AMP‘d by SAM Electronics

We are Connecting Ships

With Alternative Maritime Power / AMP

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April 2006

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an L3 communications company

SCS Shore Connection System

LV Shore Connection System, 440V, >3 MVA

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What is AMP?

Alternative Maritime Power (AMP) is the result of a groundbreaking effort to reduce emission at the Port. Instead of burning diesel fuel while at dock, AMP ships "plug in" to shore side electrical power — literally an alternative power source for maritime vessels. While a form of AMP, in the industry often referred to as called "cold ironing," has been used for naval vessels, Baltic ferries and some Alaskan cruise ships, the Port of Los Angeles is the first Port in the world to use AMP technology for in-service container ships.

1. 1 Environmental Movement

Environmental movements have been active on the West Coast of the U.S . including L.A. and Long Beach for many years. Especially in California which has a very great number of cars and is in famous for air pollution, strict restrictions against vehicle emission have been implemented.

Now the focus of these movements is shifting to ports and they are now trying to regulate exhaust gas emission from ships anchoring at ports and from trailers coming in and out of terminals.

1. 1 Environmental Movement

It said that 70% of cancer risk is derived from diesel emission.

Some reports mention a sharp rise of asthma and
acute/ chronic bronchitis of people living in the area around the ports of Los Angeles and Long Beach, and they also point out that those areas have a much higher cancer rate.

1. 2 Diesel Emission

Every Year , 4.000t exhaust gas including Nox,PM* and Sox* is emitted from the ports of L.A. and Long Beach. Its quantity is more than the exhaust gas of half a million cars.

Moreover, ships using diesel oil of low quality (Heavy Fuel Oil). Therefore, ships generate emission gas that includes much more pollutants.

It is said that one third of emission gas in ports is generated by the ships berthing in port. This is because the ships have to run their auxiliary engines to supply electricity for the ships equipment, also while berthing in port.

1. 2 Diesel Emission

NOx (Nitrogen Oxide)

NOx is the compound of Nitrogen and Oxygen which is generated by combustion. Usually, NOx exists as NO (Nitric Oxid) or NO2 (nitrogen dioxide). It is cause of photochemical smog, acid rain and green house gas.

PM (Particulate Matter)

PM is a small discrete mass of solid or liquid matter that remains individually dispersed in gas or liquid emissions. Especially smaller PM less than 10 micro m, called SPM (Suspended Particulate Matter) is considered to be an atmospheric pollutant. It exists in the air for a long time and is deposited in human lungs or bronchial tubes and affects badly.

SOx (Sulfur Oxide)

SOx is the compound of Sulfur and Oxygen. One particle of SOx is SO2 (sulfur dioxide). When SO2 increases above a certain level, it affects humans badly.Like NOx it is also cause of acid rain.

1. 3 Background of Alternative Maritime Power (AMP)

Ports have to protect the environment, however, economic trade gets ever more active in future, and the trading volume by 2025 is estimated to triple. It is obvious that more and more ships will call the ports of Los Angeles and Long Beach.
Therefore, the Ports of Los Angeles and Long Beach launched sweeping measures which can achieve a good balance between mitigating air pollution and up keeping of public health.

1. 4 Decision for Alternative Maritime Power (AMP)

Regarding ships, there are several plans under study:

alternative fuel, improved engines, alternative sources of power supply, etc.

The most promising method is to supply electric power (6,6KV) from shore to ship and to stop the auxiliary diesel engines for electric power generation.

While receiving electric shore power according to this method, the ship does not produce any diesel emissions.

1. 5 Growth of Port of Los Angeles

- Cargo growth

It is expected that the no.s of standard containers (TEU) handled in L.A. will increase from

10 Mio TEU as of 2004

up to

30 Mio TEU in 2025

1. 5 Growth of Port of Los Angeles

- Vessel Population, Fiscal Year 2002-2003

  - 1702 Vessels made 5716 calls
  - 750 Vessels called once (44%)
  - 300 Vessels called 6 times or more (18%)
  - 46 Vessels called 12 times or more (2,7%)

1. 5 Growth of Port of Los Angeles

- Summary

  - Vessel electric power demand will increase

  - Larger Vessels = longer Port stays

1.6 Wharf - to - Vessel Cables

- Dock height above MLLW = approx. 15‘

- Min. Tide = -2,7‘

- Max. Tide = 7,5‘

- Min. - Max vessel draft = +/-20‘

- Total variability = 2,7 + 7,5 + 20 = +/-30‘

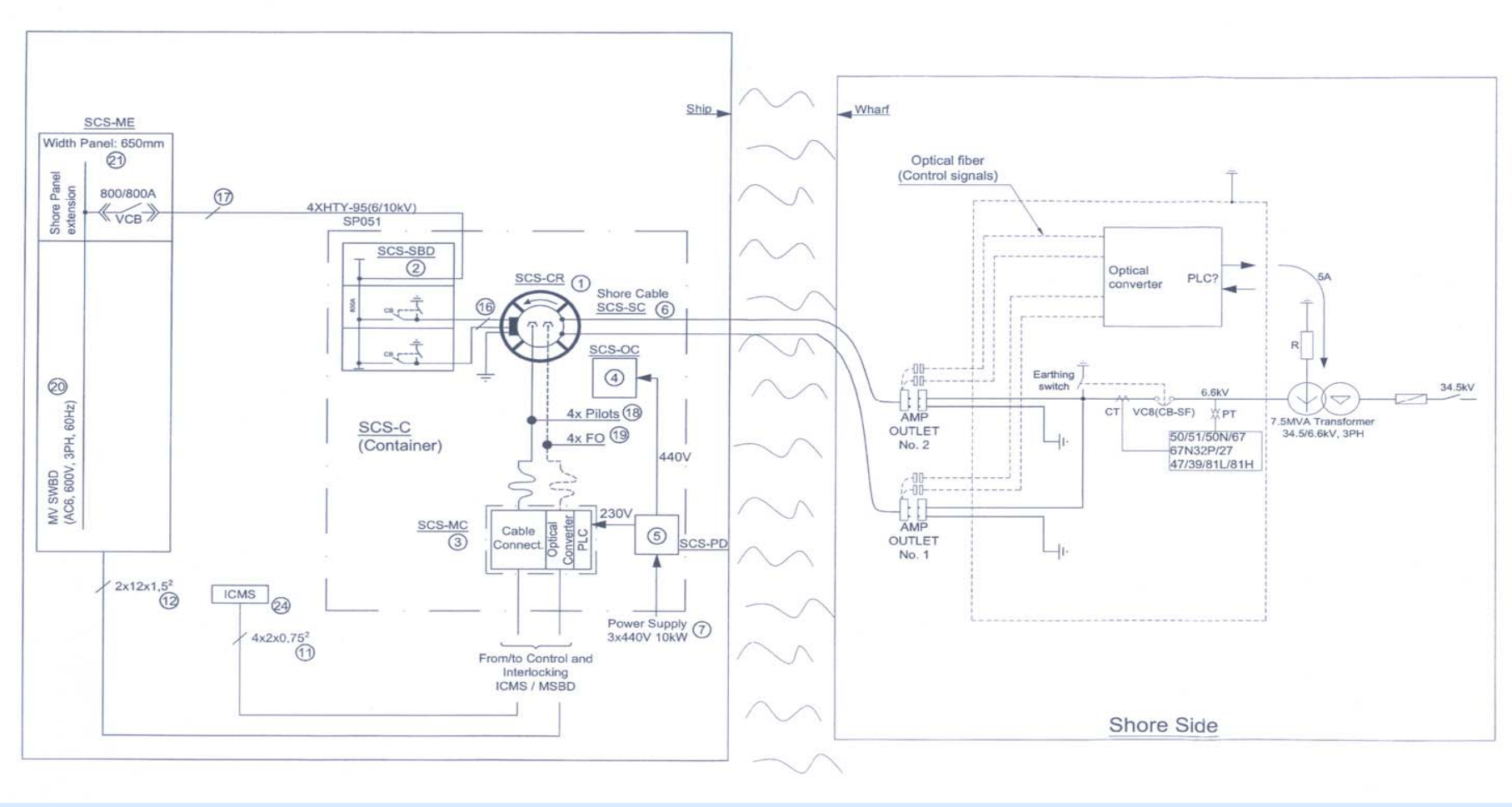
- Vessel freeboard above dock = 30 - 50 feet

1.7 Other Ports in the USA

The next Ports under development for Alternative Maritime Power

- **Houston**
- **Richmond**
- **Norfolk**
- **Seattle**
- **Oakland**
- **San Francisco**

MV Shore Connection SCS- C20 Single Line



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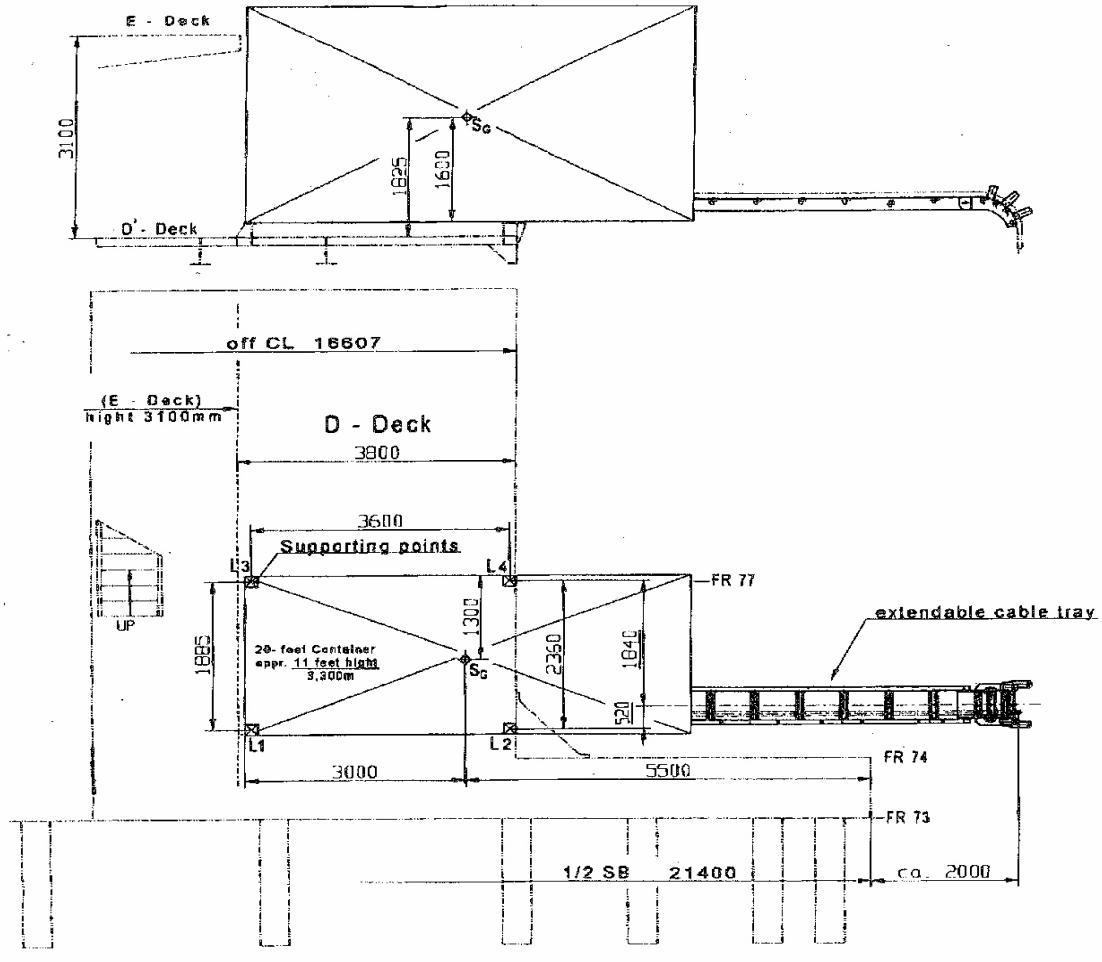
MV Shore Connection Container - SCS-C20



SK 1117 - A M1:50

Container for shore connection on Stb - side
NB 1512 Samsung

SAM Electronics

NR. 420

Ausgabe: 03 - 15.03.2005

D01

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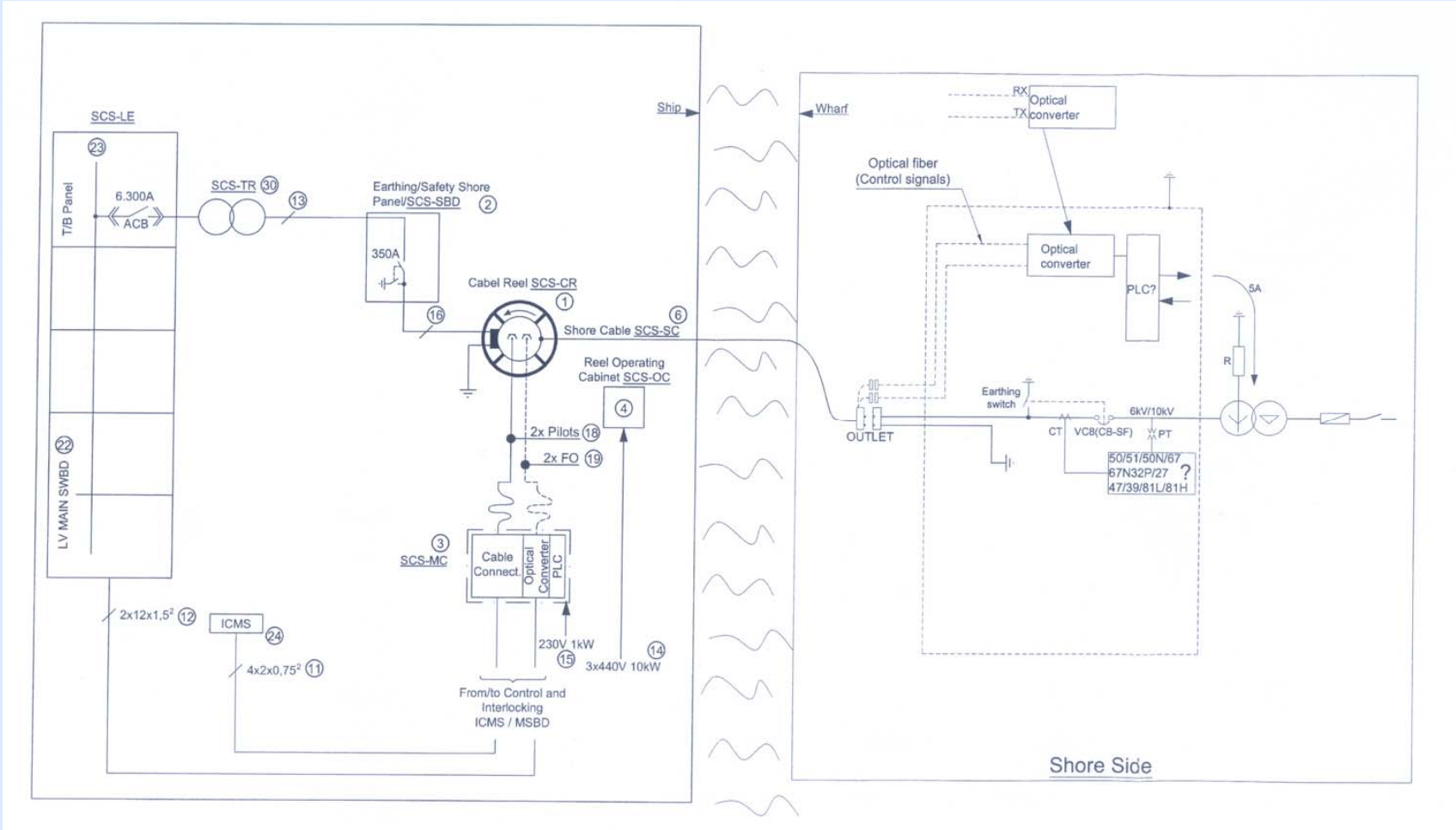
SCS Shore Connection System

