Certificate No:
TAA000030S

TYPE APPROVAL CERTIFICATE

This is to certify:

That the NOx Selective Catalytic Reduction Control System

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, offshore units, and high speed and light craft

Application :

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

Temperature	**A**
Humidity	**B**
Vibration	**A**
EMC	**A**
Enclosure	**B**

Issued at **Hamburg** on **2021-06-16**
This Certificate is valid until **2023-06-08**.
DNV local station: **Augsburg**

Approval Engineer: **Jens Dietrich**

for **DNV**

Joannis Papanuskas
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.

Place of production

Hug Engineering AG
Im Geren 14
CH-8352 Elsau
SWITZERLAND

Product description

Control- and Monitoring system for urea-based NOx Selective Catalytic Reduction system.
Related type approval for the piping part is TAP00002CW.

The SCR system includes the following components:

	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*"))(1)	"*ss*" / "*is*"	"*ss*" / "*is*"	"*ss*"
Control Units (VNC)	VNC24V VNC230V VNC400V	VNC24V VNC230V VNC400V	VNC24V VNC230V
Reactant Supply Unit (VNR)	VNR095 VNR125 VNR190	VNR095 VNR125 VNR190	VNR115(2)
Supply Pump Safety Cabinet (VNRE)	VNRE ("*is*" only)(1)	VNRE ("*is*" only)(1)	-
Dosing Unit (VND)	VND003 VND006 VND012 VND025 VND050 VND080 VND115	VND003 VND006 VND012 VND025 VND050 VND080 VND115	VND012 VND025
Injector Units (VNI)(3)	VNI030	VNI030	VNI030
Auxiliaries			
Reactant Shut-off valve	RSV ("*is*" only)(2)	RSV ("*is*" only)(2)	-
Temperature sensor (TCB) (4)	TCB201.1 TCB201.2	TCB201.1 TCB201.2	TCB201.1 TCB201.2
Air Mass Sensor (optional) (4)	ME30	ME30	-
Sensor boxes (4)	VNS1 VNS2	VNS1 VNS2	VNS1 VNS2
NOx Sensor (4)	NOE1501	NOE1501	NOE1501
Differential Pressure Sensor (4)	PEA100	PEA100	PEA100

(1): 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).
(2): VNR095 and VNR115 are identical
(3): For information only. Items covered by TAC TAP00002CW
(4): For information only, items not part of this TAC

VNC
PLC based control cabinet with or without HMI: Integrated touch panel TPM or Integrated display VNCD
-Emergency stop button
-Safety Relay
-Reset button

VNR
Connection box for reactant pump(s), deaeration valve and optional reactant quality sensor.

VNRE
Reactant supply Emergency Stop Unit (used only for interconnected system with shared urea supply pump).
-Control Relays

-Safety Relay

VND
Dosing cabinet for connection of:
-Injector drive for separation of air and reactant
-Pressure sensors
-Dosing valve(s)
-Air valve

Power supply variants:
24VDC utilizing DC/DC converter Phoenix Contact QUINT4-PS/24DC/24DC/10/SC **(TAA000027S)**
230VAC utilizing power supply PULS CP10.241 **(TAA00002YX)**
400VAC utilizing power supply PULS CT10.241 **(TAA00002YX).**

Interfaces:
-Relay output for alarms and warnings.
-Optional gateway CAN for customer monitoring system*
-Optional gateway Modbus RTU customer monitoring system*
-Optional gateway Modbus TCP customer monitoring system*
-CAN J1939 to NOx sensor and Inlet-/Outlet temperature sensors
-CAN J1939 to Engine Control
-Engine control signals
-Engine load signal
-Reactant shut-off valve (RSV), in case of interconnected system
-Mass flow meter signal
-Differential pressure over SCR catalyst signal
-CAN J1939 communication for VNC master/slave communication (for interconnected system only)

*) Alarm routing via communication mandatory in case of absence of local TPM.

SW-Versions: VNC Standard:
-VNC: VNC_V523
-TPM: TPM_V442
-VNCD: VNCD_V341

OEM SW-Versions: VNC S0014:
-VNC_V212_U_S0014
-TPM_V210_T_S0014

OEM SW-Versions: VNC S0105
-VNC_V510_C_S0105
-TPM_V440_A_S0105
-VNCD: VNCD_V341_A_S0105

Approval Conditions

This type approval is valid for place of production mentioned above.

For the Control- and Monitoring System the following documentation / information for the actual application is to be submitted for approval in each case:
- Reference to this Type Approval Certificate
- Software Revision used for the specific application
- System Cable Block Diagram
- Circuit diagrams
- List of Monitored Points
- Test checklist for product certification

The Type Approval covers hardware and software listed under Product description.

When the type approved software is revised (affecting all future deliveries) DNV is to be informed by forwarding updated software version documentation. If the changes are judged to affect functionality for which rule requirements apply a new functional type test may be required and the certificate may have to be renewed to identify the new software version.

Application/Limitation

-Manual emergency stop to be applied respectively according to document “Concept Emergency Stop for exhaust gas purification system VN (is), Interconnected System, V3.0” or “Concept Emergency Stop for exhaust gas purification system VN (ss), Single System, V3.0”.

-For the interconnected systems a reactant shut-off valve (RSV) per VND is mandatory.

-This type approval does not cover any exhaust gas damper or bypass control and monitoring.

-Evaluation of exhaust gas cleaning efficiency capabilities is not in the scope of this certificate.
Compliance with MARPOL Annex VI Reg.13 / NOx Technical Code and MEPC.291(71) is to be certified separately as applicable.

Product certificate
Each delivery of the application system is to be certified according to Pt.4 Ch.9 Sec.1. The certification test is to be performed at the manufacturer of the application system before the system is shipped to the yard. After the certification the clause for application software control will be put into force.

Application software control
All changes in software are to be recorded as long as the system is in use on board. Documentation of major changes is to be forwarded to DNV GL for evaluation and approval before implemented on board.

Tests carried out

Applicable tests according to DNV GL CG-0339, December 2019;
Functional performance test, witnessed 2021-06-11.

Marking of product

The cabinets are labelled as follows:
-Manufacturer
-Serial number
-Fabrication date
-Name Control Unit (VNC), Dosing System (VNDxxx.y), Reactant dosing unit VNREx.yyyV, VNR
-IP-rating
-Electric rating
-Software Version sticker

Periodical assessment

The scope of the periodical assessment is to verify that the conditions stipulated for the type are complied with, and that no alterations are made to the product design or choice of systems, software versions, components and/or materials.

The main elements of the assessment are:

- Ensure that type approved documentation is available
- Inspection of factory samples, selected at random from the production line (where practicable)
- Review of production and inspection routines, including test records from product sample tests and control routines
- Ensuring that systems, software versions, components and/or materials used comply with type approved documents and/or referenced system, software, component and material specifications
- Review of possible changes in design of systems, software versions, components, materials and/or performance, and make sure that such changes do not affect the type approval given
- Ensuring traceability between manufacturer’s product type marking and the type approval certificate

Periodical assessment is to be performed at renewal of the certificate.

END OF CERTIFICATE