# VMAN ENGINE

### 2024 Gas







### ABOUT VMAN ENGINE



Vacaation is a set design, research and development, production, sales as one of the most professional engine manufacturing enterprises located in Shanghai. The company was founded in 2007 by importing the technology of high power diesel engine. After constant study abroad and imported machine (CBU) .The parts assembly (CKD) localization, builds a skilled and cohesive enterprise team.

The company constantly develop new products, adopt advanced manufacturing technology sophisticated production equipment, rich experience in production management, modern test methods to build perfect VMAN brand. Products have been strictly controlled from the design, procurement, technology, field, quality and other aspects, design and manufacture with domestic and international standards.

Our main products cover automotive, engineering machinery, generator sets, marine and other fields. Including diesel engine and gas engine. Powers range from 25 -2000kW, Emissions meet the second stage, and the third stage.

VMAN Engines is headquartered in Shanghai, with a factory in Changzhou, China.

VMAN has a branch in Singapore and planning for a European branch.





 Importing technology & Drawing interpretation
 Part drawing, assemble drawing, machine drawing, QA system, etc
 Learning & Training

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



• CKD & CBU Diesel engines Getting aptitude of assembling CKD diesel engine,Match up CBU&CKD diesel engines with Customers

Build new factory in Shanghai
Realize home manufacture and finish all series of V6 V8 V12
V16 engine and get excellent feedback from customers



Starting international trading business
 Now had export to Korea, Taiwan, Indonesia,
 Algeria, Nigeria, Pakistan, Malaysia, UAE,
 Vietnam, Poland, Albania, Argentina and other



#### Building New Branch factory

In ChangZhou City, Extend more power range products In particular high power engines up to 2MW.



New C & CE series Engines Launch

Develop New C&CE series Engines and put to the market.Extend full power range from 62kW to 1100kW



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#### Set up branch in Singapore

VMAN Engine Singapore Pte., Ltd set up on July.2022.. Provide technical training and service support for the global market.



#### Further expand the product range

DC03 series diesel engine put on the market, power range 25kW to 55kW; CET13 AND DT30 gas engine put on the market, power range 250kW to 500kW.



New branch factory in ChangZhou City

### Manufacturer

VMAN Engine has fully advanced manufacture process and quality management system. We are well-equipped and experienced in modern production management. We take vigorous position in part assembly and debug to prevent the leak of gas, water and oil, we inspect all the engines with standard leak test to guarantee the tightening quality ,we use ESTIC technology(Japanese Nut runner machine) on all key bolts. Each engine will be debugged before going to the market.

#### Used advanced instruction

Overall test equipments are imported from famous engine company. All the engines shall meet the technical standards during on-site trials;

#### Multi-level testing and 110% Load testing

Each engine will be proceeding multi-level testing according to the customer's requirements, and also proceeding 110% load testing, sudden loading and unloading testing to ensure our engine's quality.

#### Quality management system ISO9001:2015 certification

Manufacturer line use advanced methods including auto-delivery, rotary carriers, cylinder press fitting and front-rear oil seal press fitting, etc, to have control of production and quality.





### Gas Engine



DT series Gas engine is developed from 2018, cooperate with our Polish parter, over 5 years of research on cogeneration systems and developed their own solutions for industrial gas engines working on biogas with variable parameters, nature gas and others. By changing the construction of the engine's main parts, let them more suitable for different gas resource, enhance efficiency of engine, also enhance the parts service time to save the maintenance cost of fully service life time.

**CET series Gas engine** is developed by AVL, AVL is a famous engine technology consulting company in the world, headquartered in Austria. Most of main parts of engine till now still import or used famous brand product to ensure the engine highly service time less maintenance cost.





Vman



Model	Туре	Speed (rpm)	Electrical power (kW)	Thermal output (kW)	Disp. (L)	Size (mm)	Flywheel
CT07A	L6		100	110	6.5	1212 x 841 x 1146	SAE 3#11.5
CET12A	L6	1500	200	221	11.81	1360 x 898 x 1138	
CET13A	L6	1500	250	271	12.80	1360 x 898 x 1138	SAE 0#14
DT30A	V16		500	609	30.14	2340 x 1392 x 1360	
CT07B	L6		100	110	6.5	1212 x 841 x 1146	SAE 3#11.5
CET12B	L6	1800	200	221	11.81	1360 x 898 x 1138	
CET13B	L6	1000	250	271	12.80	1360 x 898 x 1138	SAE 0#14
DT30B	V16		500	609	30.14	2340 x1392 x1360	