LV Shore Connection - SCS-S Single Line



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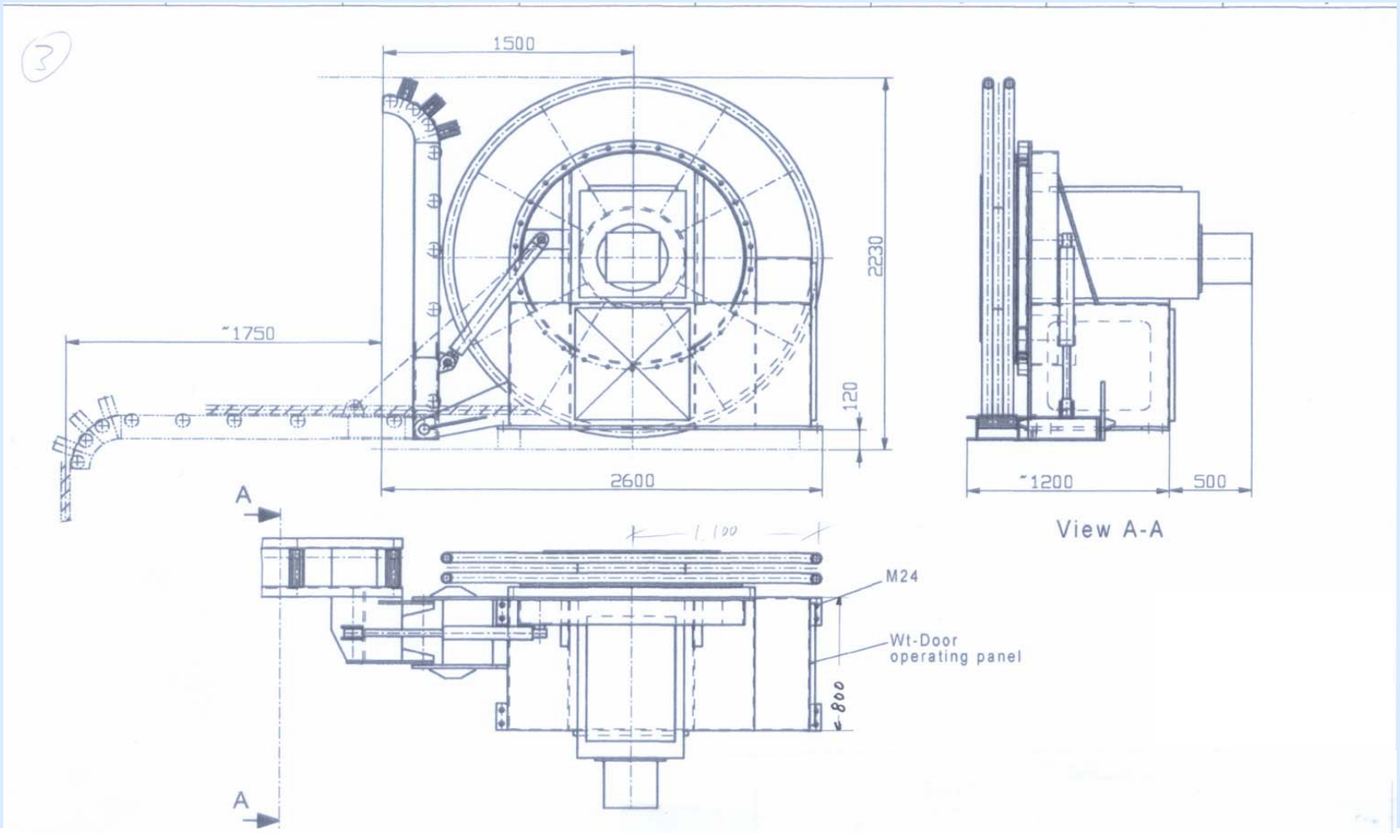
Shore Connection singel Cable Reel - SCS-S



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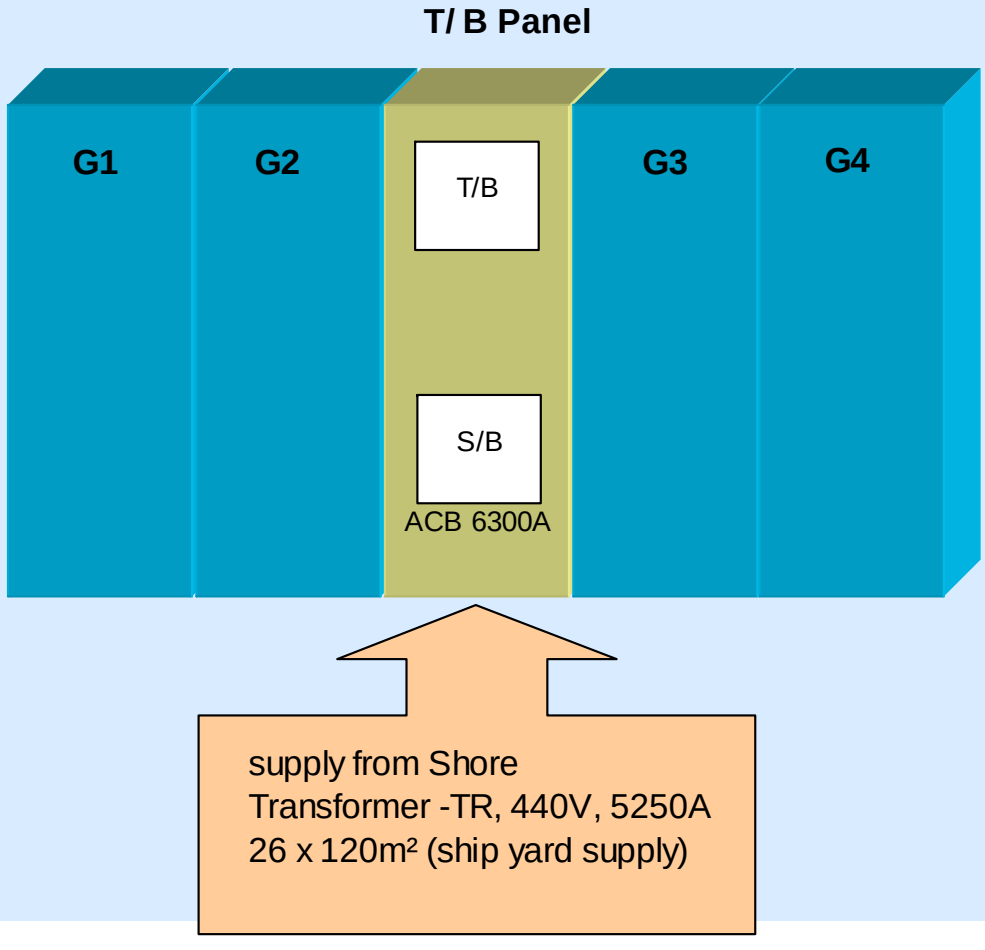
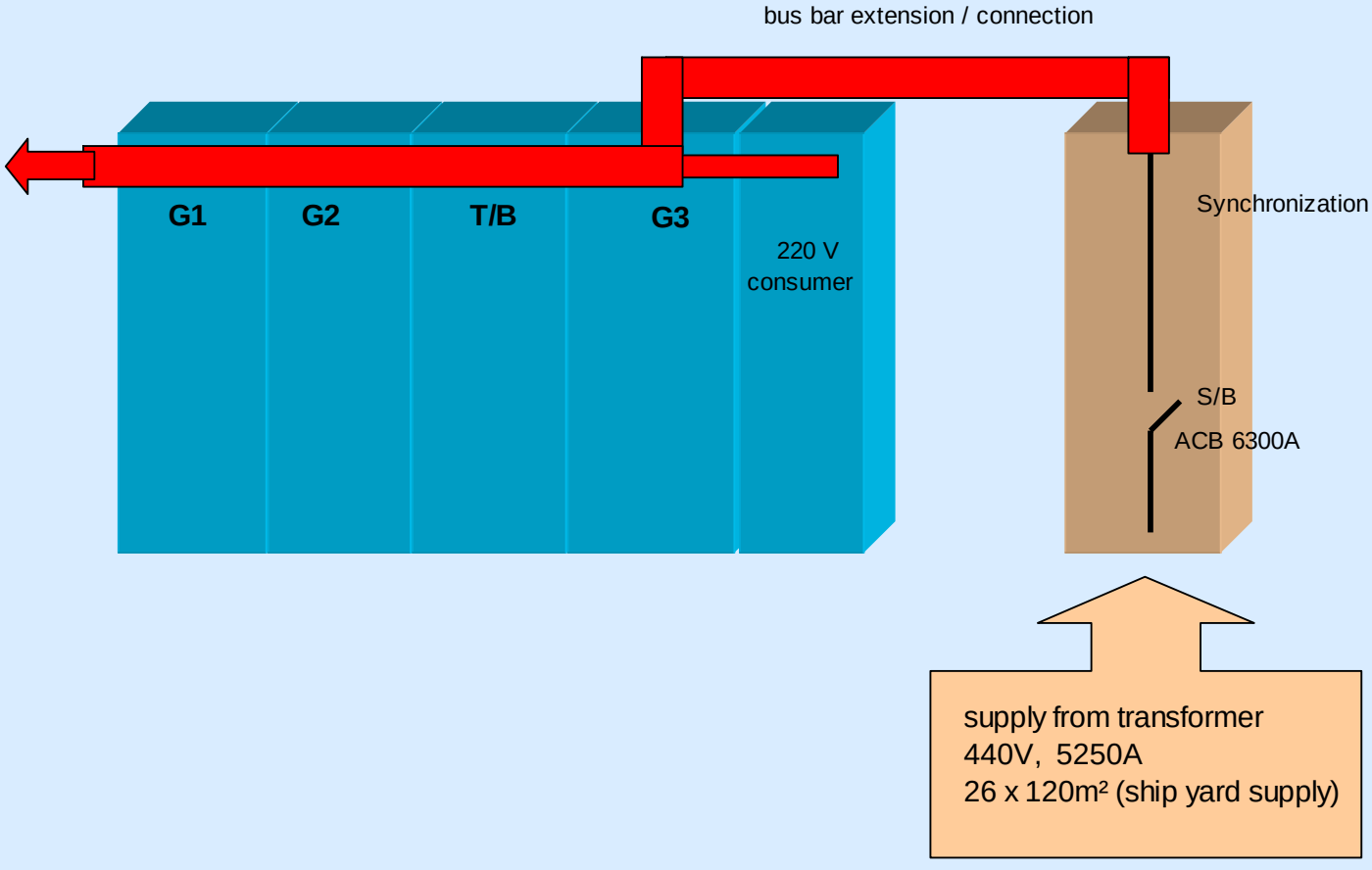
Alternative I:
LV Main SWBD with Shore Breaker - S/B, fitted in Tie Breaker - T/B - Panel

