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HiMSEN Engine

Hi-touch Marine & Stationary ENGINE
IMO Tier II Programme 2012



2012

Marine & Offshore GenSets
Marine Propulsion System
Stationary GenSets

 **HYUNDAI** ENGINE & MACHINERY
HEAVY INDUSTRIES CO., LTD.

HiMSEN Engine Programme

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HEAVY INDUSTRIES CO., LTD.
ENGINE & MACHINERY

A01-081-12 JAN. 2012
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Key to Components

HYUNDAI-HIMSEN

- | | |
|----------------------|-------------------------|
| 1 Common base frame | 14 Lub.oil priming pump |
| 2 Resilient mounting | 15 Lub.oil pump |
| 3 Engine block | 16 Lub.oil cooler |
| 4 Cylinder liner | 17 Lub.oil filter |
| 5 Flywheel cover | 18 Cooling water pump |
| 6 Crank case cover | 19 Intake air duct |
| 7 Cylinder head | 20 Turbocharger |
| 8 Rocker arm | 21 Air cooler |
| 9 Camshaft | 22 Engine control panel |
| 10 Piston | 23 Fuel pump cover |
| 11 Connecting rod | 24 Exhaust gas pipe |
| 12 Crankshaft | 25 Alternator |
| 13 Counter weight | |

HYUNDAI

HIMSEN Engine

Hi-touch Marine & Stationary Engine



Earth-Friendly Engine

HYUNDAI-HiMSEN

HiMSEN Family

Design Philosophy

Hyundai's HiMSEN Family have simple and smart design suitable for marine applications with high reliability and performance.

The key features are:

Heavy Fuel Engine with same fuel of main engine (Uni-Fuel concept).

Hence, the diesel fuel and heavy fuel oil of the viscosity of upto 700 cSt at 50 °C is acceptable.



HYUNDAI-HiMSEN

Earth-Friendly Engine

Economical and Ecological Engine with low fuel consumption, NOx emission, and Smoke, etc. , which is based on the below specific designs;

- Optimized Supercharging with Miller Cycle
- High Fuel Injection Pressure

Reliable and Practical Engine with simple, smart and robust structure.

- Number of engine components are minimized with Pipe-Free design
- Most of the components are directly accessible for easier maintenance
- 'Individual Part' maintenance concept is provided
- Feed System is fully modularized with direct accessibility

Earth-Friendly Engine

HYUNDAI-HIMSEN

Main Features

Performance characteristics

- High output in the similar range engines
- Low fuel oil consumption
- Quick acceleration & load response

Maintenance

- Easier maintenance by modularized design
- Minimal number and kind of components

Earth-friendly engine

- Low NO_x emissions
- Compliance with IMO NO_x Tier II
- Low vibration & noise

Major Application

Marine

- Propulsion system
- Generating sets

Offshore

- Drill ship
- FPSO

Stationary

- Stationary diesel power plants
- Packaged power stations
- Gas engine power plants
- Pre-fabricated power plants
- Barge-mounted diesel power plants
- Emergency diesel generator (EDG) for nuclear power plants



Jack-up Platform/Drilling Rig

HYUNDAI-HIMSEN

Earth-Friendly Engine



FPSO



Drill ship



Car Ferry & Passenger Vessel



Container ship



Diesel Power Plant



Emergency GenSets for Nuclear Power Plant

Introduction

HYUNDAI-HiMSEN

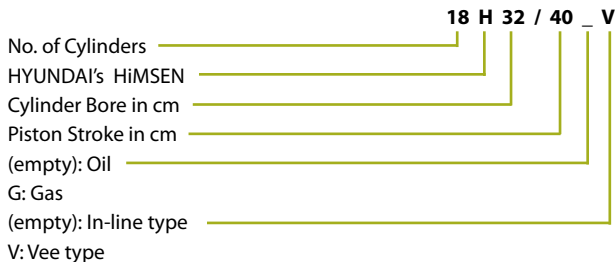
General

This programme provides necessary information and recommendations for the application of HYUNDAI's HiMSEN engines.

'HiMSEN'® is the registered brand name of HYUNDAI's own design engine and the abbreviation of '**Hi-touch Marine & Stationary ENGINE**'.

Please note that all data and information prepared in this programme are for guidance only and subject to change without notice. Therefore, please contact Hyundai Heavy Industries Co., Ltd. before actual applications of the data. Hyundai Heavy Industries Co., Ltd. will always provide the data for the installation of specific project.

Engine Model Designation



HYUNDAI-HiMSEN

Engine Operation

Reference Condition

General definition of diesel engine rating is specified in accordance with ISO 3046/1:2002, ISO 15550:2002.

However the engine outputs are available within tropical conditions without de-rating.

Tropical Conditions

- Turbocharger air inlet pressure: 1,000 mbar
 - Turbocharger air inlet temperature: 318 K (45 °C)
 - Charge air coolant temperature: 309 K (36 °C)*
- * Valid for central cooling system up to 36 °C normally, 38 °C specially.

Specific Fuel Oil Consumption (SFOC) & Heat Rate

The stated consumption figures refer to the following ISO reference conditions:

- Turbocharger air inlet pressure: 1,000 mbar
- Turbocharger air inlet temperature: 298 K (25 °C)
- Charge air coolant temperature: 298 K (25 °C)

- Lower calorific value of fuel 42,700 kJ/kg
- Without engine driven pumps
- Tolerance +5 %
- At 100 % load

Specific Lube Oil Consumption (SLOC)

The stated consumption is given with a tolerance of +25% depending on the operating conditions.

Engine Power

The engine brake power is stated in kW. For conversion between kW and metric horsepower, please note that $1 \text{ bhp} = 75 \text{ kg-m/s} = 0.7355 \text{ kW}$.

Ratings are given according to ISO 3046/1:2002, ISO 15550:2002.

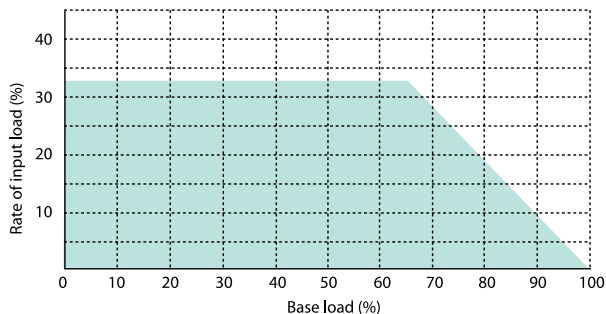
In case of HR(Higher Rating) version, no overload is permissible except for 10 % overload during official factory test.

Power Management of Gensets

When making power management system of multi-Gensets for marine application, a proper load balance is to be considered by shipyard.

In case of a failure of one engine, its output has to be made up for by the remaining engines or by reducing/switching off electric consumers.

No overload of remaining engine is allowed for such a case and the electric power scheme of the ship can be derived from the following load characteristics.



Continuous Load-Up

The quickest way to load-up from 0 % to 100 % load can be achieved by increasing the load continuously and gradually.

Step by Step Load-Up

Considering the time required for stabilizing the frequency deviation due to sudden load-up, it is recommended to load up from idle to full load by more than three steps IACS (especially for GenSets of 720rpm or 900rpm due to higher BMEP of over 24 bar).

HiMSEN GenSets fulfill the requirements of classification societies concerning the frequency deviation and recovery time when loading up by 3 steps from 0 % to 100 %.

Information for Fuel oil control by EU Directive 2005-33-EC and California Code of Regulations

All HiMSEN engines are suitable and developed for continuous operation on HFO as well as MDO/MGO. There is no lower limit for the sulfur content of fuel oil. In connection to the low viscosity of MGO, (Marine Gas Oil, DMA as defined in ISO 8217) the viscosity at engine inlet should be kept within the value of 2 ~ 14 cSt in order to avoid possible wear or sticking of fuel injection pump due to low lubricity and in order to maintain the suitable hydrodynamic film between fuel injection pump plunger and barrel.

- Recommended stable viscosity at engine inlet: Min. 3 cSt
- Recommended minimum viscosity at engine inlet: Min. 2 cSt

So, a proper cooling device (D.O cooler or chiller etc.) is to be considered, if needed, to keep the above mentioned viscosity (2 ~ 14 cSt) at engine inlet.

When the MGO is to be used only for temporary engine operation (e.g. in port), higher BN lube oil used for residual fuel (HFO) should not present any problems in case of short periods of running.

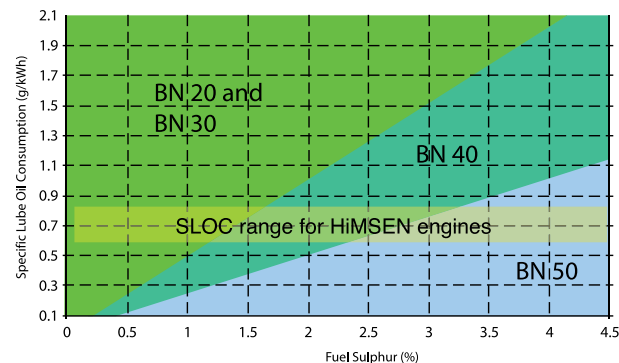
When engine is not operated continuously with low sulfur fuel such as MGO, lube oil should be chosen according to the highest sulfur contents of the fuel with normal operation.

Guideline for Lube Oil

Base Number (BN) must be carefully selected depending on fuel grade and sulfur contents.

Following are guidance values for initial filling.

Typical recommended BN depending on the fuel sulfur contents and SLOC (g/kWh)



Reference: CIMAC recommendation number 29/2008 'Guidelines for the lubrication of medium speed diesel engine'

IMO NO_x EMISSION AND HiMSEN ENGINES

Annex VI of the MARPOL 73/78 convention entered into force 12 May 2005. All HiMSEN engines included in this booklet comply with the NO_x Limits specified in the IMO regulation.