### 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 (kW)	100	100
Thermal output (kW)	110	110
Electrical efficiency	38.36%	38.36%
Thermal efficiency	42.1%	42.1%
Total efficiency	80.46%	80.46%



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 1	24 mm	
Number of valve per cylinder	2	1	
Displacement	6.5	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	V	V	
Controller system	Woodwa	ard PG+	
Outstanding dimistation	1212 x 841	x 1146 mm	
Engine Dry Weight	560 kg		
Flywheel and flywheel housing	SAE 11.5	# flywheel	
	SAE 3# flywr	neel housing	



# 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	27.5	100	27.5
50%	50	16.5	50	16.5

-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 (kg/h)	478	478
Max.Intake Gas Flow (m³/h)	27.5	27.5
Max.Intake Air Flow (m³/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 Heat release	56 kW	56 kW
Radiator Flow	210 L/min	240 L/min
Intake air type	Air to air intercooler	Air to air intercooler
Intercooler allowance press drop	8 kPa	8 kPa
Intercooler Heat release	25 kW	25 kW
Intercooler allowance intake temperature	195 ±5°C	195 ±5°C
Max.Intercooler intake air	863 kg/h	863 kg/h

## CT07 Gas Engine

#### LUBRICATION SYSTEM

Lube oil pressure @ idle speed	Min 80 ±10 kPa	Min 80 ±10 kPa
Lube oil pressure @ rated speed	350 ±10 kPa	350 ±10 kPa
Max.Permissible Oil Temperature	115 ≤ °C	115 ≤ °C
Oil capacity	18 L	18 L
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	CT07A(Value)	CT07B(Value)
CH <sub>4</sub>	1069.5 ppm	ppm
O <sub>2</sub>	≤ 7%	≤ 7%
N <sub>2</sub>	73% - 77%(Standard values)	73% - 77%(Standard values)
CO <sub>2</sub>	64900 ppm	64900 ppm
NO <sub>x</sub>	500mg/Nm3 @ 5% O2	500mg/Nm3 @ 5% O2
SO <sub>2</sub>	From your natural gas	From your natural gas
СО	705 ppm	705 ppm
DUST	From your local air	From your local air

#### **CT07 SERIES GAS ENGINE DRAWING**







### CET12/13 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	
	CET12A	CET13A	CET12B	CET13B
Electrical power (kW)	200	250	200	250
Thermal output (kW)	221	271	221	271
Electrical efficiency	37.5%	38.4%	37.5%	38.4%
Thermal efficiency	41.5%	41.6%	41.5%	41.6%
Total efficiency	79%	80%	79%	80%

#### **GENERAL ENGINE DATA**

Engine Model	CET12A	CET12B	CET13A	CET13B
Engine Type	6 cylinder, Inline-type, Four- stroke			
Speed	1500 rpm	1800 rpm	1500 rpm	1800 rpm
Bore x stroke	CET12: 128r	mm x 153mm	CET13: 130r	nm x 161mm
Number of valve per cylinder		2	1	
Displacement	11.81 L	11.81 L	12.82 L	12.82 L
Compression ratio	11.5 : 1	11.5 : 1	11.5 : 1	11.5 : 1
Rotation {Looking at flywheel}	Anti-clockwise (facing the power delivery end)			d )
Firing order	1-5-3-6-2-4			
Cylinder distance	162 mm			
Combustion Type	W			
Controller system	Woodward PG+			
Outstanding dimistation		1360 x 898	x 1138 mm	
Engine Dry Weight	1065kg			
Rotational Inertia	2.9 kgm2			
Flywheel and flywheel housing	SAE 14" flywheel			
	SAE 1# flywheel housing			

### CET12/13 Gas Engine

#### GAS CONSUMPTION CALCULATION

Engine Model	CET 12		CET 13	
Fuel	Nature Gas			
Fuel Consumption of generator set				
	kW	Nm3/h	kW	Nm3/h
100%	200	53	250	65
50%	100	28	125	34

