Driven by technology.
Built to endure.

Gas&Methanol SUSTAINABLE

PRODUCT CATALOG

Presented by VMAN Engine, where power meets precision.

Year **2026**
01st Edition

ABOUT VMAN ENGINE

VMAN is a highly professional engine manufacturing enterprise based in Shanghai, integrating design, research and development, production, and sales into one cohesive operation. Founded in 2007, the company initially imported high-power diesel engine technology. Through continuous overseas study and the localization of parts assembly (CKD) for imported machines (CBU), VMAN has built a skilled and cohesive team.

The company consistently develops new products, adopts advanced manufacturing technologies, utilizes sophisticated production equipment, and leverages extensive production management experience and modern testing methods to establish the VMAN brand as a benchmark of excellence. Every product is strictly controlled across all stages, including design, procurement, technology, field operations, and quality, ensuring compliance with both domestic and international standards.

VMAN's product portfolio spans from construction machinery, generator sets, marine applications, and more, covering both diesel and gas engines. The power range extends from 25 kW to 2020 kW, with future plans to expand up to 3700 kW. All engines meet Stage II and Stage III emission standards.

Headquartered in Shanghai, VMAN operates a manufacturing facility in Changzhou, China. Additionally, the company has a branch in Singapore and is planning to establish a European branch in the near future.

Manufacturer

The **VMAN Engine** boasts a fully advanced manufacturing process and a robust quality management system. Equipped with state-of-the-art facilities and extensive experience in modern production management, we maintain a rigorous approach to part assembly and debugging to prevent leaks of gas, water, and oil. Every engine undergoes a standardized leak test to ensure the highest tightening quality. Additionally, we utilize ESTIC technology (Japanese Nut Runner Machines) for all critical bolts. Each engine is thoroughly debugged and tested before being released to the market.

Utilization of Advanced Technology

All testing equipment is imported from renowned engine manufacturers. Every engine must meet stringent technical standards during on-site trials.

Multi-Level Testing and 110% Load Testing

Each engine undergoes multi-level testing tailored to customer requirements. Additionally, it is subjected to 110% load testing, as well as sudden loading and unloading tests, to ensure the highest quality and reliability.

ISO 9001:2015 Certified Quality Management System

Our production line incorporates advanced methods, including automated delivery systems, rotary carriers, cylinder press fitting, and front-rear oil seal press fitting, to ensure precise control over production and quality.

History & Product Overview

High-Performance Platform

Electric Output: 200 kWe - 250 kWe

- Engine platform designed and developed by AVL (Austria)
- High-strength inline 6-cylinder block
- Symmetrical gantry frame with deep-skirt structure
- Four-stroke, four-valve cylinder head
- Double water-jacket cooling system
- Overhead camshaft design
- Low lubricating oil consumption
- Key components sourced from global leading brands

Applications: Continuous Operation / High-Load Conditions

◀ CET Series Gas Engine

Compact & Efficient Platform

Electric Output: 50 kWe - 100 kWe

- Independently developed by VMAN
- Small-bore inline 4-cylinder and 6-cylinder configuration
- Four-valve structure for improved intake and exhaust efficiency
- Optimized combustion and fuel economy
- Equipped with Woodward control system
- Compact structure, small footprint, space-saving design

Applications: Small-Scale Distributed Energy / Commercial & Industrial Use

◀ CT Series Gas Engine

2007

IMPORTING TECHNOLOGY
& INTERPRETATION

Technical Development

LEARNING & TRAINING

5 times staff training abroad
4 times professors to our factory for guidance

2009

CKD & CBU DIESEL ENGINES
BUILD NEW FACTORY IN SHANGHAI

Realize home manufacture and finish all series of V6 V8 V12 V16 engine and get excellent feedback from customers

2016

START INTERNATIONAL BUSINESS

Launched upgraded R&D for the DT Series gas Engine. Models DT15/22/30 deployed in Poland to commence a 64,000-hour full lifecycle test.

2019 NEW FACTORY FOR D SERIES ENGINE

MANUFACTORY LINE USE ADVANCED METHODS

Including auto-delivery, rotary carriers, cylinder press fitting and front-rear oil seal press fitting, etc.
To further control production and quality.

History & Product Overview

Proven CHP Platform

Electric Output: 250 kWe – 1200 kWe

- Developed based on a European benchmark engine platform
- 90° V-type cylinder configuration with modular single-cylinder maintenance
- Individual Cylinder Heads
- 130 mm / 170 mm "golden ratio" bore platform
- Optimized for CHP applications with full life-cycle validation in Europe
- Compatible with natural gas, biogas, LPG, ammonia, and variable-composition fuels
- Time to first overhaul: up to 64,000 hours
- Total global installed capacity exceeding 250 MW

Applications: Distributed Energy / CHP / Medium & Large Power Plants

◀ **DT Series Gas Engine**

Newly developed HMM Series Methanol Engine

Electric Output: 100kWe - 280kWe

- Designed based on VMAN CET series
- Bosch Control System
- Environmental Friendly - Engineered for Efficiency, Designed for the Planet

◀ **HMM Series Methanol Engine**

Ongoing Research and Development
For next-generation solutions.

40+
Countries/Regions
Clients Approved

2020

EXPAND ASIAN MARKET

VMAN Engine Singapore Pt, Ltd set up.
Technical training and service support for the global market.

FURTHER EXPAND THE PRODUCT RANGE

New C&CE series Engines and put to the market.Extend full power range from 62kW to 1,100kW.

2024

IMPROVEMENT AND NEW PRODUCTS

Launch of DE58 and DT58 series engine.
Expanding power range to 2,222 kW for diesel engines, and 1,350KW for gas engines.

INNOVATION IN METHANOL ENGINES

As the world increasingly focuses on the development of sustainable energy, VMAN has launched environmentally friendly engines fueled by methanol. Combine stable combustion with clean energy output, providing global clients with a reliable pathway to lower carbon emissions.

From 2025

MORE CHOICES OF ENGINES

VMAN enhances its alternative fuel engine lineup. The new DT Series gas engines—DT15, DT22, and DT30+—deliver an expanded power spectrum, enabling tailored solutions for a wider array of customer applications.

METHANOL ENGINES - 100-280KWE

HMM06F and HMM13F Series

VMAN Methanol Engine

BOSCH

Model	Type	Speed (rpm)	Electrical power (kWe)	Disp. (L)	Size (mm)	Flywheel
HMM06FA	L4	1500	100	5.91	1332 x 828 x 1209	SAE 1#14
HMM13FA	L6		280	12.82	1814 x 1100 x 1549	
HMM06FB	L4	1800	100	6.5	1332 x 828 x 1209	
HMM13FB	L6		280	12.82	1814 x 1100 x 1549	

HMM06F Methanol Engine

HMM06F is a turbocharged, inter-cooled methanol engine designed for power generation. Available in 1500rpm and 1800rpm models, it delivers 122kW of engine power and 100kW of electrical output. Key features include manifold injection for M100 methanol fuel, a compact four-cylinder design, and a comprehensive electronic management system. Its high efficiency is demonstrated by a fuel consumption of 49 kg/h at full load, making it a sustainable solution for prime or standby power applications.

Ratings Of Engine	1500rpm	1800rpm
	HMM06FA	HMM06FB
Engine Power	122kW	122kW
Electrical Power (COP)	100kWe	100kWe
Electrical efficiency *	38.31%	38.31%
Thermal efficiency *	44.04%	44.04%
Total efficiency *	82.36%	82.36%

GENERAL ENGINE DATA

Engine Model	HMM06FA	HMM06FB
Engine Type	Line-type 4-Cylinder, Water-cooling, Turbocharged, Inter-cooled	
Speed	1500 rpm	1800 rpm
Bore x stroke	112 × 150 mm	
Displacement	5.91 L	
Compression ratio	12.5:1	
Rotation (Looking at flywheel)	Counter clockwise (CCW)	
Firing order	1-3-4-2	
Dry weight (W/O cooling system)	560 kg	
Dimension (L x W x H)	1332 x 828 x 1209 mm	
Flywheel housing	SAE 1#	
Flywheel	SAE 14#	
Fuel system	Manifold injection	
Fuel type	M100 Methanol	
Injector Advance Angle	Electronic	
Combustion Strategy	Stoichiometric Combustion	

HMM06F Methanol Engine

INTAKE SYSTEM

Charge temperature @rated output	50°C
Intake depression	3.6 kPa
Intercooled pressure loss @rated output	≤ 10 kPa
Inlet flow @rated output	520 kg/h
Maximum intake resistance with clean filter element	3.5 kPa
Maximum intake resistance with dirty filter element	6.5 kPa

EXHAUST SYSTEM

Exhaust back pressure loss @rated output	10 kPa
Exhaust flow @rated output	580 kg/h
Maximum exhaust temperature (Before turbo)	750°C
Maximum exhaust temperature (After turbo)	650°C

COOLING SYSTEM

Engine Model	HMM06FA	HMM06FB
Maximum coolant temperature	100°C	
Thermostat(Modulating) range	85 to 95°C	
Heat loss from the cooling system	80 kW	
Coolant flow rate	236 L/min	262 L/min
Intercooler dissipates heat	13 kW	
Allowable intake air temperature of intercooler	170°C	
Maximum air intake of intercooler	520 kg/h	

LUBRICATION SYSTEM

Maximum oil temperature	≤120°C
Oil pressure @ idle speed	>100 kPa
Oil pressure @ rated speed	700 kPa
Oil pan allows dip Angle	5°
Oil capacity	18 - 22 L

HMM06F Methanol Engine

FUEL SYSTEM

Methanol pump injection pressure	500 kPa	
Methanol Maximum supply fuel pressure	13.5 kPa	
Governor	Electric type	
Fuel pump	Electrical	
Fuel filter	Methanol filter	
Methanol consumption of generator set	Loading (kWe)	Methanol consumption (kg/h)
25% load	25	16
50% load	50	29
75% load	75	40
100% load	100	49
Fuel consumption of HMM06F methanol engine	410 g/kWh (methanol) at 100% load	

ELECTRICAL SYSTEM

Generator	2.24kW / 28V (80A)
Voltage regulator	Inline, Integrated circuit regulator
Starting motor	7 kW / 24V
Battery voltage	24 V
Battery capacity	2×150 AH

VALVE SYSTEM

Type	Overhead valve type
Number of valve	Intake 2, Exhaust 2 per cylinder
Valve lashes at cold	Intake 0.4±0.05 mm, Exhaust 0.6±0.05 mm

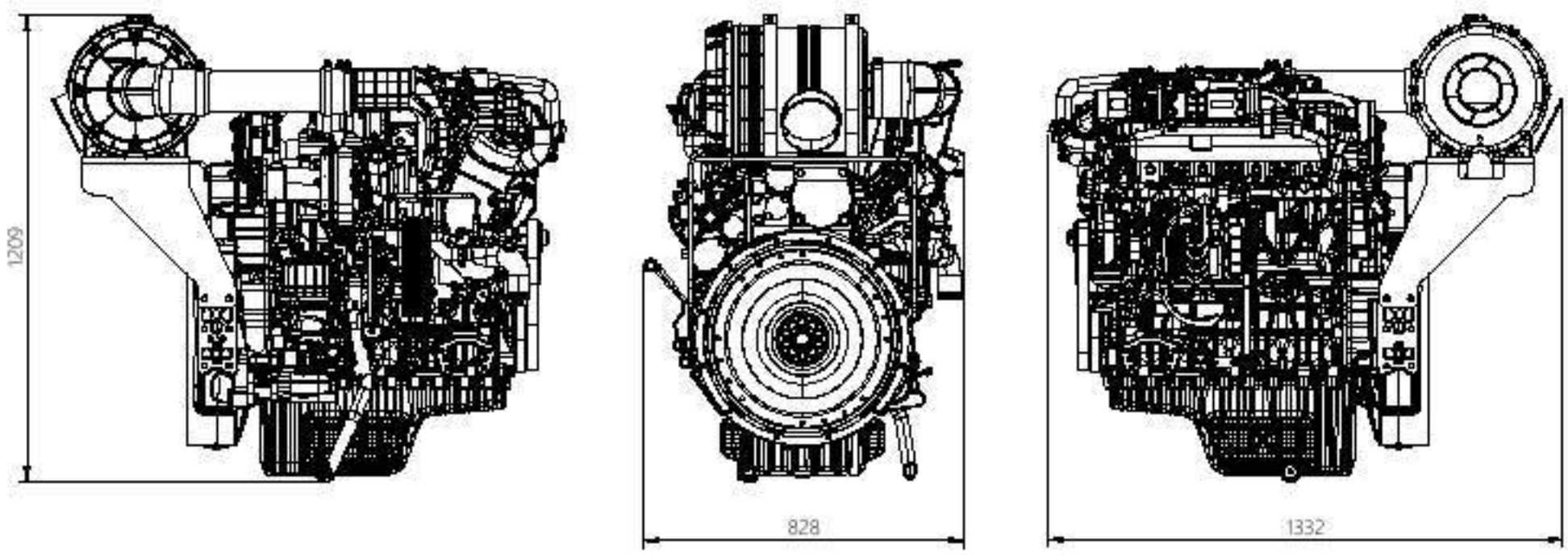
HMM06F Methanol Engine

TECHNOLOGY BULLETIN OF HMM06F METHANOL ENGINE EMISSION DATA

After-Treatment Device: Three-Way Catalytic								
Weighting Factor	0.05	0.25	0.3	0.3	0.1	Σ(weighted val.)	Emission (val.)	StageV (val.)
Power_kW	100	75	50	25	10	47.25	g/kWh	g/kWh
CO_g/h	14.25	11.17	8.73	6.78	5.34	8.692	0.184 ↓	3.5
THC_g/h	4.27	3.77	2.66	1.23	0.53	2.376	0.050 ↓	0.19
Nox_g/h	17.31	9.62	5.72	6.41	3.11	7.221	0.153 ↓	0.4

Demonstrating exceptional environmental performance, the engine's emissions are **62-95% below EU Stage V limits**, ensuring full compliance with a substantial future-ready margin.

