Certificate no.:
TAS00004EU

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Sacrificial Anode Material for Corrosion Protection

with type designation(s)
Aluminium Anode

issued to
Thai Marine Protection Co., Ltd.
Nakhonpathom, **Thailand**

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 free running testing is 2481 Ah/kg.
The mean closed circuit potential is -1073 mV vs. Ag/AgCl seawater.

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

Issued at **Hamburg** on **2024-10-10**
This Certificate is valid until **2029-10-09**.
DNV local unit: **Bangkok**

for **DNV**

Approval Engineer: **Gisle Hersvik**

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

Aluminium Anode

Anode alloy specifications (%):

Zn	In	Fe	Cu	Si	Cd	Al
2.50-6.00	0.015-0.030	0.09 max.	0.003 max.	0.10 max.	0.100 max.	Remainder

Others (each): 0.100 max.
The test specimen had a Fe-content of 0.06%, approximately.

Application/Limitation

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

The mean current capacity of the sacrificial anode material after 12 months free running testing is calculated to be **2481** Ah/kg. The mean closed circuit potential is -1073 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. Please observe Guidance note in 10.4.4 of DNV-RP-B401.

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-Zn-In	≤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 DNV Technical Report No. 2024-5295 / 2364230, Rev. 0 of 2024-09-18 for details on testing performed.

Testing has been performed with basis in DNV-RP-B401 (2021).

Marking of product

Product shall be marked with *manufacturer's name:* **Thai Marine Protection Co., Ltd., Thailand** or *logo*, *type*, *gross weight*, *net weight*, *heat numb*er and *serial 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