-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	CET12	CET13
Max.Exhaust Back Pressure (kPa)	10±1	10±1
Max.Exhaust Temp.(After Turbo°C)	580	580
Max.Exhaust Flow (kg/h)	933	1165
Max.Intake Gas Flow (m³/h)	53	65
Max.Intake Air Flow (m³/h)	880	1100
Max.Intake Resistance ( Clean filter ) (kPa)	3.5	3.5
Max.Intake Resistance ( Dirty filter ) (kPa)	6.5	6.5
Alarm Value of Intake Resistance (kPa)	6.3	6.3

#### **COOLING SYSTEM**

50 : 50 ( Ethylene Glycol, water )	50 : 50 ( Ethylene Glycol, water )
95°C	95°C
6 ±1°C	6 ±1°C
104 °C	104 °C
156 kW	192 kW
440L/min	490L/min
Air to air intercooler	Air to air intercooler
11 - 13 kPa	11 - 13 kPa
65 kW	79 kW
195 ±5°C	195 ±5°C
1450 kg/h	1450 kg/h
	50 : 50 ( Ethylene Glycol, water ) 95°C 6 ±1°C 104 °C 156 kW 440L/min Air to air intercooler 11 - 13 kPa 65 kW 195 ±5°C 1450 kg/h

### CET12/13 Gas Engine

#### LUBRICATION SYSTEM

Oil capacity	
Max.Permissible Oil Temperature	
Lube oil pressure @ rated speed	
Lube oil pressure @ idle speed	
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#### 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**

EATIAOST		
Item	CET12(Value)	CET13(Value)
CH <sub>4</sub>	1069.5 ppm	1069.5 ppm
O2	≤5%	≤5%
N2	73%-77%(Standard values)	73%-77%(Standard values)
CO <sub>2</sub>	70654.63 ppm	70654.63 ppm
NO <sub>x</sub>	500 mg/Nm3 @ 5% O2	500mg/Nm3 @ 5% O2
SO <sub>2</sub>	From your natural gas	From your natural gas
СО	705 ppm	705 ppm
DUST	From your local air	From your local air

#### **CET 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 6-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 (kW)	500	500
Thermal output (kW)	609	609
Electrical efficiency	38%	38%
Thermal efficiency	46%	46%
Total efficiency	84%	84%

#### **GENERAL ENGINE DATA**

Engine Model	DT30A	DT30B
Engine Type	16 cylinder, Inline-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+	
Outstanding dimistation	1887 x 1120 x 1362 mm	
Engine Dry Weight	2100 kg	
Rotational Inertia	2.9 kgm2	
Flywheel and flywheel housing	SAE 14" flywheel	
	SAE 0# flywl	heel housing



# DT30 Gas Engine

#### GAS CONSUMPTION CALCULATION

Engine Model	DTG	30A	DT3	30B
Fuel	Nature Gas			
Fuel Consumption of generator set				
	kW	Nm3/h	kW	Nm3/h
100%	500	140	500	140
50%	250	80	250	80

-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 (m³/h)	140	140
Max.Intake Air Flow (m³/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
Alaitti value ol litilake nesislarice (kFa)	0.3	0.0

#### **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	477 kW	477 kW
Radiator Flow	1040L/min	1040L/min
Intake air type	Air to air intercooler	Air to air intercooler
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	Min 160 ±10 kPa	Min 160 ±10 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

#### **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. Tempe <mark>r</mark> ature for Unaided )	Block heater ( Min. Temperature for Unaided )

#### **EXHAUST**

Item	DT30A(Value)	DT30B(Value)
CH <sub>4</sub>	1069.5 ppm	1069.5 ppm
O <sub>2</sub>	≤5%	≤5%
N <sub>2</sub>	73%-77%(Standard values)	73%-77%(Standard values)
CO <sub>2</sub>	70654.63 ppm	70654.63 ppm
NOx	500mg/Nm3 @ 5% O2	500mg/Nm3 @ 5% O2
SO <sub>2</sub>	From your natural gas	From your natural gas
СО	705 ppm	705 ppm
DUST	From your local air	From your local air

#### **DT30 SERIES GAS ENGINE DRAWING**



### 1MW-2MW Gas Engine



### 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.



### Standard Configuration

<b>Engine and block:</b> nodular cast iron the tensile strength can reach 120kgf /m <sup>2</sup> , 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 /m <sup>2</sup> , and it has good toughness.
<b>Moving Parts:</b> 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.
<b>Inlet &amp; exhaust valves valve seats:</b> 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



