HD HYUNDAI ENGINE & MACHINERY

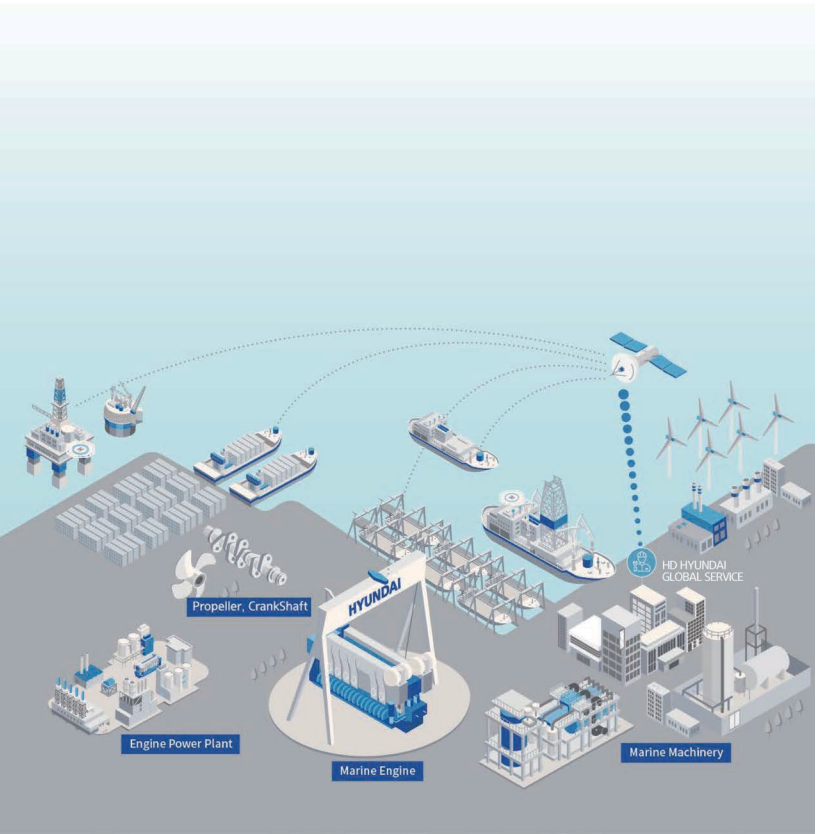
PROGRAMME 2025

Hi-OPTIMIZED POWER SOLUTIONS

Hi-touch Marine & Stationary Engine

HD HYUNDAI HEAVY INDUSTRIES

HYUNDAI HiMSEN



HD HYUNDAI HEAVY INDUSTRIES ENGINE & MACHINERY LANDSCAPE

HD Hyundai Heavy Industries(HHI) has been remarkably succeeded in shipbuilding since company's inception in 1972. As one of the leading engine builders in the world, Engine & Machinery has enjoyed its reputation since its beginning in 1978. HHI-EMD has taken up 35% of the world's market share in 2-stroke engines covering marine and stationary purposes. HHI-EMD has also developed its own engine brand HiMSEN, which is specially designed as a part of the ongoing efforts to provide the most practical and highest quality engines to our customers.

Proven Technology
Approval from major Classification societies

Global NO.1
2-stroke & 4-stroke engine Manufacturer

Total Solution
Engine & Marine machinery Total Solution

Lifecycle Service
Global service support

ENGINE & MACHINERY

Marine Propulsion System

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HiMSEN propulsion system Sales	1000, Bangeojinsunhwan-doro, Dong-gu, Ulsan, Korea (Zip code : 44032)	Tel. : +82-52-202-7683 e-mail : K2Z0group@hd.com

Marine Engine & Eco-Machinery

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Engine System Sales	1000, Bangeojinsunhwan-doro, Dong-gu, Ulsan, Korea (Zip code : 44032)	Tel. : +82-52-202-7281/7291 e-mail : enginesales@hd.com

Power Plant

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Engine Power Plant Sales	1000, Bangeojinsunhwan-doro, Dong-gu, Ulsan, Korea (Zip code : 44032)	Tel. : +82-2-479-6084 e-mail : hi_pin@hd.com

Customer Service

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HD Hyundai Marine Service Co. Ltd	Centum Science Park 6F 79, Centum jungang-ro, Haeundae-gu, Busan, Korea (Zip code : 48058)	Tel. : +82-52-204-7760/7887(for Warranty Service) Tel. : +82-52-204-7718/7742(for Parts Sales) e-mail : service@hd.com / sales@hd.com

Marine Engine & Machinery

HD Hyundai Heavy Industries

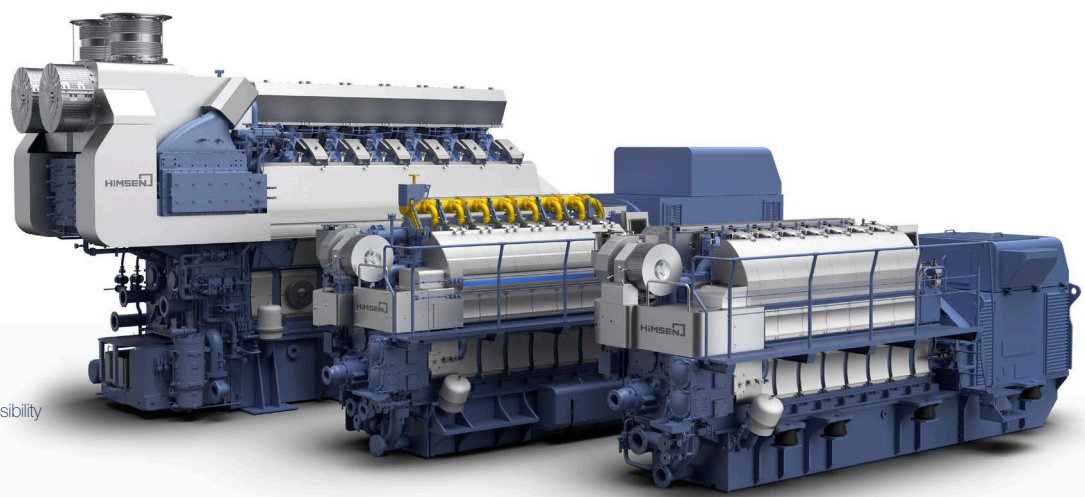
Design Philosophy
HD Hyundai's HiMSEN Family have simple and smart design suitable for marine & stationary applications with high reliability and performance.
The key features are:

Heavy Fuel Engine with same fuel of main engine (Uni-Fuel concept).
Hence, the viscosity of the diesel fuel and heavy fuel is acceptable up to 700 cSt at 50 °C.