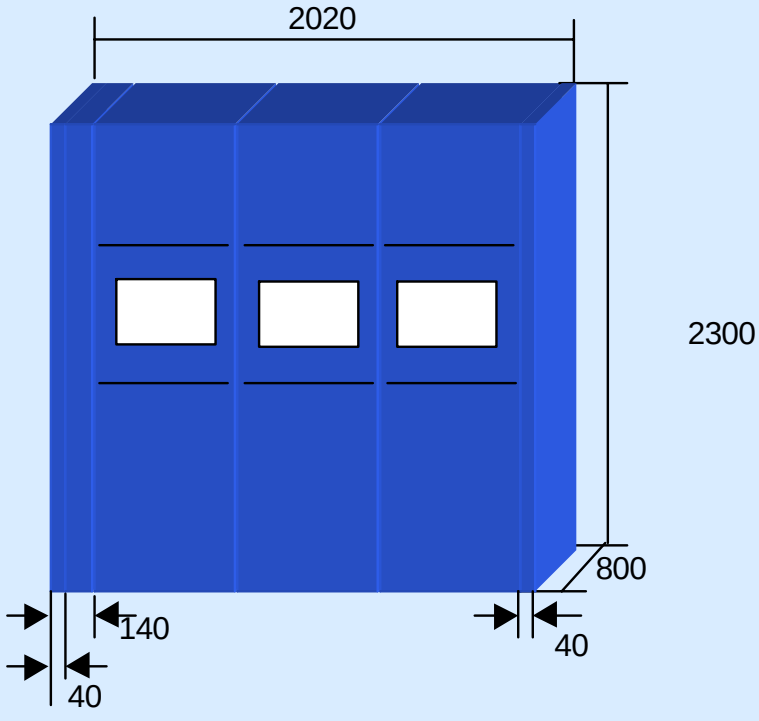


Alternative II:
LV Main SWBD with Shore Extension Panel - SCS-LE



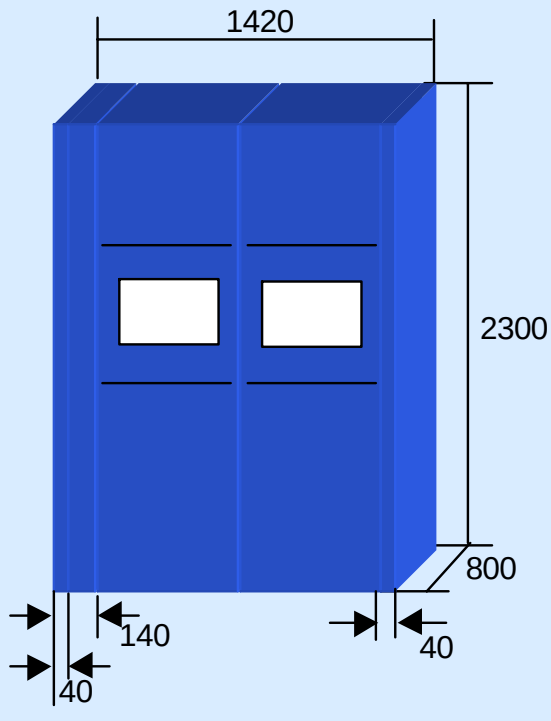
MV Shore Connection SBD - SCS-SBD

2 shore cable version, each max. 350A



Weight: ab't 2,5 to

1 shore cable version, max. 350A



Weight: ab't 1,8 to

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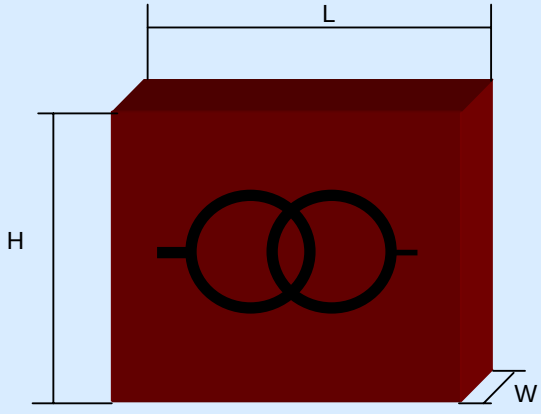
Shore Connection Transformer - SCS-TR

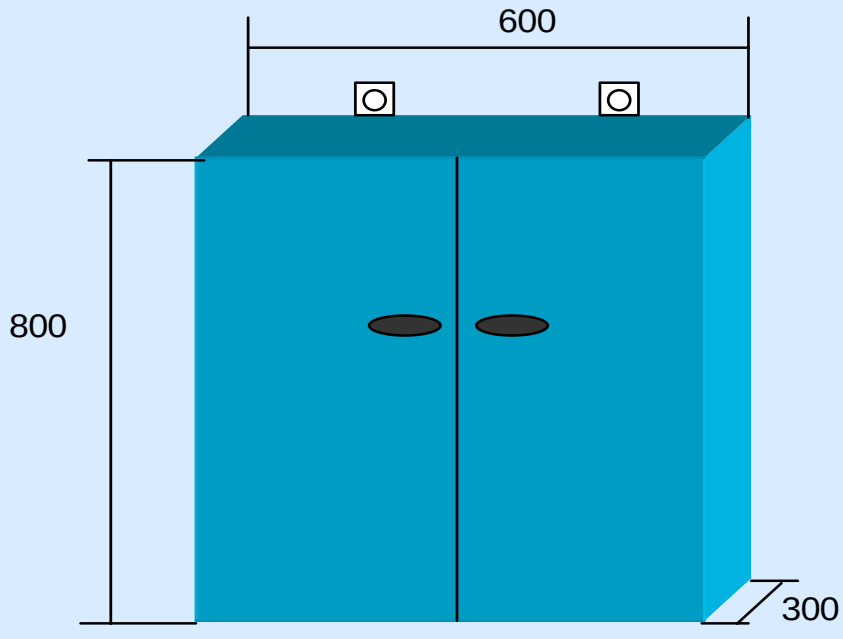


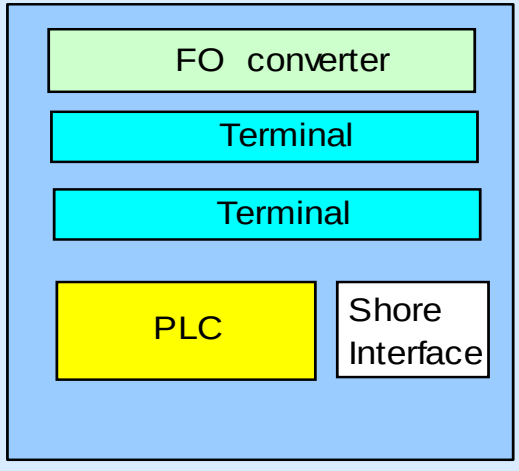
IP 23

6600 V **440V**

KVA	KW cos 0,8	I (A) 6,6KV	DIMENSION (MM)			WEIGHT (abt') To
			LENGTH L	WIDTH W	HEIGHT H	
1565	**1250**	**157**	**2500**	**1350**	**2100**	**4,2**
1.875	1.500	165	2500	1450	2350	5,4
2.500	2.000	220	2500	1450	2350	6,7
3.670	2.936	321	2.600	1.800	2.250	7,7
4.000	3.200	350	2.600	1.800	2.250	7,7
4700	3.760	411	2.750	1.800	2.500	9,1
4.800	3.840	420	2.750	1.800	2.500	9,1

Shore Connection Management & Control - SCS-MC





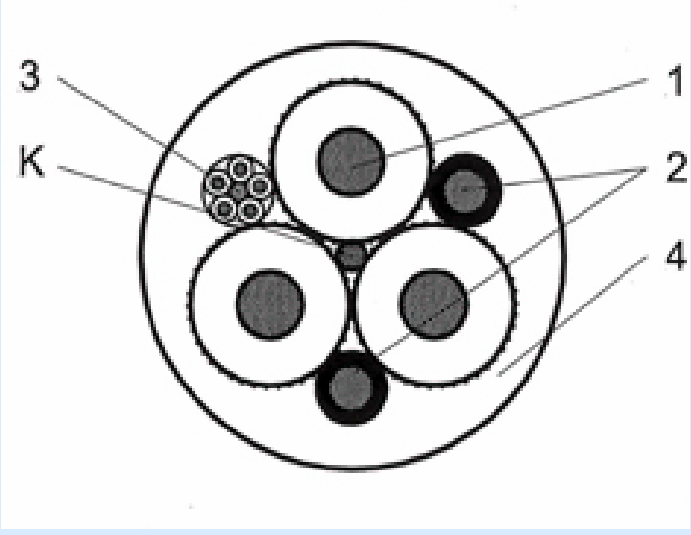
Weight: appr. 300Kg

IP 23

Shore Connection Power Cable - SCS-SC

3- pilot cores with optical fibre element
K- Centre element, synthetic threads with high tensile force

Stranding: Screened power cores assembled with grounding conductor, the optical fibre elements and the stranded pilots in the interstices

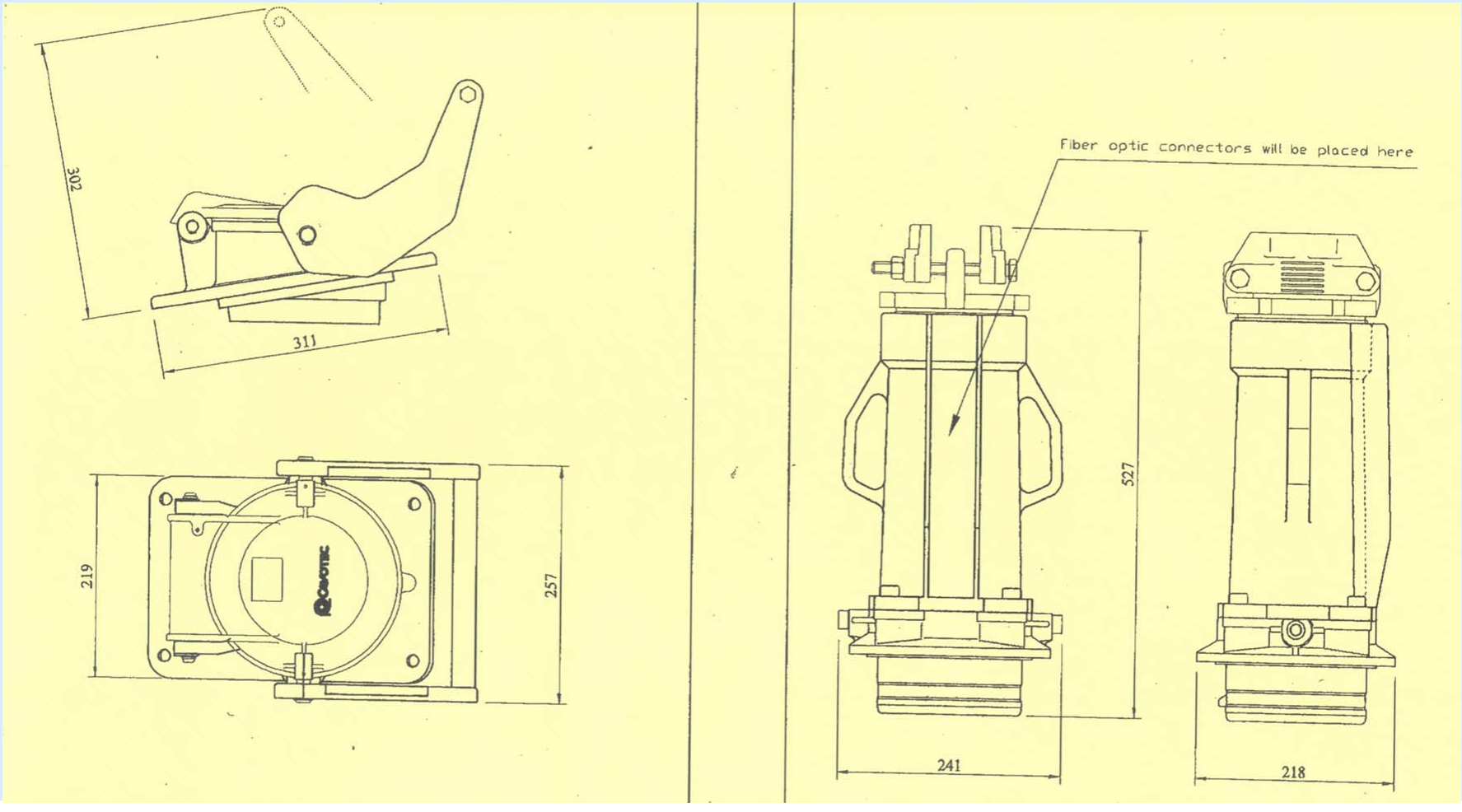


1- power cores
2- grounding conductor
4- outher sheath
outer diameter: 64 - 67 mm
weight: appr. 8Kg/ m

Cable load: 6.600/ 10.000KV
max. 350 A at 30°C
max. 321 A at 45°C

SCS Shore Connection System

MV Shore Connection Power Cable Plug- SCS-CP



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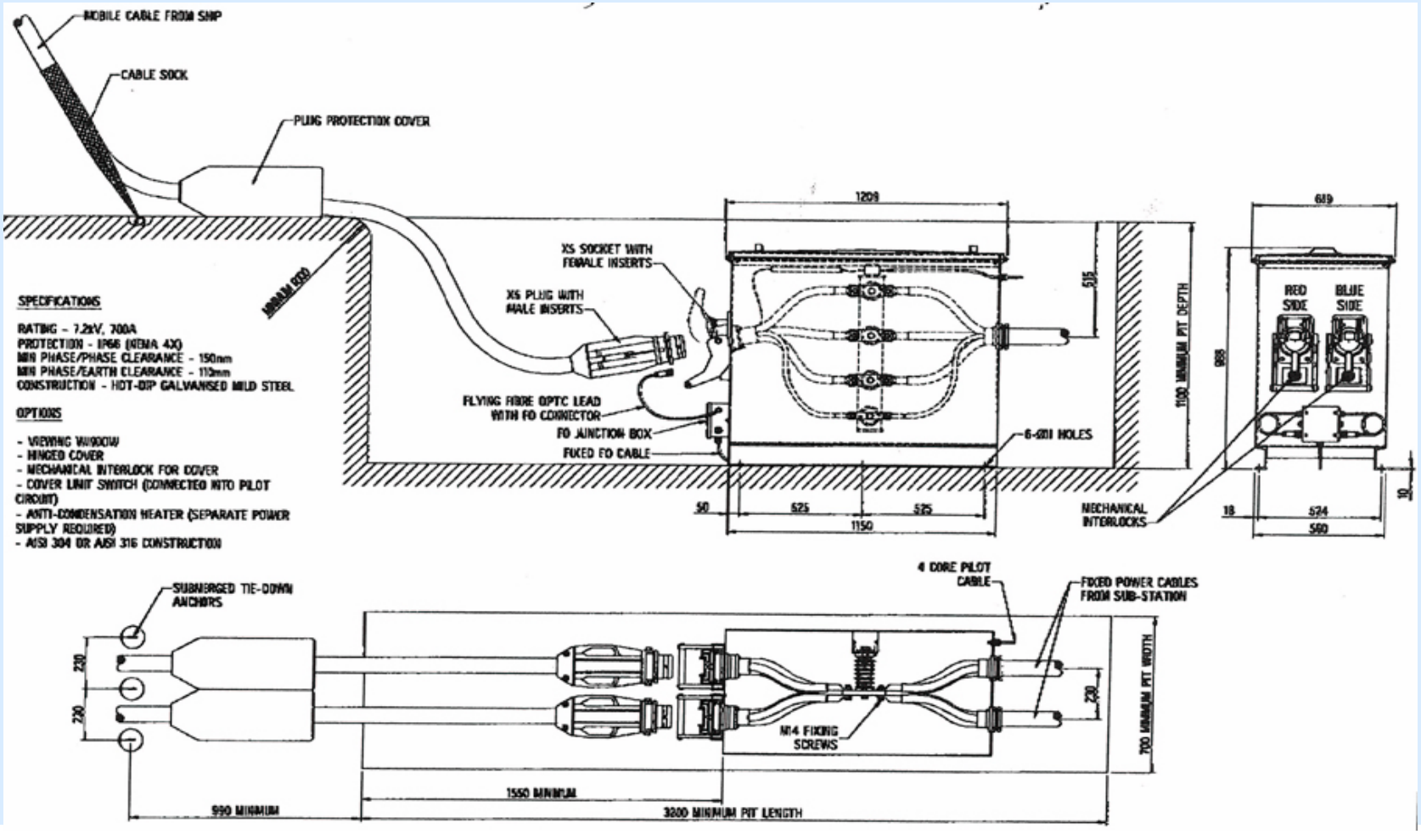
Wharf Power Connection and Sockets