#### 1. Engine technical parameter list

ITEM	LINIT	
	ONIT	
Model		CHG620V12
Rated power	kW	1080
Heat loss	MJ/kWh	9.003
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	1.62
mean speed of piston	m/s	9.75
Oil quantity	m <sup>3</sup> (kg)	0.18
Cooling water quantity	m <sup>3</sup> (kg)	0.1
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 <sup>2</sup>	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		
Gas energy	kW	1471	1974	2202	2412	2626
Electrical power	kW	500	700	800	900	1000
Electrical efficiency	%	33.98%	35.46%	36.33%	37.31%	38.08%
Water thermal of cylinder liner	kW	381	496	548	586	633
Thermal efficiency of waterline	%	25.90%	25.13%	24.87%	24.30%	24.10%
Exhaust thermal	kW	299	419	477	526	587
Thermal efficiency of exhaust	/	20.31%	21.25%	21.66%	21.82%	22.37%
Thermal efficiency	/	46.21%	46.38%	46.53	46.12%	46.47%
Total efficiency	/	80.19%	81.84%	82.86	83.43%	84.55%

#### 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	5391
Exhaust quantity (including H2O)	Nm3/h	4290
Max Exhaust back pressure	kPa	2.5
Diameter of exhaust flange	mm	250
Combustion air flow	kg/h	5194
Combustion air quantity	Nm3/h	4026
Max air pressure before air filter	kPa	2.5

#### 4. Gas consumption data sheet

ITEM	UNIT	VALUE
Output electrical power	kW	1000
Permissible gas pressure range	kPa	≥7
Gas type		Natural gas
CH4	%	≥80
Min pressure of gas with air after turbocharger	kPa	30-50
Permissible range of gas pressure fluctuation	±%	5
Maximum fluctuation of gas pressure	kPa/sec	1/60
Gas consumption	MJ/kWh	9.454
Gas intake pipe	mm	100

#### 5. Technical parameters of engine cooling system

ITEM	UNIT	VALUE
Water flow of engine cylinder liner	m3/h	65
Water flow of Intercooler	m3/h	65
Water TD of I/O cylinder liner	°C	7-12
Water TD of I/O Intercooler	°C	2-5
Max water TEMP of cylinder liner	°C	90
Water I pipe of cylinder liner	DN/PN	DN80/PN16
Water O pipe of cylinder liner	DN/PN	DN65/PN16
Water I/O pipe of Intercooler	DN/PN	DN65/PN16
High temperature water pressure	MPa	0.2
Low temperature water pressure	MPa	0.14

#### 6. Technical parameters of engine lubricating oil system

ITEM	UNIT	VALUE
Lubricating oil system volume	Nm3	0.18
Max oil temperature	°C	90
Oil consumption rate	g/kWh	≤0.35

#### 7. Computation data for remote radiator and water pump

ITEM	UNIT	VALUE	
High temperature part heat dissipation	kw	633	
Low temperature part heat dissipation	kw	171	
Ambient temperature	°C	40	
High temperature water	°C	78 to 69.5	
Low temperature water I/O	°C	42 to 45.7	
Flow rate of high temperature pump	m3/h	65	
Flow rate of low temperature pump	m3/h	65	

#### 8. Engine emission data

ITEM	UNIT	VALUE	
NOx (5%O2)	mg/Nm3	≤500	
CO (5%O2)	mg/Nm3	≤1006	
HC (5%O2)	mg/Nm3	≤132.7	
02	%	8	
Excess air ratio	λ	1.5	

#### 9. Gas Quality requirements for engines

ITEM	UNIT	VALUE
CH4	2	80%
Rate of concentration change	$\leq$	2%/30s
Gas pressure	$\geq$	7kPa
Gas mass range	$\leq$	2%/min
H2s	$\leq$	20mg/Nm3
All of the sulfur	$\leq$	200mg/Nm3
Solid particle	$\leq$	5µm and 30mg/m3

#### 10. Torsional vibration calculation parameters

Power	Rotate	Speed	Connecting Rod Length	Main Journal	Journal Crank pin	Crankshaft Tensile Strength
1080 kW	1500	rpm	350 mm	152 mm	128 mm	55 MPa
Cylinder Diameter(d)	Length of Stroke(s)	Length of Stroke	Torque Efficiency	Single Cylinder Reciprocating Mass(m)	Crank Connecting Rod Ratio(λ)	Angle of Cylinder Arrangement(v)
170 mm	195 mm	4	85.3%	12.61 kg	0.2786	90°
Firing Order	A1-B2-A5-B4-A3-B1-A6-B5-A2-B3-A4-B6					