Economical and Ecological Engine with low fuel consumption, NOx emission, and Smoke, etc., which is based on the below specific designs;
- Optimized high efficiency turbocharging with Miller Cycle
- High Fuel Injection Pressure
- Variable valve and injection timing

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

The development of a pure LNG gas engine and dual fuel engine has been completed, organizing line up of cutting-edge engines that consider the environment.
The LNG DF engine is increasing its market share to 60% with its outstanding perfection.
In addition, by establishing a hybrid propulsion system, we are contributing to the environment as minimizing fuel consumption and emissions with high efficiency.



Earth-Friendly Engine

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 NOx emissions
- Compliance with IMO NOx Tier II, Tier III
- Low vibration & noise

Jack-up Platform/Drilling Rig

FPSO

Drillship

Major Application

Marine
- Propulsion system
- Generating sets

Offshore
- Drill ship
- FPSO

Energy Solution
- Gas & Dual fuel power plant
- Diesel power plant
- Modular power plant & PPS
- EDG & BSDG
- EDG for Nuclear power plant
- CHP & Hybrid

Emergency GenSets for
Nuclear Power Plant

Power Plant

Car Ferry & Passenger Vessel

Container ship

HiMSEN ENGINE

Introduction

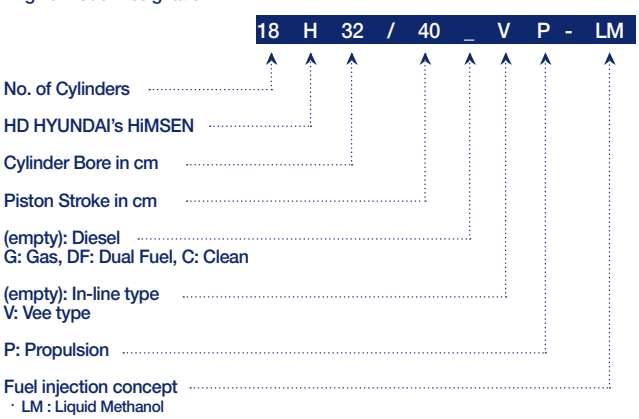
General

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

'HiMSEN'® is the registered brand name of HD 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 HD Hyundai Heavy Industries before actual applications of the data.
HD Hyundai Heavy Industries will always provide the data for the installation of specific project.

Engine Model Designation



Engine Operation

Reference Condition

General definition of engine rating is specified in accordance with ISO 3046/1:2002, ISO 15550:2002.
However the engine outputs are available within tropical conditions without derating.

Tropical Conditions

- Turbocharger inlet air pressure: 1 bar
- Intake air temperature: 318 K (45 °C)
- L.T cooling water temperature: 309 K (36 °C)

Specific Fuel Oil Consumption (SFOC) & Heat Rate

The stated consumption figures refer to the following ISO reference conditions:
- Turbocharger inlet air pressure: 1 bar
- Intake air temperature: 298 K (25 °C)
- L.T cooling water temperature: 298 K (25 °C)
- Lower calorific value of fuel 42,700 kJ/kg
- Without engine driven pumps
- Tolerance +5 % at MCR

Specific Lube Oil Consumption (SLOC)

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

HiMSEN ENGINE

Engine Operation

Engine Power

The engine brake power is stated in kW. For conversion between kW and metric horsepower, please note that 1 bhp = 75 kg·m/s = 0.7355 kW.
Ratings are given according to ISO 3046/1:2002, ISO 15550:2002.

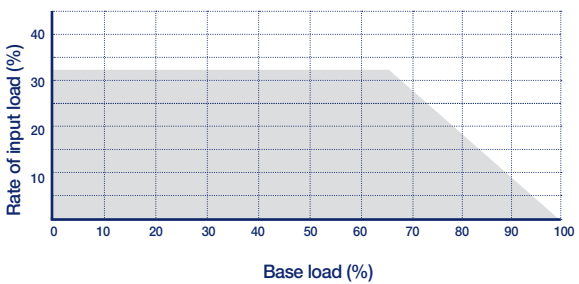
In case of HR (Higher Rating) version, overload is not permissible except for 10 % overload during official factory test.

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.

In this case, an overload of remaining engine is not allowed, 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 according to IACS (especially for Gensets of 720rpm or 900rpm due to higher BMEP of over 24 bar).

HiMSEN Gensets except gas mode of DF and gas engine fulfill the requirements of classification societies concerning the frequency deviation and recovery time when loading up by 3 steps from 0 % to 100 %.

HiMSEN Gensets gas engine fulfill the requirements, considering the time and safety required for stabilizing the frequency due to sudden load up,
it is recommended to load up from idle to full load by more five steps.

HYUNDAI HiMSEN

Engine Operation

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 with 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: 2 cSt

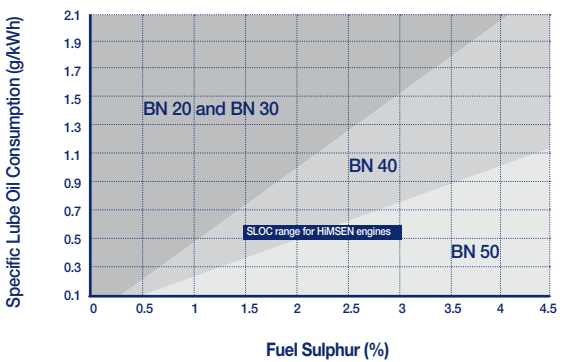
So, a proper cooling device (DO cooler or chiller etc.) is to be considered, if needed, to keep the above mentioned viscosity (2 ~ 14 cSt) at engine inlet.

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.
The followings 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'

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HiMSEN ENGINE

Engine Operation

IMO NOx EMISSION AND HiMSEN ENGINES

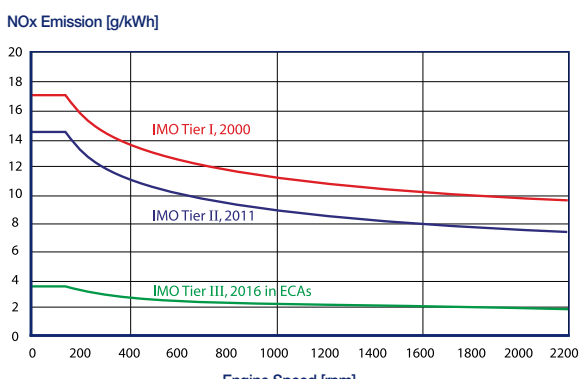
Annex VI of the MARPOL 73/78 convention entered into force 12 May 2005. All HiMSEN engines included in this booklet comply with the NOx Limits specified in the IMO regulation.

