Certificate No:
TAK000023C

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Composite Repair Systems

with type designation(s)
FORTEC

Issued to
ENSOL ENGINEERING & TECHNOLOGY SERVICES.
Accra, **Ghana**

is found to comply with
ISO/TS 24817:2006 "Petroleum, petrochemical and natural gas industries – Composite repairs for pipework – Qualification and design, installation, testing and inspection"

Application :

Composite repair of all geometries of pipe work and structural members including tanks, vessels and decks with various defect sizes and operating conditions.

Issued at **Høvik** on **2021-11-29**
This Certificate is valid until **2026-11-28** .
DNV local unit: **France CMC**

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

FORTEC: a two-component epoxy resin system with fibre reinforcement

The FORTEC system comprises:

- FORTEC M (epoxy filling mastic)
- FORTEC M SF (steel-filled epoxy putty)
- FORTEC Plugging stick (filler for holes)
- FORTEC P SL (epoxy primer)
- FORTEC G SL (epoxy resin for use with FORTEC fibre fabric)
- FORTEC MX (thixotropic agent for use with FORTEC G SL resin)
- FORTEC TB Series (fibre glass - aramid cloth)
- FORTEC CF 5 (compression cloth)

Manufactured by

PROKEM SARL, 11 bis, rue Raymond Poincaré 92420 Vaucresson – France

DNV local station: France

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

This Type Approval certificate is not valid for designs, components, equipment, systems or products which are subject to classification by DNV.

The FORTEC system is specifically designed for the repair of pipeline defects, either internal or external, with the restriction that the maximum allowable wall loss is no greater than 80% of the original wall thickness. i.e. Type A (non-through wall) defects, repair classes 1-3.

- Composite repair of all geometries of pipe work and structural members including tanks, vessels and decks with various defect sizes and operating conditions.
- Surface preparation of substrates to be according to the *FORTEC Installation Procedure*.
- For specific substrates the manufacturer must be consulted.
- The repair must be applied in accordance with the *FORTEC Installation Procedure*, using qualified, competent installers.

Design calculations to be performed as per ISO 24817:2015, and as later amended.

Any significant changes in design and / or quality of the material will render the approval invalid.

Type Approval documentation

Tests carried out

Testing has been carried out in accordance with ISO/TS 24817:2006 *Petroleum, petrochemical and natural gas industries — Composite repairs for pipework — Qualification and design, installation, testing and inspection*.

Results from testing and material properties are available in *PROKEM's Technical Specification for FORTEC*.

Marking of product

Product/package to be marked with *manufacturer's name*, **ENSOL**/**PROKEM** and in accordance with above *type designation/product name:* ***FORTEC***, and *storage conditions*.

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 and 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