#### **11. Oil Selection Recommendations**

No	BRAND	MODEL
1	SINOPEC	Great Wall lubricating oil for gas engine
2	CHEVRON	"Chevron" HDAX5200 SAE40

#### 12. 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	1575
Heat loss	MJ/kWh	9.003
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	1.62
mean speed of piston	m/s	10.75
Oil quantity	m <sup>3</sup> (kg)	0.28(240)
Cooling water quantity	m³ (kg)	0.18(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 <sup>2</sup>	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		
Gas energy	kW	2207	2961	3303	3618	3939
Electrical power	kW	750	1050	1200	1350	1500
Electrical efficiency	%	33.98%	35.46%	36.33%	37.31%	38.08%
Water thermal of cylinder liner	kW	705	878	824	1039	1150
Thermal efficiency of waterline	%	31.9%	30.04%	29.91%	29.42%	29.02%
Exhaust thermal	kW	404	570	649	717	802
Thermal efficiency of exhaust	/	18.31%	19.25%	19.66%	19.82%	20.37%
Thermal efficiency	/	50.21%	49.28%	49.57%	49.23%	49.39%
Total efficiency	/	84.19%	84.74%	85.9%	86.54%	87.47%

#### 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	8087	
Exhaust quantity (including H2O)	Nm3/h	6434	
Max Exhaust back pressure	kPa	2.5	
Diameter of exhaust flange	mm	250	
Combustion air flow	kg/h	7790	
Combustion air quantity	Nm3/h	6039	
Max air pressure before air filter	kPa	2.5	
4. Gas consumption data sheet	A B		
ITEM	UNIT	VALUE	
Output electrical power	kW	1500	
Permissible gas pressure range	kPa	≥3	
Gas type		Natural gas	
CH4	%	≥80	
Min pressure of gas with air after turbocharger	kPa	30-50	
Permissible range of gas pressure fluctuation	±%	5	
Maximum fluctuation of gas pressure	kPa/sec	1/60	
Gas consumption	MJ/kWh	9.454	
Gas intake pipe	mm	100	

#### 5. Technical parameters of engine cooling system

ITEM	UNIT	VALUE
Water flow of engine cylinder liner	m3/h	75
Water flow of Intercooler	m3/h	65
Water TD of I/O cylinder liner	°C	7-12
Water TD of I/O Intercooler	°C	3-5
Max water TEMP of cylinder liner	°C	90
Water I/O pipe of cylinder liner	DN/PN	DN80/PN16
Water I/O pipe of Intercooler	DN/PN	DN65/PN16
High temperature water pressure	MPa	0.2
Low temperature water pressure	MPa	0.14

### CHG622V16 Gas Engine

#### 6. Technical parameters of engine lubricating oil system

ITEM	UNIT	VALUE
Lubricating oil system volume	Nm3	0.28
Max oil temperature	°C	95
Oil consumption rate	g/kWh	≤0.35
Diameter of lubricating oil refill pipe	mm	25
Diameter of lubricating oil drain pipe	mm	15

#### 7. Computation data for remote radiator and water pump

ITEM	UNIT	VALUE
High temperature part heat dissipation	kw	1150
Low temperature part heat dissipation	kw	150
Ambient temperature	°C	40
High temperature water	°C	83 to 70
Low temperature water I/O	°C	45 to 43
Flow rate of high temperature pump	m3/h	75
Flow rate of low temperature pump	m3/h	65

#### 8. Engine emission data

ITEM	UNIT	VALUE	
NOx (5%O2)	mg/Nm3	≤500	
CO (5%O2)	mg/Nm3	≤1006	
HC (5%O2)	mg/Nm3	≤132.7	
02	%	8	
Excess air ratio	λ	1.5	

