Azipod® CZ1400 Product Introduction

Power and productivity
for a better world™

Preface

This Product Introduction provides system data and information for preliminary project planning of Azipod podded propulsion and steering system outfit. Furthermore, our project and sales departments are available to advise on more specific questions concerning our products and regarding the installation of the system components.

Our product is constantly reviewed and redesigned according to the technology development and needs of our customers. Therefore, we reserve the right to make changes to any data and information herein without notice.

All information provided by this publication is meant to be informative only. All project specific issues shall be agreed separately and therefore any information given in this publication shall not be used as part of agreement or contract.

Helsinki, November 2009

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1 General

The first original Azipod® installation onboard was commissioned in 1990. By November 2009, the milestone of five million cumulated operating machinery hours has been reached. This is the total figure obtained with the various product variants of which the Azipod CZ is one particular application.

1.1 Azipod Propulsion and Steering

The Azipod CZ main propulsion and steering system was originally developed with the experiences gained from the already existing family of larger Azipod products. Azipod is a podded electric main propulsion and steering device driving a fixed-pitch propeller at a variable speed setting.

Azipod CZ propulsion is designed for preferential use in e.g. oil rigs. The Azipod CZ is azimuthing (steering around its vertical axis) infinitely by 360° and is available generally for propeller power ratings of up to 3,3 MW. The available static thrust is approximately 63 metric tons.

The full ship system consists of the required number of Azipod CZ steering propulsors, plus the delivery of an “ACS” series marine Propulsion Power Drive per each Azipod. Additionally propulsion supply transformers (if needed), and the power plant (generators, switchboards) are usually included in the scope of the delivery.

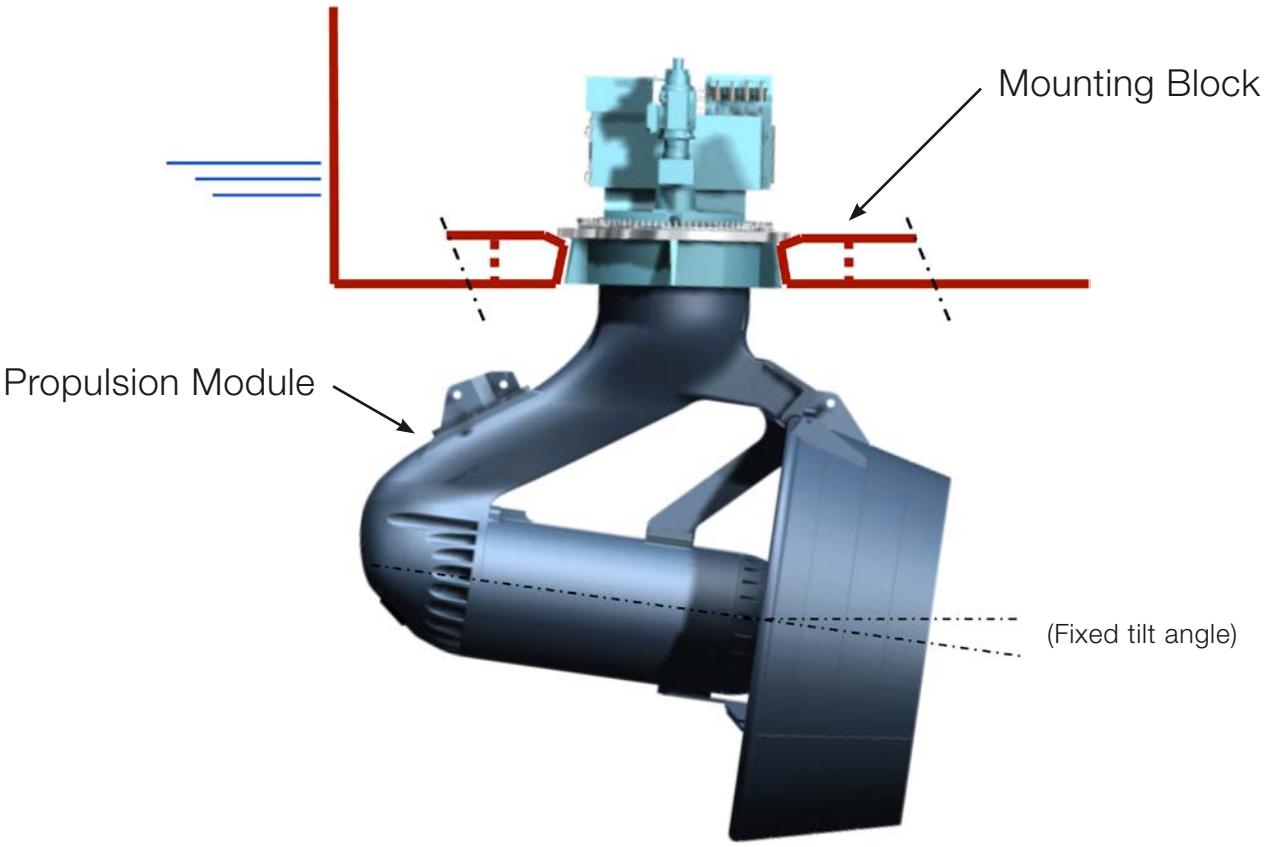
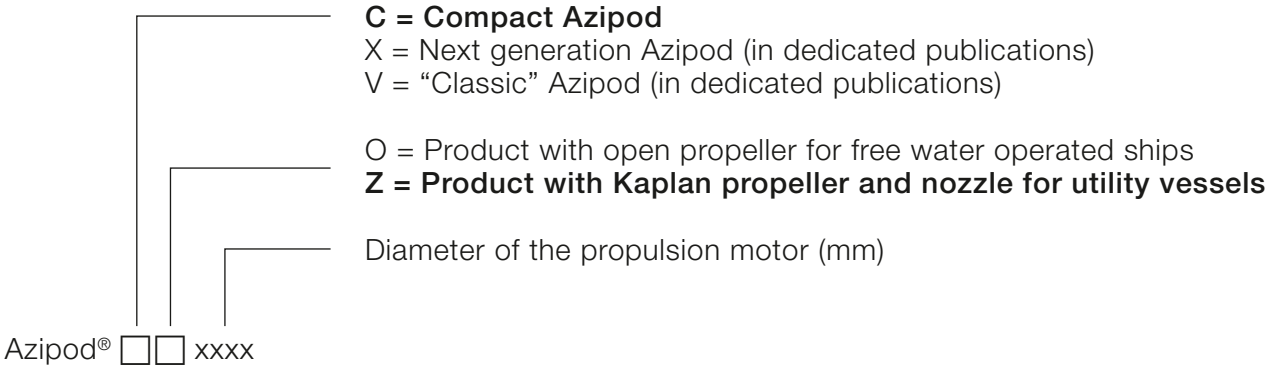