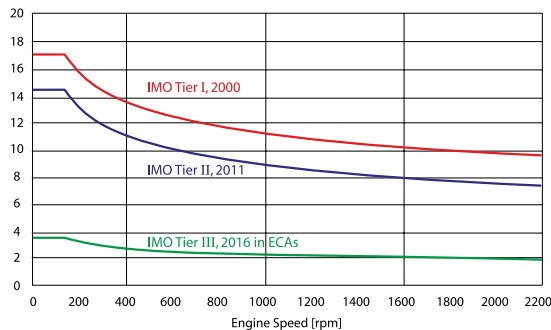
The exhaust emission regulations in Annex VI were referred to as IMO Tier I, MARPOL Annex VI regulations were amended at the MEPC (Marine Environment Protection Committee) in October 2008. These specify further NO_x emission limits to be known as IMO Tier II and Tier III.

IMO Tier II regulations were entered into force on 1 January 2011 based on keel laying, according to a speed dependent function, with reduction of about 20 % in comparison with IMO Tier I (refer to chart).

Under IMO Tier III, the NO_x emission limits for marine engines will become effective on 1 January 2016 based on keel laying, according to a speed dependent function, with reduction of 80 % in comparison with IMO Tier I when the ship is operated in a designated Emission Control Areas (so called ECAs).

All types of HiMSEN engine are complied with the new upcoming NO_x emission regulations, and do its best to satisfy further request if any from customers.

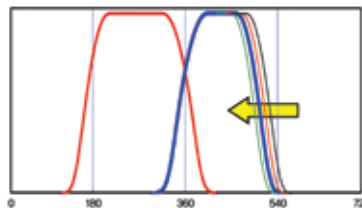
NO_x Emission [g/kWh]



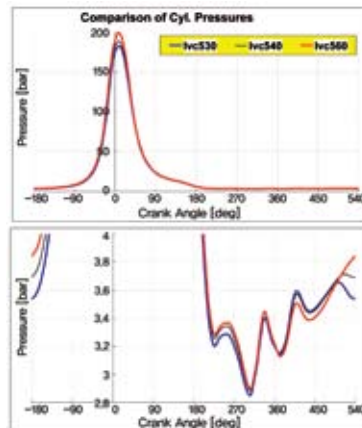
HYUNDAI ENVIRONMENTAL TECHNOLOGIES against IMO Tier II

HYUNDAI is introducing technologies to meet IMO Tier II regulation with internal engine measures only such as:

- Miller valve timing requiring increased charger air pressure by applying the high pressure ratio turbocharger
- Optimised combustion by applying the combustion control technologies with optimising the piston bowl shape and the fuel injection valve nozzle etc.



Various Intake Valve Closing Timing for 1-D Cycle Simulation



Miller valve timing

This technology is very useful to reduce the NO_x emission by optimising the intake valve's closing timing especially, result in changing the effective compression and expansion ratio. In order to apply this technology, the high pressure ratio turbocharger is required to increase the charge air pressure and new developed T/C with high pressure ratio is mounted on HiMSEN engine.

Combustion pressure depending on IVC timing from 1-D Cycle Simulation

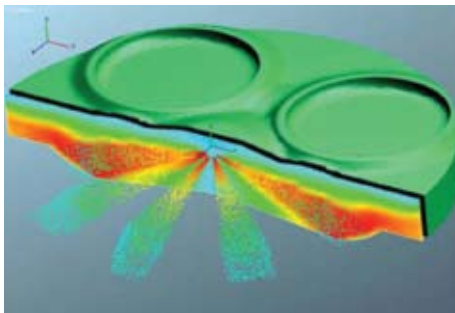
Engine Operation

HYUNDAI-HIMSEN

Optimized combustion

The NO_x emission can be reduced by the combustion control technologies with the optimum combination of the piston bowl shape and the fuel injection valve nozzle etc.

The piston bowl shape and the fuel injection valve nozzle's specification are optimized to meet the IMO Tier II regulation, which are evaluated by 3-D combustion analysis and verified by the measurement at HiMSEN Techno Center.



3-D Combustion Analysis

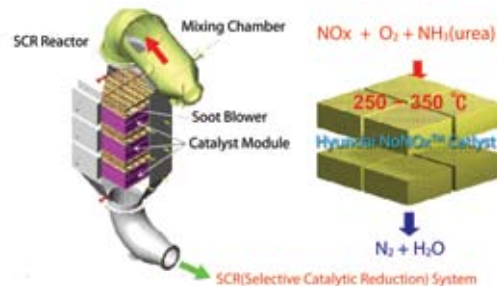
HYUNDAI-HIMSEN

Engine Operation

HYUNDAI ENVIRONMENTAL TECHNOLOGIES against IMO Tier III as one of solutions

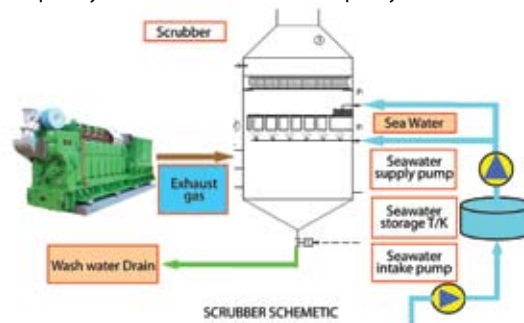
HD NoNO_xTM SCR (SELECTIVE CATALYTIC REDUCTION) SYSTEM

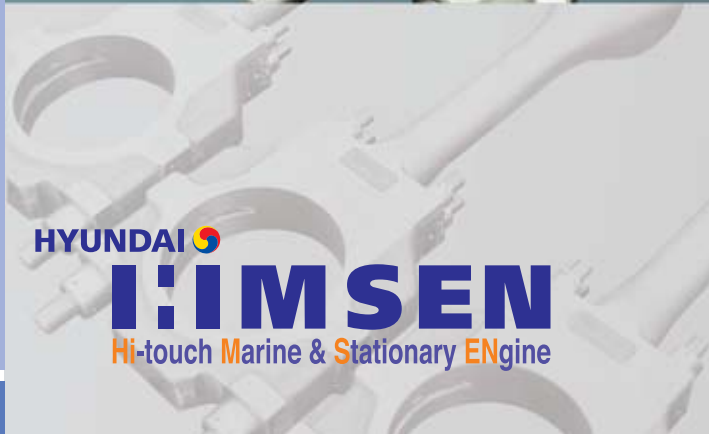
HYUNDAI can offer NoNO_xTM SCR technology that can reduce NO_x emissions by 95 %, designed for Tier III limits. HYUNDAI is optimizing the whole installation, performance and engine in order to achieve low cost of production and give benefits to the customers.



SCRUBBER

Exhaust gas scrubbing is an alternative solution to low sulphur content fuels for reducing SO_x emissions. SCRUBBER has been developed by HYUNDAI for much better quality.





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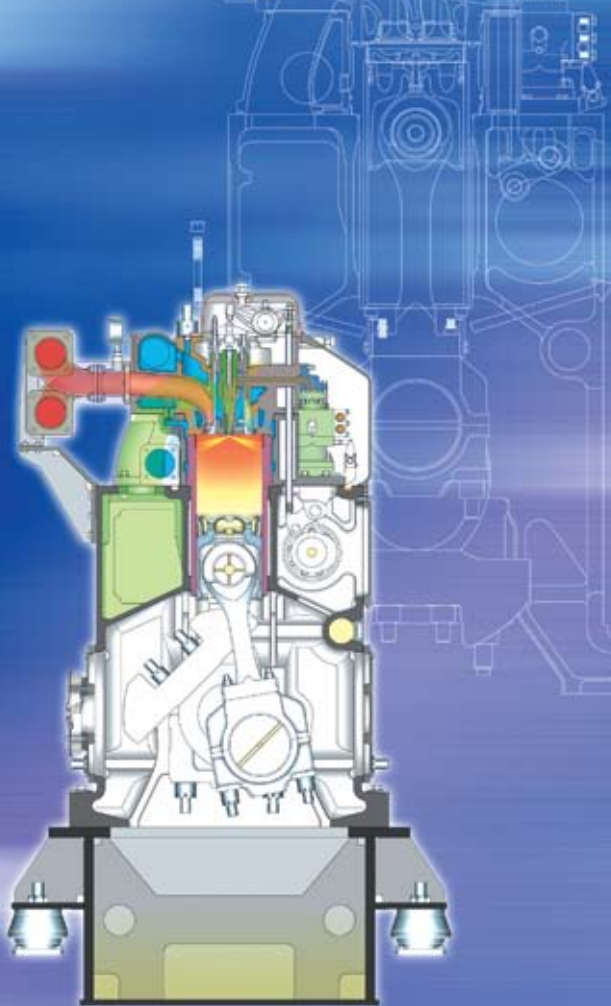
Hi-touch Marine & Stationary Engine

Marine & Offshore GenSets for Tier II

Power Range

H17/21V	1,680~3,200 kW
H17/28	575~1,000 kW
H17/28E	660 kW
H17/28U	805 kW
H21/32	800~1,980 kW
H25/33	1,440~2,970 kW
H25/33V	4,080~6,800 kW
H32/40	3,000~4,500 kW
H32/40V	6,000~10,000 kW





Engine (kW) 
Generator (kW) 