HMM06F SERIES METHANOL ENGINE DRAWING



** All ratings are based on operating conditions specified in ISO 8528-1:2018. Performance tolerance: ±4%.*

** Reference test conditions: 100 kPa atmospheric pressure, 25°C air inlet temperature, 30% relative humidity, as defined in ISO 3046-1. Derating may be required under non-standard ambient conditions; please consult the manufacturer for site-specific performance adjustments*

**. Engine output power represent net engine power per ISO 3046-1, including essential auxiliaries (fuel injection pump, water pump, and lubricating oil pump). Excluded: battery charging alternator, cooling fan, and optional equipment;*

**. Exhaust emissions comply with EU Stage V requirements under Regulation (EU) 2016/1628 (or specify other applicable standard, e.g., U.S. EPA Tier 4 Final)*

HMM13F Methanol Engine

HMM13F is a robust methanol-fueled engine designed for demanding power generation. This turbocharged, inter-cooled 6-cylinder unit delivers prime, standby, and continuous power up to 352kW, 320kW, and 256kW respectively at 1500rpm. It features advanced electronic injection for M100 methanol and a sophisticated four-valve design. The engine is engineered for efficiency, with a fuel consumption of 145 kg/h at its rated 320kW standby load, making it an ideal choice for reliable prime or backup power applications.

Ratings Of Engine	1500rpm	1800rpm
	HMM13F	HMM13FB
Engine Power	310kW	310kW
Electrical Power (COP)	280kWe	280kWe
Electrical efficiency *	38.30%	38.30%
Thermal efficiency *	44.45%	44.45%
Total efficiency *	82.75%	82.75%

GENERAL ENGINE DATA

Engine Model	HMM13F
Engine Type	Line-type 6-Cylinder, Water-cooling, Turbocharged , Inter-cooled
Speed	1500 rpm
Bore x stroke	130 × 161 mm
Displacement	12.82 L
Compression ratio	12.5 : 1
Rotation {Looking at flywheel}	Counter clockwise {CCW}
Firing order	1-5-3-6-2-4
Dry weight {W/O cooling system}	1173 kg
Dimension {L x W x H}	1814 x 1100 x 1549 mm
Flywheel housing	SAE 1#
Flywheel	SAE 14#
Fuel system	Manifold injection
Fuel type	Methanol
Injector Advance Angle	Electronic
Combustion Strategy	Stoichiometric Combustion

- Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m

HMM13F Methanol Engine

INTAKE SYSTEM

Charge temperature @rated output	50°C
Intake depression	3.6kPa
Intercooled pressure loss @rated output	11kPa to 13kPa
Inlet flow @rated output	1450kg/h
Maximum intake resistance with clean filter element	3.5kPa
Maximum intake resistance with dirty filter element	6.5kPa

EXHAUST SYSTEM

Exhaust back pressure loss @rated output	12kPa
Exhaust flow @rated output	1580kg/h
Maximum exhaust temperature (Before turbo)	750°C
Maximum exhaust temperature (After turbo)	650°C

COOLING SYSTEM

Engine Model	HMM13FA	HMM13FB
Maximum coolant temperature	104°C	
Thermostat(Modulating) range	85 to 95°C	
Heat loss from the cooling system	199kW	
Coolant flow rate	425L/min	525L/min
Intercooler dissipates heat	47kW	
Allowable intake air temperature of intercooler	194°C	
Maximum air intake of intercooler	1450kg/h	

LUBRICATION SYSTEM

Maximum oil temperature	≤120°C
Oil pressure @ idle speed	>130kPa
Oil pressure @ rated speed	500kPa
Oil pan allows dip Angle	5°
Oil capacity	41L

HMM13F Methanol Engine

FUEL SYSTEM

Methanol pump injection pressure	550kPa	
Methanol Maximum supply fuel pressure	13.5kPa	
Governor	Electric type	
Fuel pump	Electrical	
Fuel filter	Methanol filter	
Methanol consumption of generator set	Loading (kWe)	Methanol consumption (kg/h)
25% load	70	44
50% load	140	78
75% load	210	109
100% load	280	133
Fuel consumption of HMM13F methanol engine	449 g/kWh (methanol) at 100% load	

ELECTRICAL SYSTEM

Engine Model	HMM13F
Generator	2.24kW/28V (80A)
Voltage regulator	Inline, Integrated circuit regulator
Starting motor	7.5 kW/24V
Battery voltage	24 V
Battery capacity	2×150 AH

VALVE SYSTEM

Type	Overhead valve type
Number of valve	Intake 2, exhaust 2 per cylinder
Valve lashes at cold	Intake 0.4 mm, Exhaust 0.65 mm

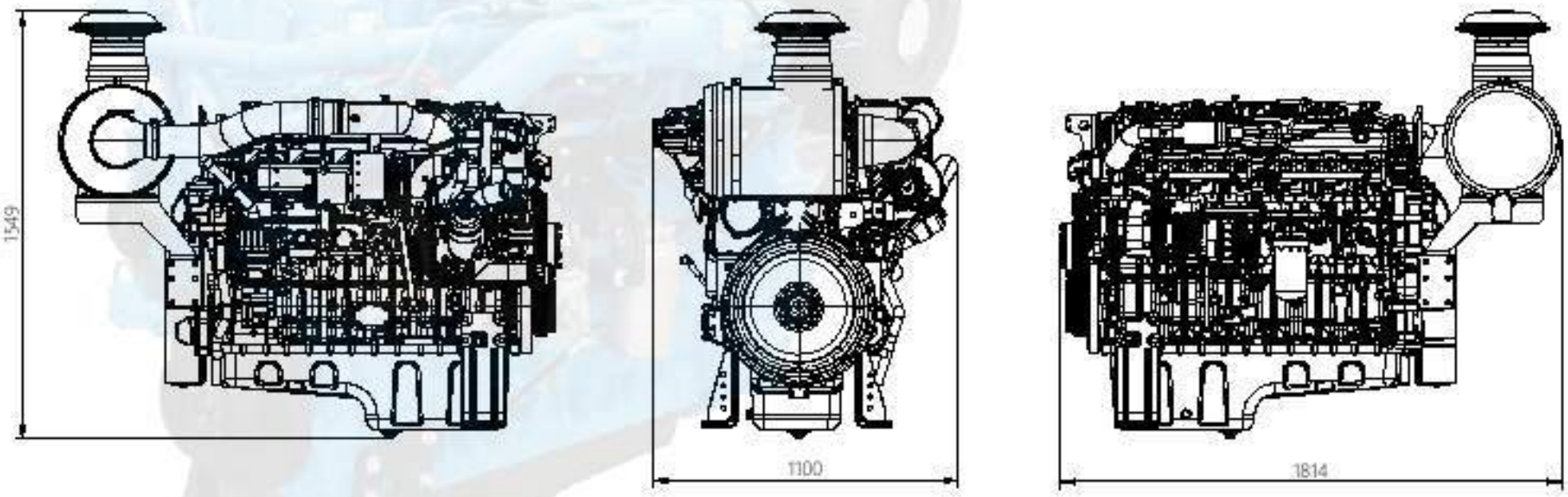
HMM13F Methanol Engine

TECHNOLOGY BULLETIN OF HMM13F METHANOL ENGINE EMISSION DATA

After-Treatment Device: Three-Way Catalytic								
Weighting Factor	0.05	0.25	0.3	0.3	0.1	Σ(weighted val.)	Emission (val.)	StageV (val.)
Power_kW	260.00	195.00	130.00	78.00	26.00	126.75	g/kWh ↓	g/kWh
CO_g/h	54.667	42.746	30.89	26.61	9.68	31.638	0.250 ↓	3.5
THC_g/h	16.954	13.543	8.49	4.315	1.759	8.251	0.065 ↓	0.19
Nox_g/h	476	97	1.1	0.7	0.15	48.605	0.383 ↓	0.4

Demonstrating exceptional environmental performance, the engine's emissions are **4-93% below EU Stage V limits**, ensuring full compliance with a substantial future-ready margin.

HMM13F SERIES METHANOL ENGINE DRAWING



** All ratings are based on operating conditions specified in ISO 8528-1:2018. Performance tolerance: ±4%.*

** Reference test conditions: 100 kPa atmospheric pressure, 25°C air inlet temperature, 30% relative humidity, as defined in ISO 3046-1. Derating may be required under non-standard ambient conditions; please consult the manufacturer for site-specific performance adjustments.*

**. Engine output power represent net engine power per ISO 3046-1, including essential auxiliaries (fuel injection pump, water pump, and lubricating oil pump). Excluded: battery charging alternator, cooling fan, and optional equipment;*

**. Exhaust emissions comply with EU Stage V requirements under Regulation (EU) 2016/1628 (or specify other applicable standard, e.g., U.S. EPA Tier 4 Final)*

VMAN Gas Engine

Model	Type	Speed (rpm)	Electrical power (kWe)	Thermal output (kW)	Disp. (L)	Size (mm)	Flywheel
CT07A	L6	1500	100	115	6.5	1212 x 841 x 1146	SAE 3#11.5
CET13A	L6		250	282	12.80	1360 x 898 x 1138	SAE 1#14
DT15A-NG	V8		280	341	15.07	1867x1410x1561	
DT15A-BG	V8		250	327			
DT22A	V12		400	460	22.61	1717 x1392 x1360	
DT30A	V16		500	641	30.14	1887 x 1120 x 1362	
DT30A+			550	581		2181 x 1308 x 1655	
DT58A	V12		1200	1231	57.2	2526 × 1781 × 2109	SAE 00# 21
CT07B	L6	1800	100	115	6.5	1212 x 841 x 1146	SAE 3#11.5
CET13B	L6		250	282	12.80	1360 x 898 x 1138	SAE 1#14
DT15B-NG	V8		280	341	15.07	1867x1410x1561	
DT15B-BG	V8		250	327			
DT22B	V12		400	460	22.61	1717 x1392 x1360	
DT30B	V16		500	641	30.14	1887 x 1120 x 1362	
DT30B+			550	581		2181 x 1308 x 1655	
DT58B	V12		1200	1231	57.2	2526 × 1781 × 2109	SAE 00# 21

CT07 Gas Engine

INTRODUCTION

CT series gas engine developed independently by VMAN is a classic product. It is characterized by energy-saving and environmental-friendly, excellent performance, compact structure, reliable and durable.The indexes, such as pollutant emission, dynamic performance, economy, and reliability, reach the international advanced level.

The CT07 gas engine uses Woodward gas engine control system to ensure stable and reliable engine operation.

Ratings	1500rpm / 50Hz	1800rpm / 60Hz
	CT07A	CT07B
Electrical power (kWe)	100	100
Thermal output (kW)	115	115
Electrical efficiency *	38.31%	38.31%
Thermal efficiency *	44.14%	44.14%
Total efficiency *	82.45%	82.45%

GENERAL ENGINE DATA

Engine Model	CT07A	CT07B
Engine Type	6 cylinder, Inline-type, Turbo charged & intercooled (air to air)	
Speed	1500 rpm	1800rpm
Bore x stroke	105 x 124 mm	
Number of valve per cylinder	4	
Displacement	6.5 L	
Compression ratio	10.5 : 1	10.5 : 1
Rotation {Looking at flywheel}	Counter clockwise {CCW}	
Firing order	1-5-3-6-2-4	
Combustion Type	W	
Controller system	Woodward PG+	
Outstanding dimistation	1212 x 841 x 1146 mm	
Engine Dry Weight	560 kg	
Flywheel and flywheel housing	SAE 11.5# flywheel	
	SAE 3# flywheel housing	

- Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m

CT07 Gas Engine

GAS CONSUMPTION CALCULATION

Engine Model	CT07A		CT07B	
Fuel	Nature Gas			
Fuel Consumption of generator set				
	kW	Nm³/h	kW	Nm³/h
100%	100	26.2	100	26.2
50%	50	15.3	50	15.3

-Standard reference conditions: ; Atmospheric pressure 100kPa, intake temperature 25°, relative humidity 50%. The deviation range of the data is +/-4%.

INTAKE & EXHAUST SYSTEM

Engine Model	CT07A	CT07B
Max.Exhaust Back Pressure (kPa)	10	10
Max.Exhaust Temp.(After Turbo°C)	590	590
Max.Exhaust Flow (Nm³/h)	478	478
Max.Intake Gas Flow (Nm³/h)	27.5	27.5
Max.Intake Air Flow (Nm³/h)	450	450
Max.Intake Resistance (Clean filter) (kPa)	2.5	2.5
Max.Intake Resistance (Dirty filter) (kPa)	6	6
Alarm Value of Intake Resistance (kPa)	5.5	5.5

COOLING SYSTEM

Coolant main content	(Ethylene Glycol, water)	(Ethylene Glycol, water)
Coolant outlet Temperature	90°C	90°C
Temperature Difference with inlet & outlet	6 ±1°C	5 ±1°C
Max.Coolant warning Temperature	95 °C	95 °C
Radiator Flow	252 L/min	277 L/min
Intake air type	Air to air intercooler	Air to air intercooler
Intercooler allowance press drop	8 kPa	8 kPa
Intercooler Heat release	19 kW	19 kW
Intercooler allowance intake temperature	195 ±5°C	195 ±5°C

ELECTRICAL SYSTEM

Charging Alternator Voltage	24V	24V
Unaided Cold Start Average Start Speed	130 r/min	130 r/min
Starting aid (Option)	Block heater (Min. Temperature for Unaided)	Block heater (Min. Temperature for Unaided)

CT07 Gas Engine

LUBRICATION SYSTEM

Lube oil pressure @ idle speed	>80 kPa	>80 kPa
Lube oil pressure @ rated speed	350 ±10 kPa	350 ±10 kPa
Max.Permissible Oil Temperature	≤115 °C	≤115 °C
Oil consumption rate	<0.25 g/kWh	<0.25 g/kWh
Oil capacity	18 L	18 L

