

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Engine Subsystem

with type designation(s)
ME-GA Secondary Fuel System

Issued to

**MAN Energy Solutions, branch of MAN Energy Solutions SE, Germany
København SV, Denmark**

is found to comply with

DNV rules for classification – Ships Pt.4 Ch.3 Sec.1 Reciprocating internal combustion engines

Application :

The dual-fuel ME-GA secondary fuel system is approved for use on MAN Energy Solution SE ME-C engines with natural gas (LNG/CNG) as fuel.

Product approved by this certificate is accepted for installation on all vessels classed by DNV.

The approval is only covering the principle of the ME-GA secondary fuel system.

Issued at **Høvik** on **2023-04-17**

This Certificate is valid until **2028-04-16**.

for **DNV**

DNV local unit: **Copenhagen FIS**

Approval Engineer: **Dag Harald Williksen**

Olaf Drews
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

The ME-GA engine subsystem is an electronically controlled gas secondary fuel injection admission system for use on MAN Energy Solution SE ME-C/-B engines which consist of the following:

- Two gas admission valves (SGAV) installed on each side of the cylinder above the scavenging air ports.
- Two fuel pilot booster injection valves (MBIV) installed in each cylinder cover. The MBIV increases the injection pressure by hydraulic oil pressure to the designed injection pressure.
- A hydraulic supply unit and fast acting hydraulic/electric valves serving the purpose of creating pilot injection pressure and controlling the opening and closing of the injection valves in the MBIV and gas admission valves in the SGAV.
- Sealing oil system delivering sealing oil to the SGAV, separating control oil and fuel gas.
- Fuel gas system with double walled piping where the ventilation in the annular space goes to gas detection.
- A gas regulating unit (GRU) located at the non-driving end of the engine. The GRU ensures correct admission pressure at all loads.

The ME-GA secondary fuel system is fully controlled by the ME-ECS type approved with certificate TAA000027G.

Application/Limitation

The ME-GA secondary fuel system may be installed on MAN Diesel & Turbo ME-C/-B engines.

Fuel type: Natural gas (CNG)

Fuel inlet pressure: 13 bar

Tests carried out

The ME-GA secondary fuel system was successfully tested at Hyundai Heavy Industries, Korea, on the 27th and 28th of February 2023.

Marking of product

The product to be marked with manufacturer's name or trademark and type number identification

Periodical assessment

Meetings on regularly basis and at least every second year with the Type Approval applicant (hereof: the Engine Designer) shall be arranged with the objective to verify that the conditions for the Type Approval are not altered since the Type Approval Certificate was issued, and to keep DNV updated with regard to:

- The latest development status and design as covered by the Type Approval certificate.
- Damages and failures of products certified by DNV leading to break down or other malfunctions in service. The causes and reasons for the failure and results from investigations are to be made available to DNV upon request. Failure to inform DNV may lead to suspension of this Type Approval certificate.

Engine type approval conditions

The following are to be submitted for each new engine type that shall be updated based on this approval:

- Application for update of the type approval of the certificate covering the engine type in question.
- Reference to this Type Approval Certificate.
- Reference to applicable revision of General System Information 6136662-7
- Piping and instrumentation diagram (P&ID) - including hydraulic actuating system
- ME-GA engine size specific documentation of those components listed in the last part of the table of documents earlier in this certificate.
- Workshop test report from the first engine tested.

Other conditions

Engine safety, control and monitoring systems, including sensors and actuators are not covered by this type approval certificate. Documentation for engine safety, control including speed governing and monitoring systems shall be submitted for approval according to the Rules Pt.4 Ch.9 Sec.1 Table 5 and/or as listed in relevant type approval certificates.

Electric cables and installation of this is not covered by this approval and must be verified to comply with the requirement of the Rules Pt.4 Ch.8 - Electrical Installation.

END OF CERTIFICATE