Marine & Offshore GenSets

Model rpm

H17/21V 1500/1800

H17/28 900/1000

H17/28E 900/1000

H17/28U 900/1000

H21/32 720/750

900/1000

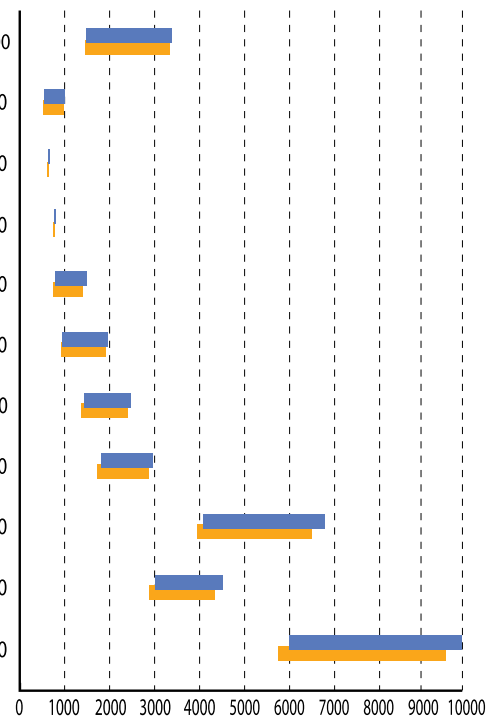
H25/33 720/750

900/1000

H25/33V 900/1000

H32/40 720/750

H32/40V 720/750



Marine & Offshore GenSets

HYUNDAI-HIMSEN

Bore: 170 mm, Stroke: 210 mm

Main Data

Speed	1500 rpm		1800 rpm	
Frequency	50 Hz		60 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H17/21V	1,680	1,613	1,920	1,843
16H17/21V	2,240	2,150	2,560	2,458
18H17/21V	2,520	2,419	2,880	2,765
20H17/21V	2,800	2,688	3,200	3,072

Based on alternator efficiency of 96 %.

Specific Fuel Oil Consumption at 100% Engine Load

Load	1500 rpm	1800 rpm
100 %	192 g/kWh	197 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

HYUNDAI-HIMSEN

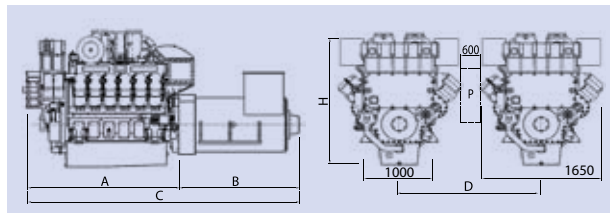
Marine & Offshore GenSets

Bore: 170 mm, Stroke: 210 mm

Dimensions

1500 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	2,200	2,050	4,250	2,100	6.7	13.2
	16	2,600	2,050	4,650	2,100	8.0	15.2
	18	2,800	2,680	5,480	2,100	8.9	16.8
	20	3,100	2,680	5,780	2,100	9.8	18.0

1800 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	2,200	2,050	4,250	2,100	6.7	13.2
	16	2,600	2,050	4,650	2,100	8.0	15.2
	18	2,800	2,680	5,480	2,100	8.9	16.8
	20	3,100	2,680	5,780	2,100	9.8	18.0



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,450 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

(Note) All dimensions and weight are approximate value and subject to change without prior notice.

Marine & Offshore GenSets

HYUNDAI-HIMSEN

Bore: 170 mm, Stroke: 280 mm

Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
5H17/28	575	538	600	561
6H17/28	690	645	720	673
7H17/28	805	757	840	790
8H17/28	920	865	960	902

Based on alternator efficiency of 93.5 ~ 94 %.

Specific Fuel Oil Consumption at Engine

Load	900 rpm	1000 rpm
100 %	188 g/kWh	188 g/kWh

Main Data (for Higher Power Rating)

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H17/28	750	701	750	701
7H17/28	875	823	875	823
8H17/28	1,000	940	1,000	940

Based on alternator efficiency of 93.5 ~ 94 %.

Specific Fuel Oil Consumption at Engine (for Higher Power Rating)

Load	900 rpm	1000 rpm
100 %	191 g/kWh	191 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

HYUNDAI-HIMSEN

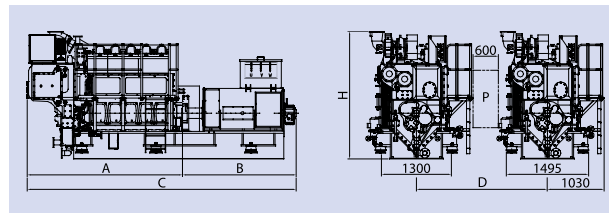
Marine & Offshore GenSets

Bore: 170 mm, Stroke: 280 mm

Dimensions

900 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	2,791	2,200	4,991	2,314	7.7	13.6
	6	3,071	2,200	5,271	2,314	8.5	14.5
	7	3,351	2,200	5,551	2,314	9.4	15.6
	8	3,631	2,320	5,951	2,314	10.4	16.7

1000 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	2,791	2,200	4,991	2,314	7.7	13.6
	6	3,071	2,200	5,271	2,314	8.5	14.5
	7	3,351	2,200	5,551	2,314	9.4	15.6
	8	3,631	2,320	5,951	2,314	10.4	16.7



Remarks

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- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,552 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

(Note) All dimensions and weight are approximate value and subject to change without prior notice.

Marine & Offshore GenSets

HYUNDAI-HIMSEN

Bore: 170 mm, Stroke: 280 mm

Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H17/28E	660	618	660	618
6H17/28U	805	750	805	750

Based on alternator efficiency of 93.2 ~ 94 %.

Specific Fuel Oil Consumption at Engine

	Load	900 rpm	1000 rpm
6H17/28E	100 %	189 g/kWh	190 g/kWh
6H17/28U	100 %	191 g/kWh	191 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

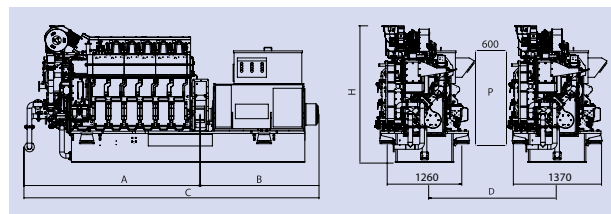
HYUNDAI-HIMSEN

Marine & Offshore GenSets

Bore: 170 mm, Stroke: 280 mm

Dimensions

900 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6H17/28E	2,774	1,939	4,713	2,323	6.9	13.0
	6H17/28U	2,774	2,069	4,843	2,393	7.1	13.8

**Remarks**

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min distance between engines 2,445 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

This type of engine is optimized as planning products.

1. Optimized capacity for front module (pump, cooler, filter, valve, etc) .
2. Only 6cyl. for pump cover.
3. Optimized design for crankshaft, engine module.
4. Reducing of weight, simplification, etc.

Marine & Offshore GenSets

HYUNDAI-HIMSEN

Bore: 210 mm, Stroke: 320 mm

Main Data

Speed	720 rpm		750 rpm		900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz		60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW
5H21/32	800	752	800	752	960	910	-	-
6H21/32	960	902	960	902	1,200	1,140	1,200	1,140
7H21/32	1,120	1,064	1,120	1,064	1,400	1,330	1,400	1,330
8H21/32	1,280	1,216	1,280	1,216	1,600	1,520	1,600	1,520
9H21/32	1,440	1,368	1,440	1,368	1,800	1,710	1,800	1,710

Based on alternator efficiency of 94 ~ 95 %.

Specific Fuel Oil Consumption at Engine

Load	720 rpm	750 rpm	900 rpm	1000 rpm
100 %	182 g/kWh	182 g/kWh	183 g/kWh	185 g/kWh

Exceptionally, 5H21/32 × 900 rpm is 190 g/kWh

Main Data (for Higher Power Rating)

Speed	720 rpm		750 rpm		900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz		60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H21/32	1,050	987	1,050	987	1,320	1,254	1,320	1,254
7H21/32	1,225	1,164	1,225	1,164	1,540	1,463	1,540	1,463
8H21/32	1,400	1,330	1,400	1,330	1,760	1,672	1,760	1,672
9H21/32	1,575	1,496	1,575	1,496	1,980	1,881	1,980	1,881

Based on alternator efficiency of 94 ~ 95 %.

Specific Fuel Oil Consumption at Engine (for Higher Power Rating)

Load	720 rpm	750 rpm	900 rpm	1000 rpm
100 %	184 g/kWh	184 g/kWh	185 g/kWh	187 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

HYUNDAI-HIMSEN

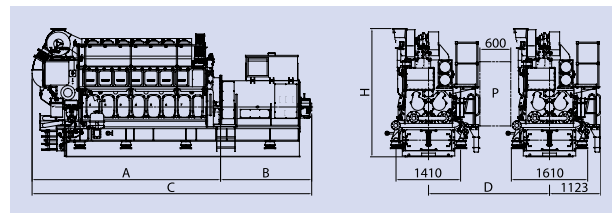
Marine & Offshore GenSets

Bore: 210 mm, Stroke: 320 mm

Dimensions

720 / 750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	3,405	1,926	5,331	2,712	14.0	22.4
	6	3,781	1,977	5,758	2,712	15.6	23.5
	7	4,111	1,977	6,088	2,781	17.1	26.5
	8	4,453	2,175	6,628	2,781	18.5	29.1
	9	4,783	2,265	7,048	2,911	19.9	31.7

900 / 1000 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	3,411	2,097	5,508	2,712	13.4	22.9
	6	3,781	1,977	5,758	2,781	15.1	26.1
	7	4,235	1,977	6,212	2,781	16.7	28.6
	8	4,453	2,175	6,628	2,911	18.4	29.1
	9	4,783	2,265	7,048	2,911	19.8	31.7



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,613 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Marine & Offshore GenSets

HYUNDAI-HIMSEN

Bore: 250 mm, Stroke: 330 mm

Main Data

Speed	720 rpm		750 rpm		900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz		60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H25/33	1,440	1,368	1,500	1,425	1,800	1,710	1,800	1,710
7H25/33	1,680	1,596	1,750	1,663	2,100	1,995	2,100	1,995
8H25/33	1,920	1,824	2,000	1,900	2,400	2,280	2,400	2,280
9H25/33	2,160	2,052	2,250	2,138	2,700	2,565	2,700	2,565

Based on alternator efficiency of 95 %.

