

TYPE APPROVAL CERTIFICATE

This is to certify:**That the Exhaust gas cleaning systems for the reduction of NOx**

with type designation(s)

SCR on engine for 2-stroke diesel engine CSSC WinGD 6X52

Issued to

**China Shipbuilding Power Engineering Institute Co., Ltd.
Shanghai, China**

is found to comply with

DNV GL class programme DNVGL-CP-0353 – Type Approval - Selective catalytic reduction systems**DNV GL rules for classification – Ships Pt.6 Ch.7 Environmental protection and pollution control****Application :****Product(s) approved by this certificate is/are accepted for installation on all vessels classed by DNV GL.****Design pressure: 4 bar(g) exh. gas, 10 bar(g) urea solution****Pressure drop: max. 100 mbar exh. gas****Design temperature: min. 310 °C, max. 550 °C exh. gas**Issued at **Hamburg** on **2021-08-09**This Certificate is valid until **2026-08-08**.for **DNV GL**DNV GL local station: **Shanghai**Approval Engineer: **Jan Sell**

**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 GL AS, its parent companies and subsidiaries as well as their officers, directors and employees ("DNV GL") 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 system is designed for reduction of NOx emissions from marine diesel engine exhaust gas.

Reactant is aqueous urea solution (40 %).

It consists of the following components:

Welded SCR reactor with 4 chambers including catalyst elements, reactor inlet-, outlet- and bypass valve(s) (louver valves), cylinder individual urea solution injection nozzles, urea solution supply pump unit, urea solution dosing unit, urea solution piping system, compressed air piping system, control air piping system, soot blowing system, exhaust waste gate, exhaust expansion joints, fresh water flushing piping system.

Overview of the system and the components is given in DAAD068604B, page 8.

All components of the system are mounted on the engine. The reactor is in the engine exhaust manifold between cylinder and turbocharger turbine (integrated part of the engine design).

Application/Limitation

Design temperature for preparation (heating up): min. 200 °C, max. 550 °C exh. gas

Sulphur content of the engine fuel oil shall not exceed 0.1 %. Heavy fuel oil (HFO) shall not be used during operation of the SCR system.

The system is approved for use on 2-stroke diesel engine CSSC WinGD 6X52.

The control and monitoring system incl. sensors and actuators of the SCR system are not covered by this type approval.

The emission reduction performance of the SCR system has not been verified.

Type Approval documentation

262.1-033582-1

Tests carried out

Type approval test of SCR on engine CSSC WinGD 6X52 (engine no. 1261, 11640 kW, 105 rpm), on 2021-06-15 – 16 at CSSC Dalian Marine Diesel Co., Ltd..

SCR main components used: SCR reactor LN-C08101, Injector complete with nozzle LN-C08102, Urea dosing unit LN-C08103, SCR catalytic elements LN-C08104, Injector nozzle LN-C08108, Louver valves V1, V2, V3 LN-C08105, Butterfly valve LN-C08106

Marking of product

The product shall as a minimum be marked with the manufacturer's name or trademark and the type designation as specified on the first page of this certificate.

Periodical assessment

Meetings on regularly basis and at least every second year shall be arranged with the Type Approval applicant (the designer of the SCR system) 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, if any. 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.

In cases where the type approved design is manufactured at other companies, DNV shall verify that the Type Approval applicant has a quality control system for consistent production at their licensees/subcontractors.

A renewal assessment will be performed at renewal of the certificate.

Refer to the Class Programme DNVGL-CP-0338.

Other Conditions

1. Dip trays shall be provided for components of the urea solution system which are often opened or where leakages are possible; DNV GL Rules Ships Pt.6 Ch.7 Sec.7 [4.1.6].
2. The control system for the urea injection shall automatically control the injection rate depending on the engine load to prevent excessive ammonia slip; DNV GL Rules Ships Pt.6 Ch.7 Sec.7 [5.2.12].
3. The control and monitoring system of the SCR system, incl. sensors and actuators, is not covered by this certificate. Documentation for the control and monitoring system shall be submitted for approval according to DNV GL Rules Ships Pt.6 Ch.7 Sec.7 Tab.3 and Pt.4 Ch.9 Sec.1 Tab.5 and/or as listed in relevant Type Approval certificates.
4. The following documentation shall be submitted for each installation:
 - Reference to this Type Approval Certificate
 - Conformity declaration for compliance with the type approved design and documentation/drawings.
 - Piping and instrumentation diagrams of ship systems connected to the SCR system; DNV GL Rules Ships Pt.6 Ch.7 Sec.7 Tab.3
5. Regular operation and inspection of the exhaust louver valves shall be performed to ensure operability any time; DNV GL Rules Ships Pt.6 Ch.7 Sec.7 [4.1.9]. A corresponding sign plate shall be fitted at the SCR and relevant instructions shall be given in the operation manual. Any findings on valves in service shall be reported to DNV.
6. An integration test shall have been carried out with engine type CSSC WinGD 6X52 to verify engine response in case of SCR system failures; DNV GL Rules Ships Pt.4 Ch.3 Sec.1 [1.5.5].
7. Evidence for testing of urea tank monitoring (tank temperature low, temperature high, level low, level high) shall be provided (pending item from type approval testing of SCR system).
8. Operation manual shall be provided (pending item from type approval process of SCR system). It shall also contain information about the content of condition 5.