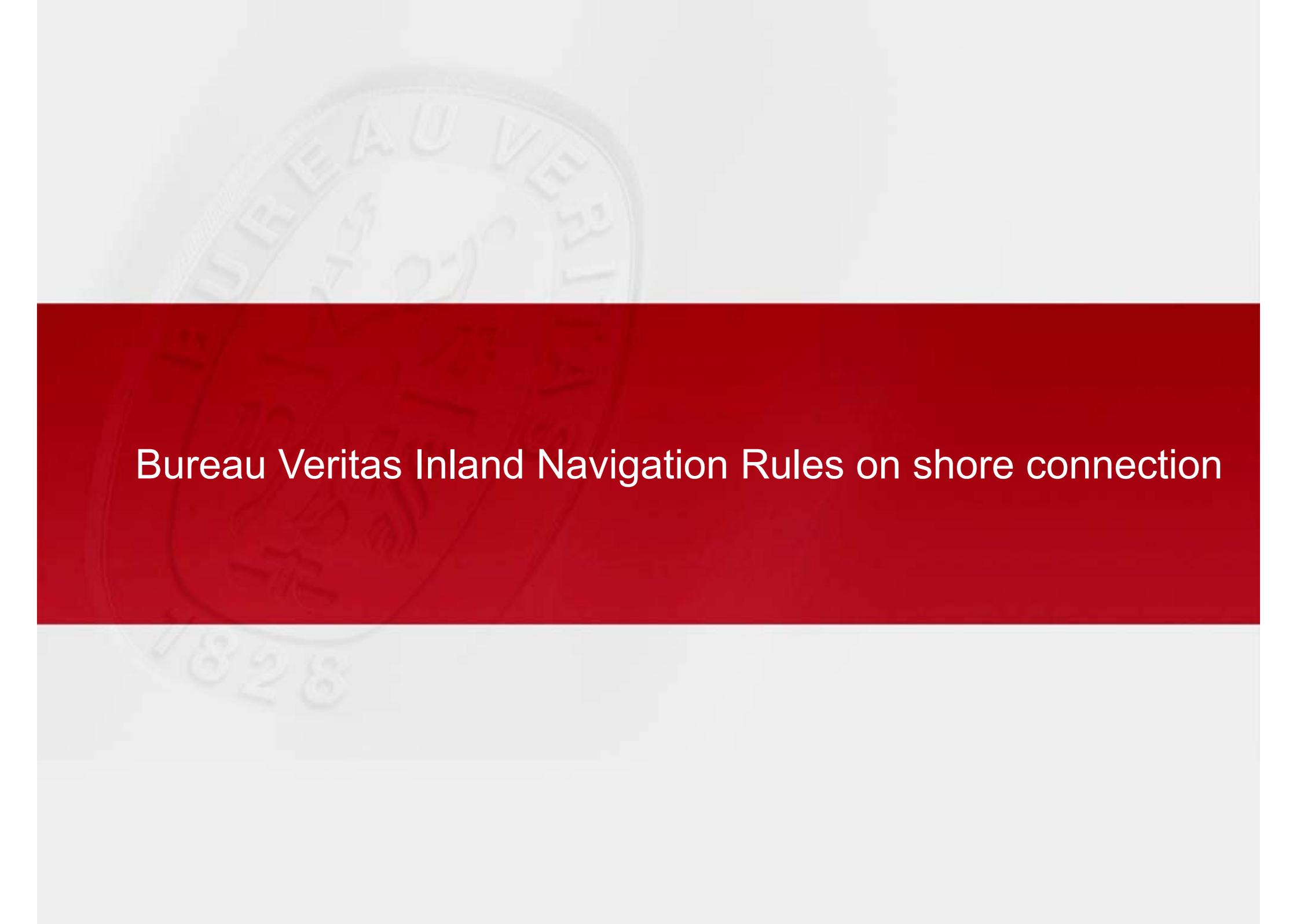


- 1 Single-core plug
- 2 Single-core on-board coupling
- 3 Single-core line
- a Designation field

► On-board rectifier unit



- 1 Single-core on-board plugs
- 2 Phase sequence instrument with phase sequence indicator
- 3 All-pole (3P+N) disconnection device with phase toggle switch
- 4 Overcurrent protection
- 5 Shore connection monitoring
- 6 Electrical interlocking of on-board mains generators
- a To the main distribution panel



Bureau Veritas Inland Navigation Rules on shore connection

- ▶ ES-TRIN refers to class society rules

ES-TRIN

Chapter 10
Electrical equipment and installations

CHAPTER 10 ELECTRICAL EQUIPMENT AND INSTALLATIONS

Article 10.01 General

1. When no special requirements are specified for certain parts of an electrical installation or an electrical equipment, the safety level shall be considered satisfactory when these parts have been installed in accordance with an approved European Standard or in accordance with the requirements of a recognised classification society.

The relevant documents must be submitted to the inspection body.

- ▶ There is no contradiction between ES-TRIN and BV rules (NR 217)
- ▶ BV rules also refer to international standard

1.2 References to other regulations and standards

1.2.1 Besides these Rules, electrical equipment shall meet a standard approved by the Society, such as IEC and EN.

1.2.2 When referred to by the Society, publications by the International Electrotechnical Commission (IEC) or other internationally recognised standards, are those currently in force at the date of agreement for vessel classification.

- ▶ BV proposes in addition surveys depending on the Classification mark selected (Dot Vs Maltese cross)



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