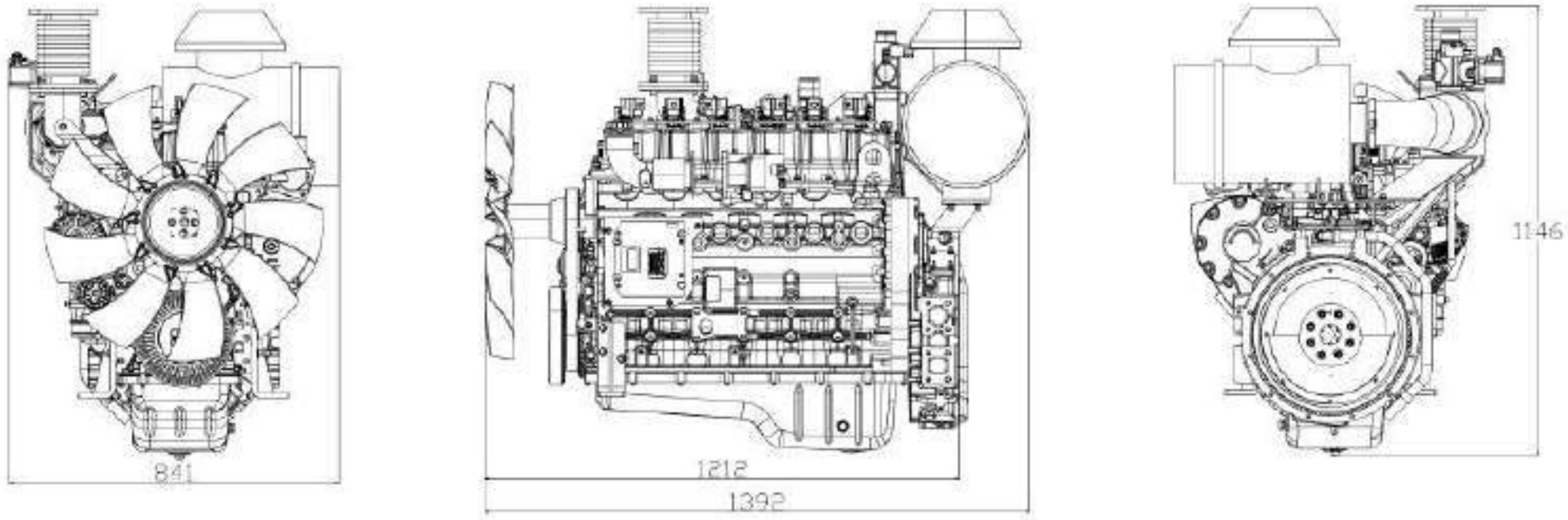
OIL SELECTION RECOMMENDATIONS

No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	MOBIL	MOBIL PEGASUS 805 SAE40

EXHAUST

Item	CT07A	CT07B
CH_4	1069.5 ppm	1069.5 ppm
O_2	≤ 5%	≤ 5%
N_2	73% - 77%(Standard values)	73% - 77%(Standard values)
CO_2	64900 ppm	64900 ppm
NO_x	500mg/Nm^3 @ 5% O2	500mg/Nm^3 @ 5% O_2
SO_2	Dependent on gas sulfur content	Dependent on gas sulfur content
CO	705 ppm	705 ppm
DUST	Background Particulate Matter	Background Particulate Matter

CT07 SERIES GAS ENGINE DRAWING



CET13 Gas Engine

INTRODUCTION

CET series engine developed independently by VMAN is a classic product. It is characterized by energy-saving and environmental-friendly, excellent performance, compact structure, reliable and durable.The indexes, such as pollutant emission, dynamic performance, economy, and reliability, reach the international advanced level. The engine basically adopt new technology of Overhead camshaft. All main parts are imported.

Such as engine block, crankshaft, piston, Connecting rod, starting motor, bolt are all imported from Germany.Valve, turbocharger, charging alternator are all imported from U.S.A.

The engine design, component development, complete test validation came from AVL, AVL is a famous engine technology consulting company in the world, headquartered in Austria.

Ratings	1500rpm / 50Hz	1800rpm / 60Hz
	CET13A	CET13B
Electrical power (kWe)	250	250
Thermal output (kW)	282	282
Electrical efficiency *	38.40%	38.40%
Thermal efficiency *	43.30%	43.30%
Total efficiency *	81.70%	81.70%
GENERAL ENGINE DATA		
Engine Model	CET13A	CET13B
Engine Type	6 cylinder, Inline-type, Four- stroke	
Speed	1500 rpm	1800 rpm
Bore x stroke	CET13: 130mm x 161mm	
Number of valve per cylinder	4	
Displacement	12.82 L	12.82 L
Compression ratio	11.5 : 1	11.5 : 1
Rotation {Looking at flywheel}	Anti-clockwise (facing the power delivery end)	
Firing order	1-5-3-6-2-4	
Cylinder distance	162 mm	
Combustion Type	W	
Controller system	Woodward PG+	
Outstanding dimistation	2000 x 946 x 1557 mm	
Engine Dry Weight	1183kg	
Rotational Inertia	2.9 kgm^2	
Flywheel and flywheel housing	SAE 14" flywheel	
	SAE 1# flywheel housing	

- Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m

CET13 Gas Engine

GAS CONSUMPTION CALCULATION

Engine Model	CET13A / CET13B	
Fuel	Nature Gas	
Fuel Consumption of generator set		
	kW	Nm^3/h
100%	250	65
50%	125	36

-Standard reference conditions: ; Atmospheric pressure 100kPa, intake temperature 25°, relative humidity 50%. The deviation range of the data is +/-4%.

INTAKE & EXHAUST SYSTEM

Engine Model	CET13A / CET13B
Max.Exhaust Back Pressure (kPa)	10±1
Max.Exhaust Temp.(After Turbo°C)	580
Max.Exhaust Flow (Nm^3/h)	1165
Max.Intake Gas Flow (Nm^3/h)	65
Max.Intake Air Flow (Nm^3/h)	1100
Max.Intake Resistance (Clean filter) (kPa)	3.5
Max.Intake Resistance (Dirty filter) (kPa)	6.5
Alarm Value of Intake Resistance (kPa)	6.3

COOLING SYSTEM

Engine Model	CET13A	CET13B
Coolant main content	50 : 50 (Ethylene Glycol, water)	
Coolant outlet Temperature	95°C	
Temperature Difference with inlet & outlet	6 ±1°C	
Max.Coolant warning Temperature	104 °C	
Radiator Flow	533 m^3/min	670 m^3/min
Intake air type	Air to air intercooler	
Intercooler allowance press drop	11 - 13 kPa	
Intercooler Heat release	62 kW	
Intercooler allowance intake temperature	195 ±5°C	

ELECTRICAL SYSTEM

Charging Alternator Voltage	24V
Unaided Cold Start Average Start Speed	130 r/min
Starting aid (Option)	Block heater (Min. Temperature for Unaided)

LUBRICATION SYSTEM

Lube oil pressure @ idle speed	>100 kPa
Lube oil pressure @ rated speed	550±10 kPa
Max.Permissible Oil Temperature	≤120 °C
Oil consumption rate	<0.21 g/kWh
Oil capacity	41.6 L

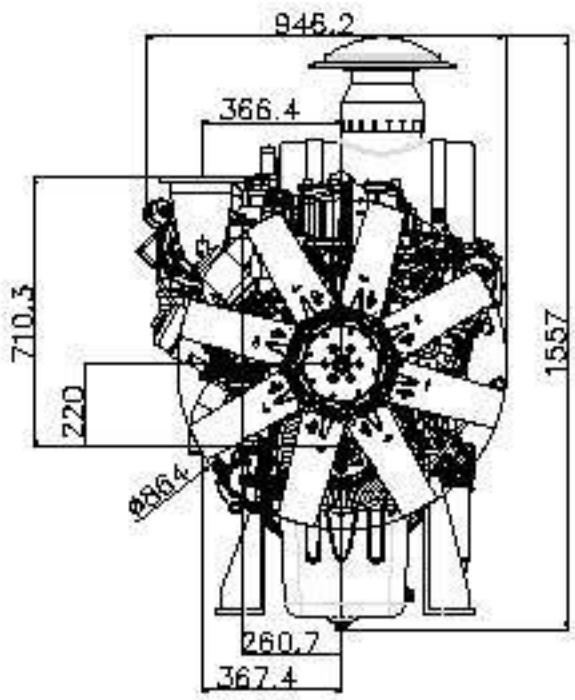
OIL SELECTION RECOMMENDATIONS

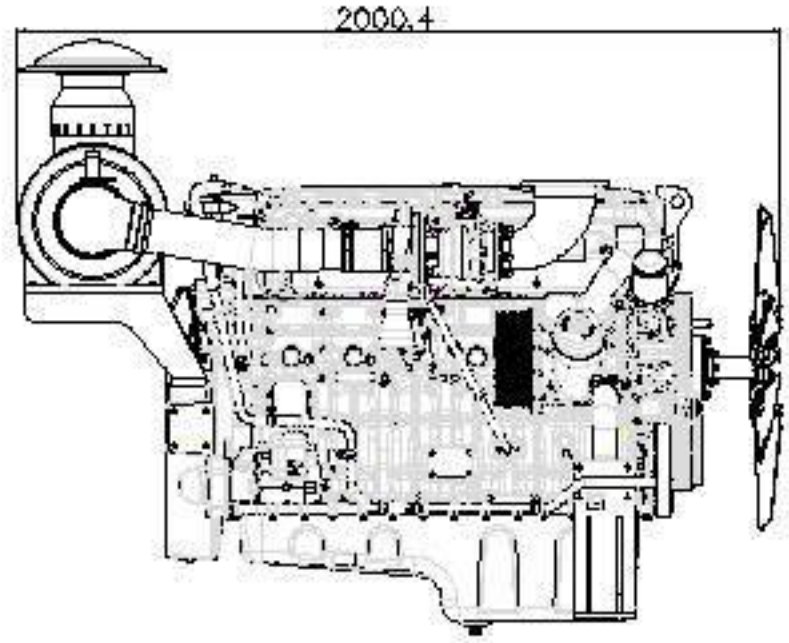
No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	Mobil	MOBIL PEGASUS 805 SAE40

EXHAUST

Item	CET13(Value)
CH_4	1069.5 ppm
O_2	≤5%
N_2	73%-77%(Standard values)
CO_2	70654.63 ppm
NO_x	500mg/Nm^3 @ 5% O_2
SO_2	Dependent on gas sulfur content
CO	705 ppm
DUST	Background Particulate Matter

CET13 SERIES GAS ENGINE DRAWING





DT15 Gas Engine

INTRODUCTION

The VMAN DT15 series is a European Union CE-certified natural gas engine developed from the block up to be a reliable and durable power unit. Built upon a proven European diesel grade block, the 8-cylinders V-configuration, turbocharged and after-cooled engine features replaceable wet liners and water-cooled exhaust.

Superior engine performance is driven by Woodward control system, ECU that integrates and coordinates all critical functions including: governor, Variable ignition timing, Air fuel ratio control, Knock suppression and engine protection.

Ratings	1500rpm / 50Hz		1800rpm / 60Hz	
	DT15A-NG	DT15A-BG	DT15B-NG	DT15B-BG
Electrical power (kWe)	280	250	280	250
Thermal output (kW)	341	327	341	327
Electrical efficiency *	38.25%	36.02%	38.25%	36.02%
Thermal efficiency *	43.31%	44.12%	43.31%	44.12%
Total efficiency *	81.56%	80.14%	81.56%	80.14%

GENERAL ENGINE DATA

Engine Model	DT15A-NG DT15A-BG	DT15B-NG DT15B-BG
Engine Type	8 cylinder, V-type, Four - stroke	
Speed	1500 rpm	1800 rpm
Bore x stroke	130 x 142 mm	
Number of valve per cylinder	2	
Displacement	15.07 L	
Compression ratio	12.5 : 1 (Nature Gas)	14 : 1 (Biogas)
Rotation (Looking at flywheel)	Counter clockwise (CCW)	
Firing order	1-5-7-2-6-3-4-8	
Combustion Type	Lean-burn premixed SI combustion	
Controller system	Woodward PG+	
Outstanding dimistation	1867 x 1410 x 1561 mm	
Engine Dry Weight	1700 kg (Engine 1400kg + Radiator 300kg)	
Rotational Inertia	2.9 kgm^2	
Flywheel and flywheel housing	SAE 14" flywheel	
	SAE 1# flywheel housing	

- Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m

DT15 Gas Engine

GAS CONSUMPTION CALCULATION

Engine Model	DT15A-NG		DT15B-NG	
Fuel	Nature Gas			
Fuel Consumption of generator set				
	kW	Nm³/h	kW	Nm³/h
100%	280	73.4	280	73.4
50%	140	42.5	140	42.5

-Standard reference conditions: Methane content ≥95 vol% of nature gas, Atmospheric pressure 100kPa, intake temperature 25°, relative humidity 50%. The deviation range of the data is +/-4%.

Engine Model	DT15A-BG		DT15B-BG	
Fuel	Biogas			
Fuel Consumption of generator set				
	kW	Nm³/h	kW	Nm³/h
100%	250	69.6	250	69.6
50%	125	42.0	125	42.0

-Standard reference conditions: Methane volume content ≥60% of biogas, Atmospheric pressure 100kPa, intake temperature 25°, relative humidity 50%. The deviation range of the data is +/-4%.

INTAKE & EXHAUST SYSTEM

Engine Model	DT15A-NG	DT15B-NG	DT15A-BG	DT15B-BG
Max.Exhaust Back Pressure (kPa)	10			
Max.Exhaust Temp.(After Turbo°C)	480			
Max.Exhaust Flow (kg/h)	1705		1522	
Max.Intake Gas Flow (m³/h)	70 (Natural gas,CH_4 ≥95 vol%)		140 (Biogas,CH_4 ≥ 60 vol%)	
Max.Intake Air Flow (m³/h)	1232		1100	
Max.Intake Resistance (Clean filter) (kPa)	5			
Max.Intake Resistance (Dirty filter) (kPa)	6.5			
Alarm Value of Intake Resistance (kPa)	6.3			

-Standard reference conditions: Natural gas,CH_4 ≥95 vol%; Biogas, CH_4 ≥ 60 vol%.

