



TYPE APPROVAL CERTIFICATE

Certificate no.:
TAS00001VE
Revision No:
3

This is to certify:

that the **Sacrificial Anode Material for Corrosion Protection**

with type designation(s)
BAC Zinc Cd-free Anode Alloy

issued to
BAC Corrosion Control Denmark A/S
Herfølge, Denmark

is found to comply with
DNV class programme DNV-CP-0107 – Type approval – Sacrificial anode materials

Application:

The mean current capacity of the sacrificial anode material after 12 months free running testing is 800 Ah/kg. The mean closed circuit potential is -940 mV vs. Ag/AgCl/Seawater. The approval is given for use in sea water at temperatures up to maximum 50°C.

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

Issued at **Hamburg** on **2024-02-22**

This Certificate is valid until **2029-01-14**.

for **DNV**

DNV local unit: **Denmark CMC**

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

BAC Zinc Cd-free Anode Alloy: Zinc alloy sacrificial anode material.

Chemical Composition (%):

Fe	Cd	Pb	Cu	Al	In	Sn	Zn
0.005 max	0.001 max	0.005 max	0.005 max	0.10-1.0	0.008-0.03	0.005-1.0	Remainder

Manufactured by

BAC Corrosion Control A/S, Færøvej 7-9, 4681 Herfølge, Denmark

DNV local station: Copenhagen

Impalloy Ltd., Fryers Road, Walsall, East Midlands, WS2 7LZ, UK

DNV local station: Manchester

Responsibility

The Company (stated on the front page of this Certificate) takes the responsibility that both design and production are in compliance with Rules, Standards and/or Regulations listed on page 1 of this certificate.

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 **800 Ah/kg**. The mean closed circuit potential is -940 mV vs. Ag/AgCl_(seawater). The test temperature during the test period was between 8 and 10°C.

The recommended design electrochemical capacity for zinc-based alloys in seawater at temperatures up to max. 50°C is 780 Ah/kg (ref. 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:

Seawater temperature [°C]	Design electrochemical capacity [Ah/kg]		Reference
	Immersed in seawater	Buried in seawater sediments	
≤30	780	750	DNV-RP-B401
>30 to 50	780	580	
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 **Type Approval documentation**. Ref. DNV Technical Report No. 27036_{BSC}.R2, Rev. 01 "LONG TERM ELECTROCHEMICAL TESTING ACCORDING TO NORSOK STANDARD M CR 503 OF A SACRIFICIAL CADMIUM FREE ZINC ANODE ALLOY" of 1999-10-13. Please refer to the reports for details on testing performed.

Testing has been performed with basis in NORSOK M-CR-503, Rev. 1, December 1994, COMMON REQUIREMENTS, CATHODIC PROTECTION and DNV-RP-B401, Cathodic Protection Design, 1993.



Job ID: **262.1-030066-4**
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Marking of product

Product shall be marked with *manufacturer's name and/or logo*: **BAC** and *type designation, batch no./anode weight*.

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