Specific Fuel Oil Consumption at Engine

Load	720 rpm	750 rpm	900 rpm	1000 rpm
100 %	180 g/kWh	180 g/kWh	181 g/kWh	181 g/kWh

Main Data (for Higher Power Rating)

Speed	720 rpm		750 rpm		900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz		60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H25/33	1,560	1,482	1,650	1,568	1,890	1,796	1,980	1,881
7H25/33	1,820	1,729	1,925	1,829	2,205	2,095	2,310	2,195
8H25/33	2,080	1,976	2,200	2,090	2,520	2,394	2,640	2,508
9H25/33	2,340	2,223	2,475	2,351	2,835	2,693	2,970	2,822

Based on alternator efficiency of 95 %.

Specific Fuel Oil Consumption at Engine (for Higher Power Rating)

Load	720 rpm	750 rpm	900 rpm	1000 rpm
100 %	182 g/kWh	182 g/kWh	183 g/kWh	183 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

HYUNDAI-HIMSEN

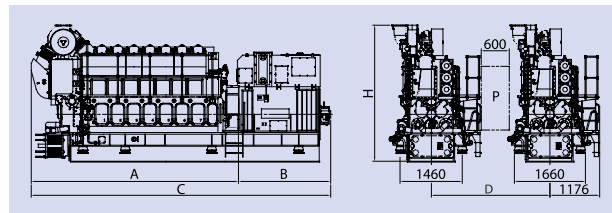
Marine & Offshore GenSets

Bore: 250 mm, Stroke: 330 mm

Dimensions

720 / 750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	4,414	2,262	6,676	2,961	20.2	29.8
	7	4,794	2,262	7,056	2,961	22.5	33.9
	8	5,311	2,262	7,573	3,241	24.1	39.5
	9	5,691	2,262	7,953	3,371	26.2	45.0

900 / 1000 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	4,414	2,262	6,676	2,961	20.2	29.8
	7	4,794	2,262	7,056	3,241	22.5	33.9
	8	5,311	2,340	7,651	3,371	24.1	39.5
	9	5,691	2,490	8,181	3,371	26.2	45.0



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,844 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Marine & Offshore GenSets

HYUNDAI-HIMSEN

Bore: 250 mm, Stroke: 330 mm

Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H25/33V	4,080	3,917	4,080	3,917
14H25/33V	4,760	4,570	4,760	4,570
16H25/33V	5,440	5,222	5,440	5,222
18H25/33V	6,120	5,875	6,120	5,875
20H25/33V	6,800	6,528	6,800	6,528

Based on alternator efficiency of 96 %.

Specific Fuel Oil Consumption at Engine

Load	900 rpm	1000 rpm
100 %	183 g/kWh	183 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

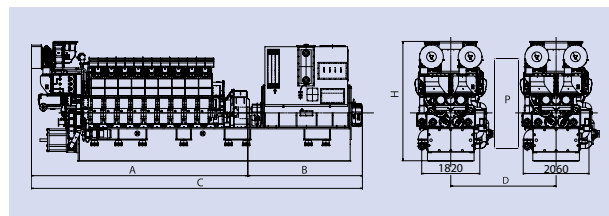
HYUNDAI-HIMSEN

Marine & Offshore GenSets

Bore: 250 mm, Stroke: 330 mm

Dimensions

900 / 1000 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	5,524	3,334	8,858	3,750	33.5	58.2
	14	5,944	3,504	9,448	3,750	36.5	63.4
	16	6,364	3,682	10,046	3,750	39.5	69.6
	18	6,784	3,772	10,556	3,750	42.5	77.5
	20	7,204	3,727	10,931	3,750	45.5	79.5

**Remarks**

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 3,840 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

(Note) All dimensions and weight are approximate value and subject to change without prior notice.

Marine & Offshore GenSets

HYUNDAI-HIMSEN

Bore: 320 mm, Stroke: 400 mm

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H32/40	3,000	2,880	3,000	2,880
7H32/40	3,500	3,360	3,500	3,360
8H32/40	4,000	3,840	4,000	3,840
9H32/40	4,500	4,320	4,500	4,320

Based on alternator efficiency of 96 %.

Specific Fuel Oil Consumption at Engine

Load	720 rpm	750 rpm
100 %	179 g/kWh	181 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.7 g/kWh

HYUNDAI-HIMSEN

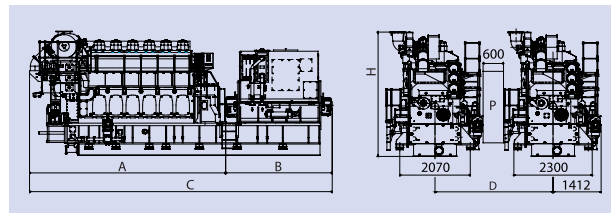
Marine & Offshore GenSets

Bore: 320 mm, Stroke: 400 mm

Dimensions

720 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	5,760	3,130	8,890	3,959	33.7	68.6
	7	6,112	3,374	9,486	4,130	38.6	77.1
	8	6,602	3,594	10,196	4,130	41.5	82.0
	9	7,092	4,097	11,189	4,130	44.6	89.1

750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	5,760	3,130	8,890	3,959	33.7	68.6
	7	6,112	3,374	9,486	4,130	38.6	77.1
	8	6,602	3,594	10,196	4,130	41.5	82.0
	9	7,092	4,097	11,189	4,130	44.6	89.1



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 3,408 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Marine & Offshore GenSets

HYUNDAI-HIMSEN

Bore: 320 mm, Stroke: 400 mm

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H32/40V	6,000	5,760	6,000	5,760
14H32/40V	7,000	6,720	7,000	6,720
16H32/40V	8,000	7,680	8,000	7,680
18H32/40V	9,000	8,640	9,000	8,640
20H32/40V	10,000	9,600	10,000	9,600

Based on alternator efficiency of 96 %.

Specific Fuel Oil Consumption at 100 % Engine Load

Load	720 rpm	750 rpm
100 %	179 g/kWh	181 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.7 g/kWh

HYUNDAI-HIMSEN

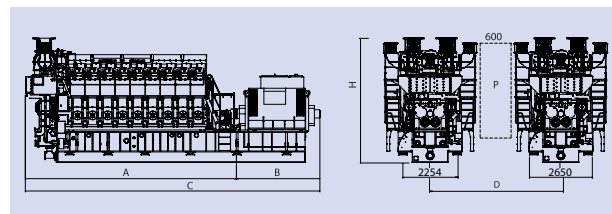
Marine & Offshore GenSets

Bore: 320 mm, Stroke: 400 mm

Dimensions

720 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	6,624	3,760	10,384	4,723	56.0	108.8
	14	7,295	3,860	11,155	4,723	63.3	121.3
	16	7,914	3,479	11,393	4,723	69.1	130.9
	18	8,585	3,859	12,444	4,794	76.3	141.2
	20	9,344	3,659	13,003	4,794	84.0	153.9

750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	6,624	3,760	10,384	4,723	56.0	108.8
	14	7,295	3,860	11,155	4,723	63.3	121.3
	16	7,914	3,479	11,393	4,723	69.1	130.9
	18	8,585	3,859	12,444	4,794	76.3	141.2
	20	9,344	3,659	13,003	4,794	84.0	153.9

**Remarks**

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 4,405 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.



HiMSEN...

The best solution for all types of marine vessels and offshore applications with proven reliability, low emission, low operation cost, multi-fuel capability...

Our extensive R&D facilities enable HHI to provide the customers with high quality and excellent services in all phases of designing, production, assembly and commissioning of HiMSEN propulsion packaged system.

Marine Propulsion System

Power Range

H21/32P	1,200~1,800 kW
H25/33P	1,740~2,610 kW
H32/40P	2,880~4,320 kW / FPP 3,000~4,500 kW / CPP



General Information

HYUNDAI-HiMSEN

Long Term Commitment...

To provide the market with reliable, cost effective and earth-friendly solution

Optimized Matching of HiMSEN Propulsion Package

- HiMSEN H21/32P, H25/33P and H32/40P engine
- C.P./F.P. propeller with shafting
- Pitch and speed control
- Load control
- Reduction gear
- Shaft generator
- Auxiliary machinery

Application

- Controllable pitch propulsion
- Fixed pitch propulsion
- Azimuth thruster propulsion
- Pump drive

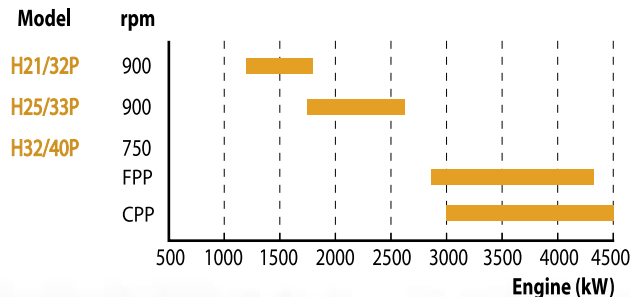
Excellent Performance of HiMSEN Propulsion Engine

- Improved transient operation with pulse charging turbocharger
- Invisible smoke with pulse charging turbocharger by part load matching
- Lower thermal load engine with lower exhaust gas temperature
- Low fuel consumption
- Low NOx emission

HYUNDAI-HiMSEN

Power Range

Marine Propulsion



Marine Propulsion System

HYUNDAI-HIMSEN

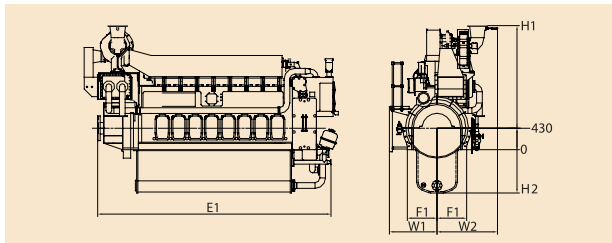
Bore: 210 mm, Stroke: 320 mm

Controllable Pitch Propeller

Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller

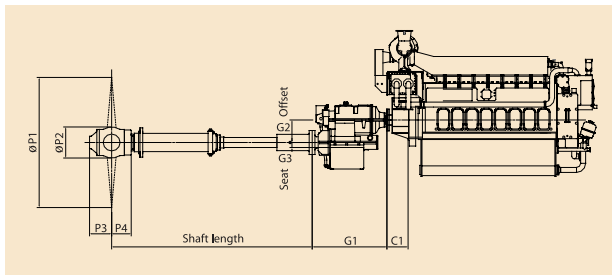
Guarantee optimum thrust, minimal noise and vibration level.