#### 9. Gas Quality requirements for engines

ITEMUNITVALUECH4 $\geq$ 80%Rate of concentration change $\leq$ 2%/30sGas pressure $\geq$ 5kPaGas mass range $\leq$ 2%/minH2s $\leq$ 20mg/Nm3All of the sulfur $\leq$ 5µm and 30mg/m3			
CH4 $\geqq$ 80%Rate of concentration change $\le$ 2%/30sGas pressure $\end{Bmatrix}$ 5kPaGas mass range $\le$ 2%/minH2s $\le$ 20mg/Nm3All of the sulfur $\le$ 20mg/Nm3Solid particle $\le$ 5µm and 30mg/m3	ITEM	UNIT	VALUE
Rate of concentration change $\leq$ $2\%/30s$ Gas pressure $\geq$ $5kPa$ Gas mass range $\leq$ $2\%/min$ H2s $\leq$ $20mg/Nm3$ All of the sulfur $\leq$ $20mg/Nm3$ Solid particle $\leq$ $5\mum$ and $30mg/m3$	CH4	2	80%
Gas pressure≥5kPaGas mass range≤2%/minH2s≤20mg/Nm3All of the sulfur≤20mg/Nm3Solid particle≤5µm and 30mg/m3	Rate of concentration change	≤	2%/30s
Gas mass range         ≤         2%/min           H2s         ≤         20mg/Nm3           All of the sulfur         ≤         20mg/Nm3           Solid particle         ≤         5µm and 30mg/m3	Gas pressure	2	5kPa
H2s       ≤       20mg/Nm3         All of the sulfur       ≤       20mg/Nm3         Solid particle       ≤       5µm and 30mg/m3	Gas mass range	≤	2%/min
All of the sulfur       ≤       20mg/Nm3         Solid particle       ≤       5µm and 30mg/m3	H2s	≤	20mg/Nm3
Solid particle ≤ 5µm and 30mg/m3	All of the sulfur	≤	20mg/Nm3
	Solid particle	≤	5µm and 30mg/m3

#### 10. Torsional vibration calculation parameters

Power	Rotate	Speed	Connecting Rod Length	Main Journal	Journal Crank pin	Crankshaft Tensile Strength	
1600 kW	1500	) rpm	360 mm	170 mm	130 mm	55 MPa	
Cylinder Diameter(d)	Length of Stroke(s)	Length of Stroke	Torque Efficiency	Single Cylinder Reciprocating Mass(m)	Crank Connecting Rod Ratio(λ)	Angle of Cylinder Arrangement(v)	
170 mm	215 mm	4	89%	15.24 kg	0.2986	90°	
Firing Order	A1-A7-B4-B6-A4-B8-A2-A8-B3-B5-A3-A5-B2-A6-B1-B7						



#### **11. Oil Selection Recommendations**

No	BRAND	MODEL
1	SINOPEC	Great Wall lubricating oil for gas engine
2	CHEVRON	"Chevron" HDAX5200 SAE40

#### 12. 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.

### CHG622V20 Gas Engine

#### 1. Engine technical parameter list

Total efficiency

ITEM	UNIT	VALUE					
Model			CHG622V20				
Rated power	kW		2100				
Heat loss	MJ/kWh			9.0	003		
Quantity of Cylinders	PCS			2	20		
Cylinder bore	mm			1	70		
Stroke	mm			2	15		
Displacement	L			9	7.6		
Speed	rpm			15	500		
Compression ratio				1:	2:1		
mean effective pressure	MPa			1.	.72		
mean speed of piston	m/s			10	.75		
Oil quantity	m³ (kg)			0.33	8(280)		
Cooling water quantity	m³ (kg)			0.22	2(220)		
Dimension(L*W*H)	mm			3860×16	600×2400		
Dry weight	kg			88	300		
Weight with oil	kg			93	300		
Moment of inertia of an area(flywheel)	kgm <sup>2</sup>			- 11	.35		
Direction of rotation		UTUS X		CCW(Look a	t the flywhee	el)	
Fly wheel				SA	E21		
EMC				N (By VI	DE0857)		
Starter	kW			2×13 @	DC24V		
2. Heat balance list of generator set							
ITEM	UNIT	VALUE					
Gas energy	kW	2947	3423	4175	4406	4837	5252
Electrical power	kW	1000	1200	1500	1600	1800	2000
Electrical Efficiency	%	33.93%	35.06%	35.93%	36.31%	37.21%	38.08%
Water thermal of cylinder liner	kW	886	1018	1209	1251	1357	1470
Thermal efficiency of water liner	%	30.07%	29.76%	28.97%	28.39%	28.06%	27.98%
Exhaust thermal	kW	534	645	817	869	996	1097
Thermal efficiency of exhaust	/	18.11%	18.85%	19.56%	19.72%	20.58%	20.89%
Thermal efficiency	/	48.18%	48.61%	48.53%	48.11%	48.64%	48.87%

