Lithium-ion batteries
FOREWORD

DNV GL class programmes contain procedural and technical requirements including acceptance criteria for obtaining and retaining certificates for objects and organisations related to classification.

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Any comments may be sent by e-mail to rules@dnvgl.com

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CHANGES – CURRENT

This document supersedes the December 2015 edition of DNVGL-CP-0418. Changes in this document are highlighted in red colour. However, if the changes involve a whole chapter, section or subsection, normally only the title will be in red colour.

Changes September 2018

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<thead>
<tr>
<th>Topic</th>
<th>Reference</th>
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<tr>
<td>Alignment with DNVGL-RU-SHIP Pt.6 Ch.2 Sec.1 and clarifications</td>
<td>Sec.1, Sec.2 and Sec.3</td>
<td>Align with the updated DNV GL rules.</td>
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<td>Sec.3 [2]</td>
<td>Specified verification activities for initial assessment, software development, change management and cell production.</td>
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Editorial corrections

In addition to the above stated changes, editorial corrections may have been made.
SECTION 1 GENERAL

1 Introduction

1.1 Objective
The objective of this class programme (CP) is to describe the type approval (TA) scheme for lithium-ion batteries.

For a description of the Society’s type approval scheme in general and further information on general conditions and procedures for obtaining the Society's TA certificate, see DNVGL-CP-0338 Type approval scheme.

1.2 Scope
This CP gives a description of the procedures and requirements related to documentation, design and type testing applicable for type approval (TA) of lithium-ion batteries.

The extent of type approval of a battery system should normally encompass:

— one or several defined combinations of battery cells in a battery module
— one or several defined combinations of battery modules in a battery string
— one or multiple battery strings in a battery system
— one set of main contactors or main circuit breaker (including control) for connection of the battery system to the charger/load.

This CP does not set the design requirements to the equipment. TA is based on compliance with design requirements given in the Society’s rules and/or other regulations and standards. The CP describes the applicable design requirements and how to document compliance with the requirements in order to obtain a TA certificate for the equipment.

1.3 Application
The procedures and requirements described in this CP are applicable for obtaining the Society’s type approval certificate based on requirements given in:

— DNV GL rules for classification – Ships DNVGL-RU-SHIP Pt.4 Ch.8 Electrical Installations
— DNV GL rules for classification - Ships DNVGL-RU-SHIP Pt.4 Ch.9 Control and monitoring systems
— DNV GL rules for classification - Ships DNVGL-RU-SHIP Pt.6 Ch.2 Sec.1 Battery power
— DNV GL offshore standard DNVGL-OS-D201 Electrical installations
— DNV GL offshore standard DNVGL-OS-D202 Automation, Safety and Telecommunication Systems
— DNV GL class guideline DNVGL-CG-0339 Environmental test specification for electrical, electronic and programmable equipment and systems

A TA certificate will confirm compliance with the requirements in the Society’s rules as specified above. The TA certificate will not confirm compliance with requirements in other parts of the rules. In case additional requirements in other parts of the rules shall be covered by the TA certificate, this shall be specified in the application for TA and will be stated in the TA certificate.

TA of equipment in accordance with this CP is not mandatory, but may be used as a part of the case by case design approvals for equipment to be installed on vessels classed with the Society.

2 Documentation
Documentation shall be submitted as required by DNVGL-RU-SHIP Pt.6 Ch.2 Sec.1 Table 5 in addition to the test reports from the tests required in Sec.3.
SECTION 2 PRODUCT REQUIREMENTS

1 General
The lithium-ion batteries shall comply with the relevant requirements of the following publications in its latest edition including amendments.

2 Design requirements
The Society’s type approved lithium-ion batteries shall comply with the requirements of the following publications:

— DNV GL rules for classification – Ships DNVGL-RU-SHIP Pt.6 Ch.2 Sec.1 Battery power
— DNV GL rules for classification – Ships DNVGL-RU-SHIP Pt.4 Ch.8 Electrical Installations
— DNV GL rules for classification - Ships DNVGL-RU-SHIP Pt.4 Ch.9 Control and monitoring systems
— DNV GL offshore standard DNVGL-OS-D201 Electrical installations
— DNV GL offshore standard DNVGL-OS-D202 Automation, Safety and Telecommunication Systems
SECTION 3 TEST AND VERIFICATION REQUIREMENTS

1 General
The testing and verification requirements are divided into:
— verification
— cell tests
— battery system tests
— battery system environmental tests.
Test programs shall be approved before the tests are performed. Signed test programs/reports shall be submitted for review after the tests are completed.

2 Verification
All verifications shall be performed by a DNV GL surveyor.

2.1 Initial assessment
Verification that the manufacturer has a quality system in operation ensuring consistent production of the products for which the TA is requested.

2.2 Software development
Verification of software development activities as described in DNVGL-RU-SHIP Pt.4 Ch.9 Sec.1 [4.2].

2.3 Change management procedure
Verification of change management procedure as required in DNVGL-RU-SHIP Pt.4 Ch.9 Sec.1 [1.5].

2.4 Cell production
Verification of cell production quality procedures.

Guidance note:
Primary objective is to establish confidence in the minimization of potential for defects from the manufacturing process as well as consistency of the product performance and quality. In addition to the quality system the cell production, acceptance inspection/procedure should be verified, including parameters such as capacity, resistance, dimensions etc.

---e-n-d---o-f---g-u-i-d-a-n-c-e---n-o-t-e---

3 Cell tests
The tests shall be according to DNVGL-RU-SHIP Pt.6 Ch.2 Sec.1 Table 6. The tests shall be witnessed by a DNV GL surveyor or performed at a recognized laboratory.

4 Battery system tests
The tests shall be according to DNVGL-RU-SHIP Pt.6 Ch.2 Sec.1 Table 7. The tests shall be witnessed by a DNV GL surveyor.
5 Battery system environmental tests

The tests shall be according to DNVGL-CG-0339 Sec.3. The tests shall be witnessed by a DNV GL surveyor or performed at a recognized laboratory.

Note:

— Dry heat test, see DNVGL-CG-0339 Sec.3 [7]. The electronics inside the battery module shall be tested with temperature class B due to the high maximum operating temperature.
— Inclination test, see DNVGL-CG-0339 Sec.3 [11] is not required to be performed.
— Flame-retardant test, see DNVGL-CG-0339 Sec.3 [16.1]. If flammable materials is used, then it shall be tested as described in IEC 60092-101.
This is a new document.
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