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 NOx 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 NOx emission limits for marine engines 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).

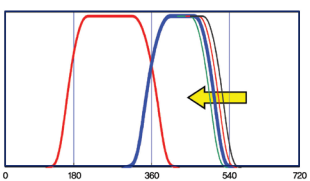
All types of HiMSEN engine are complied with the new upcoming NOx emission regulations, and do its best to satisfy further request if any from customers.



HD HYUNDAI ENVIRONMENTAL TECHNOLOGIES against IMO Tier II, Tier III

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

- Miller valve timing requiring increased charge 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.

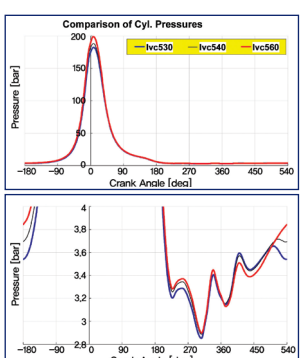


Various Intake Valve Closing Timing for 1-D Cycle Simulation

Miller valve timing

This technology is very useful to reduce the NOx 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

HYUNDAI HiMSEN

HiMSEN ENGINE

Two Stage Turbo-Charger(TSTC)

TSTC with intercooler provides high charge air pressure and high turbocharging efficiency.
The availability on the high charge air pressure allows extreme Miller valve timing that increase engine thermal efficiency(SFOC) at same NOx emission level.

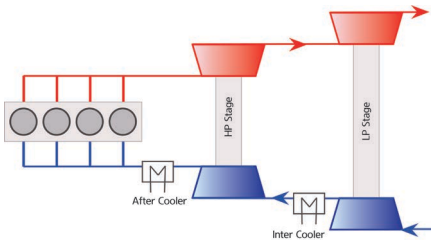
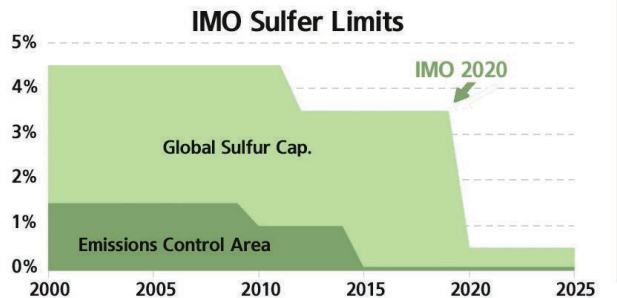


Figure 1 Schematic Diagram of Two Stage Turbocharger

IMO 2020 Ready

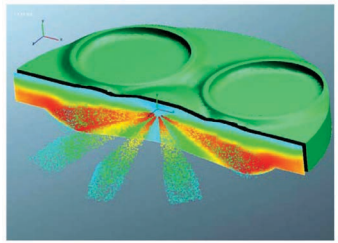
International Marine Organization (IMO) implements the worldwide sulphur regulations on January 1, 2020.



Engine Operation

Optimized combustion

The NOx 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, Tier III regulation, which are evaluated by 3-D combustion analysis and verified by the measurement at HiMSEN Techno Center.

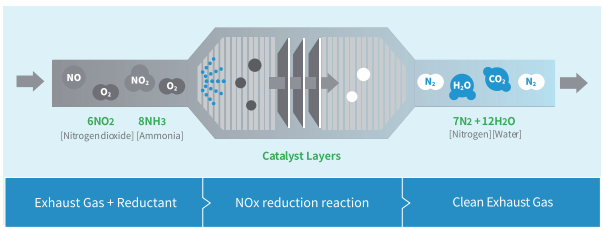


3-D Combustion Analysis

HD HYUNDAI ENVIRONMENTAL TECHNOLOGIES against IMO Tier III

As one of solutions, NoNOx™ SCR (Selective Catalytic Reduction) system

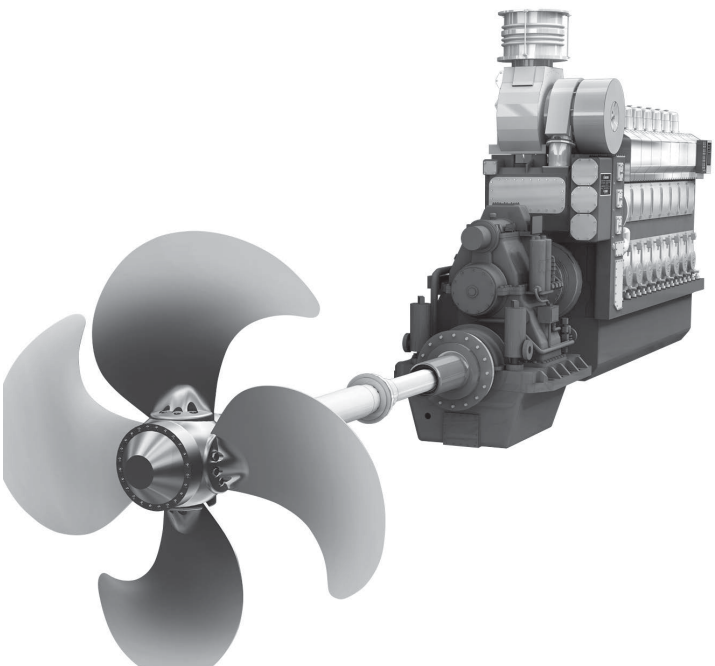
HD HYUNDAI can offer NoNOx™ SCR technology that can reduce NOx emissions by 95 %, designed for Tier III limits. HD HYUNDAI is optimizing the whole installation, performance and engine in order to achieve low cost of production and give benefits to the customers.



HYUNDAI HiMSEN

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 HD Hyundai Heavy Industries 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

Long Term Commitment...