Figure 1-1 Basic arrangement of the Azipod CZ1400

1.2 Type designation for the Azipod product

In the ship concept design stage, the following main designation is used. (A more specific type code will be allocated for the product during the advanced design stage).



1.3 Electric propulsion and power plant

In order to drive the Azipod propulsion system the ship needs an electric power plant (not specifically presented on this document). Alternator sets supply power to the 50 or 60 Hz installation of electric switchboards for distribution to all consumers onboard, including Azipod propulsion.

Generally, ABB would aim to deliver the power plant as well as the Azipod system. Our mechanical interface to the engine maker is basically standard, although dependant on the delivery of engines or e.g. gas turbines from the contractors.

During the whole project the basic tool for power plant design is the so-called single line diagram. The actual onboard configuration can be efficiently discussed already in the early stages of work by using this clear visual representation.

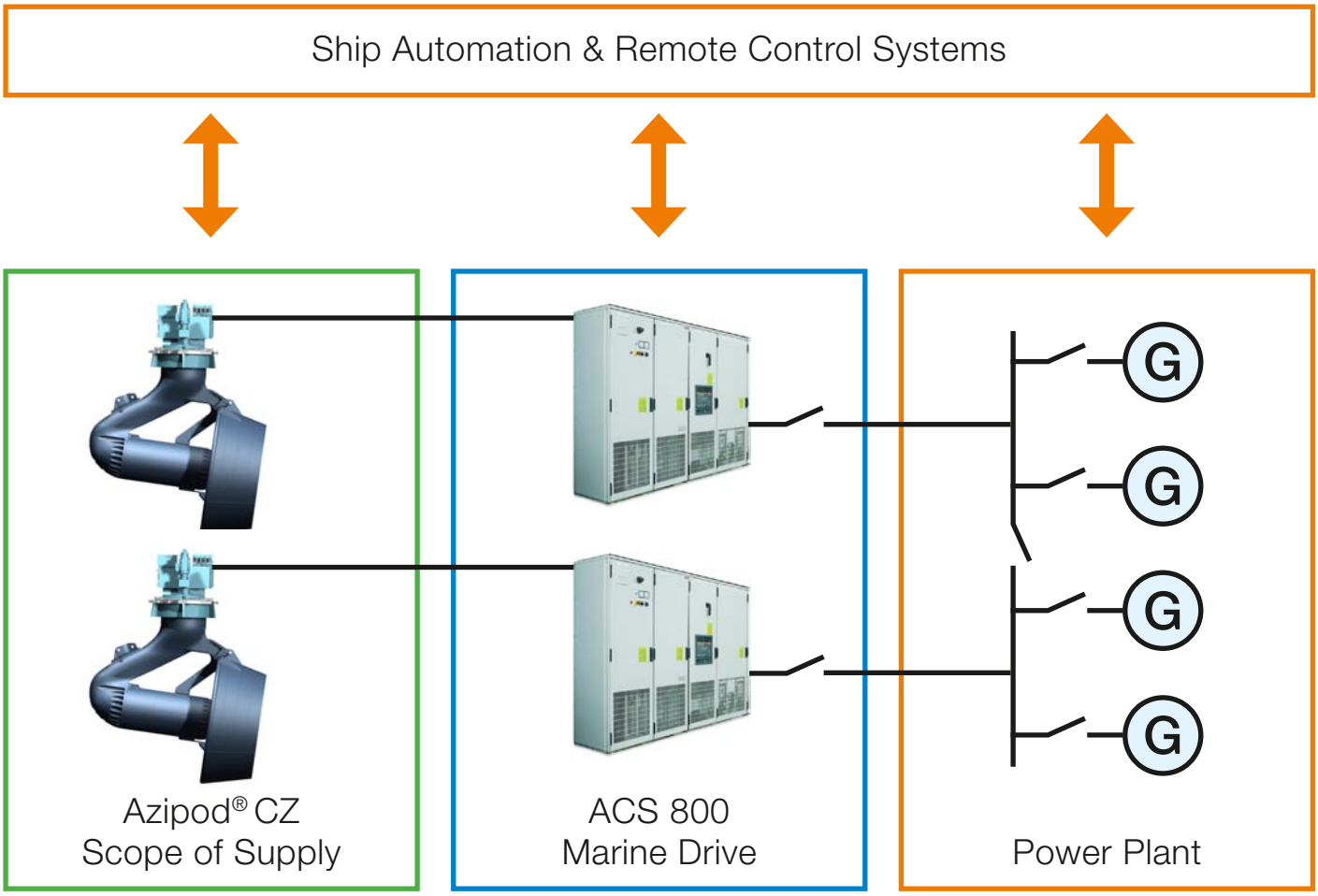


Figure 1-2 Simplified single line diagram of the power plant with a propulsion system.

2 Scope of Supply

2.1 General

The **Propulsion Module** of the Azipod CZ uses a permanent magnet synchronous motor to drive a fixed-pitch propeller that is mounted directly onto the motor shaft and runs inside a streamlined nozzle. The motor is directly cooled via convection to the surrounding seawater without using any additional cooling media. The motor is pressurized by air. The Propulsion Module incorporates the steering mechanics that also act as the mechanical interface with the so-called Mounting Block in the hull of the vessel.

2.2 Azipod Specific Basic Items for Delivery

Each Azipod CZ consists of twelve (12) separate packages with the equipment for installation into the ship:

One (1)	Propulsion Module (Steering mechanics, strut, nozzle, motor, propeller and inner installation dome)
One (1)	Slipring Unit
Two (2)	Gearboxes for steering
Two (2)	Motors for steering
One (1)	Connection box extension
One (1)	Local Backup Unit (for local emergency control)
One (1)	Installation fittings' kit
Two (2)	Steering Drive Units (Power electronic cubicle)
Two (2)	Brake Resistor Units (Steering gear accessory)

2.3 Azipod Specific or Contract Specific Optional items

In addition to the above listed basic Azipod hardware delivery, the following items may also be delivered when ordered, to assist the Shipyard in the installation work:

A. An Azipod-specific Mounting Block with the outer installation dome

B. Contract-specific Lifting and installation kit (Spreader beam, wires, jacks)

C. Contract-specific Guide base welding Dummy

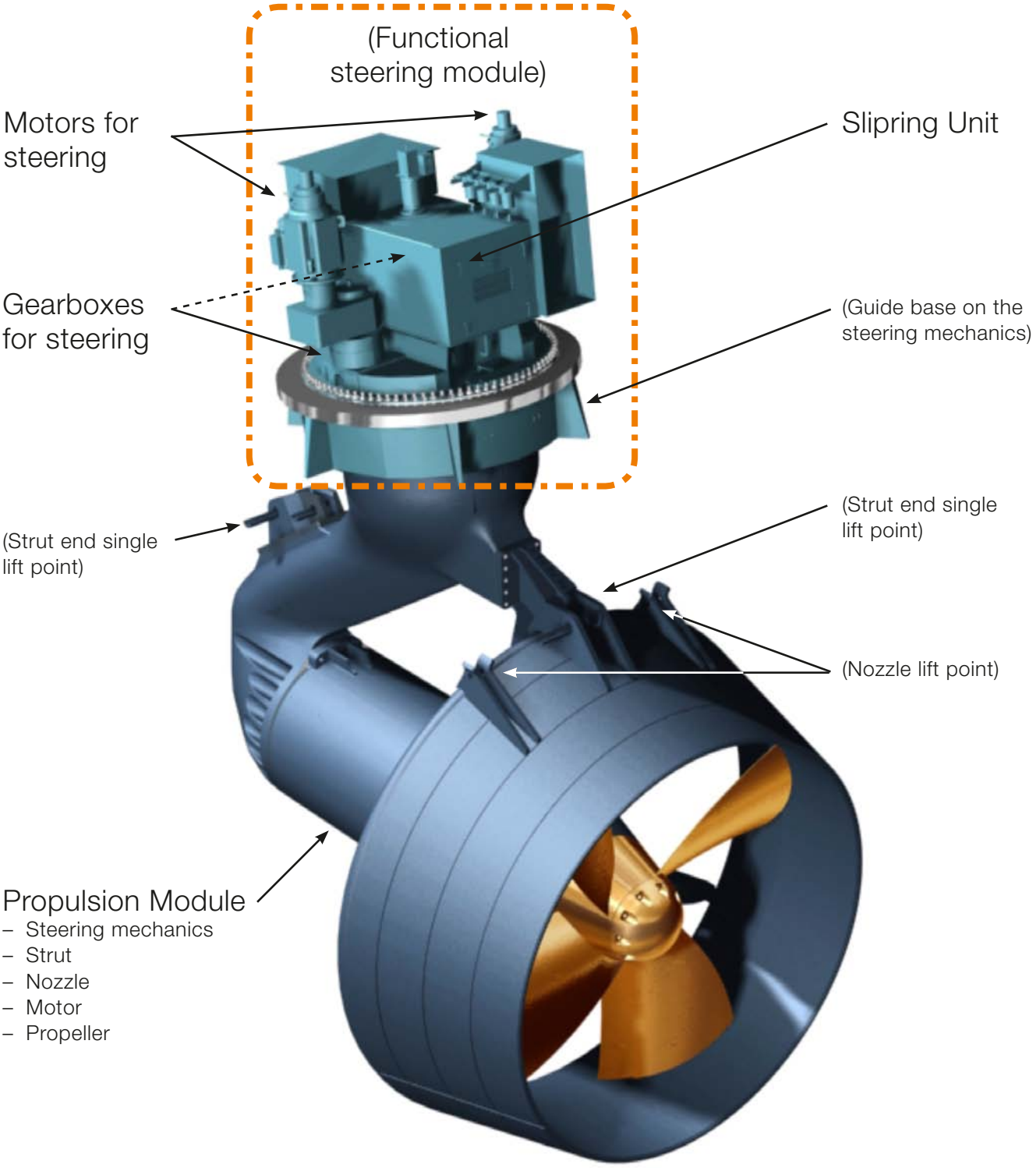


Figure 2-1 Functional elements of the Azipod CZ1400

2.4 Ship Specific Delivered Items

The ABB scope of supply would also typically include all or most of the following items:

A. One Propulsion Power Drive per each Azipod CZ

B. Remote Control System

C. The Generator and Switchboard power network outfit

2.5 Propulsion Module

The motor, nozzle, strut and the steering mechanics are mounted together with the propeller at ABB, to form the Propulsion Module. The Propulsion Module is to be bolted into the Mounting Block by the shipyard.

The Propulsion Module incorporates a permanent magnet synchronous motor with a fixed-pitch propeller that is mounted directly onto the motor shaft. The motor section of the Propulsion Module therefore includes the complete electric motor with bearings, shaft seals, and a maintenance brake.

Permanent magnet technology brings a number of benefits. The design enables the motor to be directly cooled via convection to the surrounding sea water without using any additional cooling media.

The propeller shaft seal assembly combines a water lubricated face type seal and two grease lubricated lip type seals running on a steel liner. The set air pressure inside the motor prevents sea water from entering into the Propulsion Module.

The Nozzle / Strut combination is designed to enhance hydrodynamic steering performance and acts also as a connective element in the Azipod CZ structure. Control cables, piping and power supply bus bars for the propulsion motor are located inside the single piece cast strut.

