

TYPE APPROVAL CERTIFICATE

Certificate No:
TAM00000YV**This is to certify:****That the Dual Fuel Engine**with type designation(s)
WL46DF(A,A3)

Issued to

Wartsila Italia S.p.A.
Trieste, Italy

is found to comply with

DNV GL rules for classification: Ships Pt.4 Ch.3 Sec.1 Reciprocating internal combustion engines**Application :**

propulsion / auxiliary

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

This Certificate is valid until **26th March, 2024**.Issued at **Hamburg** on **27th March, 2019**DNV GL local station: **Venice**for **DNV GL**Approval Engineer: **Jan Sell**

Burkhard Lilienthal
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.

Product description

four stroke, in-line engine, non-reversible, trunk-piston, with supercharging, with charge air cooling, constant-pressure charging system, direct injection, injection operation by cams (main diesel fuel), injection operation electronically controlled (gas and pilot fuel), valve operation by cams, dual fuel

Cylinder bore [mm]	460
Piston stroke [mm]	580
No. of cylinders	6, 7, 8, 9

Additional place of production

not applicable

Application/Limitation

Rated power [kW/cyl.]	1145
Rated speed [rpm]	600
Mean effective pressure [bar]	23.8
Max. firing pressure [bar]	230

Type Approval documentation

Tests carried out

Documentation:

Test report titel	TYPE TESTING RESULTS Wärtsilä W9L46DF - Serial no. PAAE320983
Place of test	Wärtsilä Italia S.p.A., Trieste, Italia
Date of test	2017-11-08 until 2017-11-13

Test engine:

Model	W9L46DFA
Serial no.	PAAE320983
No. of cylinders	9
Power [kW/cyl.]	1145
Speed [rpm]	600

Further tests:

- Functional Type Tests and Integration Test of UNIC DF system (see TAA00001KK) on W9L46DF, Serial no. PAAE320983, performed at Wärtsilä Italia S.p.A., Trieste, Italia, 2017-11-20 – 22.
- Second functional Type Tests of UNIC DF system on W9L46DF, Serial no. PAAE320983, performed at Wärtsilä Italia S.p.A., Trieste, Italia, 2017-12-14.

Marking of product

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

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 certificate. Documentation for engine safety, control (including speed governing), and monitoring systems shall be submitted for approval according to DNV GL Rules Ships Pt.4 Ch.9 Sec.1 Table 5 and/or as listed in relevant Type Approval certificates.

2. For single main propulsion application,
 - an actuator with integrated mechanical back-up speed control shall be installed for quantity fuel rack,
 - manual start, stop and speed setting shall be possible,
 - the engine safety, control and monitoring system shall have been tested and explicitly approved respectively type approved for single main engine applications,
 - integration test according to DNV GL Rules Pt.4 Ch.3 Sec.1 [2.16.4.5] shall have been carried out with the control system on the engine with focus on single main engine applications, and
 - it shall be documented that continuous engine operation at permissible operating parameters is ensured without limitations in the range of operation (power, speed) in case of control failure for waste gate, bypass, or VIC.
3. The explosion protection of the Woodward gas admission valves is not in compliance with the hazardous area zone definition of the IGF Code, paragraph 12.5.1 and -2. However, the applied measures, documented in the existing DBAE739336 "Risk analysis Woodward SOGAV 65, 105 and 250 installed on Wärtsilä Gas Engines", in addition to the existing explosion protection level of the valve are considered suitable for the intended use. Final acceptance shall be confirmed by the relevant flag state administration for ships subject to the IGF Code.
4. Oil mist detector having multiple sampling points to monitor the complete crankcase shall be installed as long as an alternative system (if applicable) or another oil mist detector is not particularly approved.
5. Arrangement of oil mist detection system and corresponding declaration of conformity from the supplier shall be submitted for approval for 6 and 7 cylinder engines as long as approval is pending for these cylinder configurations.
6. Propulsion system respectively power management system is to be designed according to engine load step/ramp capability.
7. For mechanical propeller drive applications, controllable pitch propellers shall be used.
8. Start and stop shall be performed in diesel mode. Start, stop and low load operation in gas mode are not covered by this certificate yet.

END OF CERTIFICATE