

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Exhaust gas cleaning systems for the reduction of NOx

with type designation(s)
VariNOx® VN

Issued to

Hug Engineering AG
Elsau, ZH, Switzerland

is found to comply with

DNV GL rules for classification – Ships Pt.6 Ch.7 Environmental protection and pollution control
DNV GL class programme DNVGL-CP-0353 – Type Approval - Selective catalytic reduction systems

Application :

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

Type:	Design pressure:	Pressure drop:	Design temperature:
VariNOx® VN	7 bar (supply pump VNR) 4 bar (piping system)	170 mbar (VariNOx® VN only) 310 mbar (VariNOx® VN with DPF)	max. 550 °C

Issued at **Hamburg** on **2021-08-10**

This Certificate is valid until **2026-08-09**.

DNV local station: **Essen**

Approval Engineer: **Wolfgang Schütz**

for **DNV**

.....
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 VariNOx® VN exhaust aftertreatment system (SCR) is designed for reduction of NOx emissions, applicable for diesel marine engines. It is intended for the use with main propulsion and auxiliary engines.

The VariNOx® VN exhaust aftertreatment system includes the following components:

- Control Unit (VNC)⁽¹⁾
- Reactant Supply Unit (VNR)
- Supply Pump Safety Cabinet (VNRE)⁽¹⁾⁽²⁾
- Dosing Unit (VND)
- Injector Units (VNI)
- Converter housing / mixing tube
- Auxiliaries

The following table specifies the components in more detail:

	Standard	OEM system	OEM system
Name (as indicated on VNC):	Control unit - Standard	Control unit - S0105	Control unit - S0014
Installation configuration (single system ("ss") or interconnected system ("is")) ⁽²⁾	"ss" / "is"	"ss" / "is"	"ss"
Control Unit (VNC) ⁽¹⁾	VNC24V VNC230V VNC400V	VNC24V VNC230V VNC400V	VNC24V VNC230V
Reactant Supply Unit (VNR)	VNR095 VNR125 VNR190	VNR095 VNR125 VNR190	VNR115 ⁽⁴⁾
Supply Pump Safety Cabinet (VNRE) ⁽¹⁾	VNRE ("is" only) ⁽²⁾	VNRE ("is" only) ⁽²⁾	-
Dosing Unit (VND)	VND003 VND006 VND012 VND025 VND050 VND080 VND115	VND003 VND006 VND012 VND025 VND050 VND080 VND115	VND012 VND025
Injector Units (VNI)	VNI030	VNI030	VNI030
Converter housing / mixing tube			
MCE / BIE	X	X	-
MCEA / BIE	X	X	-
MCEI / BRE	X	X	-
MCSI / -	X	X	-
MCEI / EP	X	X	-
MCEI / -	X	X	-
MCE / BSE	X	X	X
MCE / ES	X	X	-
MCI / -	X	X	-
CBHK / ES	X	X	-
CBHK / BSE	X	X	-
X = applicable, - = not applicable			
Auxiliaries			
Reactant Shut-off valve	RSV ("is" only) ⁽²⁾	RSV ("is" only) ⁽²⁾	-
Temperature sensor (TCB) ⁽³⁾	TCB201.1 TCB201.2	TCB201.1 TCB201.2	TCB201.1 TCB201.2
Air Mass Sensor (optional) ⁽³⁾	ME30	ME30	-
Sensor boxes ⁽³⁾	VNS1 VNS2	VNS1 VNS2	VNS1 VNS2
NOx Sensor ⁽³⁾	NOE1501	NOE1501	NOE1501
Differential Pressure Sensor ⁽³⁾	PEA100	PEA100	PEA100

- (1): For information only. Items covered by TAC TAA000030S
- (2): In a single system (*ss*), the one reactant supply unit (VNR) serves one dosing unit (VND). In an interconnected system (*is*), one reactant supply unit (VNR) serves more than one dosing units (VNDs).
- (3): For information only, items not part of TAC
- (4): VNR095 and VNR115 are identical

Not included in VariNOx® VN standard scope of delivery are:

- Urea storage tank incl. urea level detection
- Urea piping, shut-off valves, drain tray below pump module and filter (dip trays)
- Thermomechanical compensation

For reduction a 32.5% or 40% aqueous urea solution is used.

UREA Pressure (max. working pressure supply pump VNR): 7.0 bar

UREA Pressure (max. working pressure UREA piping system): 4.0 bar

Working temperature exhaust gas (max.): 550° C

Exhaust back pressure (max.): 170 mbar (VariNOx® VN only)

Exhaust back pressure (max.): 310 mbar (VariNOx® VN in combination with DPF)

Application/Limitation

- Pipe dimensions and standard to be according to DNV RU-Ships Pt.4 Ch.6
- The system is not approved for use with HFO (DNV RU-Ships Pt.6 Ch.7 Sec.7 [3.1.5])
- Hose assemblies and compensators are only to be used at locations where they are required for compensation of relative movements. They are to be kept as short as possible under consideration of the installation instructions of the hose manufacturer. The number of hose assemblies and compensators is to be kept to minimum (DNV RU-Ship Pt.4 Ch.6 Sec.9 [4.1.2])
- Exhaust gas bypass not required (DNV RU-Ships Pt.6 Ch.7 Sec.7 [4.1.2])

Below is not scope of this approval

- Control & monitoring system. Control and monitoring system covered by Type Approval Certificate TAA000030S
- Urea storage arrangements, including tank instrumentation, filling, ventilation and sounding arrangements. These shall be submitted for approval for each actual installation
- Drainage arrangements for urea tank/pump assembly spill tray
- Urea storage tank incl. urea level detection
- Urea piping, shut-off valves between the cabinets, drain tray below pump module and filter (drip trays)

Type Approval documentation / Tests carried out

[illegible]



Job Id: **262.1-034398-1**
Certificate No: **TAP00002CW**

[illegible]

Marking of product

The products are 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 periodical assessment after two years (+/- 90 days) and after 3.5 years (+/- 90 days) to verify that the conditions for the Type Approval are complied with. Refer to the Class Programme DNVGL-CP-0338, Sec.4.

Other conditions

1. SCR control and monitoring system is covered by certificate TAA000030S. Documentation for the control and monitoring system shall be submitted for approval as listed in Type Approval Certificate TAA000030S
2. The following documentation of each actual installation shall be submitted in each case:
 - Reference to this Type Approval Certificate
 - Information about engine type and intended use (e.g. propulsion, auxiliary, etc.)
 - Information of all pipes and hoses to be delivered by the yard as referenced in the installation manual and PIDs
 - Pressure drop calculation for the complete exhaust line
 - Urea storage arrangements, including tank instrumentation, filling, ventilation and sounding arrangements. These shall be submitted for approval for each installation
 - Drainage arrangements for urea tank/pump assembly spill trays

END OF CERTIFICATE