COOLING SYSTEM

Engine Mode	DT15A-NG DT15B-NG	DT15A-BG DT15B-BG
Coolant main content	50 : 50 (Ethylene Glycol, water)	50 : 50 (Ethylene Glycol, water)
Coolant outlet Temperature	95°C	95°C
Temperature Difference with inlet & outlet	12 ±1°C	12 ±1°C
Max.Coolant warning Temperature	97 °C	97 °C
Radiator Heat release	228 kW	204 kW
Radiator Flow	520 L/min	520 L/min
Intercooler allowance press drop	11 - 13 kPa	11 - 13 kPa
Intercooler Heat release	58 kW	58 kW
Intercooler allowance intake temperature	195 ±5°C	195 ±5°C
Max.Intercooler intake air	1419 kg/h	1419 kg/h

DT15 Gas Engine

LUBRICATION SYSTEM

Lube oil pressure @ idle speed	>160 kPa	>160 kPa
Lube oil pressure @ rated speed	450 ±10 kPa	450 ±10 kPa
Max.Permissible Oil Temperature	≤110 °C	≤110 °C
Oil capacity	45L	45L

OIL SELECTION RECOMMENDATIONS

No	Brad of Oil	Nature Gas Operation	Biogas Operation
1	Shell	Rimula R3 NG 15W-40	Mysella S5 S
2	Mobil	Pegasus 805 SAE40	Pegasus 610 / 710

ELECTRICAL SYSTEM

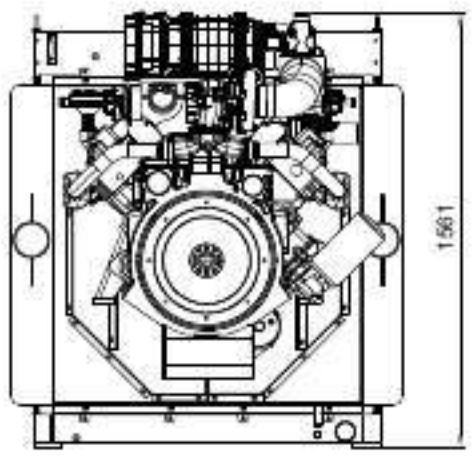
Charging Alternator Voltage	24V	24V
Unaided Cold Start Average Start Speed	130 r/min	130 r/min
Starting aid (Option)	Block heater (Min. Temperature for Unaided)	Block heater (Min. Temperature for Unaided)

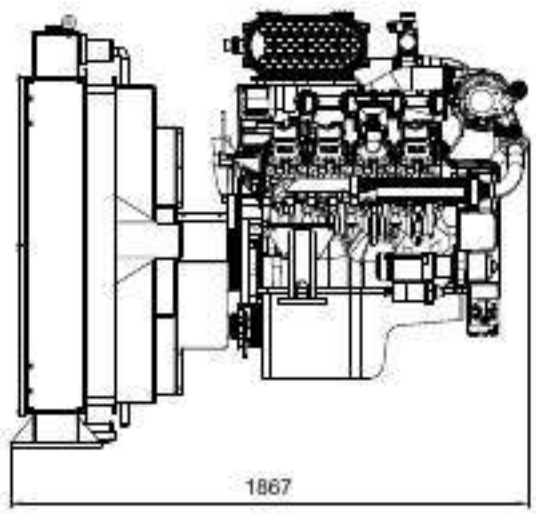
EXHAUST

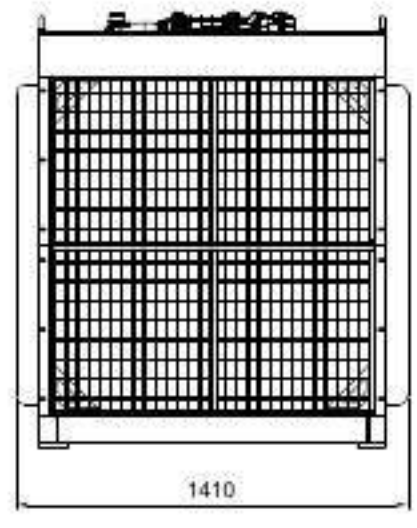
Item	DT15A-NG DT15B-NG	DT15A-BG DT15B-BG
CH_4	1,070 ppm	1,200- 1,800ppm
O_2	≤5%	≤5%
N_2	73%-77% (Standard values)	68%-73% (Typical)
CO_2	70655 ppm	100,000 -130,000 ppm
NO_x	500mg/Nm^3 @ 5% O_2	300-400mg/Nm3 @ 5% O_2
SO_2	Dependent on gas sulfur content	Dependent on gas sulfur content
CO	705 ppm	700-900 ppm
DUST	Background Particulate Matter	Background Particulate Matter

-Standard reference conditions: Natural gas,CH_4 ≥95 vol%; Biogas, CH_4 ≥ 60 vol%.

DT15 SERIES GAS ENGINE DRAWING







DT22 Gas Engine

INTRODUCTION

The VMAN DT22 series is a European Union CE-certified natural gas engine developed from the block up to be a reliable and durable power unit. Built upon a proven European diesel grade block, the 12-cylinders V-configuration, turbocharged and after-cooled engine features replaceable wet liners and water-cooled exhaust.

Superior engine performance is driven by Woodward control system, ECU that integrates and coordinates all critical functions including: governor, Variable ignition timing, Air fuel ratio control, Knock suppression and engine protection.

Ratings	1500rpm / 50Hz	1800rpm / 60Hz
	DT22A	DT22B
Electrical power (kWe)	400	400
Thermal output (kW)	460	460
Electrical efficiency *	38.50%	38.50%
Thermal efficiency *	44.25%	44.25%
Total efficiency *	82.75%	82.75%

GENERAL ENGINE DATA

Engine Model	DT22A	DT22B
Engine Type	12 cylinder, Inline-type, Four- stroke	
Speed	1500 rpm	1800 rpm
Bore x stroke	130 x 142 mm	
Number of valve per cylinder	2	
Displacement	22.61L	
Compression ratio	12.5 : 1	12.5 : 1
Rotation {Looking at flywheel}	Counter clockwise {CCW}	
Firing order	1-12-5-8-3-10-6-7-2-11-4-9	
Combustion Type	W	
Controller system	Woodward PG+	
Outstanding dimension	1552 x 1252.5 x 1320 mm	
Engine Dry Weight	1575 kg	
Rotational Inertia	2.9 kgm^2	
Flywheel and flywheel housing	SAE 14" flywheel	
	SAE 1#flywheel housing	

- Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m

DT22 Gas Engine

GAS CONSUMPTION CALCULATION

Engine Model	DT22A		DT22B	
Fuel	Nature Gas			
Fuel Consumption of generator set				
	kW	Nm^3/h	kW	Nm^3/h
100%	400	104.2	400	104.2
50%	200	60.7	200	60.7

INTAKE & EXHAUST SYSTEM

Max.Exhaust Back Pressure (kPa)	10
Max.Exhaust Temp.(After Turbo°C)	480
Max.Exhaust Flow (kg/h)	2005
Max.Intake Gas Flow (m^3/h)	105
Max.Intake Air Flow (kg/h)	1926
Max.Intake Resistance (Clean filter) (kPa)	5
Max.Intake Resistance (Dirty filter) (kPa)	6.5
Alarm Value of Intake Resistance (kPa)	6.3

COOLING SYSTEM

Coolant main content	50 : 50 (Ethylene Glycol, water)
Coolant outlet Temperature	95°C
Temperature Difference with inlet & outlet	11 ± 1°C
Max.Coolant warning Temperature	97 °C
Radiator Heat release	233 kW
Radiator Flow	790 L/min
Intake air type	Air to air intercooler
Intercooler allowance press drop	11 - 13 kPa
Intercooler Heat release	91 kW
Intercooler allowance intake temperature	195 ± 5°C

DT22 Gas Engine

LUBRICATION SYSTEM

Lube oil pressure @ idle speed	>160 kPa
Lube oil pressure @ rated speed	450 ± 10 kPa
Max.Permissible Oil Temperature	≤110 °C
Oil capacity	57 L

OIL SELECTION RECOMMENDATIONS

No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	Mobil	MOBIL PEGASUS 805 SAE40

ELECTRICAL SYSTEM

Charging Alternator Voltage	24V
Unaided Cold Start Average Start Speed	130 r/min
Starting aid (Option)	Block heater (Min. Temperature for Unaided)

EXHAUST

CH_4	1069.5 ppm
O_2	≤ 5%
N_2	73%-77% (Standard values)
CO_2	70654.63 ppm
NO_x	500mg/Nm3 @ 5% O2
SO_2	Dependent on gas sulfur content
CO	705 ppm
DUST	Background Particulate Matter

DT22 Gas Engine

Engine Coolant

When choosing water as cooling medium, the following requirements should be met:

A. Use clean water that is slightly alkaline and does not contain corrosive compounds;

B. The hardness is 0.7-5.3 mol/L, the content of chloride ion is less than150mg/L, and the PH value is 6.0-8.5;

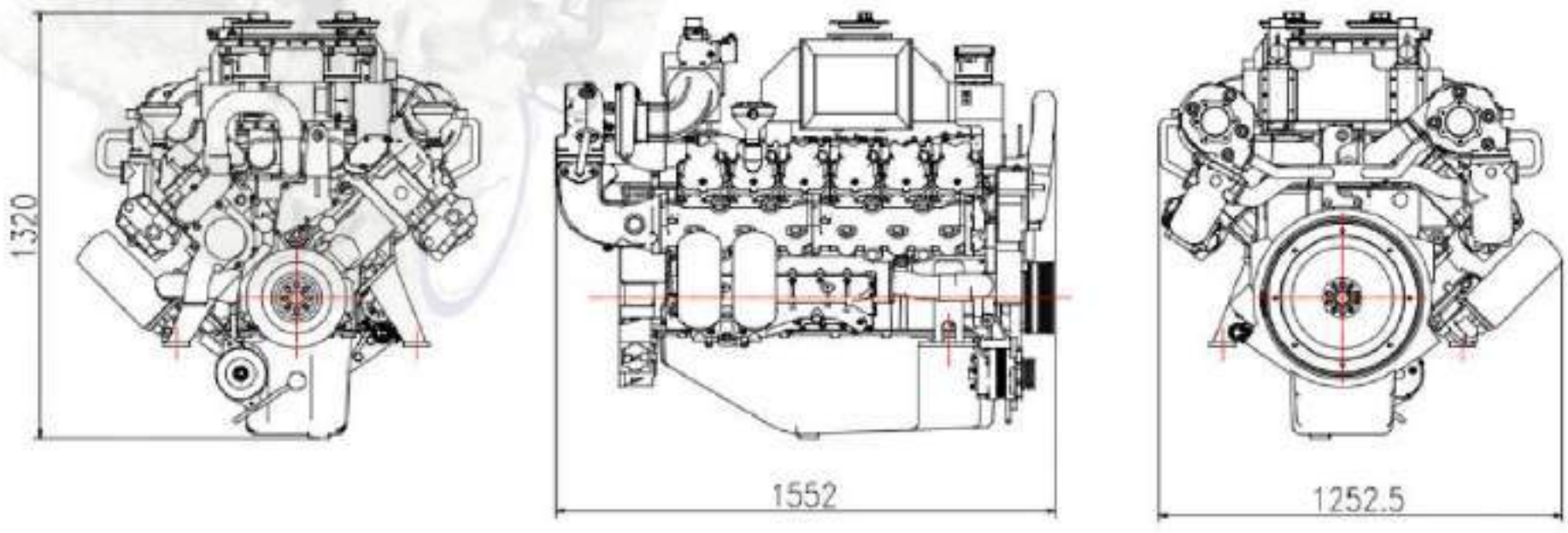
C. If the water quality does not meet the above requirements, the corresponding softening water equipment or descaling equipment should be added according to the coefficient of 1.2 times of the consumption of cooling water.

Other cooling medium

When the ambient temperature is below 5°C, antifreeze should be selected as the cooling medium.

When selecting antifreeze, the freezing point should be 5°C lower than the lowest temperature in the use area.

DT22 SERIES GAS ENGINE DRAWING



DT30 Gas Engine

INTRODUCTION

The VMAN DT30 series is a European Union CE-certified natural gas engine developed from the block up to be a reliable and durable power unit. Built upon a proven European diesel grade block, the 16-cylinders V-configuration, turbocharged and after-cooled engine features replaceable wet liners and water-cooled exhaust.

Superior engine performance is driven by Woodward control system, ECU that integrates and coordinates all critical functions including: governor, Variable ignition timing, Air fuel ratio control, Knock suppression and engine protection.

Ratings	1500rpm / 50Hz	1800rpm / 60Hz
	DT30A	DT30B
Electrical power (kWe)	500	500
Thermal output (kW)	641	641
Electrical efficiency *	38.08%	38.08%
Thermal efficiency *	45.30%	45.30%
Total efficiency *	83.38%	83.38%

GENERAL ENGINE DATA

Engine Model	DT30A	DT30B
Engine Type	16 cylinder, V-type, Four- stroke	
Speed	1500 rpm	1800 rpm
Bore x stroke	130 x 142 mm	
Number of valve per cylinder	2	
Displacement	30.14 L	
Compression ratio	12.5 : 1	12.5 : 1
Rotation (Looking at flywheel)	Counter clockwise (CCW)	
Firing order	1-15-6-12-8-5-16-7-11-4-9-2-14-10-3-13	
Combustion Type	W	
Controller system	Woodward PG+ / ComAp	
Outstanding dimistation	1887 x 1120 x 1362 mm	
Engine Dry Weight	2100 kg	
Rotational Inertia	2.9 kgm^2	
Flywheel and flywheel housing	SAE 14" flywheel	
	SAE 1# flywheel housing	

- Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa; Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m

DT30 Gas Engine

GAS CONSUMPTION CALCULATION

Engine Model	DT30A		DT30B	
Fuel	Nature Gas			
Fuel Consumption of generator set				
	kW	Nm^3/h	kW	Nm^3/h
100%	500	131.7	500	131.7
50%	250	76.2	250	76.2

-Standard reference conditions: ; Atmospheric pressure 100kPa, intake temperature 25°, relative humidity 50%.
The deviation range of the data is +/-4%.