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

Optimized Matching of HiMSEN Propulsion Package

- HiMSEN Diesel or Dual fuel engines
- C.P/F.P Propeller with shafting, Azimuth thruster
- Pitch and speed control
- Load control
- Gear box
- Shaft generator
- Auxiliary machinery

Application

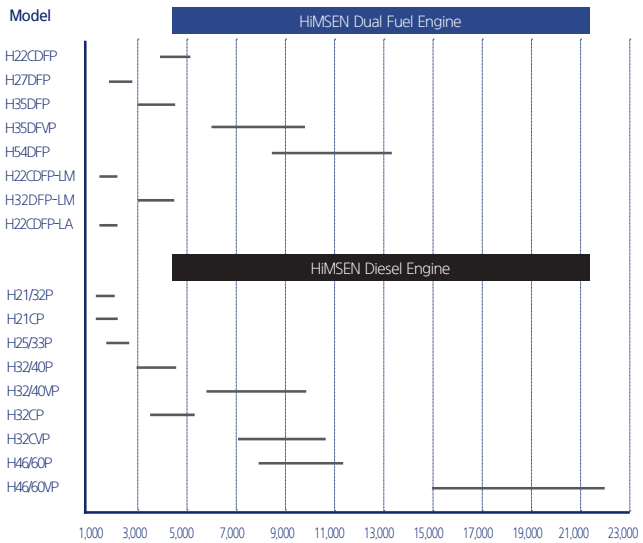
- Controllable pitch propulsion
- Fixed pitch propulsion
- Azimuth thruster propulsion
- Pump drive

Excellent Performance of HiMSEN Propulsion Engine

- Improved transient operation with pulse charging turbocharger
- Invisible smoke
- Lower thermal load engine
- Low fuel consumption
- Low NOx emission

HYUNDAI HiMSEN

Power range for HiMSEN Propulsion engines



Power Range

H22CDFP	1,100~1,980kW	**H21/32P**	1,200~1,800kW
H27DFP	1,860~2,790kW	**H21CP**	1,200~2,160kW
H35DFP	3,000~4,500kW	**H25/33P**	1,740~2,610kW
H35DFVP	6,000~10,000kW	**H32/40P**	3,000~4,500kW
H54DFP	8,820~13,230kW	**H32/40VP**	6,000~10,000kW
H22CDFP-LM	1,440~2,160kW	**H32CP**	3,600~5,400kW
H32DFP-LM	3,000~4,500kW	**H32CVP**	7,200~10,800kW
H22CDFP-LA	1,440~2,160kW	**H46/60P**	7,500~11,250kW
		H46/60VP	15,000~22,500kW

HiMSEN Dual Fuel Engines for Propulsion

Model			H22CDFP	H27DFP	H35DFP	H35DFVP	H54DFP
Bore		mm	220	270	350	350	540
Stroke		mm	330	330	400	400	600
Speed		r/min.	1,000	1,000	750	750	600
Cylinder output		kW/cyl.	220	310	500	500	1,470
Rated output #)		cyl.			kW		
		5	1,100				
		6	1,320	1,860	3,000		8,820
		7	1,540	2,170	3,500		10,290
		8	1,760	2,480	4,000		11,760
		9	1,980	2,790	4,500		13,230
		12				6,000	
		14				7,000	
		16				8,000	
		18				9,000	
		20				10,000	
SFOC *) on Diesel mode	at 100% MCR	g/kWh	193.0	186.0	185.0	185.0	175
	at 85% MCR		193.2	186.2	183.2	183.2	174.2
Heat rate *) on Gas mode	at 100% MCR	kJ/kWh	8,172	7,729	7,270	7,270	7,109

*) Note :
1) Reference condition based on ISO 3046/1
2) Main fuel oil based on marine diesel oil, LCV(Lower Calorific Value) 42,700kJ/kg
3) Fuel gas based on natural gas, Lower Heating Value 36MJ/Nm^3, Methane number Min. 80
4) Tolerance +5% and without engine driven pumps
5) NOx Emission limitation : IMO Tier II on Diesel mode, IMO Tier III on Gas mode

#) Based on the CPP Constant speed operation
(For FPP : Please contact HHI-EMD)

HYUNDAI HiMSEN

Marine Propulsion System

Tier II, Tier III

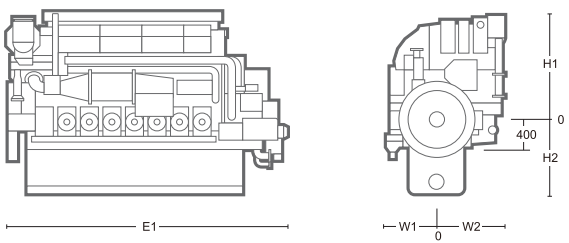
H22CDFP I Bore: 220 mm, Stroke: 330 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Dimensions

1000 rpm cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
		E1	H1	H2	W1	W2	Dry Weight
5	1,100	3,719	1,822	1,145	737	1,015	16.0
6	1,320	4,069	1,822	1,145	737	1,060	18.0
7	1,540	4,419	1,822	1,145	737	1,060	20.0
8	1,760	4,769	1,822	1,145	737	1,150	22.0
9	1,980	5,119	1,822	1,145	737	1,150	24.0

E1 : Dimension between eng. flywheel to eng. free end.
In case of dry sump, the weight and height will be reduced.



Marine Propulsion System

Tier II, Tier III

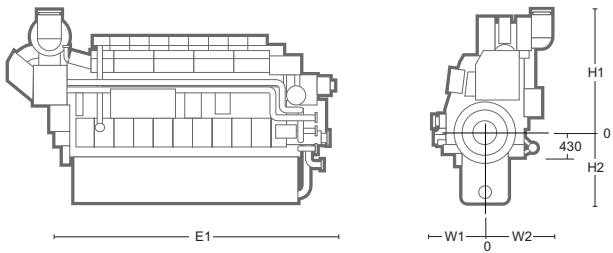
H27DFP I Bore: 270 mm, Stroke: 330 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Dimensions

1000 rpm cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
		E1	H1	H2	W1	W2	Dry Weight
6	1,860	4,200	2,199	1,360	1,030	1,214	26.5
7	2,170	4,580	2,199	1,360	1,030	1,214	28.1
8	2,480	4,960	2,199	1,360	1,030	1,214	30.1
9	2,790	5,340	2,329	1,360	1,030	1,214	32.0

E1 : Dimension between eng. flywheel to eng. free end.
In case of dry sump, the weight and height will be reduced.



Marine Propulsion System

Tier II, Tier III

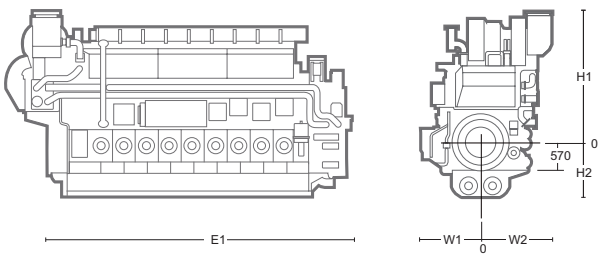
H35DFP I Bore: 350 mm, Stroke: 400 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Dimensions

750 rpm	cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
			E1	H1	H2	W1	W2	Dry Weight
	6	3,000	5,007	2,381	1,170	1,304	1,373	39.2
	7	3,500	5,497	2,473	1,170	1,304	1,430	44.9
	8	4,000	6,009	2,799	1,170	1,304	1,490	48.0
	9	4,500	6,477	2,799	1,170	1,304	1,490	51.5

E1 : Dimension between eng. flywheel to eng. free end.