Dimensions

900 rpm	cyl.	Rated Output at Engine (kW)	Engine dimension (mm) & dry weight (ton)						
			E1	H1	H2	F1	W1	W2	Dry Weight
6	1,200	3,904	2,287	1,120	595	955	1,126	18.0	
8	1,600	4,634	2,541	1,300	595	955	1,214	21.0	
9	1,800	4,994	2,541	1,300	595	955	1,214	23.0	

Specific Fuel Oil Consumption at 100 % Engine Load: 183 g/kWh



HYUNDAI-HIMSEN

Marine Propulsion System

Bore: 210 mm, Stroke: 320 mm

Engine Type	CPP Package System Type	Gear ratio (i:1)	Propeller speed (rpm)	Propeller Diameter (without nozzle) P1 (mm)		
				Optim.	Min	Max
6H21/32P 900 rpm 1200 kW	ACG 52/450	3.22	279.5	2,300	2,200	2,400
	ACG 52/450	3.38	258.6	2,400	2,300	2,500
	ACG 56/450	3.76	239.4	2,500	2,400	2,600
	ACG 56/450	4.03	223.3	2,550	2,450	2,650
	ACG 56/450	4.17	215.8	2,600	2,500	2,700
8H21/32P 900 rpm 1600 kW	ACG 56/450	3.22	279.5	2,450	2,350	2,550
	ACG 56/450	3.48	258.6	2,550	2,450	2,650
	ACG 62/450	3.76	239.4	2,650	2,550	2,750
	ACG 62/525	3.95	227.8	2,750	2,650	2,850
	ACG 62/525	4.22	213.3	2,800	2,700	2,900
9H21/32P 900 rpm 1800 kW	ACG 62/525	3.16	284.8	2,450	2,350	2,550
	ACG 62/525	3.40	264.7	2,600	2,500	2,700
	ACG 62/525	3.66	245.9	2,700	2,600	2,800
	ACG 62/525	3.95	227.85	2,800	2,700	2,900
	ACG 62/525	4.22	213.27	2,900	2,800	3,000

Engine Type	Hub Dimension (mm)			Gear box & coupling dimension (mm) & dry weight (kg)				
	P2	P3	P4	G1	G2	G3	C1	Dry Weight
6H21/32P 900 rpm 1200 kW	520	367	327	1,493	450	100	396	3,284
	520	367	327	1,493	450	100	396	3,284
	560	410	228	1,493	450	100	396	3,284
	560	410	228	1,493	450	100	396	3,284
	560	410	228	1,493	450	100	396	3,284
8H21/32P 900 rpm 1600 kW	560	410	228	1,493	450	100	420	3,321
	560	410	228	1,493	450	100	420	3,321
	620	441	254	1,493	450	100	420	3,321
	620	441	254	1,727	525	105	420	4,521
	620	441	254	1,727	525	105	420	4,521
9H21/32P 900 rpm 1800 kW	620	441	254	1,727	525	105	470	4,582
	620	441	254	1,727	525	105	470	4,582
	620	441	254	1,727	525	105	470	4,582
	620	441	254	1,727	525	105	470	4,582
	620	441	254	1,727	525	105	470	4,582

Remarks: Typical ship parameters, Speed: 16.0 knots

Marine Propulsion System

HYUNDAI-HIMSEN

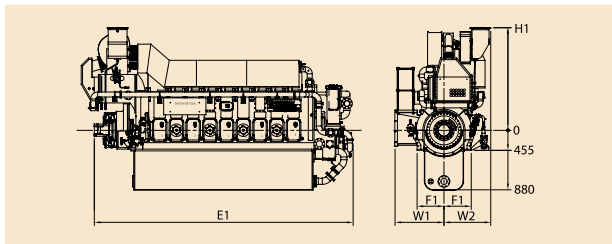
Bore: 250 mm, Stroke: 330 mm

Controllable Pitch Propeller

Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller

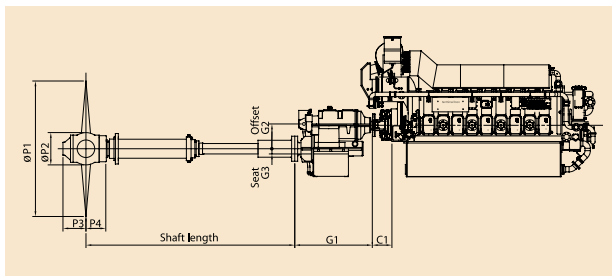
Guarantee optimum thrust, minimal noise and vibration level.



Dimensions

900 rpm	cyl.	Rated Output at Engine (kW)	Engine dimension (mm) & dry weight (ton)					
			E1	H1	F1	W1	W2	Dry Weight
6	1,740	3,830	1,924	610	1,035	1,073	23.0	
8	2,320	4,590	2,331	610	1,035	1,073	26.9	
9	2,610	4,970	2,331	610	1,035	1,073	29.3	

Specific Fuel Oil Consumption at 100 % Engine Load: 181 g/kWh



HYUNDAI-HIMSEN

Marine Propulsion System

Bore: 250 mm, Stroke: 330 mm

Engine Type	CPP Package System	Gear ratio (i:1)	Propeller speed (rpm)	Propeller Diameter (without nozzle) P1 (mm)		
				Optim.	Min	Max
6H25/33P 900 rpm 1740 kW	ACG 56/450	3.15	286	2,450	2,350	2,550
	ACG 62/450	3.49	258	2,600	2,500	2,700
	ACG 62/450	3.65	247	2,650	2,550	2,750
	ACG 62/525	3.95	228	2,750	2,650	2,850
	ACG 62/525	4.22	213	2,850	2,750	2,950
8H25/33P 900 rpm 2320 kW	ACG 62/525	3.16	285	2,600	2,500	2,700
	ACG 68/525	3.40	265	2,700	2,600	2,800
	ACG 68/525	3.66	246	2,850	2,750	2,950
	ACG 68/600	3.95	228	2,950	2,850	3,050
	ACG 68/600	4.24	212	3,050	2,950	3,150
9H25/33P 900 rpm 2610 kW	ACG 68/525	3.16	285	2,650	2,550	2,750
	ACG 68/525	3.40	265	2,800	2,700	2,900
	ACG 68/600	3.65	247	2,900	2,800	3,000
	ACG 75/600	3.95	228	3,050	2,950	3,150
	ACG 75/600	4.24	212	3,150	3,050	3,250

Engine Type	Hub Dimension (mm)			Gear box & coupling dimension (mm) & dry weight (kg)				
	P2	P3	P4	G1	G2	G3	C1	Dry Weight
6H25/33P 900 rpm 1740 kW	560	410	228	1,493	450	100	470	3,382
	620	441	254	1,493	450	100	470	3,382
	620	441	254	1,493	450	100	470	3,382
	620	441	254	1,727	525	105	470	4,582
	620	441	254	1,727	525	105	470	4,582
8H25/33P 900 rpm 2320 kW	620	441	254	1,727	525	105	500	4,658
	695	530	442	1,727	525	105	500	4,658
	695	530	442	1,727	525	105	500	4,658
	695	530	442	1,970	600	200	500	6,858
	695	530	442	1,970	600	200	500	6,858
9H25/33P 900 rpm 2610 kW	695	530	442	1,727	525	105	500	4,658
	695	530	442	1,727	525	105	500	4,658
	695	530	442	1,970	600	200	500	6,858
	765	580	478	1,970	600	200	500	6,858
	765	580	478	1,970	600	200	500	6,858

Remarks: Typical ship parameters, Speed: 16.0 knots

Marine Propulsion System

HYUNDAI-HIMSEN

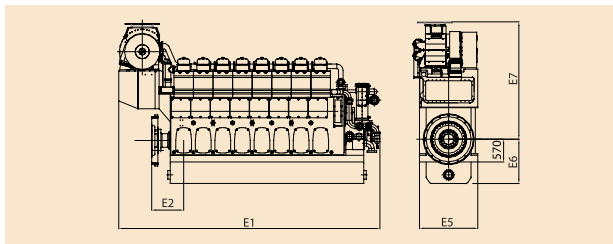
Bore: 320 mm, Stroke: 400 mm

Controllable Pitch Propeller

Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller

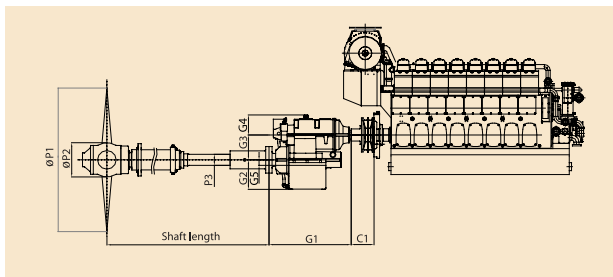
Guarantee optimum thrust, minimal noise and vibration level.



