DNV·GL

Certificate No:
TAS00002C3

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Sacrificial Anode Material for Corrosion Protection

with type designation(s)
HDM ZN-HTP

Issued to
Haedong Metal Co., Ltd.
Busan, Republic of Korea

is found to comply with
DNV GL class programme DNVGL-CP-0107 – Type approval – Sacrificial anode materials
DNV GL recommended practice DNVGL-RP-B401 – Cathodic protection design, June 2017

Application :

The mean current capacity of the sacrificial anode material after 12 months free running testing is 809 Ah/kg. The mean closed circuit potential is -998 mV vs. Ag/AgCl seawater. Intended for use in sea water at temperatures above 66°C.

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

Issued at **Høvik** on **2020-01-27**
This Certificate is valid until **2025-01-26**.
DNV GL local station: **Pusan**

Approval Engineer: **Gisle Hersvik**

for **DNV GL**

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.

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Job Id: **262.1-027697-1**
Certificate No: **TAS00002C3**

Product description

HDM ZN-HTP; Sacrificial Zinc Alloy Anode Material intended for use in hot sea water (above 66°C).

Chemical composition of **HDM ZN-HTP**:

	Zn	Al	Mg	Cd	Fe	Cu	Pb	Others
Min	Rem.	0,10	0,05					
Max		0,25	0,15	0,001	0,002	0,001	0,006	0,10

Application/Limitation

The mean current capacity of the sacrificial anode material after 12 months free running testing is **809** Ah/kg. The mean closed circuit potential is -998 mV vs. $Ag/AgCl_{seawater}$. Mean anodic current density 0.59 A/m^2.

The recommended design eletrochemical capacity for zinc based alloys in seawater is 780 Ah/kg (ref. DNVGL-RP-B401).

The anode material is intended for use in hot sea water applications and testing has justified 780 Ah/kg.

For zinc anodes buried in seawater sediments, please refer to below table for design eletrochemical capacity for temperatures up to maximum 50ºC:

Seawater temperature [ºC]	**Design eletrochemical capacity [Ah/kg]**		**Reference**
	Immersed in seawater	**Buried in seawater sediments**	
≤30	780	700	DNVGL-RP-B401
30	780	750	ISO 15589-2
40	780	580	
50	780	580	

* ISO 15589-2:2012 *Petroleum, petrochemical and natural gas industries -- Cathodic protection of pipeline transportation systems -- Part 2: Offshore pipelines*.

Type Approval documentation

Tests carried out

Type Testing carried out in accordance with **Type Approval documentation**, and in accordance with the Annex C of the DNVGL-RP-B401. Refer to DNV GL Technical Report 2019-5278, Rev. 0 of 2019-09-12 of for details on testing performed.

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

Marking of product

Product shall be marked with *manufacturer's name* or *trade mark:* **HDM** and *type designation*.

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 GL 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 and Certificate Renewal) shall be performed according to DNVGL-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.dnvgl.com

END OF CERTIFICATE