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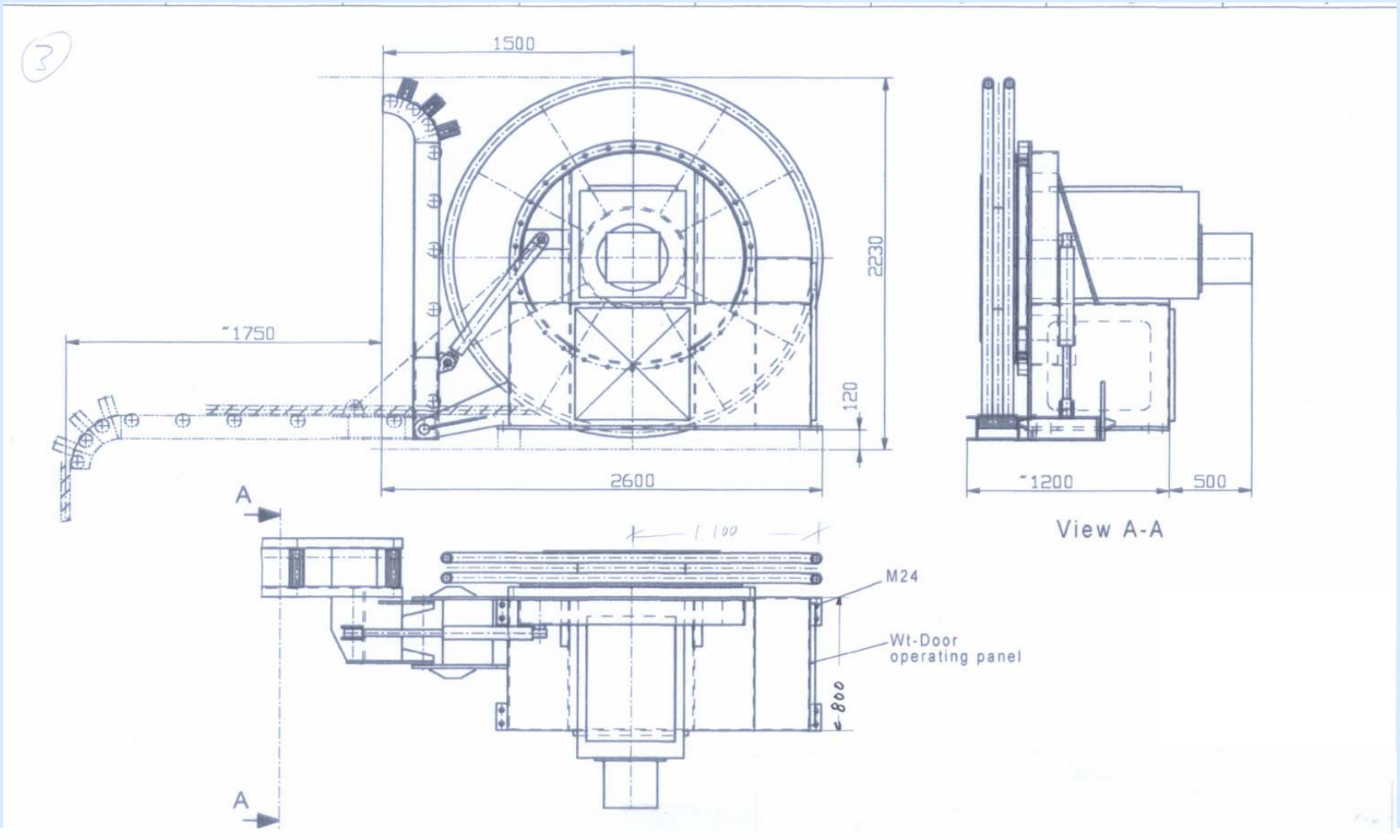
Shore Connection singel Cable Reel - SCS-S



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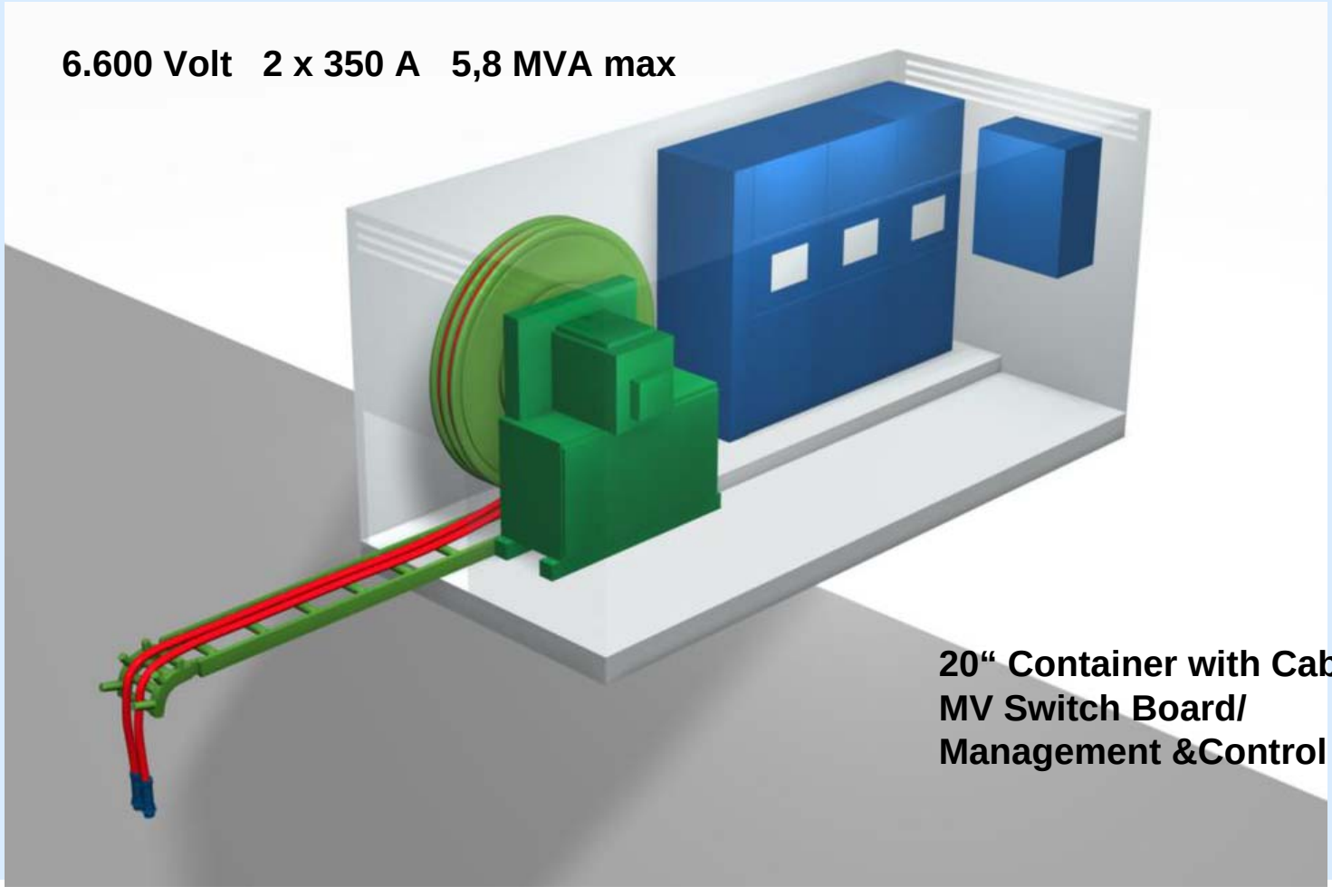
SCS Shore Connection System

MV Shore Connection Container - SCS-C20



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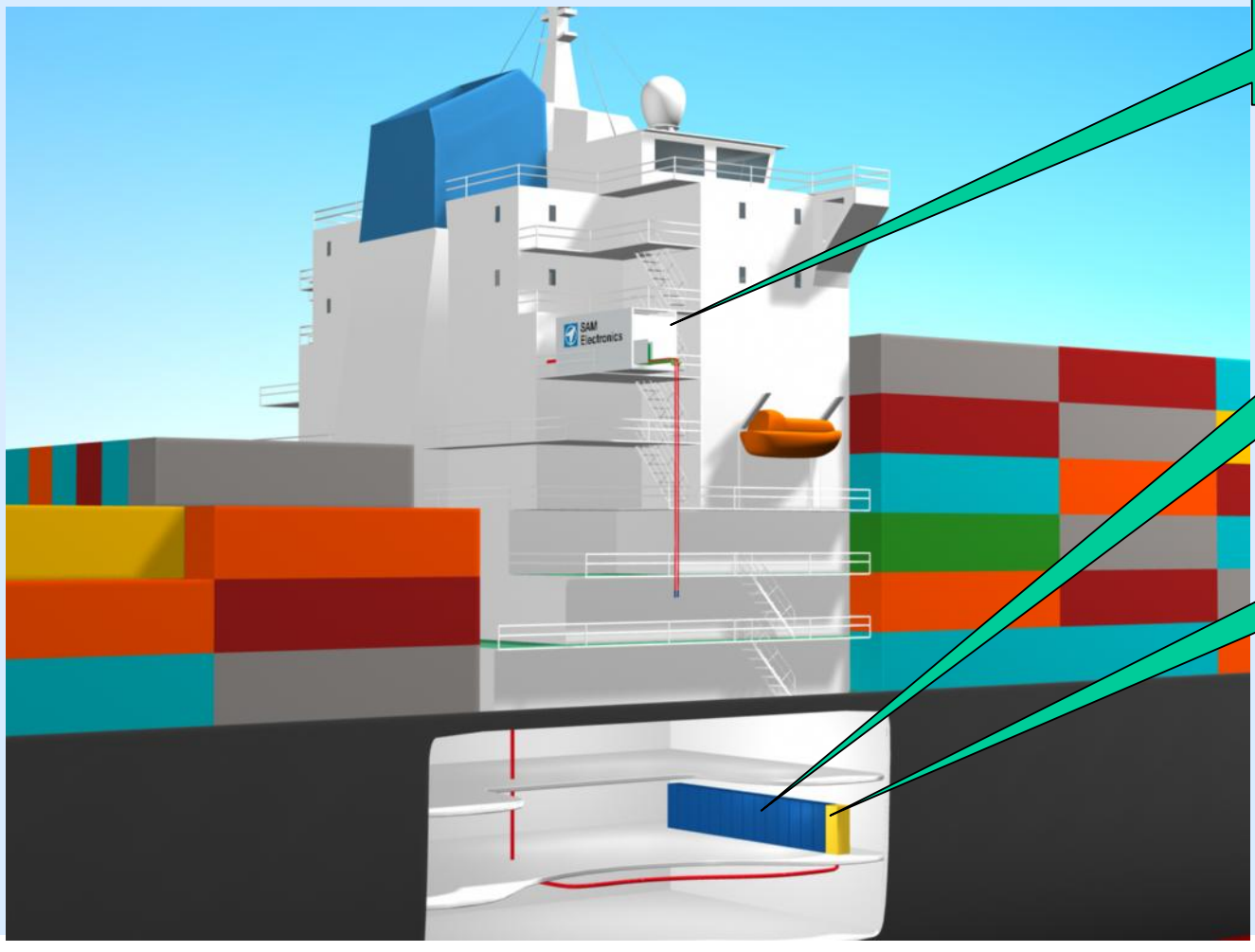
SCS Shore Connection System

