TYPE APPROVAL CERTIFICATE

Certificate No:
TAM00000JU

This is to certify:

That the Diesel Engine

with type designation(s)
4 V/AD 158/222

Issued to
Doosan Infracore Co., Ltd.
Incheon, Republic of Korea

is found to comply with
DNV GL Rules for classification – Ships Pt4 Ch3 Sec1, Reciprocating internal combustion engines
DNV GL Rules for classification – High speed and light craft Pt4 Ch3 Sec1 Reciprocating internal combustion engines

Application :

Propulsion / auxiliary / emergency

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

This Certificate is valid until **30th June, 2022**.

Issued at **Høvik** on **3rd August, 2017**
DNV GL local station: **Seoul** for **DNV GL**

Approval Engineer: **Dag Harald Williksen**

Oddvar Deinboll
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.

Job Id: **262.1-005098-3**
Certificate No: **TAM00000JU**

Product description
four stroke, v-engine, non-reversible, trunk-piston, with supercharging, constant-pressure charging system, direct injection, injection operation by cams, 2 valves per cylinder valve operation by cams, liquid fuel

Cylinder bore : 128
Piston stroke : 142
No. of cylinders : 8 and 12

Additional place of production
not applicable

Application/Limitation
The approval is valid for propulsion, auxiliary and emergency duty and is based on the following main data:

Propulsion:

Engine model	4V158TIH	4V158TIM	4V158TIL	4V222TIH	4V222TIM	4V222TIL
Mean indicated pressure (bar)	17,8	17,2	21,0	17,9	16,8	21,0
Max. cylinder pressure (bar)	125	130	150	125	130	150
Rated continous output (kW)	390	441	588	588	647	883
Corresponding to (RPM):	1800	2100	2300	1800	2100	2300

Auxiliary/Emergency:

Engine model	4AD158TIF	4AD158TIS	4AD222TIF	4AD222TIS
Mean indicated pressure (bar)	17,8	17,8	17,9	17,9
Max. cylinder pressure (bar)	138	125	138	125
Rated continous output (kW)	325	390	491	588
Corresponding to (RPM):	1500	1800	1500	1800

Type Approval documentation

Tests carried out
Documentation:

Test report titel	Type Approval Test for AD158TIS Diesel Engine Official Test
Place of test	GPC, Gimhae, Korea, Testbed No. 1
Date of test	2012-03-20 until 2012-03-21

Test engine:

Model	AD158TIS
Serial no.	EAZEG203279
No. of cylinders	8
Power [kW/cyl.]	44,1
Speed [rpm]	1800

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

Foundation arrangement to be submitted for each installation according to the Rules, Pt. 4 Ch.3 Sec.1 [1.4] - Documentation of arrangement.

Torsional vibration calculations to be submitted for each installation according to the Rules Pt.4 Ch.2 Sec.2 - Torsional Vibrations.

Signboards according to the Rules Pt.4 Ch.3 Sec.1 [2.3.6] - Warning Notice.
Flexible hoses with couplings to be type approved by DNV GL.

Engine safety, control and monitoring systems, including sensors and actuators are not covered by this type approval certificate. Documentation for engine safety, control including speed governing and monitoring systems shall be submitted for approval according to the rules Pt.4 Ch.9 Sec.1 Table 5 - Documentation requirements.

Electric cables and cabling are not covered by this approval and must be verified to comply to the rules Pt.4 Ch.8 - Electrical Installation.

END OF CERTIFICATE