INTAKE & EXHAUST SYSTEM

Engine Model	DT30A	DT30B
Max.Exhaust Back Pressure (kPa)	10	10
Max.Exhaust Temp.(After Turbo°C)	480	480
Max.Exhaust Flow (kg/h)	3045	3045
Max.Intake Gas Flow (m^3/h)	140	140
Max.Intake Air Flow (m^3/h)	2200	2200
Max.Intake Resistance (Clean filter) (kPa)	5	5
Max.Intake Resistance (Dirty filter) (kPa)	6.5	6.5
Alarm Value of Intake Resistance (kPa)	6.3	6.3

COOLING SYSTEM

Coolant main content	50 : 50 (Ethylene Glycol, water)	50 : 50 (Ethylene Glycol, water)
Coolant outlet Temperature	95°C	95°C
Temperature Difference with inlet & outlet	12 ±1°C	12 ±1°C
Max.Coolant warning Temperature	97 °C	97 °C
Radiator Heat release	407 kW	407 kW
Radiator Flow	1040L/min	1040L/min
Intercooler allowance press drop	11 - 13 kPa	11 - 13 kPa
Intercooler Heat release	116 kW	116 kW
Intercooler allowance intake temperature	195 ±5°C	195 ±5°C
Max.Intercooler intake air	2838 kg/h	2838 kg/h

DT30 Gas Engine

LUBRICATION SYSTEM

Lube oil pressure @ idle speed	>160 kPa	>160 kPa
Lube oil pressure @ rated speed	450 ±10 kPa	450 ±10 kPa
Max.Permissible Oil Temperature	≤110 °C	≤110 °C
Oil capacity	65-70 L	65-70 L

OIL SELECTION RECOMMENDATIONS

No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	Mobil	MOBIL PEGASUS 805 SAE40

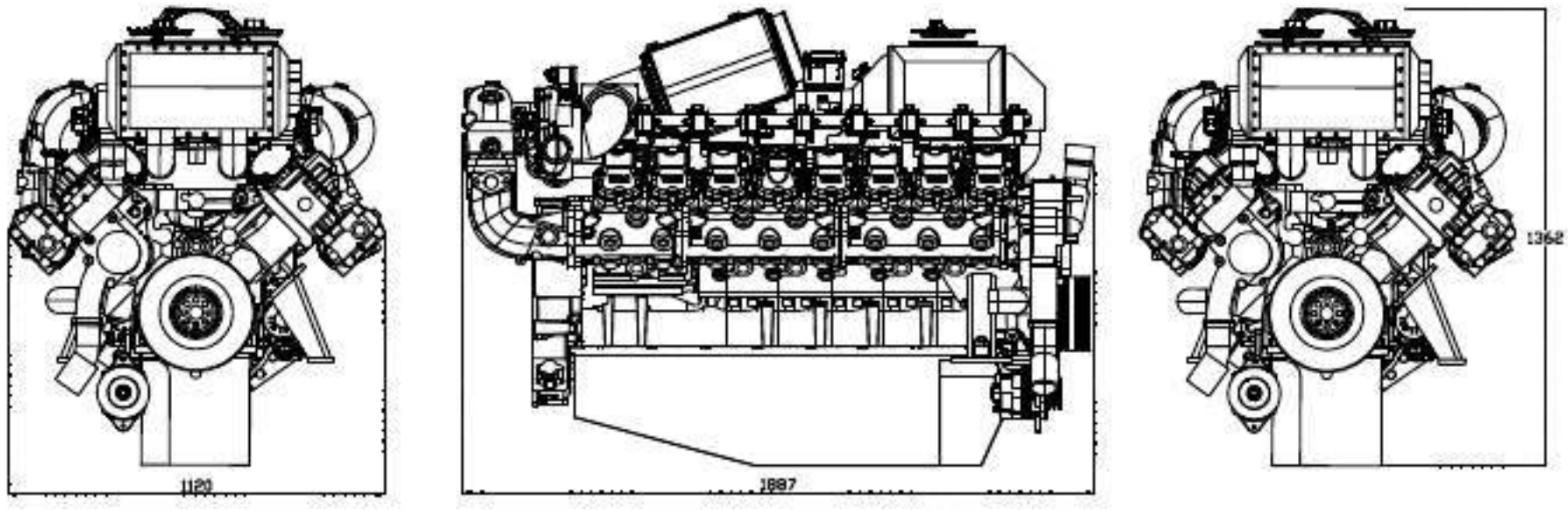
ELECTRICAL SYSTEM

Charging Alternator Voltage	24V	24V
Unaided Cold Start Average Start Speed	130 r/min	130 r/min
Starting aid (Option)	Block heater (Min. Temperature for Unaided)	Block heater (Min. Temperature for Unaided)

EXHAUST

Item	DT30A	DT30B
CH_4	1069.5 ppm	1069.5 ppm
O_2	≤5%	≤5%
N_2	73%-77% (Standard values)	73%-77% (Standard values)
CO_2	70654.63 ppm	70654.63 ppm
NO_x	500mg/Nm^3 @ 5% O_2	500mg/Nm^3 @ 5% O_2
SO_2	Dependent on gas sulfur content	Dependent on gas sulfur content
CO	705 ppm	705 ppm
DUST	Background Particulate Matter	Background Particulate Matter

DT30 SERIES GAS ENGINE DRAWING



DT30+ Gas Engine

INTRODUCTION

Ratings	1500rpm / 50Hz	1800rpm / 60Hz
	DT30A+	DT30B+
Electrical power (kWe)	550	600
Thermal output (kW)	581	711
Electrical efficiency *	37.36%	37.36%
Thermal efficiency *	45.65%	45.65%
Total efficiency *	83.01%	83.01%

The VMAN DT30 series is a European Union CE-certified natural gas engine developed from the block up to be a reliable and durable power unit. Built upon a proven European diesel grade block, the 16-cylinders V-configuration, turbocharged and after-cooled engine features replaceable wet liners and water-cooled exhaust.

The DT30A and DT30B are equipped with the Woodward PG+ control system, with an ECU that integrates and coordinates all critical functions, including the governor, variable ignition timing, air–fuel ratio control, knock suppression, and engine protection.

The DT30A+ and DT30B+ feature the Motortech and ComAP InteliSys 2000 control systems, providing more precise and efficient control of the governor, ignition timing, air–fuel ratio, knock suppression, and engine protection, as well as comprehensive power plant management.

GENERAL ENGINE DATA

Engine Model	DT30A+	DT30B+
Engine Type	16 cylinder, V-type, Four- stroke	
Speed	1500 rpm	1800 rpm
Bore x stroke	130 x 142 mm	
Number of valve per cylinder	2	
Displacement	30.14 L	
Compression ratio	12.5 : 1	
Rotation (Looking at flywheel)	Counter clockwise (CCW)	
Firing order	1-15-6-12-8-5-16-7-11-4-9-2-14-10-3-13	
Combustion Type	W	
Controller system	ComAp+Motortech	
External dimention	2181 x 1308 x 1655 mm	
Engine Dry Weight	2100 kg	
Rotational Inertia	2.9 kgm2	
Flywheel and flywheel housing	SAE 14" flywheel	
	SAE 1# flywheel housing	

- Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m

DT30+ Gas Engine

GAS CONSUMPTION CALCULATION

Engine Model	DT30A+		DT30B+	
Fuel	Nature Gas			
Fuel Consumption of generator set				
	kW	Nm^3/h	kW	Nm^3/h
100%	550	147.7	550	147.7
50%	275	81.8	275	81.8

-Standard reference conditions: ; Atmospheric pressure 100kPa, intake temperature 25°, relative humidity 50%.
The deviation range of the data is +/-4%.

INTAKE & EXHAUST SYSTEM

Engine Model	DT30A+	DT30B+
Max.Exhaust Back Pressure (kPa)	10	10
Max.Exhaust Temp.(After Turbo°C)	450	450
Max.Exhaust Flow (kg/h)	2647	2647
Max.Intake Air Flow (g/h)	2544	2544
Max.Intake Resistance (Clean filter) (kPa)	5	5
Max.Intake Resistance (Dirty filter) (kPa)	6.5	6.5
Alarm Value of Intake Resistance (kPa)	6.3	6.3

COOLING SYSTEM

Engine Model	DT30A+	DT30B+
Coolant main content	50 : 50 (Ethylene Glycol, water)	
Coolant outlet Temperature	95°C	95°C
Temperature Difference with inlet & outlet	12 ±1°C	12 ±1°C
Max.Coolant warning Temperature	97 °C	97 °C
Radiator Heat release	453 kW	453 kW
Radiator Flow	830 L/min	830 L/min
Intercooler allowance press drop	11 - 13 kPa	11 - 13 kPa
Intercooler Heat release	70 kW	79 kW
Intercooler allowance intake temperature	195 ± 5°C	195 ± 5°C
Max.Intercooler intake air	2544 kg/h	2544 kg/h

LUBRICATION SYSTEM

Lube oil pressure @ idle speed	>160 kPa
Lube oil pressure @ rated speed	450 ±10 kPa
Max.Permissible Oil Temperature	≤110 °C
Oil capacity	65-70 L

DT30+ Gas Engine

OIL SELECTION RECOMMENDATIONS

No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	Mobil	MOBIL PEGASUS 805 SAE40

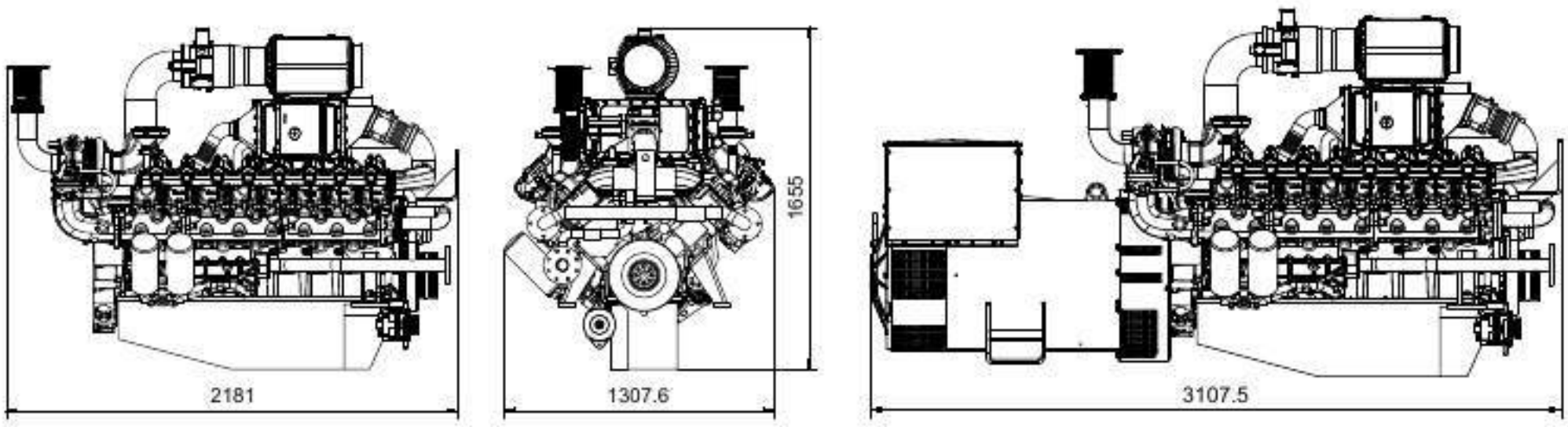
ELECTRICAL SYSTEM

Charging Alternator Voltage	24V
Unaided Cold Start Average Start Speed	130 r/min
Starting aid (Option)	Block heater (Min. Temperature for Unaided)

EXHAUST

CH_4	1069.5 ppm
O_2	≤5%
N_2	73%-77% (Standard values)
CO_2	70654.63 ppm
NO_x	500mg/Nm³ @ 5% O_2
SO_2	Dependent on gas sulfur content
CO	705 ppm
DUST	Background Particulate Matter

DT30+ SERIES GAS ENGINE DRAWING



DT58 Gas Engine

INTRODUCTION

DT series gas engine developed independently by VMAN is a classic product. It is characterized by energy-saving and environmental-friendly, excellent performance, compact structure, reliable and durable.The indexes, such as pollutant emission, dynamic performance, economy, and reliability, reach the international advanced level. The DT58 gas engine uses Heinemann gas engine control system to ensure stable and reliable engine operation.

Ratings	1500rpm / 50Hz	1800rpm / 60Hz
	DT58A	DT58B
Electrical power (kWe)	1200	1200
Thermal output (kW)	1231	1231
Electrical efficiency *	41.41%	41.41%
Thermal efficiency *	42.48%	42.48%
Total efficiency *	83.89%	83.89%

GENERAL ENGINE DATA

ITEM	UNIT	VALUE	
Model		DT58A	DT58B
Quantity of cylinders	PCS	12	12
Cylinder bore	mm	170	170
Stroke	mm	210	210
Displacement	L	57.2	57.2
Speed	rpm	1500	1800
Compression ratio		11.5 : 1	11.5 : 1
Mean effective pressure	MPa	1.54	1.54
Mean speed of piston	m/s	10.5	10.5
Oil capacity	L	300	300
Cooling water capacity	L	200	200
Dimension(L*W*H)	mm	2526 × 1781 × 2109	2526 × 1781 × 2109
Dry weight	kg	7610	7610
Moment of inertia of an area(flywheel)	kgm^2	12	12
Direction of rotation		CCW (Look at the flywheel)	CCW (Look at the flywheel)
Fly wheel		SAE 21	SAE 21
Fly wheel housing		SAE 00#	SAE 00#
EMC		N (By VDE0857)	N (By VDE0857)
Starter	kW	2×8.5 @DC24V	2×8.5 @DC24V

- Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m

DT58 Gas Engine

HEAT BALANCE LIST OF GENERATOR SET

ITEM	UNIT	VALUE	
Model		DT58A	DT58B
Gas energy	kW	2898	2898
Electrical power	kWe	1200	1200
Thermal output	kW	1231	1231
Electrical efficiency	/	41.41%	41.41%
Thermal of jacket water	kW	567	567
Exhaust thermal *	kW	664	664
Thermal efficiency	/	42.48%	42.48%
Total efficiency	/	83.89%	83.89%

LUBRICATING OIL SYSTEM

ITEM	UNIT	VALUE	
Model		DT58A	DT58B
Lube oil pressure @ idle speed	kPa	> 300	> 300
Lube oil pressure @ rated speed	kPa	600 ±10	600 ±10
Max.Permissible Oil Temperature	°C	≤105	≤105
Oil capacity	L	300	300

INTAKE & EXHAUST SYSTEM

ITEM	UNIT	VALUE	
Model		DT58A	DT58B
Exhaust temperature	°C	≤580	≤580
Max Exhaust temperature	°C	620	620
Exhaust flow (including H2O)	kg/h	5949	5949
Exhaust capacity (including H2O)	Nm^3/h	5055	5055
Max Exhaust back pressure	kPa	2.5	2.5
Diameter of exhaust pipe		DN250	DN250
Combustion air flow	kg/h	5731	5731
Max.Intake Resistance (Clean filter) (kPa)	kPa	2.5	2.5

GAS CONSUMPTION CALCULATION

Model	DT58A		DT58B	
Fuel	Nature Gas			
Fuel Consumption of generator set				
	kW	Nm^3/h	kW	Nm^3/h
100%	1200	290.8	1200	290.8
50%	1000	163.4	1000	163.4