SCS-C 20 6.600 V 5,8 MVA



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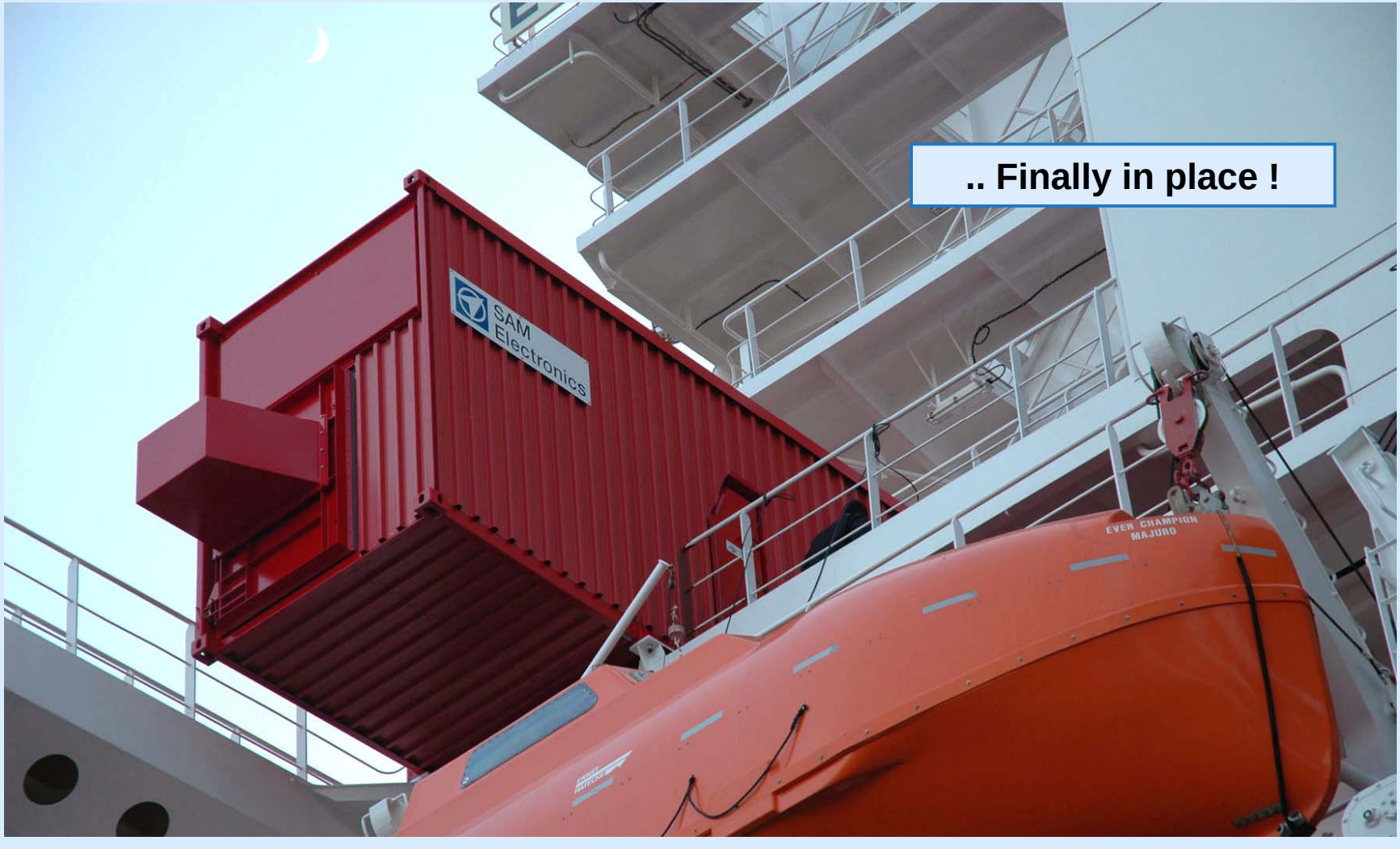
SCS Shore Connection System



Energy and Drives

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Energy and Drives

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SCS Shore Connection System

January 2006

The first AMP Container is ready for shipment

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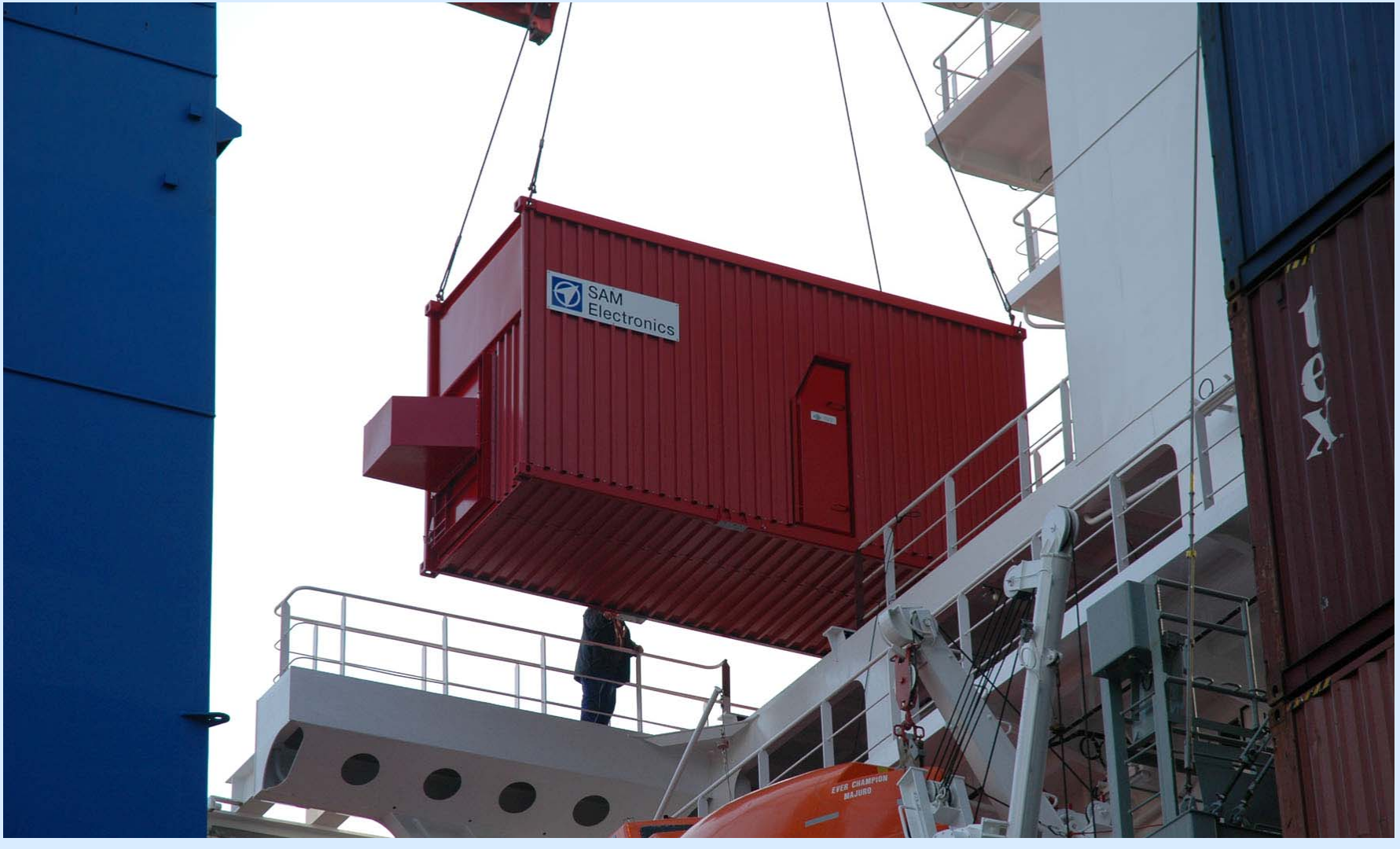
SCS Shore Connection System



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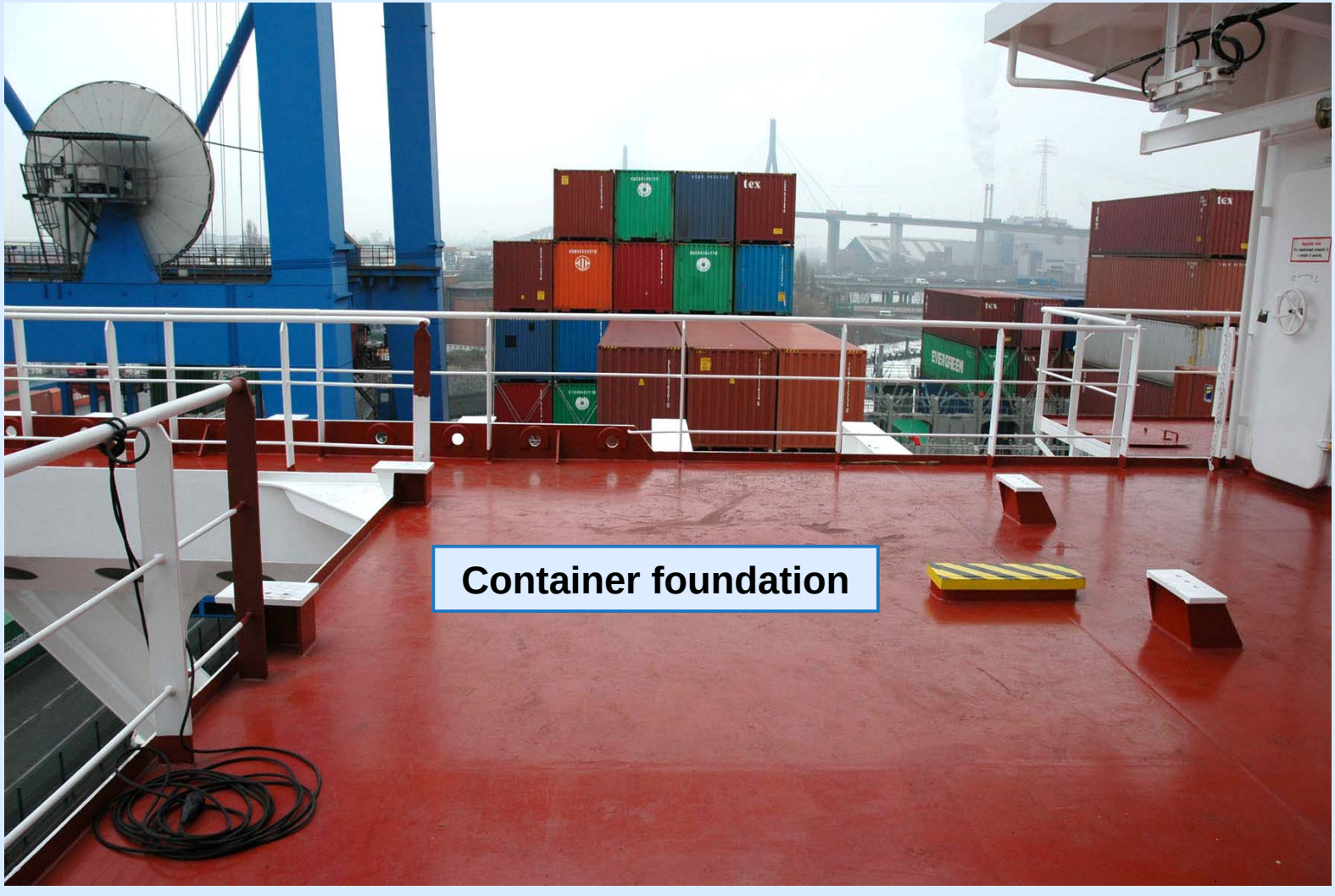

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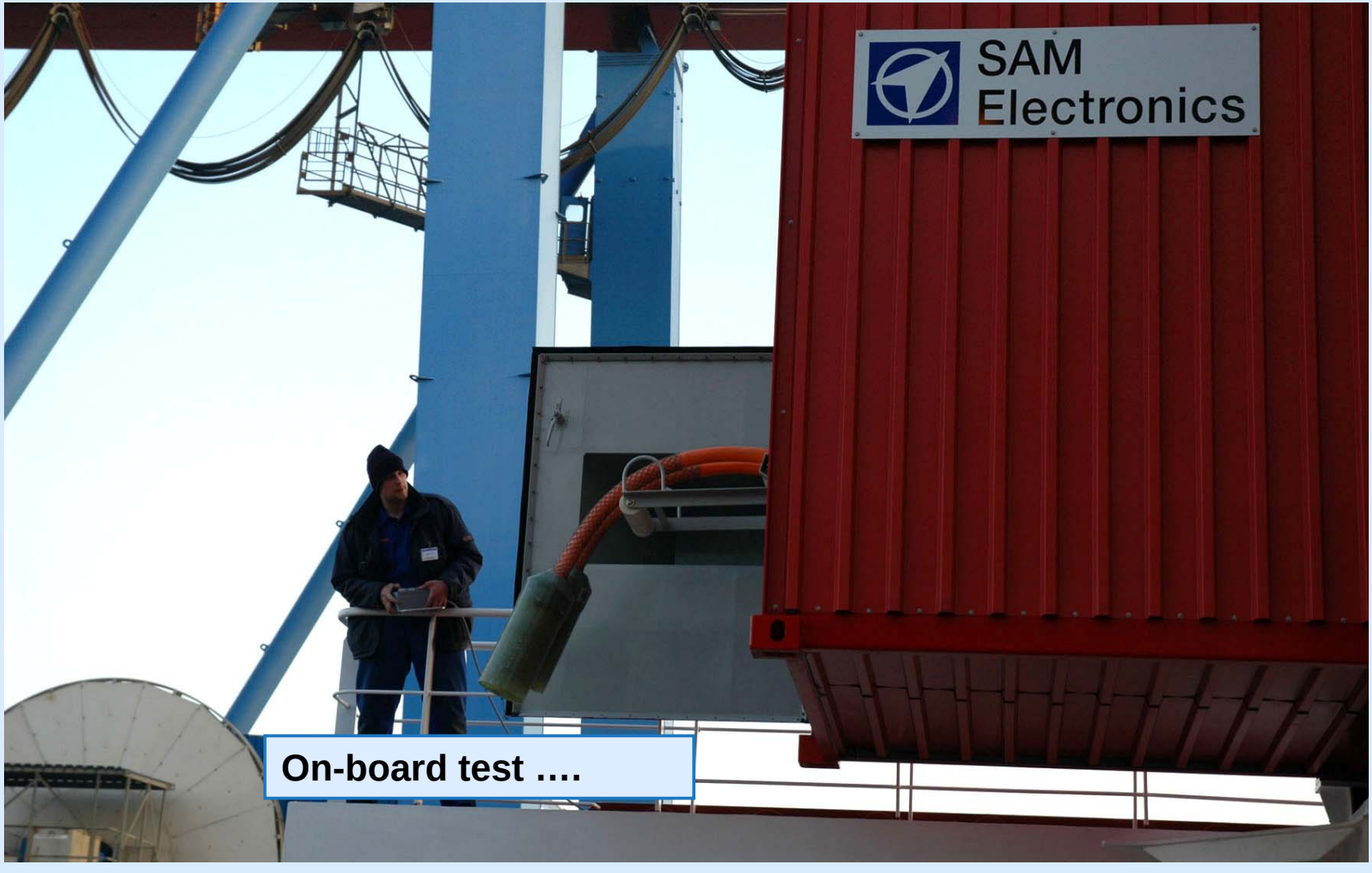