Dimensions

750 rpm	cyl.	Engine dimension (mm) & dry weight (ton)					
		E1	H1	F1	W1	W2	Dry Weight
	6	5,515	800	1,460	1,110	3,295	35.7
	8	6,545	800	1,460	1,110	3,495	43.5
	9	7,085	800	1,460	1,110	3,495	46.6

Specific Fuel Oil Consumption at 100 % Engine Load: 181 g/kWh



HYUNDAI-HIMSEN

Marine Propulsion System

Bore: 320 mm, Stroke: 400 mm

Engine Type	CPP Package System		Gear ratio n:1	Propeller speed rpm	Propeller & Hub Dimension (mm)		
	Gear box mode vertical offset	Hub model			P1	P2	P3
6H32/40P 750 rpm 2,880 kW / FPP 3,000 kW / CPP	ACG750	ECP85	4.65	155	3,900	865	280
8H32/40P 750 rpm 3,840 kW / FPP 4,000 kW / CPP	ACG950	ECP105	5.33	135	4,400	1,065	330
9H32/40P 750 rpm 4,320 kW / FPP 4,500 kW / CPP	ACG950	ECP105	5.76	125	4,800	1,065	330

Engine Type	Gear box & coupling dimension (mm) & dry weight (kg)							Typical Vessel(DWT)
	G1	G2	G3	G4	G5	C1	Gear Dryweight	14 Knots
6H32/40P 750 rpm 2,880 kW / FPP 3,000 kW / CPP	2,710	850	750	540	220	622	13,000	7,000 ton Tanker
8H32/40P 750 rpm 3,840 kW / FPP 4,000 kW / CPP	2,710	1,030	950	540	220	622	16,500	9,000 ton Tanker
9H32/40P 750 rpm 4,320 kW / FPP 4,500 kW / CPP	2,710	1,030	950	540	220	690	16,500	10,000 ton Tanker

Remarks: Typical ship parameters, Speed: 14.0 knots



Stationary GenSets

Power Range

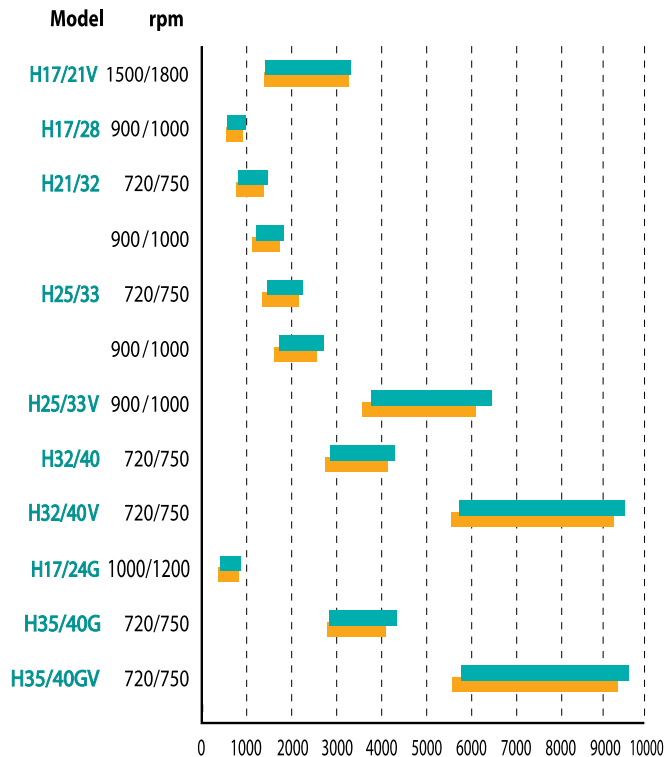
H17/21V	1,680~3,200 kW
H17/28	575~960 kW
H21/32	800~1,800 kW
H25/33	1,440~2,700 kW
H25/33V	3,840~6,400 kW
H32/40	2,850~4,275 kW
H32/40V	5,700~9,500 kW
H17/24G	455~880 kW
H35/40G	2,880~4,320 kW
H35/40GV	5,760~9,600 kW





20 MW HiMSEN Engine Diesel Power Plant (9H25/33 x 8 Sets)

Stationary GenSets



Stationary GenSets

HYUNDAI-HIMSEN

Bore: 170 mm, Stroke: 210 mm

Main Data

Speed	1500 rpm		1800 rpm	
Frequency	50 Hz		60 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
Continuous power				
12H17/21V	1,512	1,452	1,728	1,659
16H17/21V	2,016	1,935	2,304	2,212
18H17/21V	2,268	2,177	2,592	2,488
20H17/21V	2,520	2,419	2,880	2,765
Prime power				
12H17/21V	1,680	1,613	1,920	1,843
16H17/21V	2,240	2,150	2,560	2,458
18H17/21V	2,520	2,419	2,880	2,765
20H17/21V	2,800	2,688	3,200	3,072
Standby power				
12H17/21V	1,848	1,774	2,112	2,028
16H17/21V	2,464	2,365	2,816	2,703
18H17/21V	2,772	2,661	3,168	3,041
20H17/21V	3,080	2,957	3,520	3,379

Based on alternator efficiency of 96 %.

Specific Fuel Oil Consumption at 100% Engine Load

Load	1500 rpm	1800 rpm
100 %	192 g/kWh	197 g/kWh

Heat Rate

Load	Unit	1500 rpm	1800 rpm
100 %	kJ/kWh _m	8,198	8,412
	kJ/kWh _e	9,165	8,762

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

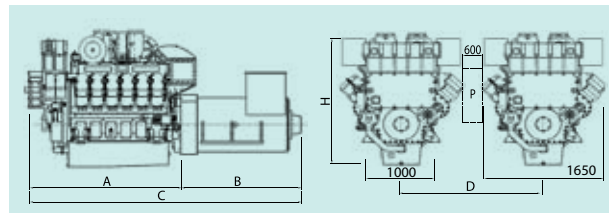
HYUNDAI-HIMSEN

Stationary GenSets

Bore: 170 mm, Stroke: 210 mm

Dimensions

1500 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	2,200	2,050	4,250	2,100	6.7	13.2
	16	2,600	2,050	4,650	2,100	8.0	15.2
	18	2,800	2,680	5,480	2,100	8.9	16.8
1800 rpm	20	3,100	2,680	5,780	2,100	9.8	18.0
	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	2,200	2,050	4,250	2,100	6.7	13.2
	16	2,600	2,050	4,650	2,100	8.0	15.2
	18	2,800	2,680	5,480	2,100	8.9	16.8
	20	3,100	2,680	5,780	2,100	9.8	18.0



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,450 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 170 mm, Stroke: 280 mm

Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
5H17/28	575	538	600	561
6H17/28	690	645	720	673
7H17/28	805	757	840	790
8H17/28	920	865	960	902

Based on alternator efficiency of 93.5 ~ 94 %.

Specific Fuel Oil Consumption at Engine

Load	900 rpm	1000 rpm
100 %	189 g/kWh	189 g/kWh

Heat Rate

Load	Unit	900 rpm	1000 rpm
100 %	kJ/kWh _m	8,070	
	kJ/kWh _e	8,631	

Based on alternator efficiency 93.5 %.

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

HYUNDAI-HIMSEN

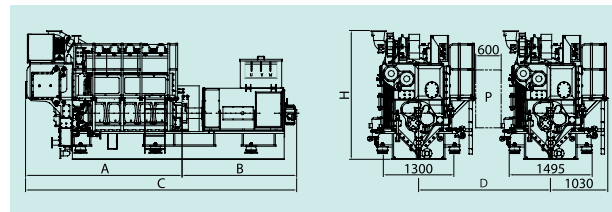
Stationary GenSets

Bore: 170 mm, Stroke: 280 mm

Dimensions

900 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	2,791	2,200	4,991	2,314	7.7	13.6
	6	3,071	2,200	5,271	2,314	8.5	14.5
	7	3,351	2,200	5,551	2,314	9.4	15.6
	8	3,631	2,320	5,951	2,314	10.4	16.7

1000 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	2,791	2,200	4,991	2,314	7.7	13.6
	6	3,071	2,200	5,271	2,314	8.5	14.5
	7	3,351	2,200	5,551	2,314	9.4	15.6
	8	3,631	2,320	5,951	2,314	10.4	16.7



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,552 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 210 mm, Stroke: 320 mm

Main Data

Speed	720 rpm		750 rpm		900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz		60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW
5H21/32	800	752	800	752	960	910	-	-
6H21/32	960	902	960	902	1,200	1,140	1,200	1,140
7H21/32	1,120	1,064	1,120	1,064	1,400	1,330	1,400	1,330
8H21/32	1,280	1,216	1,280	1,216	1,600	1,520	1,600	1,520
9H21/32	1,440	1,368	1,440	1,368	1,800	1,710	1,800	1,710

Based on alternator efficiency of 94 ~ 95 %.

Specific Fuel Oil Consumption at Engine

Load	720 rpm	750 rpm	900 rpm	1000 rpm
100 %	182 g/kWh	182 g/kWh	183 g/kWh	185 g/kWh

Exceptionally, 5H21/32 × 900 rpm is 190 g/kWh.

Heat Rate

Load	Unit	720 rpm	750 rpm	900 rpm	1000 rpm
100 %	kJ/kWh _m	7,771	7,771	7,814	7,899
	kJ/kWh _e	8,267	8,267	8,313	8,404

Based on alternator efficiency 94 %.