DT58 Gas Engine

GAS SYSTEM

ITEM	UNIT	VALUE	
Model		DT58A	DT58B
Gas type		Natural gas	Natural gas
CH_4	%	≥80	≥80
Methane number (MN)	/	≥80	≥80
Gas valve group inlet pressure	kPa	30-50	30-50
Engine inlet gas pressure	kPa	6-10	6-10
Rate of gas pressure change	kPa/sec	≤ 1	≤ 1
Rate of change of heating value of gas	%/min	≤ 2	≤ 2
H_2S	mg/Nm^3	≤ 20	≤ 20
All of the sulfur	mg/Nm^3	≤ 200	≤ 200
Solidparticle	$\mu m/m^3$	≤ 5	≤ 5
	mg/m^3	≤ 30	≤ 30

COOLING SYSTEM

ITEM	UNIT	VALUE	
Model		DT58A	DT58B
High temperature part heat dissipation	kW	567	567
Low temperature part heat dissipation	kW	240	240
Water flow of engine cylinder liner	m^3/h	65	65
Water flow of Intercooler	m^3/h	65	65
High temperature water I/O	°C	83 to 90	83 to 90
Low temperature water I/O	°C	43 to 46	43 to 46
Max.water temperature of cylinder liner	°C	90	90
Water I/O pipe of cylinder liner	DN/PN	DN100/PN16	DN100/PN16
Water I/O pipe of Intercooler	DN/PN	DN100/PN16	DN100/PN16
High temperature water pressure	MPa	0.28	0.28
Low temperature water pressure	MPa	0.21	0.21

ENGINE EMISSION DATA

ITEM	VALUE	
Model	DT58A	DT58B
CH_4	≤1500 ppm	≤1500 ppm
O_2	≤8.50%	≤8.50%
N_2	84-85%	84-85%
CO_2	6.50%	6.50%
NO_x	500mg/Nm3 @ 5% O2	500mg/Nm3 @ 5% O2
SO_2	Dependent on gas sulfur content	Dependent on gas sulfur content
CO	≤800ppm	≤800ppm
DUST	Background Particulate Matter	Background Particulate Matter

DT58 Gas Engine

Oil Selection Recommendations

No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	Mobil	MOBIL PEGASUS 805 SAE40

Engine Coolant

When choosing water as cooling medium, the following requirements should be met:

A. Use clean water that is slightly alkaline and does not contain corrosive compounds;

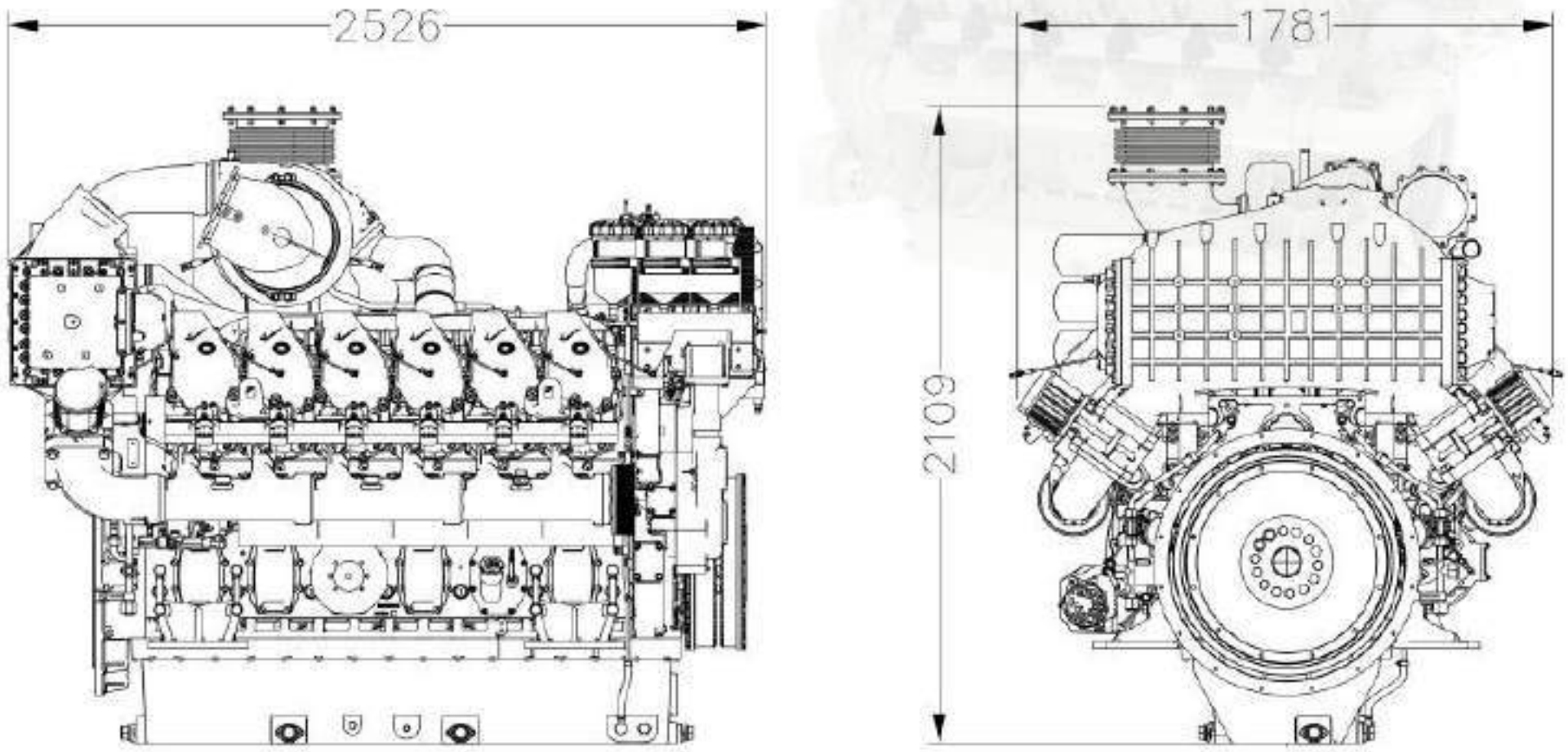
B. The hardness is 0.7-5.3 mol/L, the content of chloride ion is less than150mg/L, and the PH value is 6.0-8.5;

C. If the water quality does not meet the above requirements, the corresponding softening water equipment or descaling equipment should be added according to the coefficient of 1.2 times of the consumption of cooling water.

Other cooling medium

When the ambient temperature is below 5°C, antifreeze should be selected as the cooling medium. When selecting antifreeze, the freezing point should be 5°C lower than the lowest temperature in the use area.

DT58 (V12) SERIES GAS ENGINE DRAWING



Military quality gas engine

CHG620/622 Gas Engine

HND Gas Engine on the basis of the licensed technology from MWM Company (Germany) , started produced MWM 234 series diesel engines which type V6, V8 and V12, MWM604BL6 series diesel engines and TBD620 series V8, V12 and V16 diesel engines. In 2007,HND obtained the license of manufacturing L16/24 and L21/31 engines from MAN B&W Co., and start mass production in 2008. At present, diesel engine power range from 110kW to 2336kW.

In 2005, HND company researched and developed gas engines with its own intellectual property which technology on the basis of the MWM TBD620 diesel engine. Now which products contain CHG620L6, CHG620V8, CHG620V12,CHG620V16 and CHG622V20, 5 series gas engines, gas engines power range from 550kW to 2000kW and gas generator power range from 500kW to 2000kW.

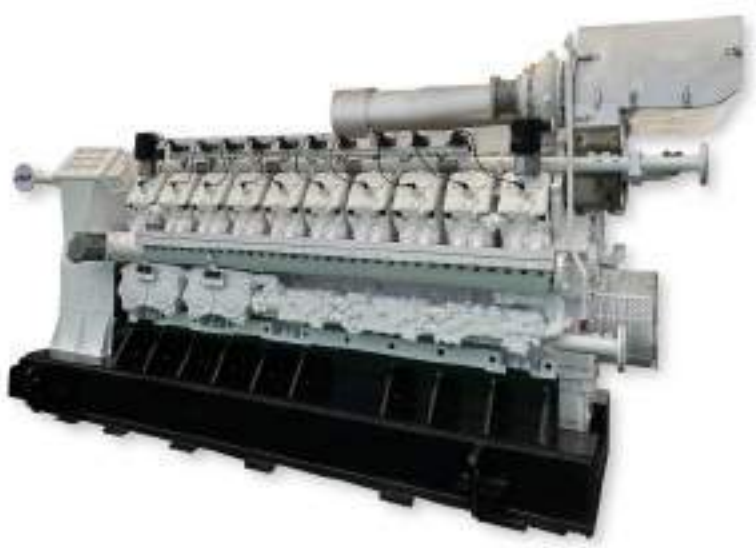
- Advanced turbocharged, intercooler, four-stroke V-type gas engine adopts the same technology as the most advanced international gas engine.
- V-type gas engine, cylinder arrangement with 90 ° angle easily for repairing and maintenance.

CHG620V12

Electrical power: 1000kW
Thermal output: 1097kW
Electrical efficiency: >40.38 %
Thermal efficiency: >44.29 %
Total efficiency: >84.68 %
Gas consumption: 248 Nm^3/h (Hu = 35.88MJ/m^3)
Oil consumption rate: ≤0.25 g/kWh
First Overhaul / Maintenance: 60000H/500H
NOx (5%O2) : ≤500 mg/Nm^3

CHG622V16

Electrical power: 1500kW
Thermal output: 1705kW
Electrical efficiency: >41.08 %
Thermal efficiency: >46.70%
Total efficiency: >87.78 %
Gas consumption: 366 Nm^3/h(Hu = 35.88MJ/m^3)
Oil consumption rate: ≤0.25 g/kWh
First Overhaul / Maintenance : 60000H/500H
NOx (5%O2) : ≤500 mg/Nm^3



CHG622V20

Electrical power: 2000kW
Thermal output: 2215kW
Electrical efficiency: >41.3 %
Thermal efficiency: >45.75 %
Total efficiency: >87.04 %
Gas consumption: 486 Nm^3/h (Hu = 35.88MJ/m^3)
Oil consumption rate: ≤0.25 g/kWh
First Overhaul / Maintenance : 60000H/500H
NOx (5%O2) : ≤500 mg/Nm^3

Standard Configuration

Engine and block: nodular cast iron the tensile strength can reach 120kgf / ㎡, and it has good toughness.	Engine body and cylinder head are made by nodular cast iron. Strong ability to bear mechanical load. Globular gold has less cracking effect on the metal matrix, It can make cast iron strength reach 70 ~ 90% of the matrix structure strength, the tensile strength can reach 120kgf /㎡, and it has good toughness.
Moving Parts: 42CrMoA alloy steel. Enhance the life of moving parts reach 100,000 hours.	Crankshaft, camshaft and other moving parts are made of 42CrMoA alloy steel. It has a higher fatigue limit and resistance to multiple impacts after treatment, good impact toughness and outstanding wear resistance. Will adopt whole forging to retain the internal natural state of the metal, greatly improves the crankshaft strength, and enhances the crankshaft wear resistance used special heat treatment. This crankshaft will be increased more than 20% strength, enhance the life of moving parts reach 100,000 hours.
Inlet & exhaust valves valve seats: MAERKISCHES WERK GMBH	HND gas Engine used original imported German inlet & exhaust valves and valve seats (MAERKISCHES WERK GMBH). The service life of inlet & exhaust valves and valve seats of HND gas engines are much longer than similar domestic products. The patented rotary air valve technology is used in fitting between the intake & exhaust valve with their valve seats. Valves and valve seat are continuously grinding during the operation of engines, let sealing surface between the two always fitted, it will double extend valves life time and rejecting "pre-ignition" and "post-ignition" of the gas engines.
Gas system (NGL): DUNGS	Gas system (NGL) includes pressure reducing valves, solenoid shut-off valves, manual shut-off valves, filters and other equipment, which are installed according to different project. The main valves of the gas transmission system adopt original German DUNGS products, DUNGS has Vibration tested combination controls Multi block and Gas Bloc according US Military Standard MIL-STD-810G/31. Worldwide support via DUNGS branches and subsidiaries in more than 50 countries.
Turbo-chargers	HND gas engine is equipped with two original imported ABB TPS series Turbo-chargers to provide strong power for the engine.
Monitoring system	Heinzmann
Ignition Controller	Heinzmann IC-20
Air-Fuel ratio control system	Heinzmann XIOS-UC2
Knock control system	Heinzmann KC-01

CHG620V12 Gas Engine

1. Engine technical parameter list

ITEM	UNIT	VALUE
Model		CHG620V12
Rated power	kW	1080
Quantity of Cylinders	PCS	12
Cylinder bore	mm	170
Stroke	mm	195
Displacement	L	53.1
Speed	rpm	1500
Compression ratio		12:1
mean effective pressure	MPa	1.63
mean speed of piston	m/s	9.75
Oil capacity	L	180
Cooling water capacity	L	100
Dimension(L*W*H)	mm	2775×1435×2055
Dry weight	kg	5000
Weight with oil	kg	5251
Moment of inertia of an area(flywheel)	kgm^2	6.69
Direction of rotation		CCW(Look at the flywheel)
Fly wheel		SAE21
EMC		N（By VDE0857）
Starter	kW	1×9 @DC24V

2. Heat balance list of generator set

ITEM	UNIT	VALUE
Electrical energy	kW	1000
Gas energy	kW	2476
Electrical efficiency	/	40.38%
Exhaust thermal *	kW	568
Water thermal of cylinder liner	kW	529
Thermal efficiency	/	44.29%
Total efficiency	/	84.68%

**Exhaust gas cooled to 120 °C for natural gas. - Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m*

3. Combustion air and exhaust data sheet for engine

ITEM	UNIT	VALUE
Exhaust temperature	°C	≤580
Max Exhaust temperature	°C	620
Exhaust flow (including H2O)	kg/h	5083
Max Exhaust back pressure	kPa	2.5
Diameter of exhaust pipe		DN250
Combustion air flow	kg/h	4897
Max air pressure before air filter	kPa	2.5

4. Gas consumption data sheet

ITEM	UNIT	VALUE
Gas type		Natural gas
CH4	%	≥80
Methane number (MN)	/	≥80
Gas valve group inlet pressure	kPa	30-50
Engine inlet gas pressure	kPa	6~10
Rate of gas pressure change	Kpa/sec	1
Rate of change of heating value of gas	≤	2%/min
Gas intake pipe	Mm	100
H2S	≤	20mg/Nm^3
All of the sulfur	≤	200mg/Nm^3
Solidparticle	≤	5μm and 30mg/m^3