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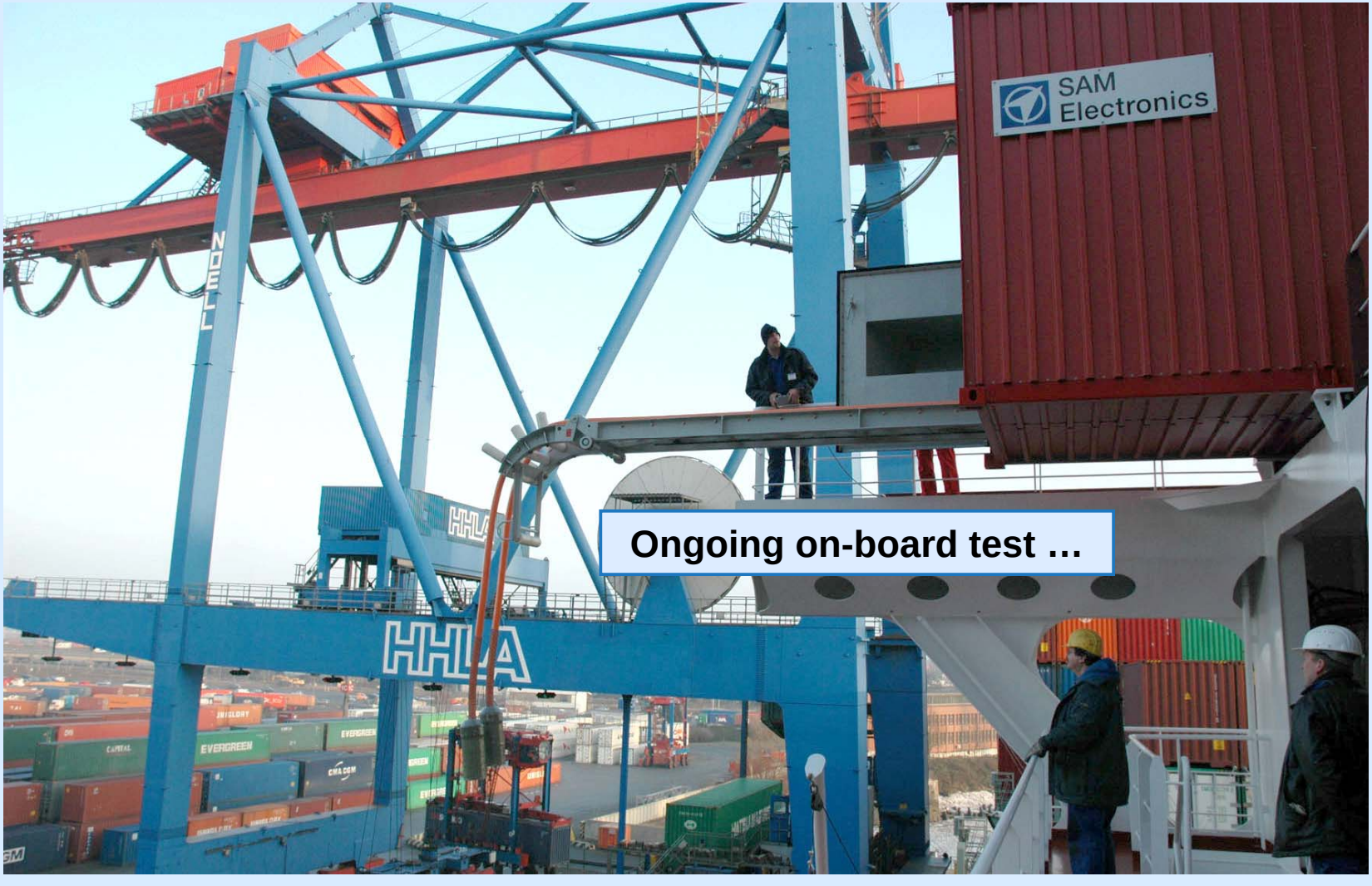

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SCS Shore Connection System

Energy and Drives

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Further prospects for AMP and its realization in European Ports

Antwerpen

First Port in Europe with an AMP Terminal
6.600V 60 Hz AMP ?
Design phase with rotating converter 50/60 Hz 4,0 MVA was started allready .
SAM is involved in the site investigation and design.

This Terminal is the property of German/ US ship owners, they are operating Container vessels with AMP system from SAM Electronics.
Shipping Rout: Europa – US/ East Coast

Further prospects for AMP and its realization in European Ports

Baltic States and Ports

Travemuende, Gothenborg, etc. with 10.000Volt 50Hz AMP

- Philosophie is different
  - For Cruise Vessels and Ferries
  - 50/ 60 Hz converter
  - Cable reel at shore side

Further prospects for AMP

Using frequency controlled Shaft Alternator System on board ships have the following prospect:

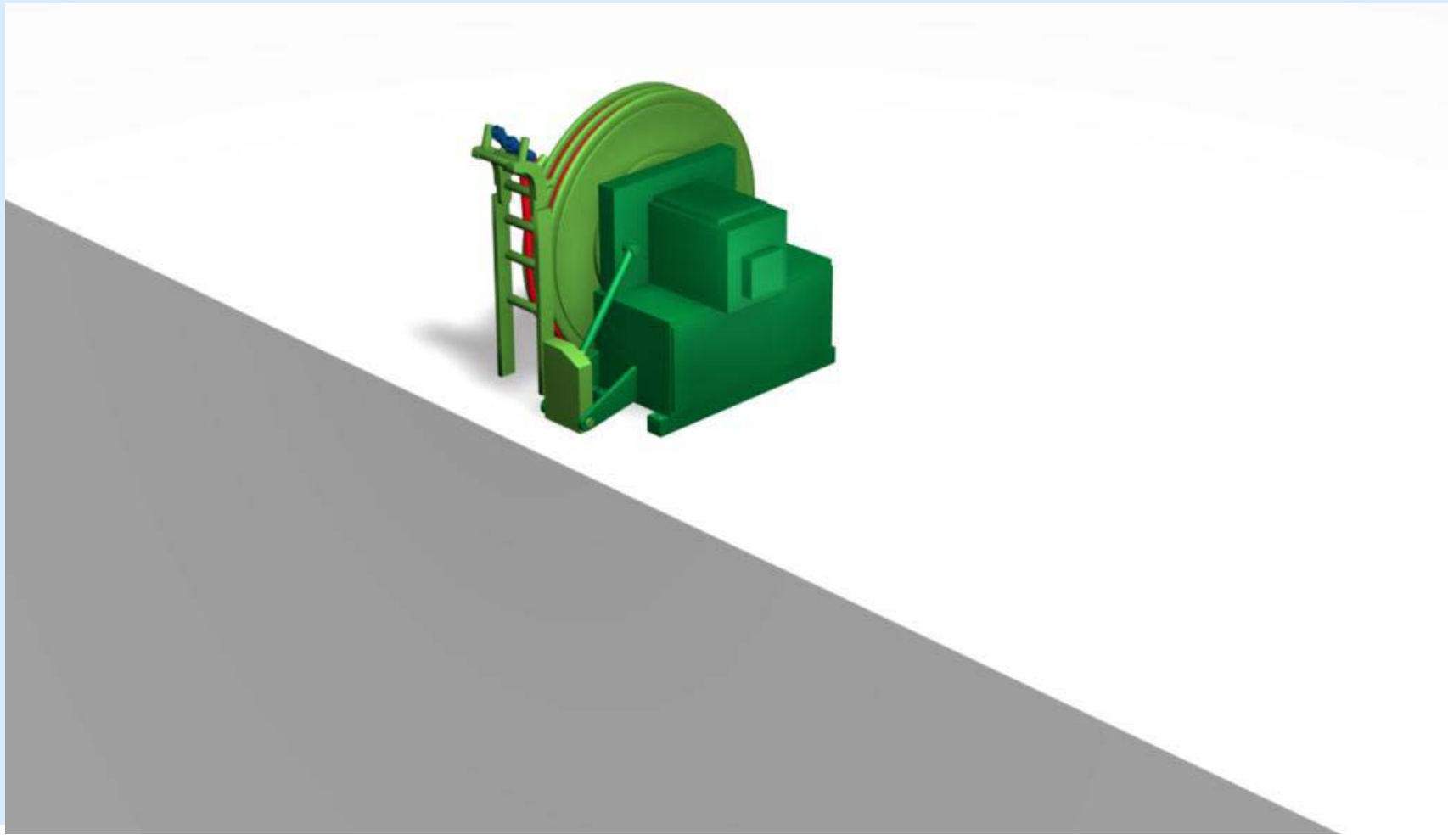
- Complete decoupling of mains
- Mains form, short circuit level, power factor cos phi and frequency may be different in both mains systems but adaptable by the S/G System
- provision of reactive power by S/G system

SCS Shore Connection System

BALTIC supply	Ship receiving	POLA supply	SHIP receiving	EURO PORTS supply
Net: 50Hz	Board net: 60Hz/ 450Volt	Net: 60Hz	Board net:60Hz 450 Volt, 6.600 Volt	50Hz
supply: 6.000-10.000 Volt	450 Volt	supply: 6.600 Volt	6.600 Volt	supply ???? Volt
	2 MVA step down transformer		MVA step down transformer for 450 V vessel only	MVA step down transformer for 450 V vessel
Frequence Converter 50/ 60 Hz				Frequence Converter 50/ 60 Hz
2 MVA Power transfer plug	receiving socket	- 7 MVA available	- 6,8 MVA Power request, max	7 MVA available ??
cable reel at quay site		non equipment at quay site ??	cable reel on-board	equipment at quay site ??

SCS Shore Connection System

MV/ LV Shore Connection Single Cable Reel - SCS-S



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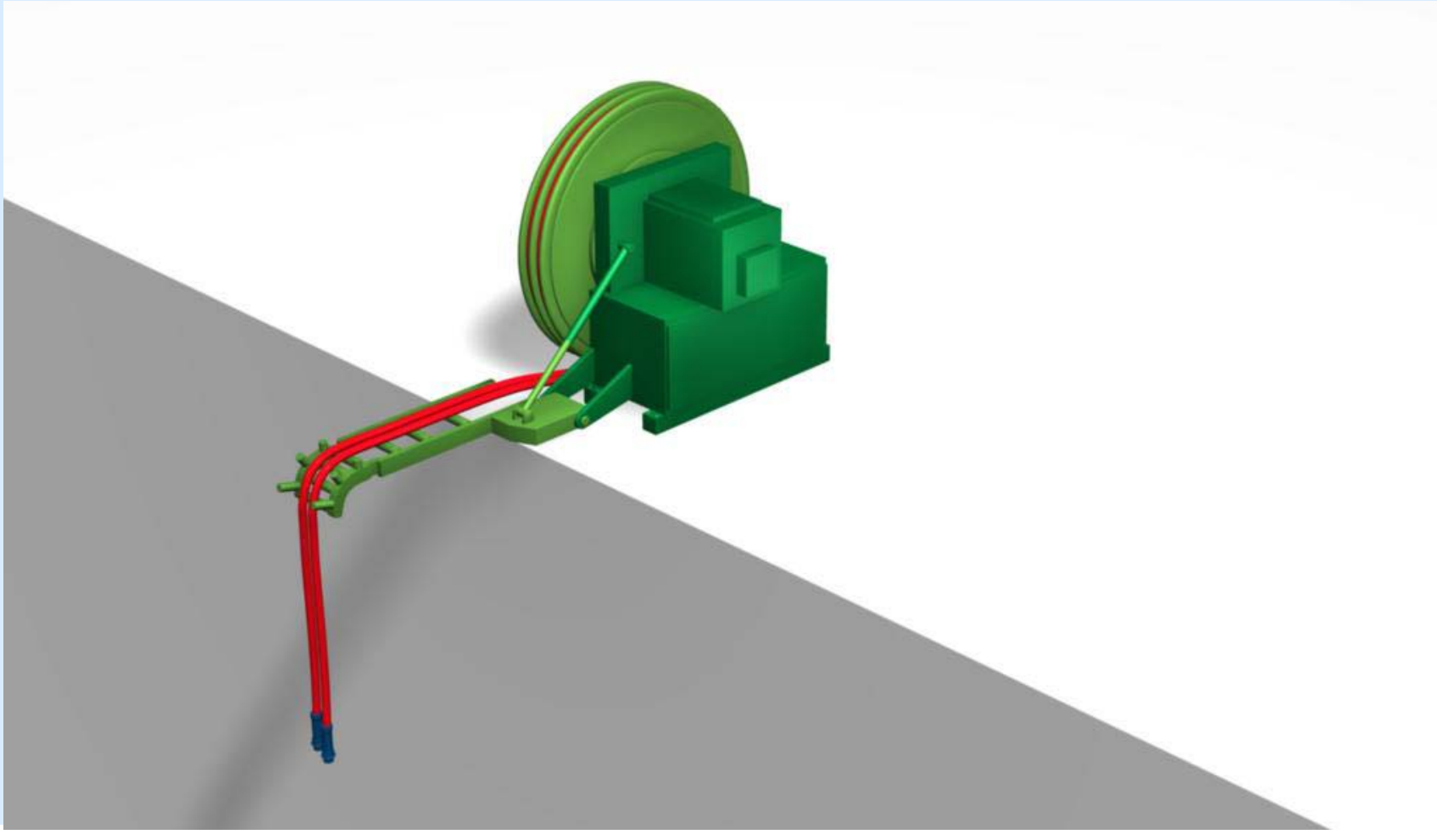
SCS Shore Connection System

