Certificate no.:
TAE000054T

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Li-Ion Battery System

with type designation(s)
Max 8C-500, Max 8C-700, Max 8C-800, Max 8C-850

issued to
ABB Switzerland Ltd.
Untersiggenthal, AG, Switzerland

is found to comply with
DNV rules for classification – Ships, offshore units, and high speed and light craft

Application:

Products approved by this certificate are accepted for installation on all vessels classed by DNV following DNV Rules December 2024 edition'.

Issued at **Høvik** on **2025-09-19**

This Certificate is valid until **2030-09-18**.

for **DNV**

DNV local unit: **Augsburg**

Approval Engineer: **Uwe Supke**

This Certificate is subject to terms and conditions overleaf. Any significant change in design or construction may render this Certificate invalid.
The validity date relates to the Type Approval Certificate and not to the approval of equipment/systems installed.

LEGAL DISCLAIMER: Unless otherwise stated in the applicable contract with the holder of this document, or following from mandatory law, the liability of DNV AS, its parent companies and their subsidiaries as well as their officers, directors and employees ("DNV") arising from or in connection with the services rendered for the purpose of the issuance of this document or reliance thereon, whether in contract or in tort (including negligence), shall be limited to direct losses and under any circumstance be limited to USD 300 000.

Product description

The Max 8C Series is a modular lithium-ion battery pack family designed for onboard energy optimal for marine applications, offering high safety, long lifecycle, and robust performance. The battery pack features a modular, liquid-cooled design with integrated safety functions and IEC 61508 certified battery management system, making it suitable for demanding marine applications.

Highest Safety Standard

ABB's traction batteries prioritize safety by design, using inherently safe LTO cell chemistry and a multilayer safety approach to detect, avoid, and contain critical situations. A certified Battery Management System (IEC 61508 SIL2) provides advanced protection against overcharging, overheating, and other hazardous conditions.
Redundant cell temperature and voltage measurements provide reliable system information, accessible via serial communication with built-in safety functions. In the event of an internal error, such as a communication loss, the battery pack is disconnected to ensure a safe state.

Long lifetime

Designed for durability, the battery delivers over 20,000 cycles at 35°C cell temperature and 80% depth of discharge. Its stable LTO chemistry maintains long lifetime even under float charging at high state of charge, helping reduce aging and total cost of ownership.

High performance within a wide operational temperature range

With 4C continuous and 8C peak charge/discharge capabilities, the battery supports rapid charging in under 10 minutes. Its design enables consistent energy delivery, using up to 80% depth of discharge during regular operation. The applied LTO cell chemistry allows a wide operational temperature from -40 to +70 °C.

High flexibility/Topology

The Max 8C Series offers flexible voltage and capacity configurations to meet a wide range of vessel requirements/applications. Depending on the type, each battery pack contains a specific number of modules connected in series, with each module housing 48 LTO cells in a 24s2p circuit configuration

Robust Design

The Max 8C Series features an extremely robust housing that is both fire integrity tested and rated for a very high protection degree, making it suitable for extreme environments. An off-gas vent and integrated fire detection system further enhance the safety of the design.

The battery system meets the DNV Pt.6 Ch.2 Sec.1 Non-Propagation Design Option #2 requirement for no module-to-module propagation.

Battery Module Data (Cell Block)

Type	BPW B01 B02
Cell	LTO 23 Ah
Configuration	24s2p
Cooling	Liquid cooling via integrated cooler
Weight (w/o coolant)	32.2 ± 0.1 kg
Dimensions	421.5 x 413 x 128.5 mm
Nominal Capacity	46 Ah
Nominal Energy	2.54 kWh
Nominal Voltage	55.2 V
Voltage Range	[36 … 64.8] V

Battery Pack Data

Max 8C-500

Module	BPW B01 B02
Configuration	up to 8 modules in series
Nominal Voltage*	442 V
Nominal Energy*	20.3 kWh
Dimensions	1200 x 484 x 490 mm
Weight (w/o coolant)*	330 kg ± 5%
Degree of Protection	IP 66 / 69

Max 8C-700

Module	BPW B01 B02
Configuration	up to 11 modules in series
Nominal Voltage*	607 V
Nominal Energy*	27.9 kWh
Dimensions	1588 x 484 x 490 mm
Weight (w/o coolant)*	440 kg ± 5%
Degree of Protection	IP 66 / 69

