

TYPE APPROVAL CERTIFICATE

This is to certify:

That the Gas Valve Unit

with type designation(s)
iGPR-2.5, iGPR-5.2, iGPR-9.6

Issued to

Winterthur Gas & Diesel Ltd.
Winterthur, ZH, Switzerland

is found to comply with

DNV GL rules for classification – Ships Pt.4 Ch.3 Sec.1 Reciprocating internal combustion engines
DNV GL rules for classification – Ships Pt.6 Ch.2 Sec.5 Gas fuelled ship installations – Gas fuelled LNG

Application :

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

Type	Inlet pressure [bar]	Size [Ø mm]	Enclosure [enclosed/open]
iGPR-2.5	16 bar	DN 50	Double walled
iGPR-5.2	16 bar	DN 80	double walled
iGPR-9.6	16 bar	DN 125	double walled

Issued at **Hamburg** on **2021-11-15**

This Certificate is valid until **2026-11-14**.

for **DNV**

DNV local station: **Augsburg**

Approval Engineer: **Guido Friederich**

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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 integrated Gas Pressure Regulation- iGPR is designed for gas pressure and mass flow control on WinGD two-stroke dual-fuel (DF) engines. The iGPR is designed as an essential part of the WinGD X-DF engines. The iGPR operation is carried out by the engine control system (ECS). Three following iGPR designs are covered within this type approval:

- iGPR-2.5, - iGPR-5.2, - iGPR-9.6

iGPR - Design data and specification

WinGD engines suitable for iGPR-2.5	5-8RT-flex50DF, 5-8X52DF, 5-7X62DF, 5X72DF		
WinGD engines suitable for iGPR-5.2	6-8X72DF, 6-9X82DF		
WinGD engines suitable for iGPR-9.6	6-12X92DF		
Gas fuel type iGPR - Machinery safety concept iGPR design features	Methane, VOC GAS-SAFE design iGPR designed with double walled pipe system, integrated double walled gas pressure control valve, double walled double-block-and bleed valve, double walled flow meter.		
Safety functions and devices connected to the Engine Safety System (EES) Valve design and operation iGPR Electronic control system	Gas pressure sensor Gas temperature sensor Double-wall airflow sensor Flow meter pressure switch Double walled, pneumatic actuated and electronic controlled iGPR-Control (based on UNIC-flex components)		
iGPR - Nominal size (DN)	iGPR-2.5	iGPR-5.2	iGPR-9.6
Design pressure / gas inlet pressure	DN 50 16 bar	DN 80 16 bar	DN 125 16 bar
Gas output pressure	15 bar	15 bar	15 bar
Maximum gas flow rate	2.500 kg/hr	5.200 kg/hr	9.600 kg/hr

Application/Limitation

Gas pressure and flow control unit to be used and installed on WinGD X-DF engines.
Operating medium: Methane, air, nitrogen.

Limitation

iGPR not approved for operation with gaseous hydrogen (H₂)

Type Approval documentation

iGPR Approved design documentation filed under relevant DNV Job identification numbers (Job ID)

iGPR Type	DNV NPS Job ID	Approval date
iGPR-2.5	262.1-033694-1	2020-05-18
iGPR-5.2	262.1-034032-1	2020-08-26
iGPR-9.6	262.1-034705-1	2020-11-27

- WinGD Type Approval Test Procedure (TAT)
- WinGD Type Approval Test Procedure (TAT) - Test protocols. Test step no. 1 to test step no.7
- Type Approval Test (TAT) Instruction - Dual Fuel Engine with WiCE
- WinGD Type Approval Test Report, dated 2021-04-12
- Type Approval Assessment Report, dated 2021-11-12
- Scope and list of approved iGPR design documentation for all iGPR types:
See confidential attachment to this type approval certificate – Not issued for public information

Tests carried out

Test of iGPR performed with installation on WinGD engine 7X82DF-1.0.

Engine designer: Winterthur Gas & Diesel Ltd. (WIN GD); CH - 8401 Winterthur / Switzerland
Test engine / engine no: 7X82DF-1.0 / CSS043
Place of test: China Shipbuilding Industry Corporation Diesel Engine Co., Ltd.
Peoples Republic of China
iGPR type for test: iGPR-5.2

<u>Test standards:</u> DNV GL Rules Pt.4 Ch.3, Section 1 "Reciprocating internal combustion engines" DNV GL CP 0186 – Valves DNV Approved WinGD Type Approval Test (TAT) procedure		Integrated Gas Pressure Regulation (iGPR) iGPR Reference test specimen: iGPR-5.2
Type of Test		Scope of test
Hydrostatic pressure test DNV GL Rules Pt.4 Ch.3, Section 1		Strength test of piping systems and valves Test pressure in amount of 1,5 times the design pressure
Visual inspection of iGPR-5.2 prior to test		Visual inspection with satisfactory results on accordance with iGPR-5.2 drawings, assembly quality, satisfactory fabrication of single parts. Check for correct iGPR installation by WinGD engine test staff
WinGD Type Approval Test (TAT)		Scope of iGPR test
Test step no.	1 2 3 4 5 6 7	▪ Preparation of test procedures / check for correct iGPR installation ▪ Verification of Performed Safety Test of DF engine and iGPR ▪ Verification of Performed Load Tests of DF engine and iGPR ▪ Failure Tests of iGPR Valves ▪ Failure Tests of iGPR Modules ▪ Failure Tests of iGPR Bus Connections ▪ Failure Tests of iGPR Signals
Performance and results of tests		All visual inspections and tests of iGPR witnessed by a DNV GL Surveyor. Additional witness of iGPR test by design approval engineer via remote survey Tests performed with positive results without objections
Scope of WinGD 7X82DF-1.0 engine tests successfully carried including installed iGPR subjected to above specified and performed tests		▪ Safety Tests for Diesel Engines and Dual Fuel Engines ▪ Dual Fuel Engine Specific Safety Tests at Test Bed ▪ Safety Test of Gas Detection System at Test Bed ▪ Safety Test of iGPR at Test Bed ▪ Gas Related Safety Tests for Dual Fuel Engines at Test Bed ▪ Gas Related Functional Tests for Dual Fuel Engines at Test Bed ▪ Engine load tests in gas mode.

Marking of product

Each iGPR is to be provided with a name plate with at least following minimum data:

- Manufacturer's name or trademark
- Manufacturers iGPR type
- Nominal inlet and outlet size
- Direction of flow

Place of manufacturing

HANJIN IND. CO., LTD.

1981-48, Yangsan-daero, Habuk-myeon,
Yangsan-si, Gyeongsangnam-do,

Zip-code: 50509

KOREA

Tel : 82 - 55 - 375 - 4004

Fax : 82 - 55 - 375 - 4010

E-mail : nom0909@hanjinind.co.kr

H-page : <http://www.hanjinind.co.kr>

Periodical assessment

For retention of the Type Approval, a DNV GL Surveyor shall perform periodical assessment to verify that the conditions for the Type Approval are complied with. Refer to the Class Programme DNVGL-CP-0338, Sec.4.

To check the validity of this certificate, please look it up in <https://approvalfinder.dnvgl.com>

End of certificate

Confidential attachment - Following seven confidential pages (Empty pages for persons outside WinGD)



Job Id: **262.1-034032-1**
Certificate No: **TAM0000187**



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