2.6 Main Dimensions and Weights

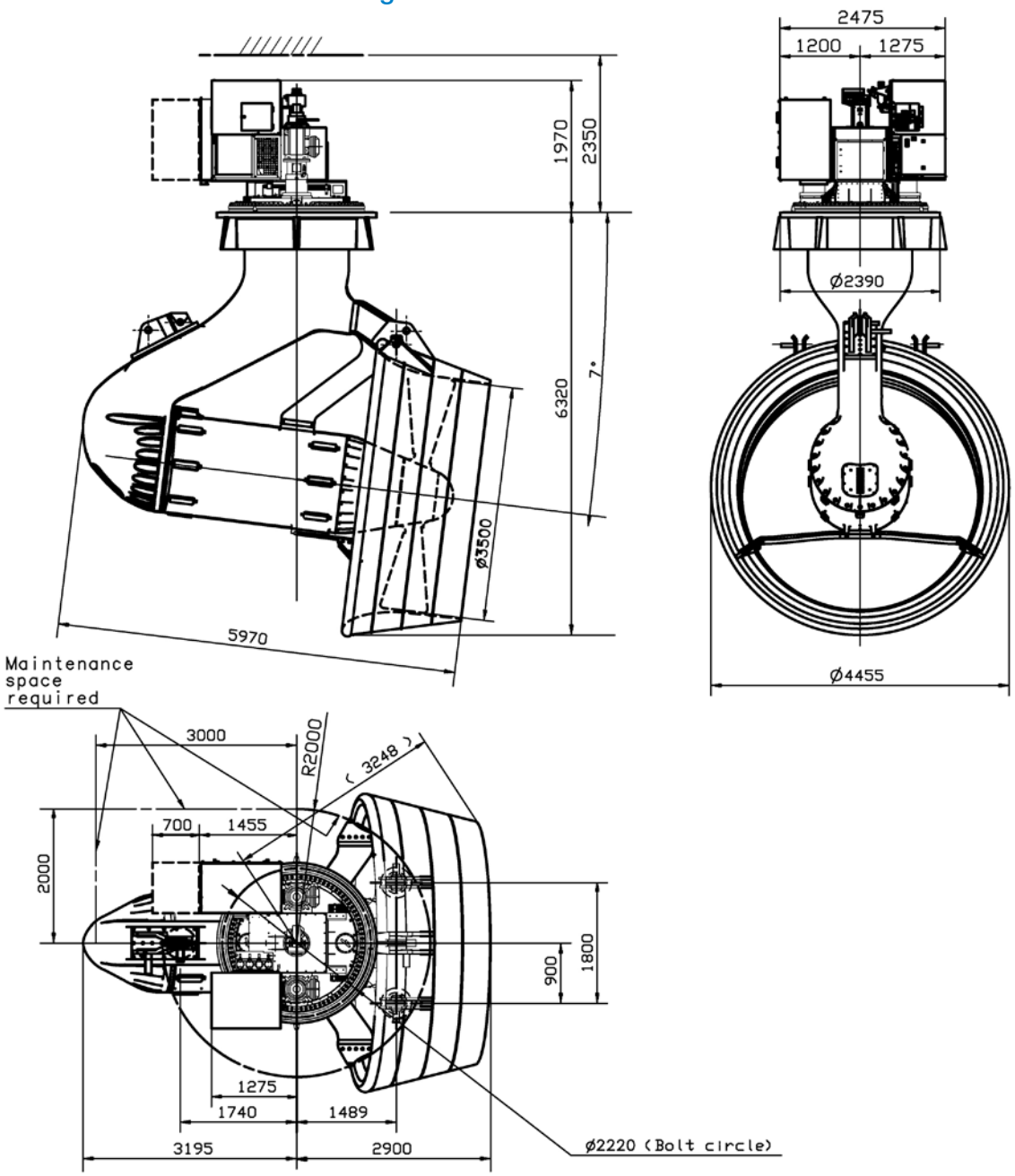


Figure 2-2 Dimensions for the Azipod CZ

Weights:

Propulsion Module	58 000 kg
Functional steering module	3 300 kg
Mounting Block (optional)	8 800 kg

2.7 Steering Drive Units

The electric steering gear of the Azipod CZ is driven by two (2) Steering Drive Units of the ACS800 type. These two Steering Drive Units operate together by the master - follower closed control principle. In case of a malfunction to one of the units, the other can steer the Azipod with a lower helm torque.

The Steering Drive Units are typically located in the Azipod room.

The maximum available steering rate is 12 (twelve) degrees per second.

The weight of each Steering Drive Unit is approximately 400 kg.