MV/ LV Shore Connection Single Cable Reel - SCS-S



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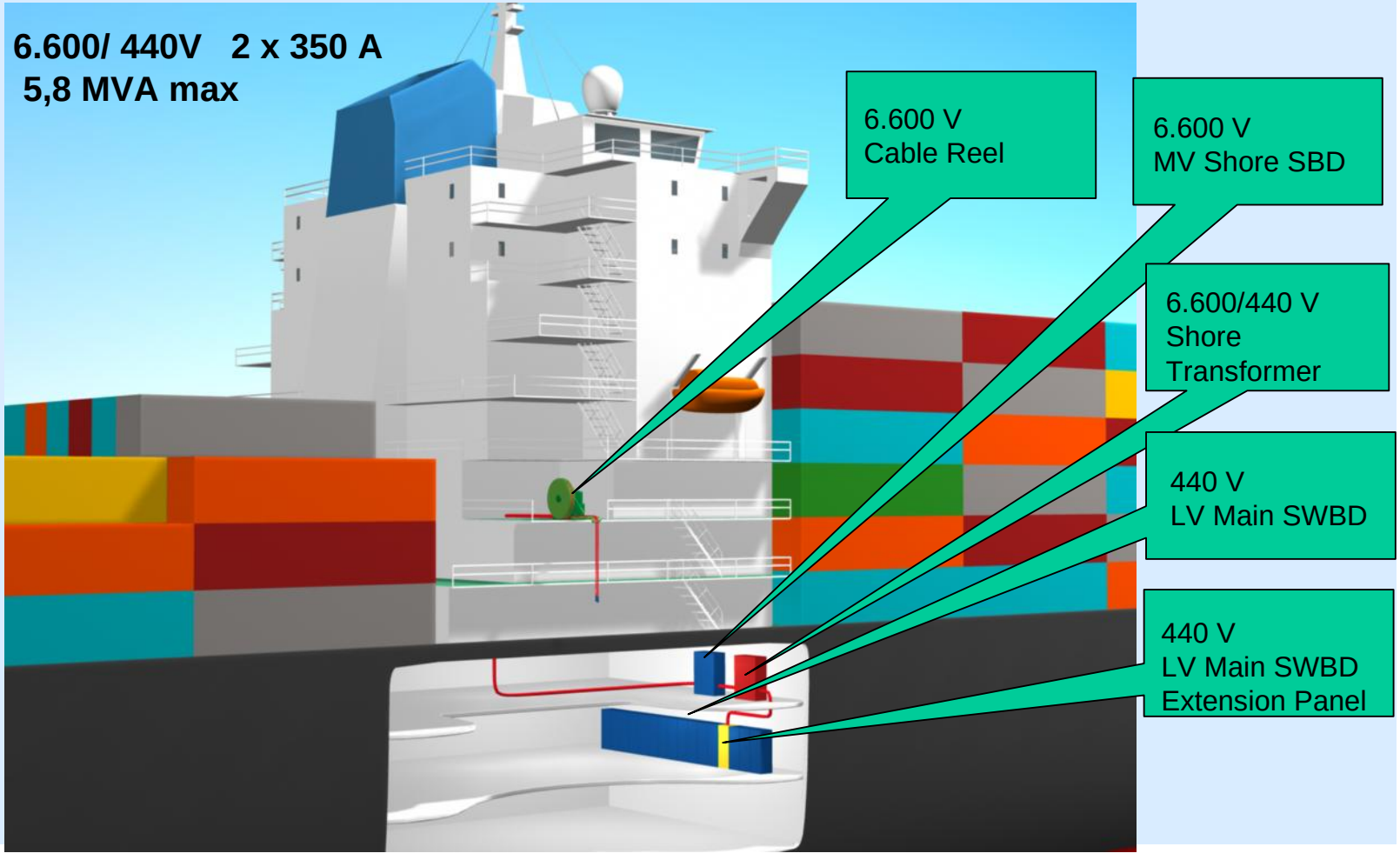
SCS Shore Connection System

LV Shore Connection Single Cable Reel - SCS-S MV SBD & Transformer in Storage Room



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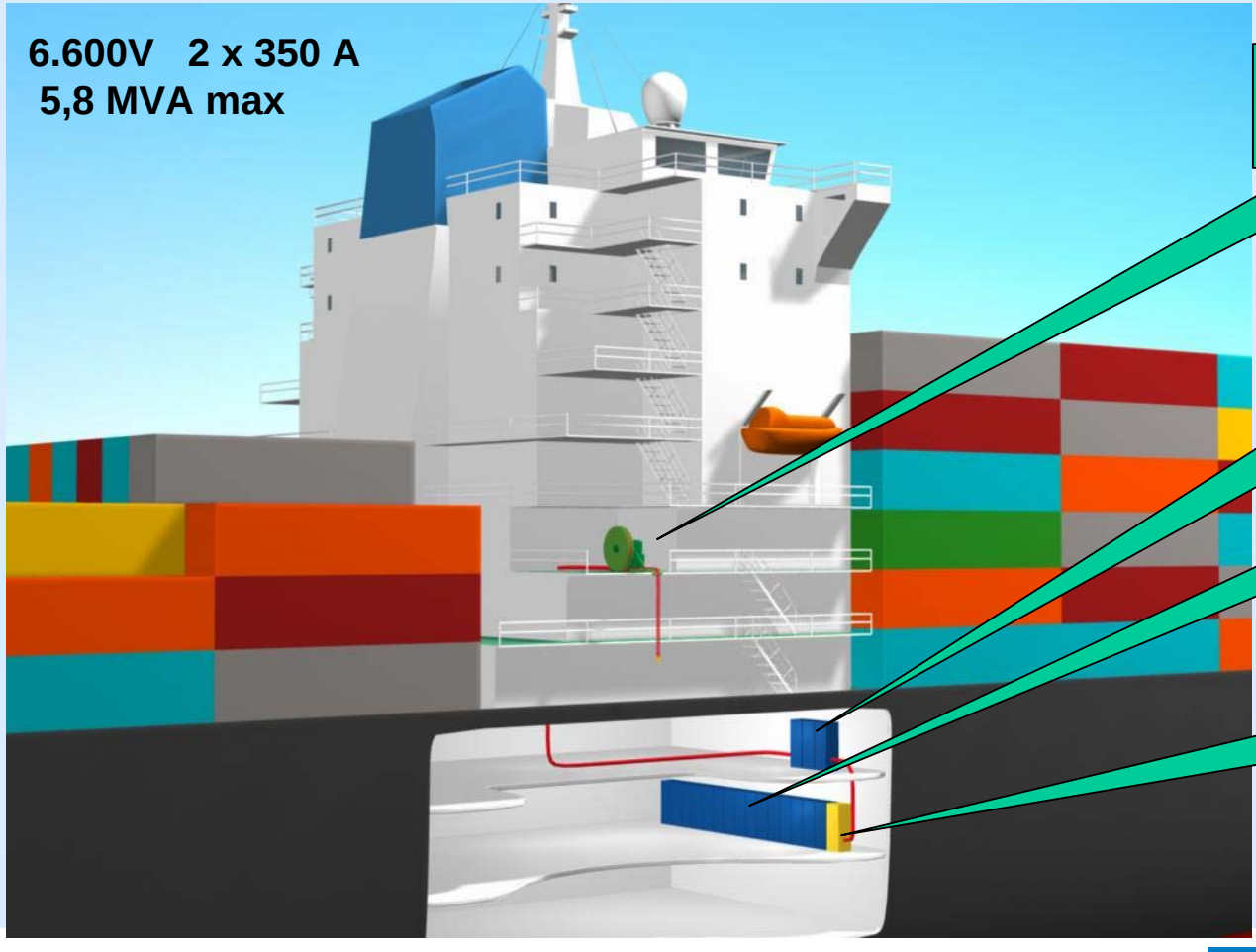
SCS Shore Connection System

MV Shore Connection Single Cable Reel - SCS-S, MV SBD in Storage Room, Extension Panel for MV Main SWBD



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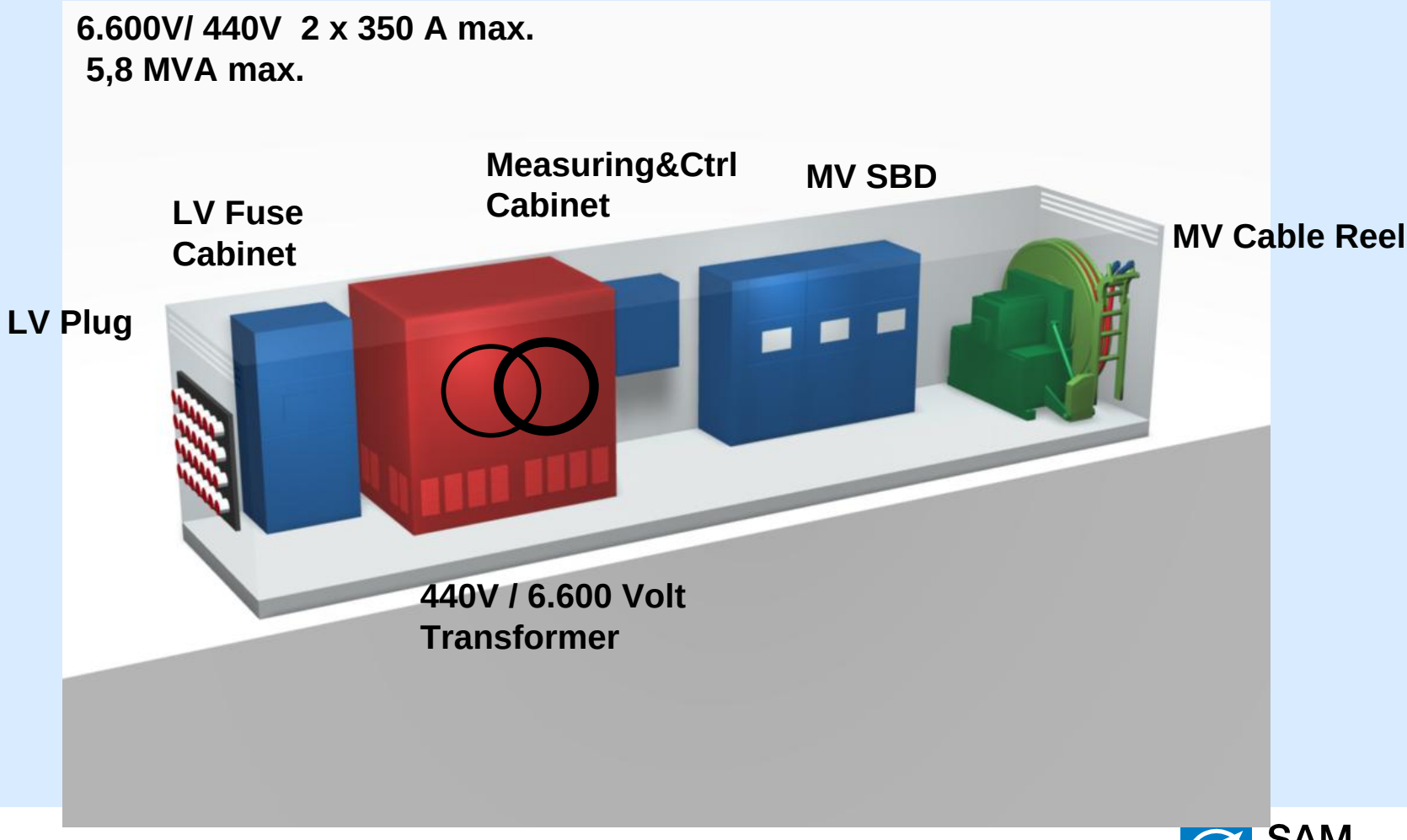
SCS Shore Connection System

LV Shore Connection System - SCS-CM40

40“ Container, Plugable



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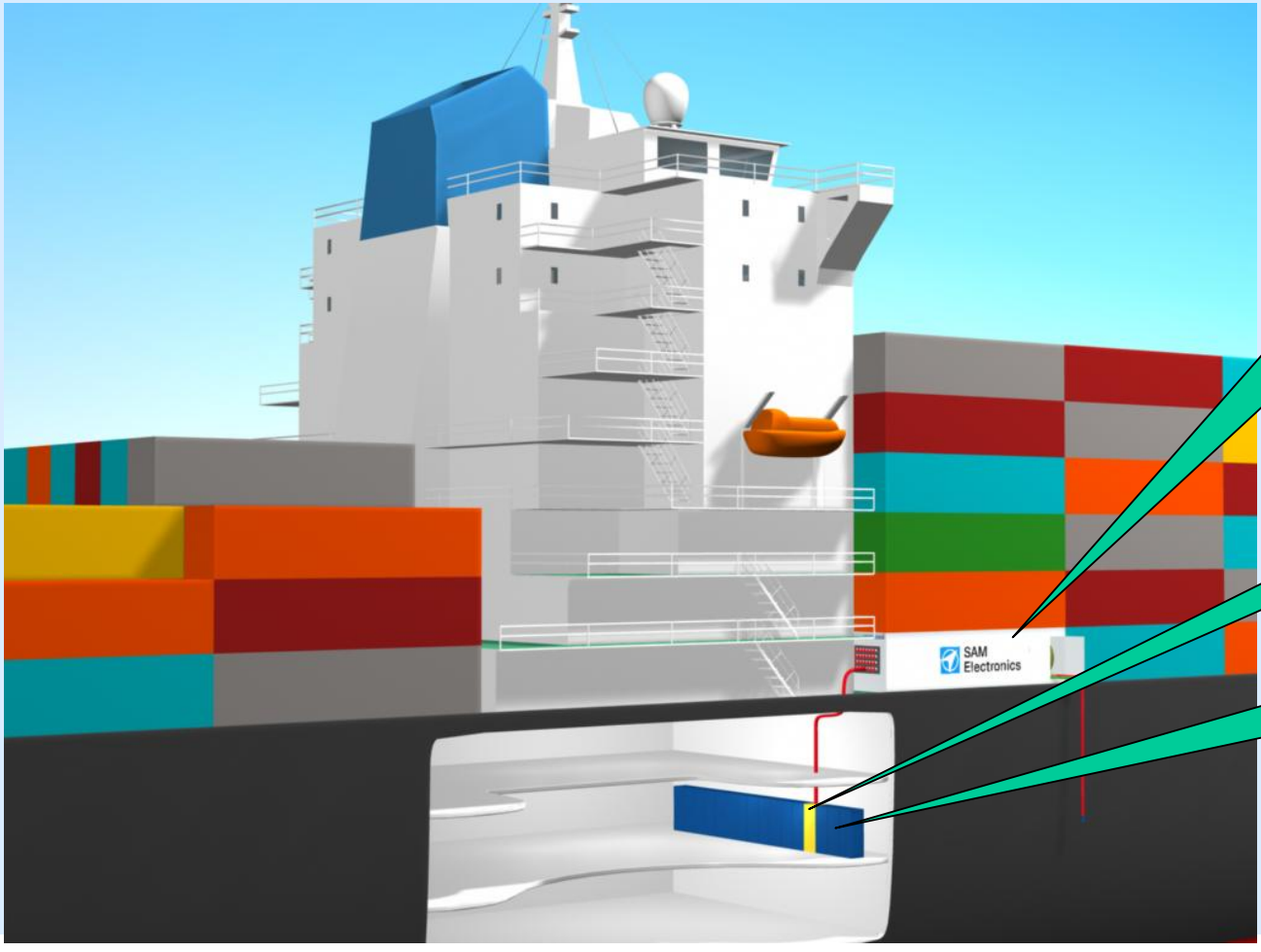
SCS Shore Connection System