Marine Propulsion System

Tier II, Tier III

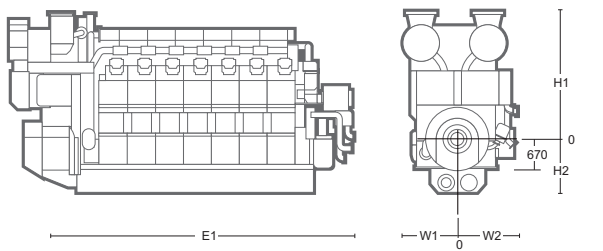
H35DFVP I Bore: 350 mm, Stroke: 400 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Dimensions

750 rpm	cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
			E1	H1	H2	W1	W2	Dry Weight
	12	6,000	6,092	2,725	1,192	1,277	1,412	79.7
	14	7,000	6,717	2,933	1,192	1,277	1,412	84.7
	16	8,000	7,342	2,933	1,192	1,277	1,412	92.9
	18	9,000	7,967	2,933	1,192	1,277	1,412	98.4
	20	10,000	8,592	2,933	1,192	1,277	1,412	107.3

E1 : Dimension between eng. flywheel to eng. free end.



Marine Propulsion System

Tier II, Tier III

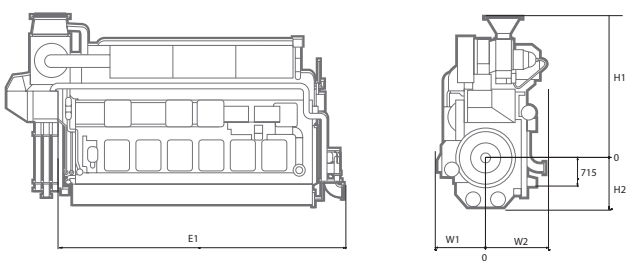
H54DFP I Bore: 540 mm, Stroke: 600 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Dimensions

600 rpm	cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
			E1	H1	H2	W1	W2	Dry Weight
	6	8,820	8,484	4,249	1,464	1,512	1,669	133
	7	10,290	9,424	4,249	1,464	1,512	1,669	151
	8	11,760	10,365	4,832	1,464	1,520	1,784	173
	9	13,230	11,305	4,832	1,464	1,520	1,784	191

E1 : Dimension between eng. flywheel to eng. free end.



HiMSEN Dual Fuel Engines for Propulsion

Model			H22CDFP-LM	H32DFP-LM	H22CDFP-LA
Bore		mm	220	320	220
Stroke		mm	330	400	330
Speed		r/min.	1,000	750	1,000
Cylinder output		kW/cyl.	240	500	240
Rated output #)		cyl.		kW	
		6	1,440	3,000	1,440
		7	1,680	3,500	1,680
		8	1,920	4,000	1,920
		9	2,160	4,500	2,160
SFOC *) on Diesel mode	at 100% MCR	g/kWh			
	at 85% MCR				
Heat rate *) on methanol mode	at 100% MCR	kJ/kWh			

*) Note :
1) Reference condition based on ISO 3046/1
2) Main fuel oil based on marine diesel oil, LCV(Lower Calorific Value) 42,700kJ/kg
3) Fuel methanol LCV(Lower Calorific Value) 19,900 kJ/kg
4) Tolerance +5% and without engine driven pumps
5) NOx Emission limitation : IMO Tier II on Diesel mode, IMO Tier III on Gas mode

#) Based on the CPP Constant speed operation
(For FPP : Please contact HHI-EMD)

Marine Propulsion System

Tier II, Tier III

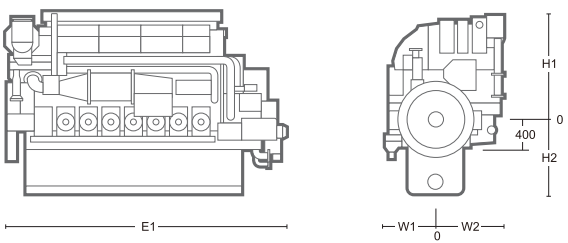
H22CDFP-LM I Bore: 220 mm, Stroke: 330 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Dimensions

1000 rpm cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
		E1	H1	H2	W1	W2	Dry Weight
6	1,440	4,032	1,860	1,043	1,248	1,017	23.4
7	1,680	4,382	1,860	1,043	1,248	1,017	26.2
8	1,920	4,732	1,860	1,043	1,248	1,017	28.6
9	2,160	5,082	1,860	1,043	1,248	1,017	31.8

E1 : Dimension between eng. flywheel to eng. free end.
In case of dry sump, the weight and height will be reduced.



Marine Propulsion System

Tier II, Tier III

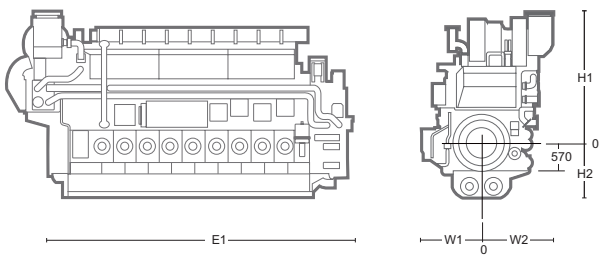
H32DFP-LM I Bore: 320 mm, Stroke: 400 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Dimensions

750 rpm cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
		E1	H1	H2	W1	W2	Dry Weight
6	3,000	5,265	2,990	1,170	986	1,100	43.2
7	3,500	5,755	3,154	1,170	986	1,100	46.5
8	4,000	6,381	3,154	1,170	986	1,100	49.7
9	4,500	6,508	3,154	1,170	986	1,100	54.4

E1 : Dimension between eng. flywheel to eng. free end.