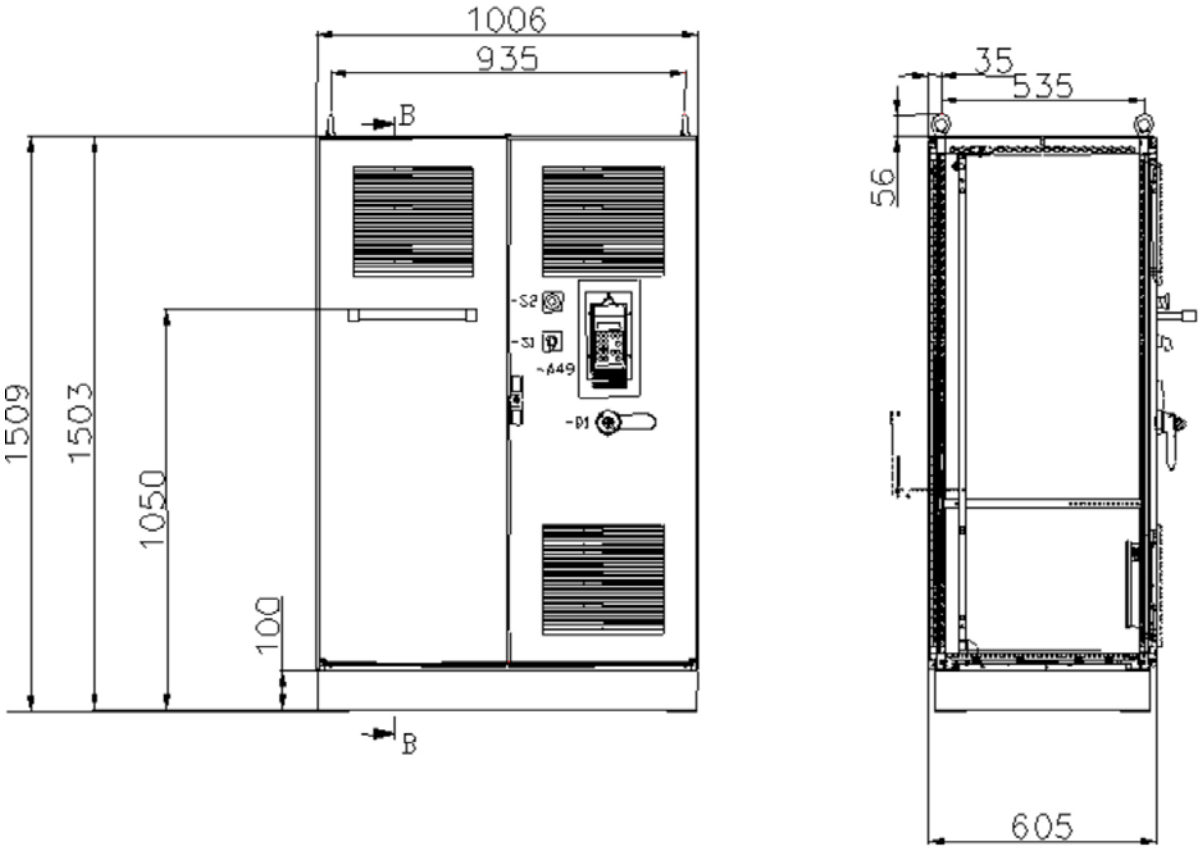


Figure 2-3 Typical dimensions of one Steering Drive Unit for Azipod CZ

2.8 Brake Resistor Units (for the steering gear)

Two (2) Brake Resistor Units are needed as accessories for each Azipod CZ steering gear. The resistor circuit absorbs functional reverse power from the respective electric steering motor. The Brake Resistor Units are to be normally installed in the Azipod room.

The weight of each Brake Resistor Unit is approximately 35 kg.

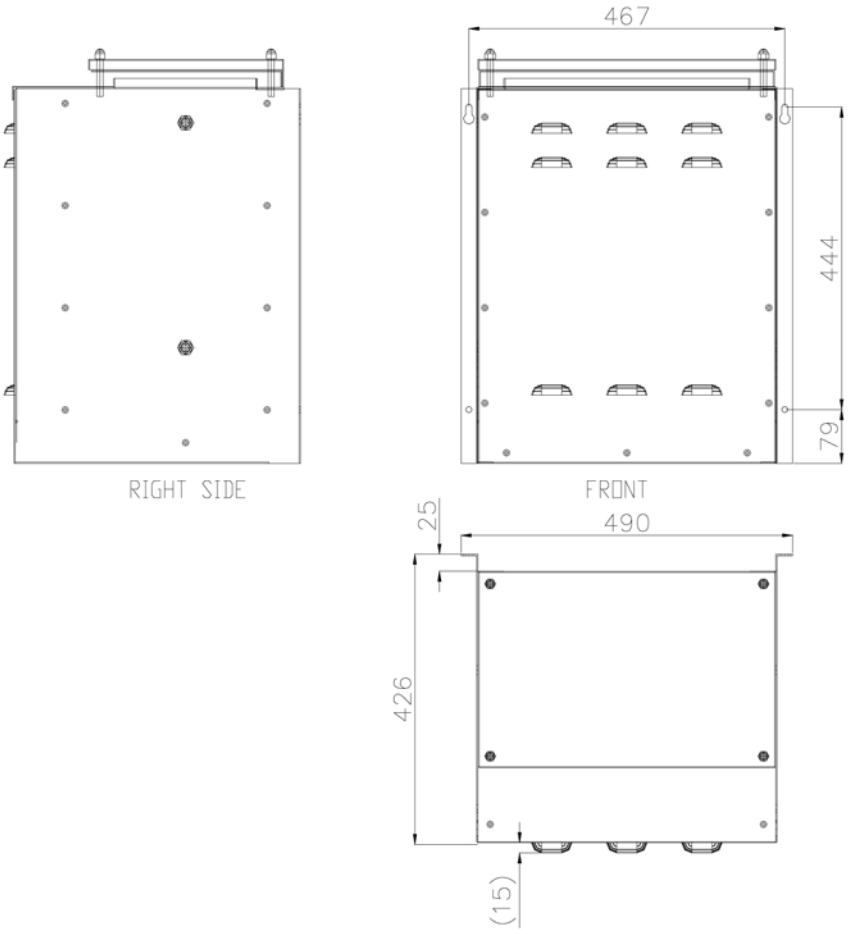


Figure 2-4 Typical dimensions of the steering brake resistor for Azipod CZ

3 Ambient Reference Conditions, Weights and Speed

Azipod	
Sea water temperature	-2 … +32 °C
Azipod room	
Maximum ambient temperature	+45 °C
Minimum ambient temperature	+2 °C
Relative humidity	95%, no condensation allowed
Propulsion Power Drives (ship specific item)	
Rated ambient temperature	+45 °C
Relative humidity	95%, no condensation allowed
Cooling fresh water inlet temperature	+2 … +38 °C
Pressure	200 ... 600 kPa
Maximum speed	
Azipod water speed (max. allowed)	8 knots

4 Interface to the Ship

The Azipod CZ propulsion controls can be built to operate with or without a ship automation system. The ship automation system is needed for monitoring the propulsion system. It should also control the auxiliaries of the propulsion, e.g. the cooling water flow. The ship automation interface is to be carried out with a serial data link and by hard wired connections.