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

HYUNDAI-HIMSEN

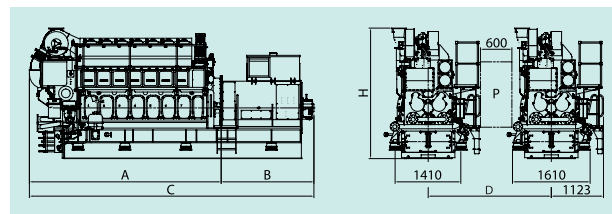
Stationary GenSets

Bore: 210 mm, Stroke: 320 mm

Dimensions

720 / 750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	3,405	1,926	5,331	2,712	14.0	22.4
	6	3,781	1,977	5,758	2,712	15.6	23.5
	7	4,111	1,977	6,088	2,781	17.1	26.5
	8	4,453	2,175	6,628	2,781	18.5	29.1
	9	4,783	2,265	7,048	2,911	19.9	31.7

900 / 1000 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	3,411	2,097	5,508	2,712	13.4	22.9
	6	3,781	1,977	5,758	2,781	15.1	26.1
	7	4,235	1,977	6,212	2,781	16.7	28.6
	8	4,453	2,175	6,628	2,911	18.4	29.1
	9	4,783	2,265	7,048	2,911	19.8	31.7



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,613 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 250 mm, Stroke: 330 mm

Main Data

Speed	720 rpm		750 rpm		900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz		60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H25/33	1,440	1,368	1,500	1,425	1,740	1,653	1,800	1,710
7H25/33	1,680	1,596	1,750	1,663	2,030	1,929	2,100	1,995
8H25/33	1,920	1,824	2,000	1,900	2,320	2,204	2,400	2,280
9H25/33	2,160	2,052	2,250	2,138	2,610	2,480	2,700	2,565

Based on alternator efficiency of 95 %.

Specific Fuel Oil Consumption at Engine

Load	720 rpm	750 rpm	900 rpm	1000 rpm
100 %	180 g/kWh	180 g/kWh	181 g/kWh	181 g/kWh

Heat Rate

Load	Unit	720 rpm / 750 rpm	900 rpm / 1000 rpm
100 %	kJ/kWh _m	7,686	7,729
	kJ/kWh _e	8,090	8,135

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

HYUNDAI-HIMSEN

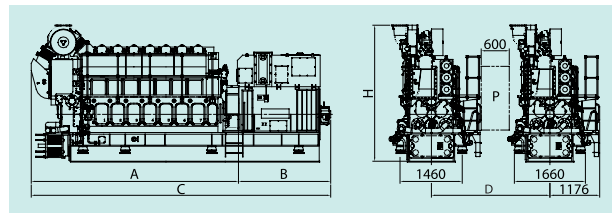
Stationary GenSets

Bore: 250 mm, Stroke: 330 mm

Dimensions

720 / 750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	4,414	2,262	6,676	2,961	20.2	29.8
	7	4,794	2,262	7,056	2,961	22.5	33.9
	8	5,311	2,262	7,573	3,241	24.1	39.5
	9	5,691	2,262	7,953	3,371	26.2	45.0

900 / 1000 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	4,414	2,262	6,676	2,961	20.2	29.8
	7	4,794	2,262	7,056	3,241	22.5	33.9
	8	5,311	2,340	7,651	3,371	24.1	39.5
	9	5,691	2,490	8,181	3,371	26.2	45.0



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,844 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 250 mm, Stroke: 330 mm

Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H25/33V	3,840	3,686	3,840	3,686
14H25/33V	4,480	4,301	4,480	4,301
16H25/33V	5,120	4,915	5,120	4,915
18H25/33V	5,760	5,530	5,760	5,530
20H25/33V	6,400	6,144	6,400	6,144

Based on alternator efficiency of 96 %.

Specific Fuel Oil Consumption at Engine

Load	900 rpm	1000 rpm
100 %	183 g/kWh	183 g/kWh

Heat Rate

Load	Unit	900 rpm	1000 rpm
100 %	kJ/kWh _m	7,814	
	kJ/kWh _e	8,140	

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

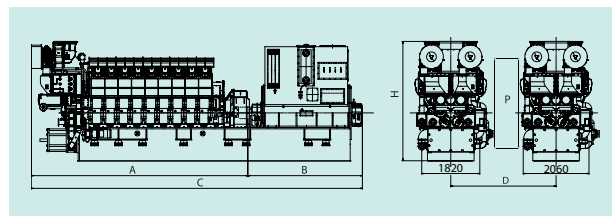
HYUNDAI-HIMSEN

Stationary GenSets

Bore: 250 mm, Stroke: 330 mm

Dimensions

900 / 1000 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	5,524	3,334	8,858	3,750	33.5	58.2
	14	5,944	3,504	9,448	3,750	36.5	63.4
	16	6,364	3,682	10,046	3,750	39.5	69.6
	18	6,784	3,772	10,556	3,750	42.5	77.5
	20	7,204	3,727	10,931	3,750	45.5	79.5



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 3,840 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

(Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 320 mm, Stroke: 400 mm

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H32/40	2,850	2,750	2,850	2,750
7H32/40	3,325	3,209	3,325	3,209
8H32/40	3,800	3,667	3,800	3,667
9H32/40	4,275	4,125	4,275	4,125

1) Based on alternator efficiency of 96.5 %.

2) In case of diesel oil (Distillate Fuels ISO 8217 DM Grade) operation continuously, 500 kW/cyl, is available.

Specific Fuel Oil Consumption at Engine

Load	720 rpm	750 rpm
100 %	178 g/kWh	180 g/kWh

Heat Rate

Load	Unit	720 rpm	750 rpm
100 %	kJ/kWh _m	7,600	7,686
	kJ/kWh _e	7,876	7,965

Specific Lubricating Oil Consumption

Lub. Oil: 0.7 g/kWh

HYUNDAI-HIMSEN

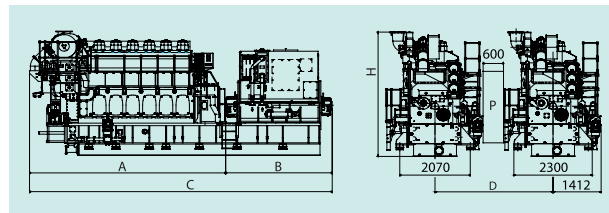
Stationary GenSets

Bore: 320 mm, Stroke: 400 mm

Dimensions

720 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	5,760	3,130	8,890	3,959	33.7	68.6
	7	6,112	3,374	9,486	4,130	38.6	77.1
	8	6,602	3,594	10,196	4,130	41.5	82.0
	9	7,092	4,097	11,189	4,130	44.6	89.1

750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	5,760	3,130	8,890	3,959	33.7	68.6
	7	6,112	3,374	9,486	4,130	38.6	77.1
	8	6,602	3,594	10,196	4,130	41.5	82.0
	9	7,092	4,097	11,189	4,130	44.6	89.1



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 3,408 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

(Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 320 mm, Stroke: 400 mm

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H32/40V	5,700	5,529	5,700	5,529
14H32/40V	6,650	6,450	6,650	6,450
16H32/40V	7,600	7,372	7,600	7,372
18H32/40V	8,550	8,243	8,550	8,243
20H32/40V	9,500	9,215	9,500	9,215

1) Based on alternator efficiency of 97 %.

2) In case of diesel oil (Distillate Fuels ISO 8217 DM Grade) operation continuously, 500 kW/cyl, is available.

Specific Fuel Oil Consumption at Engine

Load	720 rpm	750 rpm
100 %	179 g/kWh	181 g/kWh

Heat Rate

Load	Unit	720 rpm	750 rpm
100 %	kJ/kWh _m	7,643	7,729
	kJ/kWh _e	7,880	7,968

Specific Lubricating Oil Consumption

Lub. Oil: 0.7 g/kWh

HYUNDAI-HIMSEN

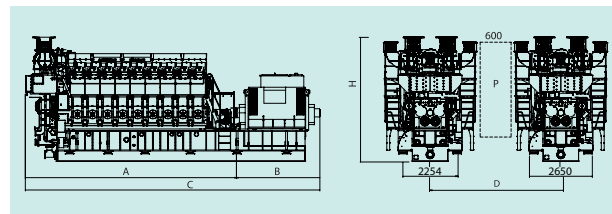
Stationary GenSets

Bore: 320 mm, Stroke: 400 mm

Dimensions

720 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	6,624	3,760	10,384	4,723	56.0	108.8
	14	7,295	3,860	11,155	4,723	63.3	121.3
	16	7,914	3,479	11,393	4,723	69.1	130.9
	18	8,585	3,859	12,444	4,794	76.3	141.2
	20	9,344	3,659	13,003	4,794	84.0	153.9

750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	6,624	3,760	10,384	4,723	56.0	108.8
	14	7,295	3,860	11,155	4,723	63.3	121.3
	16	7,914	3,479	11,393	4,723	69.1	130.9
	18	8,585	3,859	12,444	4,794	76.3	141.2
	20	9,344	3,659	13,003	4,794	84.0	153.9



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 4,405 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 170 mm, Stroke: 240 mm

Main Data

Speed	1000 rpm		1200 rpm	
Frequency	50 Hz		60 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
5H17/24G	455	428	550	517
6H17/24G	546	513	660	620
7H17/24G	637	599	770	724
8H17/24G	728	684	880	827

Based on alternator efficiency of 94 %.

Heat Rate

Load	Unit	1000 rpm	1200 rpm
100 %	kJ/kWh _m	8,746	
	kJ/kWh _e	9,305	

Fuel gas based on LNG, LCV 35 MJ/Nm³, Methane No. 80.