LV Shore Connection System - SCS-CM40

40“ Container, Plugable
6.600/ 440V



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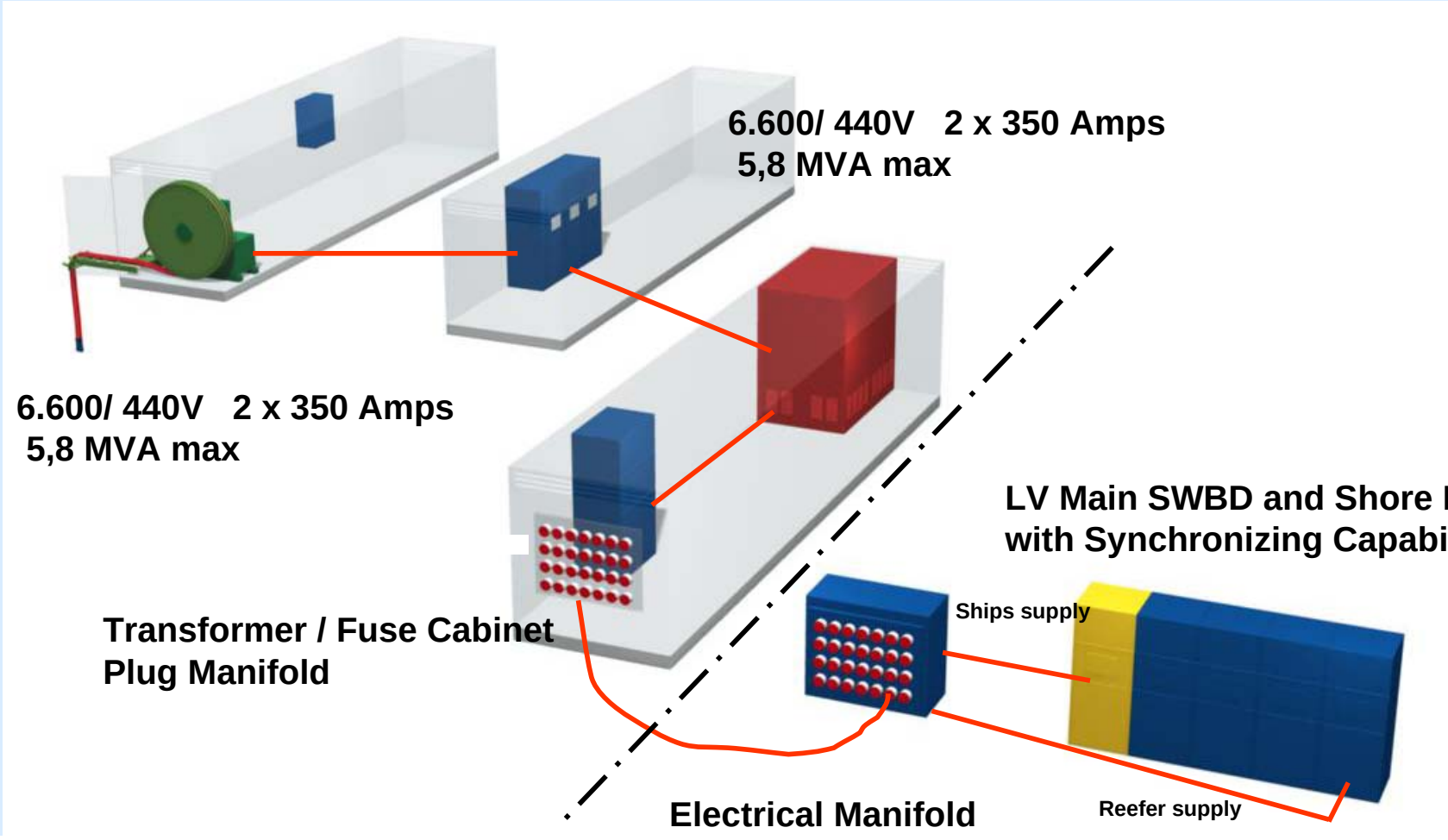
SCS Shore Connection System

LV Shore Connection System with Manifold - SCS-CM3x40 40“ Container, Plugable



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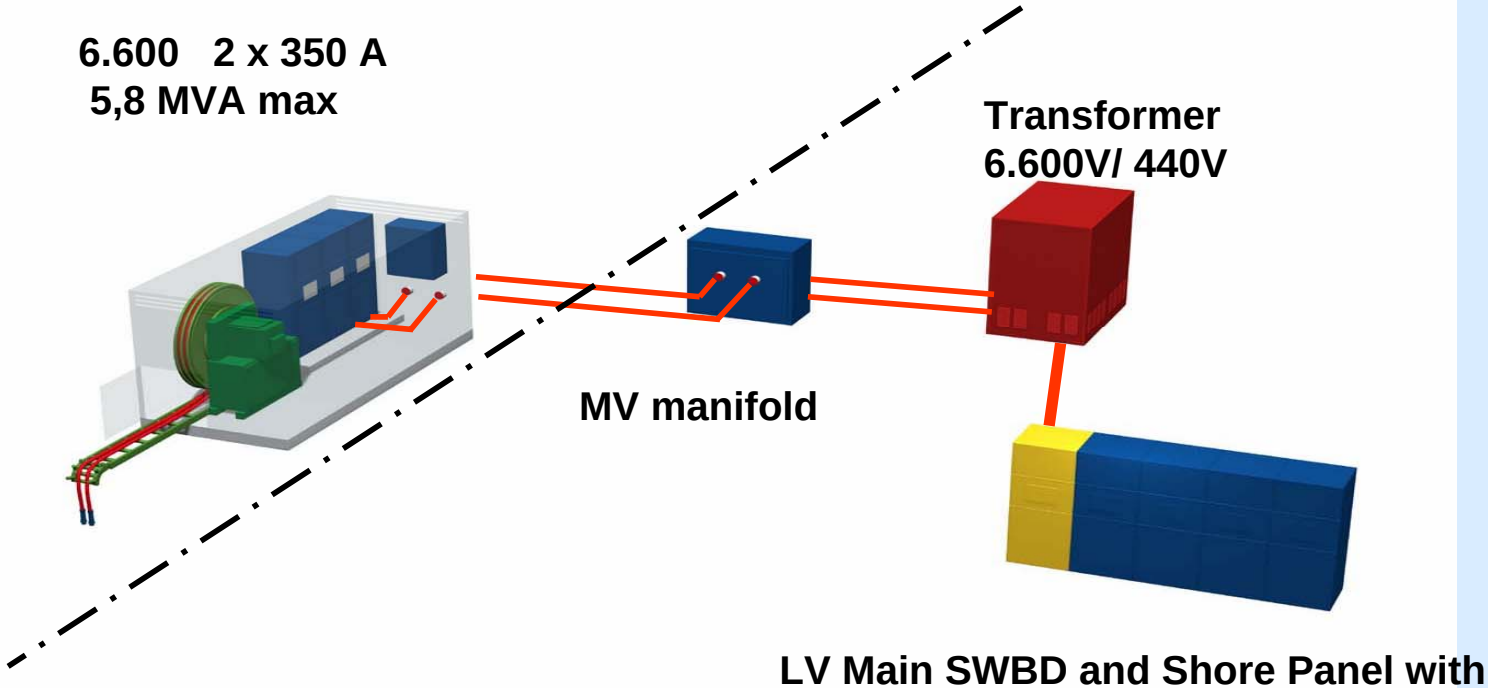
LV Shore Connection System with MV manifold - SCS-C20

20“ Container, Plugable



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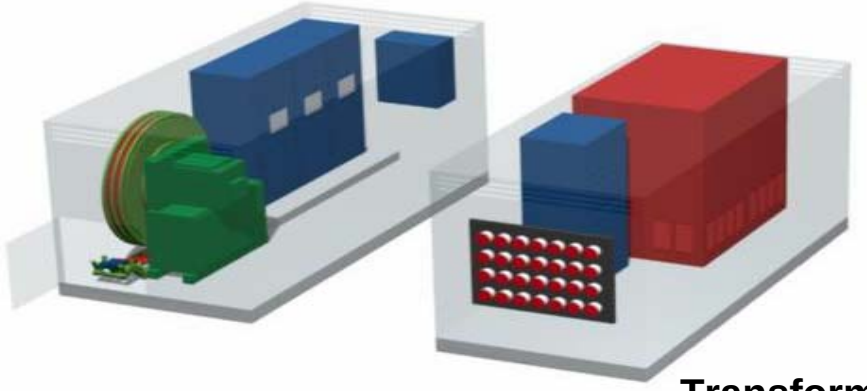
LV Shore Connection System with Manifold - SCS-CM2x20

40“ Container, Plugable

6.600 2 x 350 A
5,8 MVA max

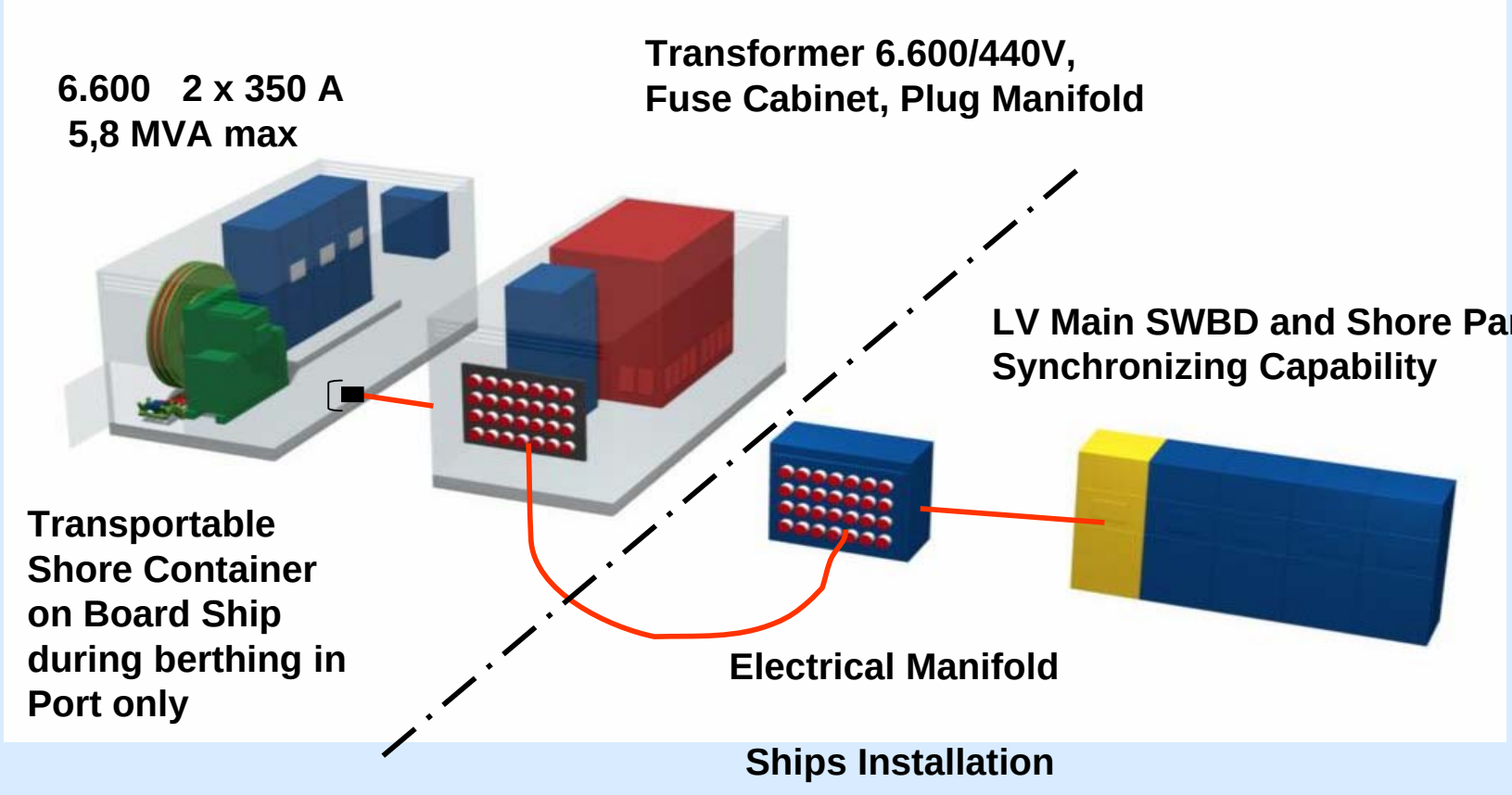


Transformer 6.600/440V,
Fuse Cabinet
Plug Manifold

SCS Shore Connection System

LV Shore Connection System with Manifold - SCS-CM2x20

20“ Container, Plugable



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LV Shore Connection System, 440V, >3 MVA

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LV Shore Connection System, 440V, >3 MVA

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