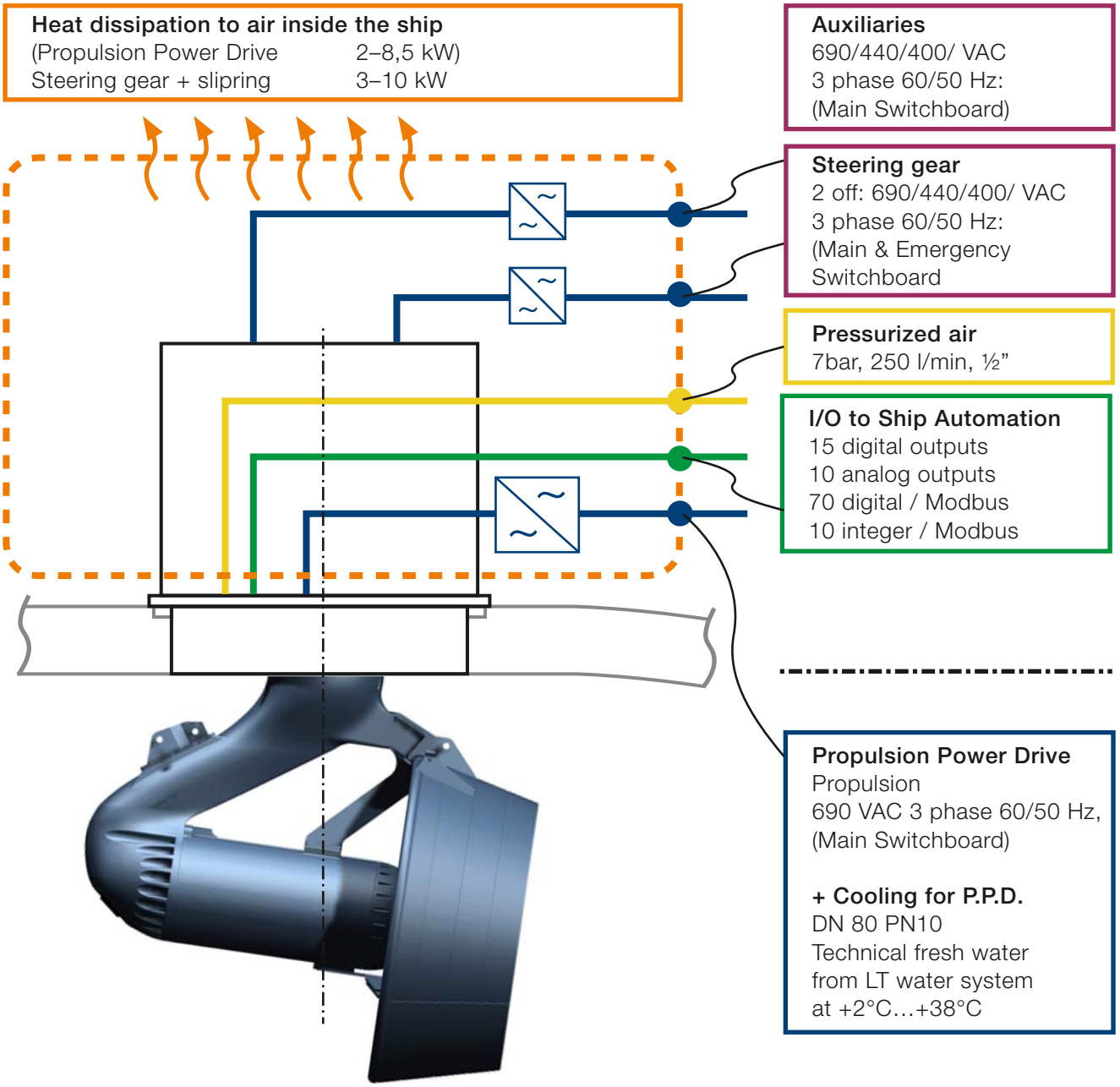


Figure 4-1 Azipod ship interface diagram in a preliminary project format

5 Examples of Typical Installations

5.1 Power Plant Ship Example

In this typical onboard configuration three main generators are connected to the main switchboard, and the low voltage switchboard is supplied by two service transformers. The total harmonics' distortion (THD) is brought to the required level with the use of filters. The main switchboard can be divided into two separate networks by means of the tie breaker to increase the redundancy of the powerplant. A typical system configuration with Azipod CZ propulsion consists of the following components:

- Three main generators
- Propulsion switchboard 690 V with a tie breaker
- Two ACS 800 marine Propulsion Power Drive frequency converters
- Two Azipod CZ steering propulsors
- Bow thruster with electrically driven motor
- Two ship service transformers 690V/440V
- 440V switchboard
- Total Harmonics Distortion (THD) Filters
- UPS and UPS supply panel
- Two low voltage transformers 440V/220V
- 220V switchboard / panel
- Emergency generator
- Emergency switchboard