/

82.11%

83.7%

84.46%

84.42%

85.85%

86.95%

#### 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	10782
Exhaust quantity (including H2O)	Nm3/h	8579
Max Exhaust back pressure	kPa	2.5
Diameter of exhaust flange	mm	400
Combustion air flow	kg/h	10387
Combustion air quantity	Nm3/h	8052
Max air pressure before air filter	kPa	2.5

#### 4. Gas consumption data sheet

ITEM	UNIT	VALUE
Output electrical power	kW	2000
Permissible gas pressure range	kPa	≥3
Gas type		Natural gas
CH4	%	≥80
Min pressure of gas with air after turbocharger	kPa	30-50
Permissible range of gas pressure fluctuation	±%	5
Maximum fluctuation of gas pressure	kPa/sec	1/60
Gas consumption	MJ/kWh	9.454
Gas intake pipe	mm	125

#### 5. Technical parameters of engine cooling system

ITEM	UNIT	VALUE
Water flow of engine cylinder liner	m3/h	85
Water flow of Intercooler	m3/h	80
Water TD of I/O cylinder liner	°C	12-15
Water TD of I/O Intercooler	°C	3-5
Max water TEMP of cylinder liner	°C	90
Water I/O pipe of cylinder liner	DN/PN	DN80/PN16
Water I/O pipe of Intercooler	DN/PN	DN65/PN16
High temperature water pressure	MPa	0.3
Low temperature water pressure	MPa	0.2

### CHG622V20 Gas Engine

#### 6. Technical parameters of engine lubricating oil system

ITEM	UNIT	VALUE
Lubricating oil system volume	Nm3	0.33
Max oil temperature	°C	95
Oil consumption rate	g/kWh	≤0.35
Diameter of lubricating oil refill pipe	mm	25
Diameter of lubricating oil drain pipe	mm	15

#### 7. Computation data for remote radiator and water pump

ITEM	UNIT	VALUE
High temperature part heat dissipation	kw	1470
Low temperature part heat dissipation	kw	195
Ambient temperature	°C	40
High temperature water	°C	83 to 68
Low temperature water I/O	°C	45 to 43
Flow rate of high temperature pump	m3/h	85
Flow rate of low temperature pump	m3/h	80

#### 8. Engine emission data

ITEM	UNIT	VALUE
NOx (5%O2)	mg/Nm3	≤500
CO (5%O2)	mg/Nm3	≤1006
HC (5%O2)	mg/Nm3	≤132.7
02	%	8
Excess air ratio	λ	1.5

#### 9. Gas Quality requirements for engines

ITEM	UNIT	VALUE
CH4	2	80%
Rate of concentration change	≤	2%/30s
Gas pressure	2	5kPa
Gas mass range	≤	2%/min
H2s		20mg/Nm3
All of the sulfur	≤	20mg/Nm3
Solid particle	≤	5µm and 30mg/m3

#### 10. Torsional vibration calculation parameters

Power	Rotate Speed		Connecting Rod Length	Main Journal	Journal Crank pin	Crankshaft Tensile Strength		
2105 kW	1500 rpm		360 mm	170 mm	130 mm	55 MPa		
Cylinder Diameter(d)	Length of Stroke(s)	Length of Stroke	Torque Efficiency	Single Cylinder Reciprocating Mass(m)	Crank Connecting Rod Ratio(λ)	Angle of Cylinder Arrangement(v)		
170 mm	215 mm	4	89%	15.24 kg	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							
	v) v) v) v)							



#### **11. Oil Selection Recommendations**

No	BRAND	MODEL
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2	CHEVRON	"Chevron" HDAX5200 SAE40

#### 12. 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

#### HND GAS ENGINE MARKET STATISTICS

Nº	Name	Model	QTY	Installed capacity (kW)	Province	Company	Date of contract
1	CHG620V8 Mashgas Generator Set	500 kW	3	1500 kW	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	2018.2.1
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

### PROJECTS

#### HND GAS ENGINE MARKET STATISTICS

N⁰	Name	Model	Amount	Installed capacity (kW)	Province	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	Guangdon g	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	CHG622V20 Gas Generator Set	2000 kW	2	4000 kW	Shanghai	Shanghai VMAN ENGINE CO.,LTD	2020.3
29	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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