



Certificate No:
TAE00004FK

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Frequency Converter

with type designation(s)
Marine Rectifier UNIREC ML/MG

Issued to
ABB AS
Fornebu, Norway

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

Application :

Product approved by this certificate is accepted for installation on all vessels classed by DNV.

Issued at **Høvik** on **2022-03-22**

This Certificate is valid until **2027-03-21**.

DNV local station: **Norway CMC, East-South**

for **DNV**

Approval Engineer: **Georgy Abramenko**

Trond Sjøvåg
Head of Section

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 300,000 USD.



Form code: TA 251

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Product description

Fully controlled three-phase thyristor bridge comprising six-disc type thyristors, liquid-cooled on both sides. Bridge is used as a controlled rectifier unit, to connect a synchronous generator and a DC main busbar in a DC-Grid power distribution system.

	ML	MG
Input characteristics		
Input AC voltage	690 – 825V (typical 750)	
AC voltage variation	±20%	
Power factor	Typical 0.95 (lagging)	
Input frequency	30 – 70Hz, nominal: 60	
Output characteristics		
Output DC voltage	800 – 1100V (typical 1000)	
Maximum output DC voltage short term due to load rejection	1200V	
Nominal output DC current single cabinet	3900A	
Surge voltage @DC output	2800V	
Max generator peak short circuit current	38kA	
Max parallel units	2	
Thyristors		
Type	ABB 5STP45Q2800	
Max repetitive voltage	2800V	

Environmental parameters according to DNV Class Guidance CG-0339:

Temperature: Class A (0 - 45°C);

Humidity: Class A (up to 96%);

EMC: Class A;

Enclosure: Class B (IP44);

Vibration: Class A.

Application/Limitation

Product Certification

Documents for the actual application are to be submitted for approval in each case in accordance with DNV Rules Pt.4, Ch.8, Sec.1 Table 2. A product certificate is required case by case in accordance with Rule requirement Pt.4. Ch.8. Sec.1 for units ≥ 100 kW.

For product certification, the following documents should be submitted for approval, Ref. DNV Pt.4 Ch.8 Sec.1 Table 2:

- Reference to this Type Approval Certificate;
- (E180) A drawing showing external location of instruments and devices for operation (panel layout);
- (E240) Functional description for the intended use, configuration and interface (e.g. alarms, monitoring and auxiliary power supplies);
- (Z252) Test program at manufacturer for routine tests and functional tests as per DNV Pt.4 Ch.8 Sec.7, 2.1.1;
- Single line diagram (only applicable for multi drive configuration);
- If additional components to the type approved rectifier are delivered, documentation according to DNV Rules Pt.4 Ch.8 Sec.1 table 2 shall be submitted for review.

Short-circuit Withstand Capability

It is required that the generator and the rectifier can withstand the short-circuit currents occurring in case of a DC busbar short circuit on the main DC busbar system.

This Type Approval Certificate is based on tests documented in test report 3BHS832711 E46 dated 2017-01-30, based on a simulation of synchronous generator by transformer and 3 single-phase series reactors, used between source and rectifier. They are bypassed at the beginning of fault and after phase by phase sequentially applied to reduce the fault current.

(Rating of transformer: 3.8 MVA fed from 8kV bus; switchable series reactors 26μH each.)

In case of certification of different configurations (combinations of rectifier and generator), the short-circuit withstand capability shall be further verified and documented.

Insulation monitoring

The converter may only be operated on an IT power system as defined in IEC 60364-1. In addition, a ground fault detection must be integrated into the system. Below 500 Ω ground fault level, the unit must be tripped.

Electro Magnetic Compatibility

The Unirec M is intended to be installed in Special Power Distribution Zone as defined in DNV-RU-SHIP Part 4 Ch.8, Sect.13 and IEC60533 Ch. 6. It does not meet the requirements for radiated and conducted (690VAC) emissions for General Power Distribution Zone.

Type Approval Documentation

Tests carried out

General type tests in accordance with IEC 61800-1 and 61800-5-1 including Full Current Test and temperature rise test. Environmental tests including Power Supply Variation, Power Supply Failure, Dielectric, EMC (immunity and emission), Vibration, Dry heat and Damp heat.

Marking of product

ABB AS – UNR880-L/G 07LC

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 change in design, materials and performance
- Ensuring traceability between manufacturer's product type marking and Type Approval Certificate.

Periodical assessment is to be performed at 2 and 3.5 years, and at renewal.

END OF CERTIFICATE