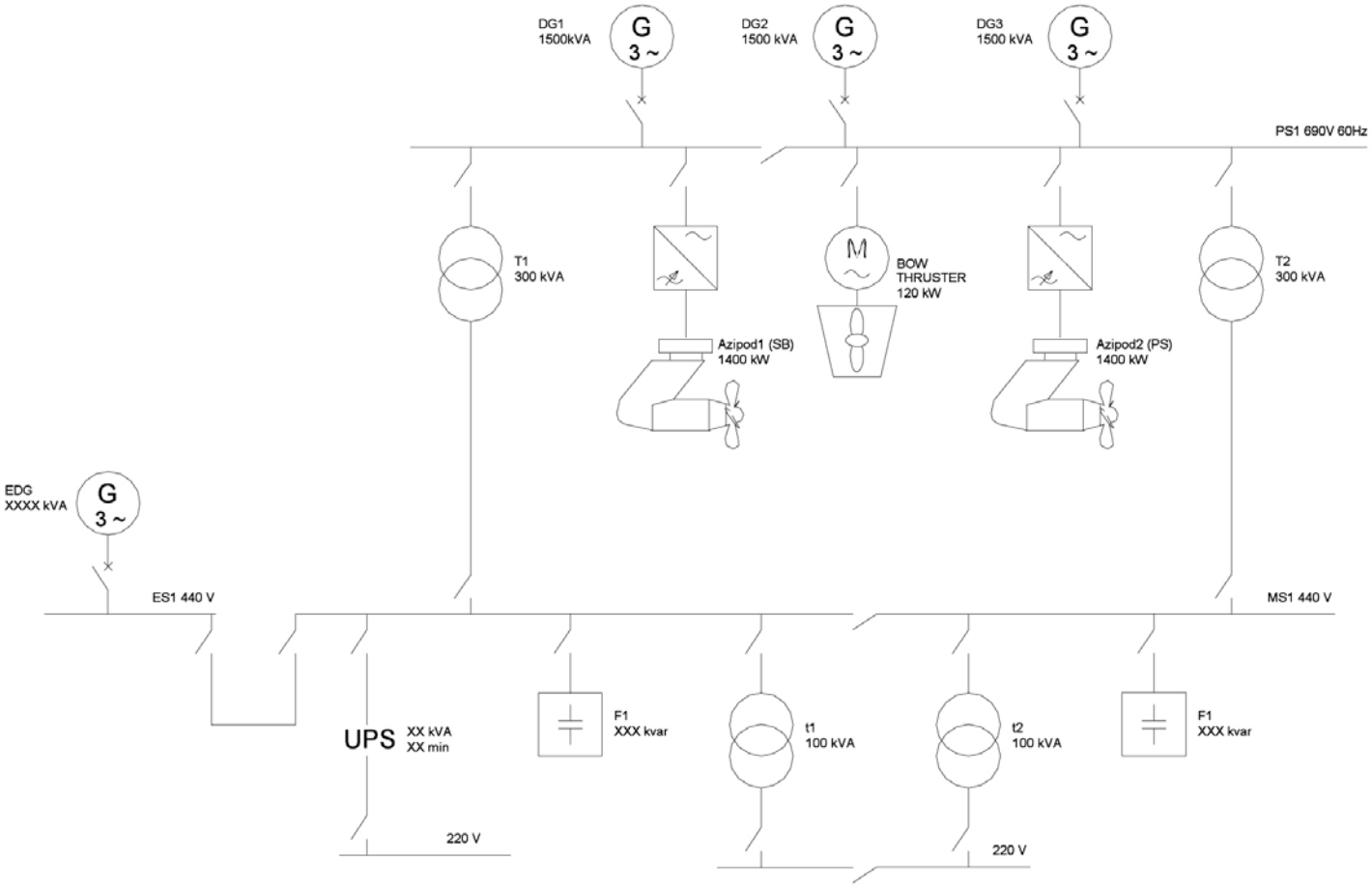


Figure 5-1 Example of a typical electrical power plant

5.2 Semisubmersible rigs for Global Santa Fe

CZ propulsors per rig	8 × 3200 kW
Rig deliveries	2003, 2004

Figure 5-2 The Global Santa Fe “Development Driller 1”

Figure 5-3 One of the eight Azipod propulsors being prepared for installation

6 Azipod Questionnaire Sheet

PROJECT INFORMATION	
Company	
Contact person	
Project no.	
Tel. No.	
Fax. No.	
Ship type	
DESIGN DATA	
Ship main dimensions	L ~ _ _ _ _ _ _ m D ~ _ _ _ _ _ _ m B ~ _ _ _ _ _ _ m
Propulsion power	_ _ _ _ _ _ × _ _ _ _ _ _ kW
Main voltage	☐ 690 V / ☐ Other _ _ _ _ _ _ V
Generator power	_ _ _ _ _ _ × _ _ _ _ _ _ kVA
Max. vessel speed	_ _ _ _ _ _ _ _ _ _ _ _ knots
Bollard pull	_ _ _ _ _ _ _ _ _ _ _ _ kN _ _ _ _ _ _ _ _ _ _ _ _ metric tons
Classification society Class notation	_ _
Nozzle	☐ No (Azipod CO) / ☐ F Yes (Azipod CZ)
QUANTITY & APPLICATION INSTALLATION	
Number of vessels	_ _ _ _ _ _ _ _ _ _ _ _ pcs
Estimated time of delivery	_ _ _ _ _ _ _ _ _ _ _ _

Contact us

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