Specific Lubricating Oil Consumption

Lub. Oil: 0.3 g/kWh

HYUNDAI-HIMSEN

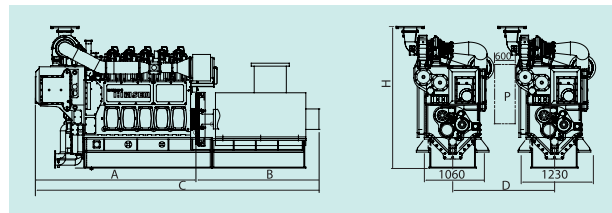
Stationary GenSets

Bore: 170 mm, Stroke: 240 mm

Dimensions

720 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	2,772	2,045	4,817	2,891	6.4	11.6
	6	3,052	2,045	5,097	2,891	7.2	13.4
	7	3,332	2,045	5,377	2,891	8.0	14.5
	8	3,612	2,045	5,657	2,958	8.8	15.6

750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	5	2,772	2,045	4,817	2,891	6.4	11.6
	6	3,052	2,045	5,097	2,891	7.2	13.4
	7	3,332	2,045	5,377	2,891	8.0	14.5
	8	3,612	2,045	5,657	2,958	8.8	15.6



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 2,425 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 350 mm, Stroke: 400 mm

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H35/40G	2,880	2,779	2,880	2,779
7H35/40G	3,360	3,242	3,360	3,242
8H35/40G	3,840	3,706	3,840	3,706
9H35/40G	4,320	4,169	4,320	4,169

Based on alternator efficiency of 96.5 %.

Heat Rate

Load	Unit	720 rpm	750 rpm
100 %	kJ/kWh _m	7,371	
	kJ/kWh _e	7,638	

Fuel gas based on LNG, LCV 35 MJ/Nm³, Methane No. 80.

Power factor 0.8.

Specific Lubricating Oil Consumption

Lub. Oil: 0.4 g/kWh

HYUNDAI-HIMSEN

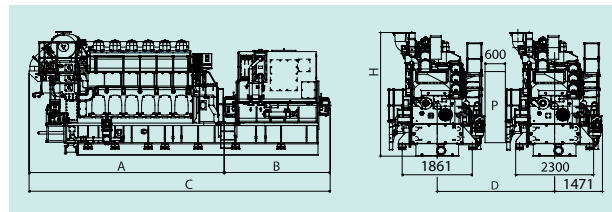
Stationary GenSets

Bore: 350 mm, Stroke: 400 mm

Dimensions

720 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	6,534	3,366	9,900	3,759	33.7	65.2
	7	7,024	3,366	10,390	3,882	38.6	72.6
	8	7,514	3,661	11,175	4,132	41.5	78.6
	9	8,004	3,761	11,765	4,132	44.6	82.7

750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	6	6,534	3,366	9,900	3,759	33.7	65.2
	7	7,024	3,366	10,390	3,882	38.6	72.6
	8	7,514	3,661	11,175	4,132	41.5	78.6
	9	8,004	3,761	11,765	4,132	44.6	82.7



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 3,037 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

Stationary GenSets

HYUNDAI-HIMSEN

Bore: 350 mm, Stroke: 400 mm

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H35/40GV	5,760	5,587	5,760	5,587
14H35/40GV	6,720	6,518	6,720	6,518
16H35/40GV	7,680	7,450	7,680	7,450
18H35/40GV	8,640	8,381	8,640	8,381
20H35/40GV	9,600	9,312	9,600	9,312

Based on alternator efficiency of 97 %.

Heat Rate

Load	Unit	720 rpm	750 rpm
100 %	kJ/kWh _m	7,371	
	kJ/kWh _e	7,599	

Fuel gas based on LNG, LCV 35 MJ/Nm³, Methane No. 80.

Power factor 0.8.

Specific Lubricating Oil Consumption

Lub. Oil: 0.4 g/kWh

HYUNDAI-HIMSEN

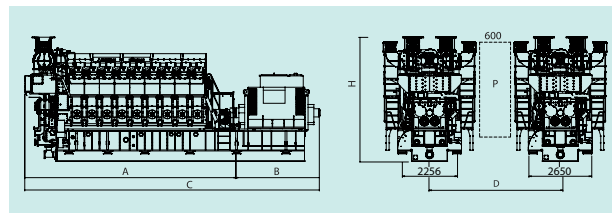
Stationary GenSets

Bore: 350 mm, Stroke: 400 mm

Dimensions

720 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	7,165	3,760	10,925	4,725	56.0	108.8
	14	7,835	3,860	11,695	4,725	63.3	121.3
	16	8,455	3,480	11,935	4,725	69.1	130.9
	18	9,365	3,860	13,225	4,995	76.3	141.2
	20	10,125	3,660	13,785	4,995	84.0	153.9

750 rpm	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B ¹⁾	C ¹⁾	H	Engine ²⁾	GenSet ^{1), 3)}
	12	7,165	3,760	10,925	4,725	56.0	108.8
	14	7,835	3,860	11,695	4,725	63.3	121.3
	16	8,455	3,480	11,935	4,725	69.1	130.9
	18	9,365	3,860	13,225	4,995	76.3	141.2
	20	10,125	3,660	13,785	4,995	84.0	153.9



Remarks

- 1) Depending on alternator.
- 2) Without common base frame.
- 3) With common base frame & alternator (Maker: HHI-EES).

D: Min. distance between engines 4,405 mm (with gallery).

P: Free passage between the engines, width 600 mm and height 2,000 mm.

Note) All dimensions and weight are approximate value and subject to change without prior notice.

**REGLA PPS**

REGLA 47.6 MW Packaged Power Station in Cuba
(HYUNDAI-HIMSEN 9H21/32 × 28 Sets)

Features

- Base load operation
- Diesel oil / Heavy fuel oil / Nature gas use
- Compact 40-foot container size
- Mobile type (option)
- Environmentally comfortable
- Low cost of operating and maintenance

Application

- Captive power
- Construction site
- Isolated area
- Rental business
- Pumping station
- Independent power producer

HYUNDAI-HIMSEN

Packaged Power Station

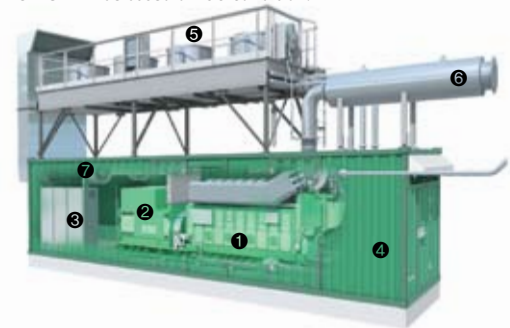
General Specifications

Engine Model	6H17/28	8H17/28	6H21/32	8H21/32	9H21/32
Engine (kW)	690/720	920/960	1,200	1,600	1,800
Generator (kW)	645/673	865/902	1,140	1,520	1,710
Total Weight (ton)	24	30	42	48	50
Dimension (W × H × L)	2.4 m × 3.4 m × 12 m (Container Size)				
Cooling Method	Radiator / Cooling Tower				
Speed	900 rpm / 1,000 rpm				
Fuel	Diesel oil / Heavy fuel oil				

General Specifications

Engine Model	5H17/24G	6H17/24G	7H17/24G	8H17/24G	9H17/24G
Engine (kW)	455/550	546/660	637/770	728/880	819/990
Generator (kW)	428/817	513/620	599/723	684/827	770/930
Total Weight (ton)	22	24	25	26	28
Dimension (W × H × L)	2.4 m × 2.9 m × 12 m (Container Size)				
Cooling Method	Radiator / Cooling Tower				
Speed	1,000 rpm / 1,200 rpm				
Fuel	Natural Gas				

※ The MCR will be based on ISO condition.



- | | |
|-----------------|-------------------------------|
| ① Engine | ⑤ Radiator |
| ② Generator | ⑥ Exhaust gas silencer |
| ③ Control panel | ⑦ Ventilation air exhaust fan |
| ④ Enclosure | |

Approval Status of Quality Management System

Product or Service Ranges	Certifying Agency
Design and Manufacture of Two-stroke Diesel Engines, Four-stroke Diesel Engines, Marine Propellers, Pumps & Valves, Press, Conveyor, Robots for Industrial Purposes, Steam Turbine, Gas Turbine, Diesel Power Plants and Engine Components including Turbochargers, Crankshafts, Cylinder Liners, Forged Steel, Shafting	ISO 9001:2000, KS A 9001:2001 ISO 14001:2004, KS A 14001:2004 OHSAS 18001:1999 (DNV)
Nuclear Diesel Generator (Class 1E), Pump and Butterfly Valve	Qualification Approval (KEPIC)
Forging Shop	Works Approval (ABS, BV, CCS, DNV, GL, KR, LR, NK, RINA)
Casting Shop	
Propeller	
Semi built-up Crankshaft	
Solid Crankshaft (TR Forging Crankshaft)	Works Approval (GL)
Welding Workshop & Overlay Welding on Cylinder Cover	

Engine Hi-service system setup

Our target is to provide quickest and most precious technical support and parts supply towards the customers.

We do utmost to minimize the trouble and inconvenience from the ship owners which might be occurred due to the damage caused by the accident.

Easy Access to Engine CS Department

Regardless of the guarantee period whether it is over or not, HHI will make it a rule to support the clients with immediate service in the order of the receipt by e-mail or through homepage. But, considering its seriousness of the damage or the schedule of the vessel, the provision timing of our technical support including repair may be adjusted.

Genuine Spare Parts Purchase Guide

HHI's authorized sales agents will supply the clients with the original genuine spare parts at the competitive condition in aspect of price, delivery time and quality etc. Please do not hesitate to contact our sales agent with the inquiry or questionnaire.

Technical Support

After the guarantee period is expired or in case that the free support is limited even during the guarantee period due to special reason, we also provide the technical support including supervision, reconditioning, conversion, retrofit of alpha cylinder lubricator and technical consultancy etc.

Global Service Network

HHI is very proud of its well organized global service network which is efficiently and systematically designed to meet every requirement of the clients. HHI's direct service centers are established at Rotterdam, Singapore, Dubai, Panama and Havana in Cuba.



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● Authorized Repairer

● Cooperative Repairer



● Spare Parts Depot

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