Marine Propulsion System

Tier II, Tier III

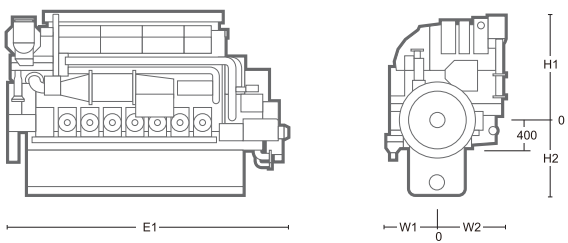
H22CDFP-LA I Bore: 220 mm, Stroke: 330 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Dimensions

1000 rpm cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
		E1	H1	H2	W1	W2	Dry Weight
6	1,440	4,032	1,860	1,043	1,248	1,017	23.4
7	1,680	4,382	1,860	1,043	1,248	1,017	26.2
8	1,920	4,732	1,860	1,043	1,248	1,017	28.6
9	2,160	5,082	1,860	1,043	1,248	1,017	31.8

E1 : Dimension between eng. flywheel to eng. free end.
In case of dry sump, the weight and height will be reduced.



HYUNDAI HiMSEN

HiMSEN Diesel Engines for Propulsion

Tier II, Tier III (with SCR)

Model			H21/32P	H21CP	H25/33P	H32/40P	H32CP	H46/60P
Bore		mm	210	210	250	320	320	460
Stroke		mm	320	330	330	400	450	600
Speed		r/min.	900	900	900	750	750	600
Cylinder output		kW/cyl.	200	240	290	500	600	1,250
Rated output #)		cyl.	kW					
		5		1,200				
		6	1,200	1,440	1,740 / 1,800	3,000	3,600	7,500
		7	1,400	1,680	2,030	3,500	4,200	8,750
		8	1,600	1,920	2,320	4,000	4,800	10,000
		9	1,800	2,160	2,610	4,500	5,400	11,250
SFOC *)	at 100% MCR	g/kWh	183.0	184.0	181.0	184.0	180.0	177.0
	at 85% MCR		183.0	181.0	181.0	181.0	176.2	175.0

Model			H32/40VP	H32CVP	H46/60VP
Bore		mm	320	320	460
Stroke		mm	400	450	600
Speed		r/min.	750	750	600
Cylinder output		kW/cyl.	500	600	1,250
Rated output #)		cyl.		kW	
		12	6,000	7,200	15,000
		14	7,000	8,400	
		16	8,000	9,600	20,000
		18	9,000	10,800	22,500
		20	10,000		
SFOC *)	at 100% MCR	g/kWh	184.0	180 (100%)	177.0
	at 85% MCR		181.0	176.2(85%)	175.0

*) Note :
1) Reference condition based on ISO 3046/1
2) Fuel oil based on LCV(Lower Calorific Value) 42,700kJ/kg
3) Tolerance +5% and without engine driven pumps
4) NOx Emission limitation : IMO Tier II

#) Based on the CPP Constant speed operation (For FPP : Please contact HHI-EMD)
H32CP, H32CVP : Based on applying 2 stage Turbochargers.
For single stage turbocharger, please contact HHI-EMD.

Marine Propulsion System

Tier II, Tier III (with SCR)

H21/32P I Bore: 210 mm, Stroke: 320 mm

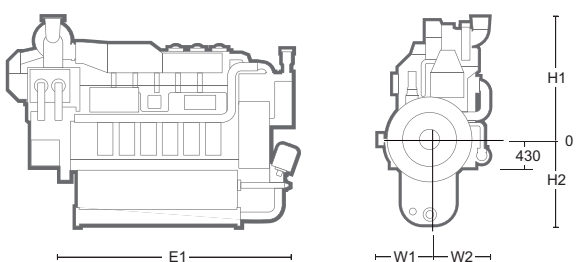
Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller
Guarantee optimum thrust, minimal noise and vibration level.

Dimensions

900 rpm	cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
			E1	H1	H2	W1	W2	Dry Weight
	6	1,200	3,535	1,885	1,300	812	939	18.0
	7	1,400	3,865	1,885	1,300	812	939	20.0
	8	1,600	4,195	2,059	1,355	812	1,005	21.0
	9	1,800	4,525	2,059	1,355	812	1,005	23.0

E1 : Dimension between eng. flywheel to eng. free end.
In case of dry sump, the weight and height will be reduced.



Marine Propulsion System

Tier II, Tier III (with SCR)

H21CP I Bore: 210 mm, Stroke: 330 mm

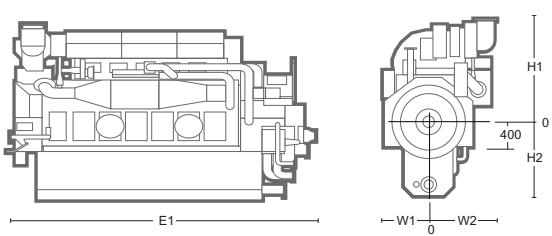
Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller
Guarantee optimum thrust, minimal noise and vibration level.

Dimensions

900 rpm	cyl.	Eng. kW	Engine dimension (mm) & dry weight (ton)					
			E1	H1	H2	W1	W2	Dry Weight
	5	1,200	3,688	1,620	1,175	798	1,065	15.0
	6	1,440	4,038	1,620	1,175	798	1,065	17.0
	7	1,680	4,388	1,620	1,175	798	1,065	19.0
	8	1,920	4,738	1,620	1,175	798	1,065	20.0
	9	2,160	5,088	1,620	1,175	798	1,065	22.0

E1 : Dimension between eng. flywheel to eng. free end.
In case of dry sump, the weight and height will be reduced.



Marine Propulsion System

Tier II, Tier III (with SCR)

H25/33P I Bore: 250 mm, Stroke: 330 mm

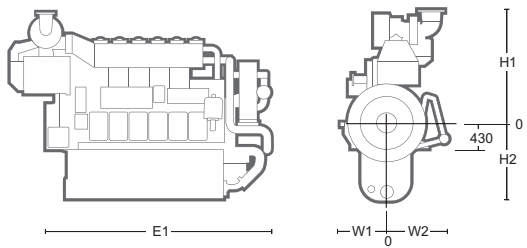
Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller
Guarantee optimum thrust, minimal noise and vibration level.

Dimensions

900 rpm	Eng. kW	Engine dimension (mm) & dry weight (ton)					
		E1	H1	H2	W1	W2	Dry Weight
6	1,740 1,800	4,238	2,209	1,360	812	998	23.0
7	2,030	4,618	2,209	1,360	812	998	25.0
8	2,320	4,998	2,331	1,360	812	1,068	26.9
9	2,610	5,378	2,331	1,360	812	1,068	29.3

E1 : Dimension between eng. flywheel to eng. free end.
In case of dry sump, the weight and height will be reduced.