5. Technical parameters of engine lubricating oil system

ITEM	UNIT	VALUE
Lube oil pressure @ idle speed	kPa	>300
Lube oil pressure @ rated speed	kPa	460-520
Max.Permissible Oil Temperature	°C	≤90
Oil capacity	L	150

CHG620V12 Gas Engine

6. Technical parameters of engine cooling system

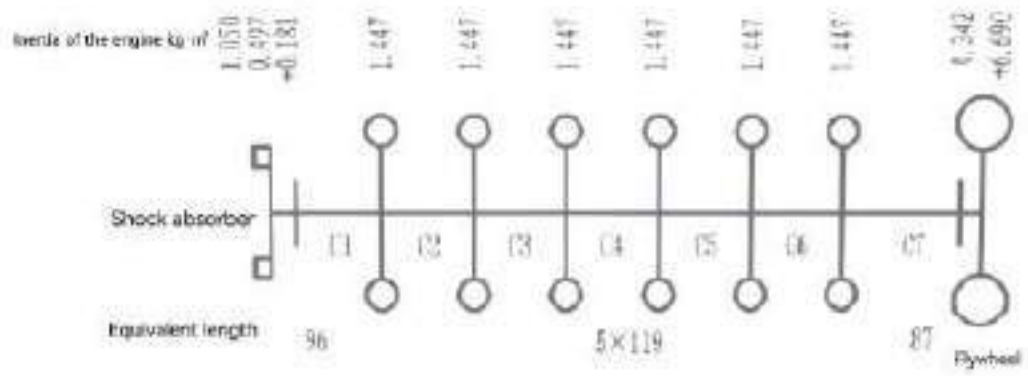
ITEM	UNIT	VALUE
High temperature part heat dissipation	kW	529
Low temperature part heat dissipation	kW	171
Flow of jacket water	m^3/h	65
Flow of Intercooler water	m^3/h	65
High temperature water I/O	°C	76 to 83
Low temperature water I/O	°C	43 to 45
Max. temperature of jacket water	°C	90
I/O pipe of jacket water	DN/PN	DN65/PN16 DN80/PN16
I/O pipe of intercooler water	DN/PN	DN65/PN16
High temperature water pressure	MPa	0.2
Low temperature water pressure	MPa	0.14

7. Engine emission data

ITEM	VALUE
CH_4	≤1500 ppm
O_2	≤8.50%
N_2	75-76%
CO_2	6.30%
NO_x	500mg/Nm^3 @ 5% O_2
SO_2	Dependent on gas sulfur content
CO	≤920ppm
DUST	Background Particulate Matter

8. Torsional vibration calculation parameters

Power	RPM		Connecting rod length	Main journal	Crank pin journal	Allowed crankshaft force
1080kW	1500		350mm	152mm	128mm	55MPa
Bore d	Stroke s	Stroke	Efficiency	Single-cylinder reciprocating mass	Crank-rod ratio	Cylinder arrangement angle
170mm	195mm	4	85.3%	12.61kg	0.2786	90°
Firing order	A1-B2-A5-B4-A3-B1-A6-B5-A2-B3-A4-B6					



Torsional rigidity	C1	C2	C3	C4	C5	C6	C7
MNm/rad	10.4	8.4	8.4	8.4	8.4	8.4	11.49

9. Oil Selection Recommendations

No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	Mobil	MOBIL PEGASUS 805 SAE40

10. Engine coolant

When choosing water as cooling medium, the following requirements should be met:

A. Use clean water that is slightly alkaline and does not contain corrosive compounds ;

B. The hardness is 0.7-5.3 mol/L, the content of chloride ion is less than 150mg/ L, and the PH value is 6.0-8.5;

C. If the water quality does not meet the above requirements, the corresponding softening water equipment or descaling equipment should be added according to the coefficient of 1.2 times of the consumption of cooling water.

Other cooling medium

When the ambient temperature is below 5°C, antifreeze should be selected as the cooling medium. When selecting antifreeze, the freezing point should be 5°C lower than the lowest temperature in the use area.

CHG622V16 Gas Engine

1. Engine technical parameter list

ITEM	UNIT	VALUE
Model		CHG622V16
Rated power	kW	1600
Quantity of Cylinders	PCS	16
Cylinder bore	mm	170
Stroke	mm	215
Displacement	L	78.04
Speed	rpm	1500
Compression ratio		12:1
mean effective pressure	MPa	1.64
mean speed of piston	m/s	10.75
Oil capacity	L	280
Cooling water capacity	L	180
Dimension(L*W*H)	mm	3495×1600×2400
Dry weight	kg	7880
Weight with oil	kg	8300
Moment of inertia of an area(flywheel)	kgm^2	11.35
Direction of rotation		CCW(Look at the flywheel)
Fly wheel		SAE21
EMC		N（By VDE0857）
Starter	kW	2×13 @DC24V

2. Heat balance list of generator set

ITEM	UNIT	VALUE
Electrical power	kW	1500
Gas energy	kW	3651
Electrical efficiency	%	41.08%
Exhaust thermal *	kW	833
Water thermal of cylinder liner	kW	872
Thermal efficiency	/	46.70%
Total efficiency	/	87.78%

**Exhaust gas cooled to 120 °C for natural gas. - Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m*

3. Combustion air and exhaust data sheet for engine

ITEM	UNIT	VALUE
Exhaust temperature	°C	≤580
Max Exhaust temperature	°C	620
Exhaust flow (including H_2O)	kg/h	7495
Max Exhaust back pressure	kPa	2.5
Diameter of exhaust pipe		DN400
Combustion air flow	kg/h	7221
Max air pressure before air filter	kPa	2.5

4. Gas consumption data sheet

ITEM	UNIT	VALUE
Gas type		Natural gas
CH4	%	≥80
Methane number (MN)	/	≥80
Gas valve group inlet pressure	kPa	30-50
Engine inlet gas pressure	kPa	6~10
Rate of gas pressure change	kPa/sec	1
Rate of change of heating value of gas	≤	2%/min
Gas intake pipe	mm	100
H2S	≤	20mg/Nm^3
All of the sulfur	≤	200mg/Nm^3
Solidparticle	≤	5μm and 30mg/m^3

5. Technical parameters of engine lubricating oil system

ITEM	UNIT	VALUE
Lube oil pressure @ idle speed	kPa	>300
Lube oil pressure @ rated speed	kPa	460-520
Max.Permissible Oil Temperature	°C	≤90
Oil capacity	L	240

CHG622V16 Gas Engine

6. Technical parameters of engine cooing system

ITEM	UNIT	VALUE
High temperature part heat dissipation	kW	872
Low temperature part heat dissipation	kW	150
Flow of jacket water	m^3/h	75
Flow of Intercooler water	m^3/h	65
High temperature water I/O	°C	74 to 84
Low temperature water I/O	°C	43 to 45
Max. temperature of jacket water	°C	90
I/O pipe of jacket water	DN/PN	DN80/PN16
I/O pipe of intercooler water	DN/PN	DN65/PN16
High temperature water pressure	MPa	0.23
Low temperature water pressure	MPa	0.13

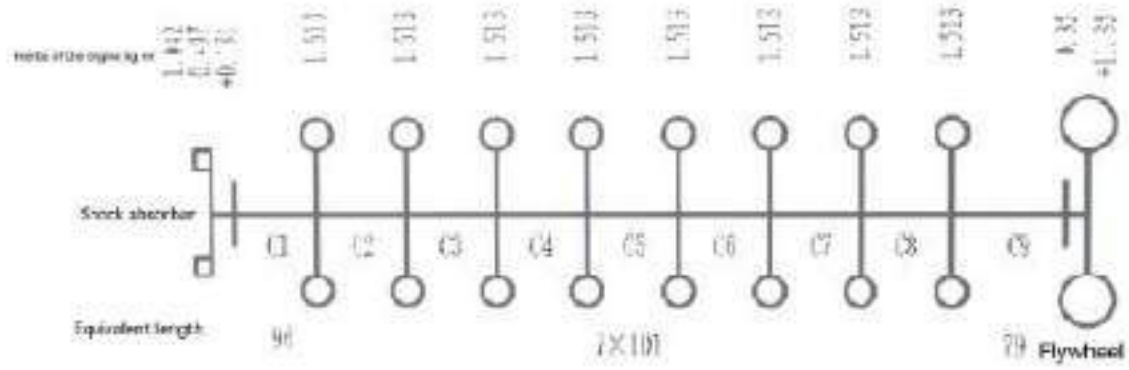
7. Engine emission data

ITEM	VALUE
CH_4	≤2000 ppm
O_2	≤8.50%
N_2	75-76%
CO_2	6.30%
NO_x	500mg/Nm^3 @ 5% O_2
SO_2	Dependent on gas sulfur content
CO	≤920ppm
DUST	Background Particulate Matter

8. Torsional vibration calculation parameters

Power	RPM		Connecting rod length	Main journal	Crank pin journal	Allowed crankshaft force
1600kW	1500		360mm	170mm	130mm	55MPa
Bore d	Stroke s	Stroke	Efficiency	Single-cylinder reciprocating mass	Crank-rod ratio	Cylinder arrangement angle
170mm	215mm	4	89%	15.24kg	0.2986	90°
Firing order	A1-A7-B4-B6-A4-B8-A2-A8-B3-B5-A3-A5-B2-A6-B1-B7					

CHG622V16 Gas Engine



Torsional rigidity	C1	C2	C3	C4	C5	C6	C7	C8	C9
MNm/rad	10.4	7.952	7.952	7.952	7.952	7.952	7.952	7.952	11.49

9. Oil Selection Recommendations

No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	Mobil	MOBIL PEGASUS 805 SAE40

10. Engine coolant

When choosing water as cooling medium, the following requirements should be met:

A. Use clean water that is slightly alkaline and does not contain corrosive compounds ;

B. The hardness is 0.7-5.3 mol/L, the content of chloride ion is less than 150mg/ L, and the PH value is 6.0-8.5;

C. If the water quality does not meet the above requirements, the corresponding softening water equipment or descaling equipment should be added according to the coefficient of 1.2 times of the consumption of cooling water.

Other cooling medium

When the ambient temperature is below 5°C, antifreeze should be selected as the cooling medium. When selecting antifreeze, the freezing point should be 5°C lower than the lowest temperature in the use area.

CHG620V20 Gas Engine

1. Engine technical parameter list

ITEM	UNIT	VALUE
Model		CHG622V20
Rated power	kW	2100
Quantity of Cylinders	PCS	20
Cylinder bore	mm	170
Stroke	mm	215
Displacement	L	97.6
Speed	rpm	1500
Compression ratio		12:1
mean effective pressure	MPa	1.72
mean speed of piston	m/s	10.75
Oil capacity	L	330
Cooling water capacity	L	220
Dimension(L*W*H)	mm	3860×1600×2400
Dry weight	kg	8800
Weight with oil	kg	9300
Moment of inertia of an area(flywheel)	kgm^2	11.35
Direction of rotation		CCW(Look at the flywheel)
Fly wheel		SAE21
EMC		N（By VDE0857）
Starter	kW	2×13 @DC24V

2. Heat balance list of generator set

ITEM	UNIT	VALUE
Electrical power	kW	2000
Gas energy	kW	4843
Electrical efficiency	%	41.3%
Exhaust thermal*	kW	1099
Water thermal of cylinder liner	kW	1116
Thermal efficiency	/	45.75%
Total efficiency	/	87.04%

**Exhaust gas cooled to 120 °C for natural gas. - Note: All data of gas generator sets are measured under the test environment: Methane volume content ≥95%, Gas temperature 10-40 °C, Gas humidity <60%, Negative pressure of air intake >-3kPa, Exhaust back pressure <5kPa, Absolute atmospheric pressure 101.32kPa, Environmental temperature 25°C, Relative humidity ≤30%, Altitude ≤1000m*

3. Combustion air and exhaust data sheet for engine

ITEM	UNIT	VALUE
Exhaust temperature	°C	≤580
Max Exhaust temperature	°C	620
Exhaust flow (including H_2O)	kg/h	9943
Max Exhaust back pressure	kPa	2.5
Diameter of exhaust pipe		DN400
Combustion air flow	kg/h	9578
Max air pressure before air filter	kPa	2.5

4. Gas consumption data sheet

ITEM	UNIT	VALUE
Gas type		Natural gas
CH4	%	≥80
Methane number (MN)	/	≥80
Gas valve group inlet pressure	kPa	30-50
Engine inlet gas pressure	kPa	6-10
Rate of gas pressure change	kPa/sec	≤ 1
Rate of change of heating value of gas	%/min	≤ 2
Gas intake pipe	mm	100
H2S	mg/Nm^3	≤ 20
All of the sulfur	mg/Nm^3	≤ 200
Solidparticle	$\mu m/m^3$	≤ 5
	mg/m^3	≤ 30

5. Technical parameters of engine lubricating oil system

ITEM	UNIT	VALUE
Lube oil pressure @ idle speed	kPa	>300
Lube oil pressure @ rated speed	kPa	460-520
Max.Permissible Oil Temperature	°C	≤90
Oil capacity	L	330

CHG620V20 Gas Engine

6. Technical parameters of engine cooling system

ITEM	UNIT	VALUE
High temperature part heat dissipation	kW	1116
Low temperature part heat dissipation	kW	195
Flow of jacket water	m^3/h	80
Flow of Intercooler water	m^3/h	80
High temperature water I/O	°C	72 to 84
Low temperature water I/O	°C	43 to 45
Max. temperature of jacket water	°C	90
I/O pipe of jacket water	DN/PN	DN80/PN16
I/O pipe of intercooler water	DN/PN	DN65/PN16
High temperature water pressure	MPa	0.3
Low temperature water pressure	MPa	0.15