Max 8C-800

Module	BPW B01 B02
Configuration	up to 12 modules in series
Nominal Voltage*	662 V
Nominal Energy*	30.5 kWh
Dimensions	1727 x 506 x 488 mm
Weight (w/o coolant)*	495 kg ± 5%
Degree of Protection	IP 66 / 69

Max 8C-850

Module	BPW B01 B02
Configuration	up to 13 modules in series
Nominal Voltage*	718 V
Nominal Energy*	33.0 kWh
Dimensions	1857 x 506 x 488 mm
Weight (w/o coolant)*	530 kg ± 5%
Degree of Protection	IP 66 / 69

*) max. configuration

BMS Master

Product name	BORDLINE® ESS String Control Unit
Ordering Code	6AAB00000004155 / C07 or C08

BMS Slave

Product name	Cell Monitoring Unit - US D384 A
Ordering Code	6AAB00000023902 / Rev A

BMS Product SW:

Product name	SCU_Product_SW_A01_v1_1
ABB Part code	6AAB00000024900
SW-Version	v1.1.x.x

Location Classes (DNV-CG-0339)

Temperature	Class C
Humidity	Class B
Vibration	Class A
EMC	Class A
Enclosure	Class C

Application/Limitation

1. When installed on a ship or offshore unit, the DNV class rules for battery installation must be followed (DNV Pt.6 Ch.2 Sec.1).
2. The Type Approval covers hardware and software listed under Product description.
3. The Type Approval is valid for systems made by production facilities stated under Manufactured by.
4. Integration requirements

The following points must be considered by the overall Energy Storage System responsible for the integration of the battery pack:

- Insulation Monitoring
- Fast Acting Fuse (in plus path)
- Independent overcharge protection
- Leakage detection and consequential coolant shut off
- Damper-assisted mechanical fastening of the battery pack
- 24V supply restriction; supply voltage shall stay in the range of 19.2V to 28.8V with reference to ABB interface description

Product certification:

Battery systems rated equal or larger than 50kWh shall have a product certificate according to DNV Pt.6 Ch.2 Sec.1 Table 4 for each delivery to DNV classed vessels. The certification test is to be performed at the manufacturer of the application system before the system is shipped to the yard. After the certification the clause for application software control will be put into force: All changes in software are to be recorded as long as the system is in use on board. Documentation of major changes is to be forwarded to DNV for evaluation and approval before implemented on board.

For product certification, at least the following documents should be submitted for approval:

- Reference to this type approval certificate;
- Copy of the safety description;
- (E120) Technical specification of the battery system that is subject for product certification;
- (E170) Electrical schematic diagram showing the battery packs, strings, modules with switchgears and control gears, dimensions of bus bars as relevant;
- (I030) Project-specific battery system block diagram;
- (I020) Functional description, including:
    - Project-specific overall description of the battery management system
    - Software and hardware versions of BMS and MCR
    - Other relevant information not covered by the safety description
- (Z252) Test procedure at manufacturer;
- Integration requirements in Application No. 4 are to be considered for product certification.

Software update notification
When the type approved software is revised (affecting all future deliveries) DNV is to be informed by forwarding updated software version documentation. If the changes are judged to affect functionality for which rule requirements apply a new functional type test may be required and the certificate may have to be renewed to identify the new software version.

Type Approval documentation

	techdocs in NPS 262.1-043632-1 available		

Tests carried out
Type tests for the battery system according to applicable DNV rules and standards as listed below have been carried out. DNV-RU-SHIP Pt.6 Ch.2 Sec.1 (Edition 2024-12), DNV-RU-SHIP Pt.4 Ch.8, DNV-RU-SHIP Pt.4 Ch.9, DNV-CG-0339 (Edition: 2021-08), DNV-CP-0418 (Edition: 2021-09).
The Propagation test has been passed in accordance with DNV-RU-SHIP Pt.6 Ch.2 Sec.1 design option 2: no propagation between modules.

Marking of product
The products to be marked with:
- - manufacturer name
- - model name
- - serial number

Periodical assessment
The scope of the periodical assessment is to verify that the conditions stipulated for the Type approval are complied with and that no alterations are made to the product design or choice of materials.
The main elements of the assessment are:
- Inspection on factory samples, selected at random from the production line (where practicable)
- Results from Routine Tests (RT) checked (if not available tests according to RT to be carried out)
- Review of type approval documentation
- Review of possible changes in design, materials and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate.

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate.

Manufactured by:
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