Marine Propulsion System

Tier II, Tier III (with SCR)

H32/40P I Bore: 320 mm, Stroke: 400 mm

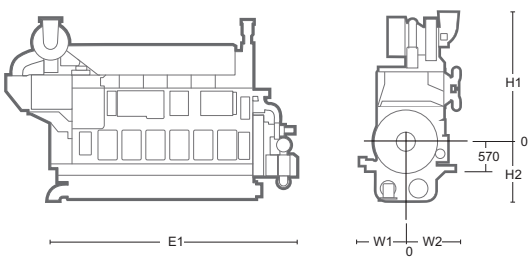
Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller
Guarantee optimum thrust, minimal noise and vibration level.

Dimensions

750 rpm	Eng. kW*	Engine dimension (mm) & dry weight (ton)					
		E1	H1	H2	W1	W2	Dry Weight
6	3,000	5,021	2,602	1,170	986	1,100	36.0
7	3,500	5,511	2,602	1,170	986	1,100	40.9
8	4,000	6,079	2,734	1,170	986	1,100	43.8
9	4,500	6,569	2,734	1,170	986	1,100	47.0

E1 : Dimension between eng. flywheel to eng. free end.
*) Based on the CPP operation(For FPP, please contact HHI-EMD)



Marine Propulsion System

Tier II, Tier III (with SCR)

H32/40VP I Bore: 320 mm, Stroke: 400 mm

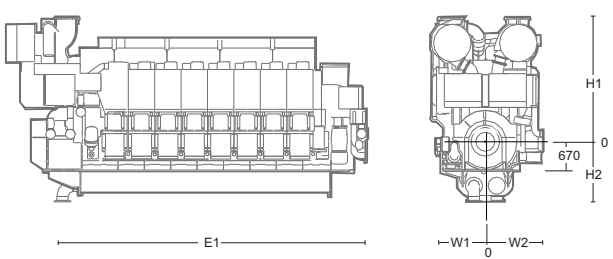
Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller
Guarantee optimum thrust, minimal noise and vibration level.

Dimensions

750 rpm	cyl.	Eng. kW*	Engine dimension (mm) & dry weight (ton)					
			E1	H1	H2	W1	W2	Dry Weight
12	12	6,000	6,048	2,749	1,270	1,294	1,356	74.7
14	14	7,000	6,673	2,933	1,270	1,294	1,356	79.7
16	16	8,000	7,298	2,933	1,270	1,294	1,356	85.9
18	18	9,000	7,923	2,933	1,270	1,294	1,356	93.4
20	20	10,000	8,548	2,933	1,270	1,294	1,356	102.3

E1 : Dimension between eng. flywheel to eng. free end.
*) Based on the CPP operation(For FPP, please contact HHI-EMD)



Marine Propulsion System

Tier II, Tier III (with SCR)

H32CP I Bore: 320mm, Stroke: 450mm

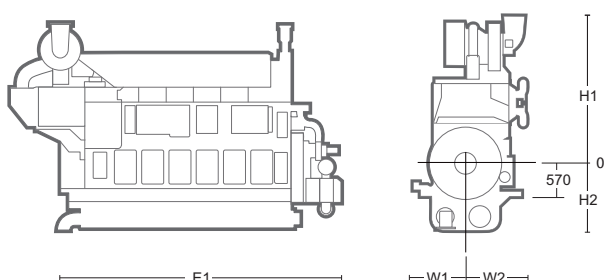
Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller
Guarantee optimum thrust, minimal noise and vibration level.

Dimensions

750 rpm		Engine dimension (mm) & dry weight (ton)					
Eng. kW	E1	H1	H2	W1	W2	Dry Weight
6	3,600	5,942	2,505	1,000	1,318	1,610	47.0
7	4,200	6,452	2,505	1,000	1,318	1,610	51.0
8	4,800	6,962	2,659	1,000	1,318	1,713	55.0
9	5,400	7,472	2,659	1,000	1,318	1,713	59.0

E1 : Dimension between eng. flywheel to eng. free end.



Marine Propulsion System

Tier II, Tier III (with SCR)

H32CVP I Bore: 320mm, Stroke: 450mm

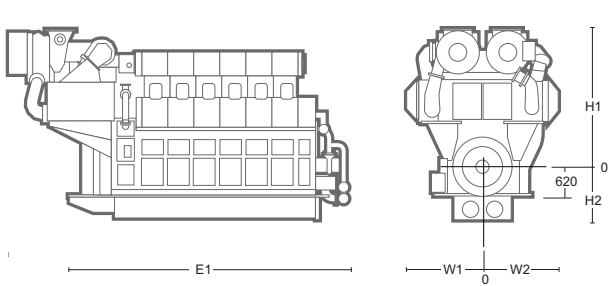
Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller
Guarantee optimum thrust, minimal noise and vibration level.

Dimensions

750 rpm			Engine dimension (mm) & dry weight (ton)					
cyl.	Eng. kW	E1	H1	H2	W1	W2	Dry Weight
12	7,200	6,118	3,026	1,220	1,745	1,745	79.0
14	8,400	6,718	3,026	1,220	1,745	1,745	89.5
16	9,600	7,318	3,180	1,220	1,745	1,745	96.0
18	10,800	7,918	3,180	1,220	1,745	1,745	108.0

E1 : Dimension between eng. flywheel to eng. free end.



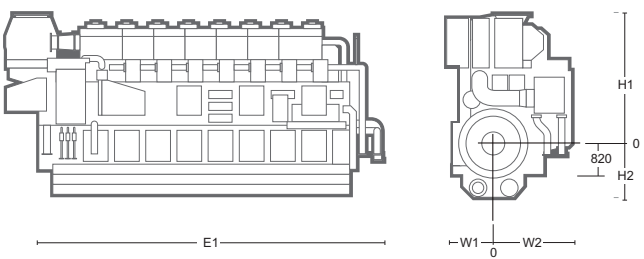
Marine Propulsion System

Tier II, Tier III (with SCR)

H46/60P I Bore: 460 mm, Stroke: 600 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

600 rpm	cyl.	Rated Output at Engine (kW)	Engine dimension (mm) & dry weight (ton)					
			E1	H1	H2	W1	W2	Dry Weight
	6	7,500	7,351	3,300	1,408	1,409	2,141	116
	7	8,750	8,171	3,400	1,408	1,409	2,141	134
	8	10,000	8,991	3,400	1,408	1,409	2,141	149
	9	11,250	9,811	3,400	1,408	1,409	2,141	165

E1 : Dimension between eng. flywheel to eng. free end.

