Certificate no.:
TAM00001E4

TYPE APPROVAL CERTIFICATE

This is to certify:

that the Diesel Engine / Dual-Fuel Engine

with type designation(s)
L49/60, L49/60DF

issued to
MAN Energy Solutions SE
Augsburg, **Germany**

is found to comply with
DNV rules for classification – Ships Pt.4 Ch.3 Sec.1 Reciprocating internal combustion engines

Application:

Propulsion (variable speed mechanical drive of controllable pitch propeller, or constant speed electric power generation), Auxiliary (constant speed electric power generation)

Issued at **Hamburg** on **2025-04-03**
This Certificate is valid until **2030-04-02**.
DNV local unit: **Augsburg**

for **DNV**

Approval Engineer: **Jan Sell**

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 USD 300 000.

Product description

4-stroke, trunk piston, in-line engine, non-reversible, with supercharging (2 stages), with charge air cooling (2 x HT and LT), constant pressure charging system, valve operation by cams
Fuel oil: HFO, MDO, MGO, FAME B40, direct injection, injection operation electronically controlled

L49/60: single fuel
L49/60DF: dual fuel, natural gas, cylinder-individual gas admission before compression stroke, gas admission valve operation electronically controlled, pilot fuel oil injection, pilot fuel oil injection electronically controlled

Cylinder bore [mm]	490
Piston stroke [mm]	600
No. of cylinders	6, 7, 8, 9, 10

Application/Limitation

Rated power [kW/cyl.]	1300
Rated speed [rpm]	600
Mean effective pressure [bar]	23
Firing pressure [bar]	255

Type Approval documentation

Tests carried out

2022-06-21: MAN Energy Solutions SE, Augsburg, Germany,
Extreme Conditions Test
test engine: 6L49/60DF, serial no. 1133000, 1300 kW/cyl. at 600 rpm, DNV ref. 262.1-039157-1
2023-03-20 – 24: MAN Energy Solutions SE, Augsburg, Germany,
initial engine type approval test,
integration test with SaCoS5000 control, alarm and safety system,
test engine: 6L49/60DF, serial no. 1133000, 1300 kW/cyl. at 600 rpm, DNV ref. 262.1-039157-1
2023-04-13: MAN Energy Solutions SE, Augsburg, Germany,
Emergency operation with one failing turbocharger,
test engine: 6L49/60DF, serial no. 1133000, DNV ref. 262.1-039157-1

Marking of product

The product is to be marked with the manufacturer's name or trademark, the engine model designation, the engine serial no. and the output rating (kW at rpm).

Periodical assessment

Periodical assessment is to be performed after 2 years and after 3.5 years. A renewal assessment will be performed at renewal of the certificate. The objective of the periodical assessment is to verify that the conditions for the type approval are not altered since the type approval certificate was issued.
In case where the type approved product is manufactured at other companies, the periodical assessment shall verify that the type approval applicant has a quality control system for consistent production at their licensees/subcontractors. Furthermore, periodical assessment shall be carried out randomly at these companies.

Other Conditions:

1. 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 TAA000038A.
2. For driving of electrical generators, the ship's electrical system shall be designed and tested for multistep on-loading; refer to DNV Ships Pt.4 Ch.2 Sec.5 [1.6]. The load steps shall be selected to meet requirements for transient frequency variations; refer to DNV Ships Pt.4 Ch.2 Sec.5 [1.1].

END OF CERTIFICATE