

TYPE APPROVAL CERTIFICATE

This is to certify:

That the exhaust gas cleaning system for the reduction of NOx

with type designation(s)
SCR-Catamiser V/H 9 - 196

Issued to

GESAB
Göteborg, Sweden

is found to comply with

DNV GL class programme CP-0353 – Type Approval of selective catalytic reduction systems
DNV GL rules for classification – Ships Pt.4 Ch.6 Piping systems

Application :

Selective Catalytic Reduction (SCR) System with damper and soot blower arrangement.
Products approved by this certificate are accepted for installation on all vessels classed by DNV GL.

Design pressure: 2.2 bar (treatment fluid)
Pressure drop: 10-12 mbar (*approximated, see application/limitation)
Design temperature: 440 °C (exhaust) / 5-45 °C (treatment fluid)

This Certificate is valid until .

Issued at **Høvik** on

for **DNV GL**

DNV GL local station: **Høvik Machinery**

Approval Engineer: **Hans Jacob Horgen**

Torill Grimstad Osberg
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

The Gesab SCR system with soot blowing arrangement is designed for reduction of NOx emissions from multiple engine installations, applicable for engine power rated 400kW – 9000kW.

The SCR-Catamiser system consists of static mixer, dosing unit, valve unit, pumping unit, damper with sealing air arrangement, and vertical (V) or horizontal reactor (H) unit(s) with soot blower (if required) and a scalable number of catalyst modules (9 to 196).

Treatment fluid system:

1. Reactant: Aqueous urea solution (UREA 40%)
2. UREA Supply pump: Vertical multistage centrifugal pump, Grundfos CRN 1-3 (Design capacity 2.2 m³/h, 2.2 bar)
3. Pipe materials: Stainless Steel

Application/Limitation

- SCR bypass arrangements are not covered by this certificate. If bypass is required due to vessel machinery configuration, the arrangement shall be reviewed, ref. Rules for ships Pt.4 Ch.6 Sec.8 2.3.1 and 2.3.2.
- The damper valves for prevention of exhaust backflow into idle systems are provided with a sealing air arrangement which is evaluated to both prevent exhaust leakage and prevent and clean soot buildup, in accordance with Rules for ships Pt.4 Ch.6 Sec.8 2.3.9 and 2.3.10.
- The exhaust damper arrangement and the soot blowing arrangements covered by this type approval may not be required, depending on vessel configuration and fuel type. This shall be evaluated for each installation.
- Pipe dimensions and standards to be according to DNV Rules Pt.4 Ch.6 Sec.9
- Exhaust gas pressure drop across SCR system is calculated from mixer inlet to SCR outlet for the covered engine size range. The value is dependent on the vessel's engine characteristics, configuration and exhaust mass flow. Project specific calculation shall be made for each installation, according to DNV GL Rules Pt.4 Ch.6 Sec.8 2.3.7
- The following documentation shall in general be submitted for each installation on a DNV GL classed vessel, updated according to the vessel arrangement and configuration (See also DNV GL rules Pt.4 Ch.6 Sec.1):
 - P&ID for urea system
 - Arrangement and details of bypass valves/dampers, if applicable
 - Back pressure calculation according to DNV GL rules
 - Operation manual
- Below items are not scope of this Type Approval Certificate
 - NOx reduction capacity
 - Control and monitoring system (Covered by Type Approval certificate TAA0000066)
 - Urea storage arrangements, including tank instrumentation, filling, ventilation and sounding arrangements
 - Tube fittings and flexible hoses to be delivered with DNV GL type approval certificate.

Type Approval documentation

Tests carried out

Marking of product

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

Periodical assessment

For retention of the Type Approval, a DNV GL surveyor shall perform a survey every second year and before the expiry date of this certificate to verify that the conditions of the type approval are complied with.

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. The main scope of the Periodical Assessment will normally include:

- Verification of the Type Approval applicant's production and quality system w.r.t. ensuring continued consistent production of the Type Approved products at the Type Approval applicant's own premises and at other companies that are given the responsibility for manufacturing of the products.
- Review of the Type Approval documentation and that this is still used as basis for the production
- Review of possible changes to the design, the material and the performance of the product
- Verification of the product marking.

-END OF CERTIFICATE-