Certificate No:
TAS00003GY

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Sacrificial Anode Material for Corrosion Protection

with type designation(s)
High Resistivity Environment Al-Alloy Sacrificial Anode Material (SR-LF-3)

Issued to
Sunrui Marine Environment Engineering Co.,Ltd.
QINGDAO, **China**

is found to comply with
DNV class programme DNV-CP-0107 – Type approval – Sacrificial anode materials
DNV recommended practice DNV-RP-B401 – Cathodic protection design, May 2021

Application :

The mean current capacity of the sacrificial anode material after 12 months galvanostatic control testing is 2661 Ah/kg. The mean closed circuit potential is -1090 mV vs. Ag/AgCl seawater.

Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV.

Issued at **Høvik** on **2022-08-24**
This Certificate is valid until **2027-08-23**.
DNV local station: **Qingdao**

Approval Engineer: **Gisle Hersvik**

for **DNV**

Gustav Heiberg
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.

Product description

High Resistivity Environment Al-Alloy Anode Material (SR-LF-3); Aluminium based alloy sacrificial anode material.

Chemical composition [wt%]:

Zn	In	Si	Ti	Fe	Cu	Sn	Al
4.0 – 6.0	0.015 – 0.030	0.05 – 0.040	≤0.03	≤0.07	≤0.003	≤0.02	Remainder

Other impurity elements: total ≤0.05

Application/Limitation

Approval is given for the sacrificial anode material; not for anode design.

Anodes may be installed on vessels, platforms and subsea constructions according to manufacturer's recommendations.

The mean current capacity of the sacrificial anode material after 12 months galvanostatic control testing is calculated to be **2661** Ah/kg. The mean closed circuit potential is -1090 mV vs. Ag/AgCl seawater.

The recommended design electrochemical capacity for aluminium based alloys in seawater is 2000 Ah/kg (ref. DNV-RP-B401) for use in seawater at temperatures up to 30ºC.

DNV-RP-B401, Edition May 2021, Table 8-6, gives recommended design electrochemical capacity and design closed circuit potential for anode materials at seawater ambient temperatures:

Anode material	Anode surface temperature [ºC]	Seawater exposure	
		Closed circuit potential [V]	Electrochemical capacity [Ah/kg]
Al-Alloy	≤30	-1.050	2,000
	60	-1.050	1,500
	80	-1.000	720

Type Approval documentation

Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**, Refer to Test Report No. JQ21131XY "Aluminium Alloy Sacrificial Anode for High Resistivity Environment" from Testing & Calibration Center of China Shipbuilding Industry Corporation (Qingdao) of 2022-06-14 for details on testing performed.

Testing has been performed with basis in DNVGL-RP-B401 (2017).

Marking of product

Product shall be marked with *manufacturer's name* **SunRui Marine Environment Engineering Co., Ltd., China**, or *symbol*, *anode material*, *heat number* and *series number*.

The marking is to be carried out in such a way that it is visible, legible and indelible. The marking of product is to enable traceability to the DNV Type Approval Certificate.

Periodical assessment

The scope of the Periodical Assessment is to verify that the conditions stipulated for the Type Approval is complied with and that no alterations are made to the product design or choice of materials.

Periodical assessments (for Certificate Retention / Certificate Renewal) shall be performed according to DNV-CP-0338.

This certificate is only valid if required Periodical assessments are carried out with satisfactory results. To check the validity of this certificate, please look it up in https://approvalfinder.dnv.com

END OF CERTIFICATE