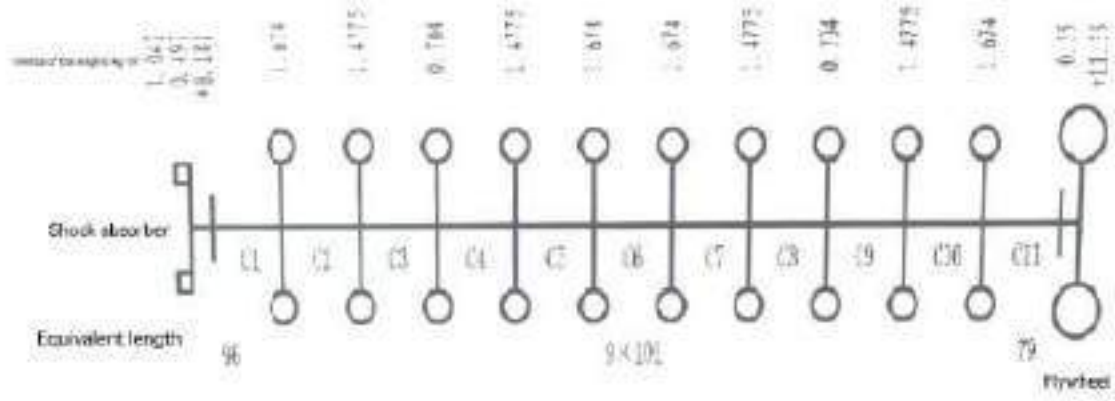
7. Engine emission data

ITEM	VALUE
CH_4	≤2000 ppm
O_2	≤8.50%
N_2	75-76%
CO_2	6.30%
NO_x	500mg/Nm^3 @ 5% O_2
SO_2	Dependent on gas sulfur content
CO	≤920ppm
DUST	Background Particulate Matter

8. Torsional vibration calculation parameters

Power	RPM		Connecting rod length	Main journal	Crank pin journal	Allowed crankshaft force
2105kW	1500		360mm	170mm	130mm	55MPa
Bore d	Stroke s	Stroke	Efficiency	Single-cylinder reciprocating mass	Crank-rod ratio	Cylinder arrangement angle
170mm	215mm	4	89%	15.24kg	0.2986	90°
Firing order	A1-B7-A2-B5-A4-B3-A6-B1-A8-B2-A10-B4-A9-B6-A7-B8-A5-B10-A3-B9					

CHG622V20 Gas Engine



Torsional rigidity	C1	C2	C3	C4	C5	C6	C7	C8	C9	C10	C11
MNm/rad	10.42	8.18	8.18	8.18	8.18	8.18	8.18	8.18	8.18	8.18	12.66

9. Oil Selection Recommendations

No	BRAND	MODEL
1	SHELL	SHELL RIMULA R3 NG 15W-40
2	Mobil	MOBIL PEGASUS 805 SAE40

10. Engine coolant

When choosing water as cooling medium, the following requirements should be met:

A. Use clean water that is slightly alkaline and does not contain corrosive compounds ;

B. The hardness is 0.7-5.3 mol/L, the content of chloride ion is less than 150mg/ L, and the PH value is 6.0-8.5;

C. If the water quality does not meet the above requirements, the corresponding softening water equipment or descaling equipment should be added according to the coefficient of 1.2 times of the consumption of cooling water.

Other cooling medium

When the ambient temperature is below 5°C, antifreeze should be selected as the cooling medium. When selecting antifreeze, the freezing point should be 5°C lower than the lowest temperature in the use area.

PROJECTS

GAS ENGINE MARKET STATISTICS

Nº	Name	Engine power	QTY	Installed capacity	Region	Company	Date of contract
1	CHG620V8 Mashgas Generator Set	500 kW	3	1500	Sichuan	Yingjing Fenghuang Coal Industry Co., Ltd	2010.10
2	CHG620V12 Mashgas Generator Set	800 kW	1	800 kW	Henan	Hebei Coal Industry Co., Ltd. No. 8 Mine	2011.5
3	CHG620L6 Natural Gas Engine	450 kW	1	450 kW	Sichuan	MIRACLE POWER SYSTEMS INC.	2011.6
4	CHG620V8 Mashgas Generator Set	600 kW	6	3600 kW	Hunan	Hunan Lida Energy Source Development Co.,Ltd.	2012.8
5	CHG620V12 Mashgas Generator Set	800 kW	4	3200 kW	Hunan	Hunan Lida Energy Source Development Co.,Ltd.	2012.12
6	CHG620V16 Silent Type Mashgas Generator Set	1000 kW	1	1000 kW	Shanxi	Shanxi Lanneng Coalbed Methane Development Co., Ltd	2013.4
7	CHG620V8、CHG620V16 Mashgas Generator Set	600 kW 1000 kW	3	2200 kW	Sichuan	Qianwei Tangba Coal Industry Co., Ltd.	2015.4
8	CHG620V8、CHG620L6 Natural Gas Generator Get	600 kW 400 kW	2	1000 kW	Shanxi	SiACTPOWER Co., Ltd.	2014.6
9	CHG620V16 Mashgas Generator Set、CHG620V12 Mashgas Generator Set	1000 kW 800 kW	4	3600 kW	Guizhou	Shuikuang Wenjiaba Coal Mine No.1 Mine	2017.3
10	CHG620L6 Natural Gas Genrator Set	400 kW	1	400 kW	Henan	Luoyang Xinaohua Oil and Gas Co., Ltd.	2016.9
11	CHG620L6 Natural Gas Engine	400kW	2	800 kW	Henan	Xin Ao(China)Gas Investment Limited	2017.4
12	CHG620L6 Natural Gas Genrator Set	400kW	1	400 kW	Shanxi	Baoji Fifth People's hospital	2017.5
13	CHG620V8 low Concentration Mashgas Generator Set	500kW	5	2500 kW	Shanghai	Shanghai Weiting Power System Co., Ltd	2018.2
14	CHG620V12 low Concentration Mashgas Generator Set	800kW	3	2400 kW	Anhui	Yuanyi Coal Mine of Huaibei Mining Co., Ltd. Electric Power Branch	2017.12
15	CHG620V16 Mashgas Generator Set	1000kW	1	1000 kW	Guizhou	Shuikuang Wenjiaba Coal No.1 Mine and Phase II	2018.3
16	CHG620V16 Mashgas Generator Set、CHG620V12 Mashgas Generator Set	1000 kW 800 kW	4	4000 kW	Guizhou	Shuikuang Wenjiaba Coal No.2 Mine	2018.6

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№	Name	Engine power	QTY	Installed capacity	Region	Company	Date of contract
17	CHG620V12 low Concentration Mashgas Generator Set	800 kW	4	3200 kW	Anhui	Suzhou Qinan Coal Mine Gas Power Plant	2018.7
18	CHG620V12 Silent Type Low Concentration Mashgas Generator Set	800 kW	1	800 kW	Shanghai	Shanghai Weitingxin Power Generating Machine Co.,Ltd.	2019.1
19	CHG620V16 Silent Type Low Concentration Mashgas Generator Set	1000 kW	10	10000 kW	Guizhou	Yonggui Energy Development Co., Ltd. (Xintian coal mine)	2019.3
20	CHG620V16 Silent Type Low Concentration Mashgas Generator Set	1000 kW	2	2000 kW	Guizhou	Yonggui Energy Development Co., Ltd. (Nuodong coal mine)	2019.5
21	CHG622V20 Silent Type Semi Coke Gas Generator Set	1500 kW	5	7500 kW	Shandong	Shandong Hengli Electric MOTOR Co., Ltd.	2019.5
22	CHG620L6/CHS620L6 Marine Main Engine	420 kW	2	840 kW	Guangdong	Guangzhou Qiaogeli Electromechanical Equipment Co., Ltd.	2019.7
23	CHG620V16 Silent Type Low Concentration Mashgas Generator Set	1000 kW	2	2000 kW	Guizhou	Yonggui Energy Development Co., Ltd. (Second Phase in Xintian)	2019.8
24	CHG620V16 Silent Type Low Concentration Mashgas Generator Set	1000 kW	2	2000 kW	Guizhou	Yonggui Energy Development Co., Ltd. (Xixiu coal mine)	2019.8
25	CHG620V16 Silent Type Low Concentration Mashgas Generator Set	1000 kW	1	1000 kW	Guizhou	Yonggui Energy Development Co., Ltd. (Jiaozishan coal mine)	2019.8
26	CHG620V16 Silent Type Low Concentration Mashgas Generator Set	1000 kW	1	1000 kW	Guizhou	Yonggui Energy Development Co., Ltd. (Qianxi Jinpo Coal Mine)	2019.8
27	CHG620V16 Low Concentration Mashgas Generator Set	1000 kW	1	1000 kW	Shanxi	Shanxi Jiayuan Zhiyuan New Energy Technology Co., Ltd.	2019.1
28	CHG620V12 Silent Type Low Concentration Mashgas Generator Set	800 kW	3	2400 kW	Guizhou	Guizhou Langyue Mining Investment Co., Ltd. (First phase)	2020.4

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№	Name	Engine power	QTY	Installed capacity	Region	Date of contract
1	CHG622V16 Gas Generator Set	1500 kW	1	1500 kW	RUSSIA	2023.3
2	CHG620V12 Gas Generator Set	1000 kW	2	2000 kW	RUSSIA	2023.7
3	CHG620V12 Gas Generator Set	1000 kW	2	2000 kW	RUSSIA	2024.1
4	CHG620V12 Gas Generator Set	1000 kW	1	1000 kW	RUSSIA	2023.9
5	CHG622V20 Gas Generator Set	2000 kW	2	4000 kW	RUSSIA	2024
6	CHG622V20 Gas Generator Set	2000 kW	4	8000 kW	RUSSIA, SAMARA	2024.1
7	CHG622V16 APG Gas Generator Set	1500 kW	1	1500 kW	RUSSIA	2023.3
8	CHG622V20 Gas Generator Set	2000 kW	1	2000 kW	RUSSIA, ROSTOV	2023.12
9	CHG622V16 Gas Generator Set	1500 kW	7	10500 kW	RUSSIA, SAKHALIN	2024.6
10	CHG620V12 Gas Generator Set	1000 kW	1	1000 kW	RUSSIA	2025.9
11	DT58 Gas Generator Set	1200 kW	1	1200 kW	RUSSIA	2025.4
12	DT58 Gas Generator Set	1200 kW	1	1200 kW	RUSSIA	2025.3
13	DT30 Gas Generator Set	500 kW	5	2500 kW	RUSSIA	2025.5
14	DT30 Gas Generator Set	500 kW	3	1500 kW	RUSSIA, SAINT-PETERSBURG	2024.12
15	CET13 Gas Generator Set	250 kW	12	3000 kW	RUSSIA, IRKUTSK	2023.3
16	CHG620V12 Gas Generator Set	1000 kW	2	2000 kW	RUSSIA	2025.9
17	CT07 Gas Generator Set	100 kW	4	400 kW	RUSSIA	2025.11
18	DT15 Gas Generator Set	250 kW	1	250 kW	RUSSIA	2025.11

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№	Name	Engine power	QTY	Installed capacity	Region	Date of contract
19	CET13 Gas Generator Set	250 kW	4	1000 kW	RUSSIA	2025.10
20	DT15 Gas Generator Set	250 kW	2	500 kW	RUSSIA	2025.9
21	DT30 Gas Generator Set	500 kW	2	1000 kW	RUSSIA	2025.9
22	CET13 Gas Generator Set	250 kW	2	500 kW	RUSSIA	2025.6
23	CET13 Gas Generator Set	250 kW	1	250 kW	RUSSIA	2025.6
24	CET13 Gas Generator Set	250 kW	1	250 kW	RUSSIA	2025.5
25	CET13 Gas Generator Set	250 kW	1	250 kW	RUSSIA	2025.5
26	DT30 Gas Generator Set	500 kW	1	500 kW	RUSSIA	2025.2
27	DT30 Gas Generator Set	500 kW	1	500 kW	RUSSIA	2024.12
28	DT30 Gas Generator Set	500 kW	1	500 kW	RUSSIA	2024.12
29	DT30 Gas Generator Set	500 kW	2	1000 kW	RUSSIA	2025.03
30	CT07 Gas Generator Set	100 kW	1	100 kW	RUSSIA	2024.12
31	DT30 Gas Generator Set	500 kW	1	500 kW	RUSSIA	2024.12
32	CET13 Gas Generator Set	250 kW	2	500 kW	RUSSIA, SAINT-PETERSBURG	2023.4
33	CET13 Gas Generator Set	250 kW	1	250 kW	RUSSIA, SAINT-PETERSBURG	2024.5
34	CET13 Gas Generator Set	250 kW	2	500 kW	RUSSIA,YAROSLAVL	2023.12
35	DT30 Gas Generator Set	500 kW	1	500 kW	RUSSIA, CHELYABINSK	2024.5
36	DT30 Gas Generator Set	500 kW	2	1000 kW	RUSSIA	2023.4
37	DT30 Gas Generator Set	500 kW	1	500 kW	RUSSIA	2023.8
38	CET13 Gas Generator Set	250 kW	1	250 kW	RUSSIA	2023.8
39	CET13 Gas Generator Set	250 kW	1	250 kW	RUSSIA	2023.8

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GAS ENGINE MARKET STATISTICS

Nº	Name	Engine power	QTY	Installed capacity (kW)	Country	Date of contract
1	CHG622V20 Gas Engine Power Plant	2000 kW	2	4000 kW	Nigeria	2020.3
2	DT30 Gas Engine Power Plant	500 kW	10	5000 kW	Russia	2023.3
3	CHG620V12 Gas Engine Power Plant	1000 kW	4	4000 kW	Russia	2023.5
4	DT30 Gas Engine Power Plant	500 kW	8	3000 kW	Russia	2023.6
5	CHG622V20 Gas Engine Power Plant	2000 kW	5	10000 kW	Russia	2023.7
6	CET13 Gas Engine Power Plant	250 kW	25	6250 kW	Ukraine	2023.8
7	CHG620V16 Gas Engine Power Plant	1500 kW	2	3000 kW	Russia	2023.9
8	CET13 Gas Engine Power Plant	250 kW	20	5000 kW	Ukraine	2024.4
9	CET13 Gas Engine Power Plant	250 kW	15	3750 kW	Ukraine	2024.5
10	CET13 Gas Engine Power Plant	250 kW	8	2000 kW	Russia	2024.6
11	DT30 Gas Engine Power Plant	500 kW	7	3500 kW	Russia	2024.6
12	CET13 Gas Engine Power Plant	250 kW	80	20000 kW	Ukraine	2024.6
13	CHG620V16 Gas Engine Power Plant	1500 kW	7	10500 kW	Russia	2024.7
14	DT15BG Biogas from Livestock Farms	250 kW	2	500 kW	Thailand	2026.2
15	CET13 Natural Gas for Computing Power	250 kW	114	28500 kW	Ukraine	2024.9
16	DT30 Natural Gas for Community Power Supply	500 kW	1	500 kW	Ukraine	2025.8
17	CET13 Natural Gas for Pharmaceutical Warehouse	250 kW	1	250kW	Ukraine	2026.1

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