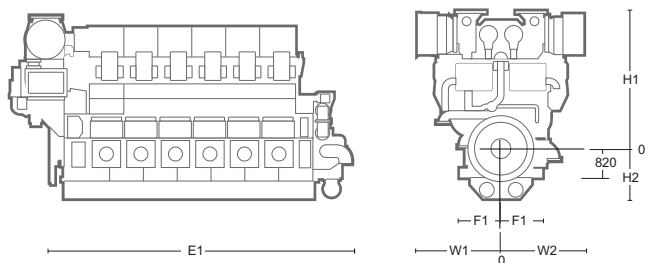
Marine Propulsion System

Tier II, Tier III (with SCR)

H46/60VP I Bore: 460 mm, Stroke: 600 mm

Controllable Pitch Propeller
Permit high skew angles to minimize noise and vibration.

Fixed Pitch Propeller
Guarantee optimum thrust, minimal noise and vibration level.

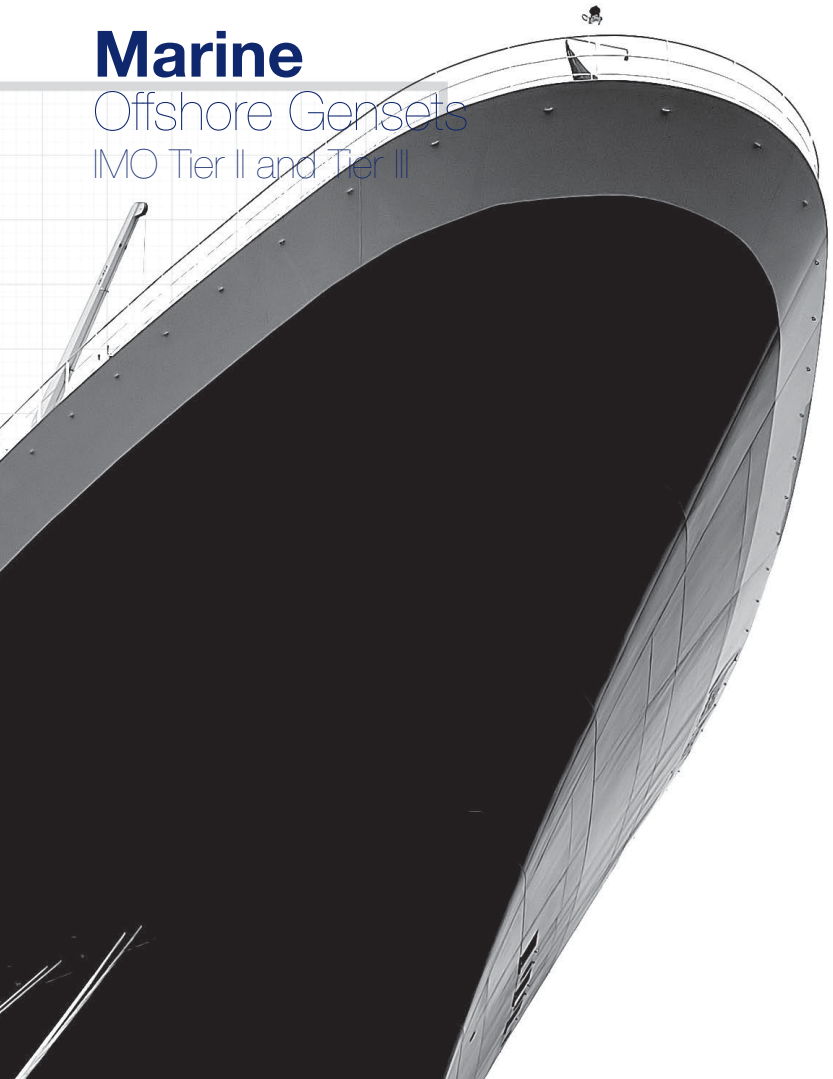


Dimensions

600 rpm	cyl.	Rated Output at Engine (kW)	Engine dimension (mm) & dry weight (ton)					
			E1	H1	H2	F1	W1	Dry Weight
	12	15,000	8,458	3,906	1,408	1,100	2,359	198
	16	20,000	10,458	4,006	1,408	1,100	2,607	251
	18	22,500	11,458	4,006	1,408	1,100	2,688	275

E1 : Dimension between eng. flywheel to eng. free end.

HYUNDAI HiMSEN



Marine

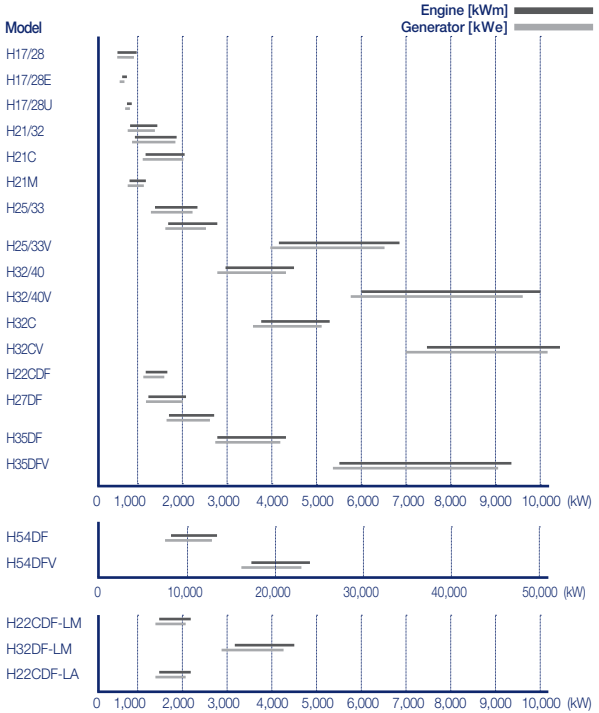
Offshore Gensets

IMO Tier II and Tier III

Power Range

H17/28	575~1,000 kW
H17/28E	660 kW
H17/28U	805 kW
H21/32	800~1,980 kW
H21C	1,200~2,160 kW
H21M	800~1,320 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
H32C	3,600~5,400 kW

H32CV	7,200~10,800 kW
H22CDF	1,075~1980 kW
H27DF	1,368~2,790 kW
H35DF	2,880~4,320 kW
H35DFV	5,760~9,600 kW
H54DF	8,820~13,230 kW
H54DFV	17,640~23,520 kW
H22CDF-LM	1,440~2,160 kW
H32DF-LM	3,000~4,500 kW
H22CDF-LA	1,440~2,160 kW



Marine Offshore Gensets

H17/28 I 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

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		50 Hz	
	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 (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

Tier II, Tier III (with SCR)

Dimensions

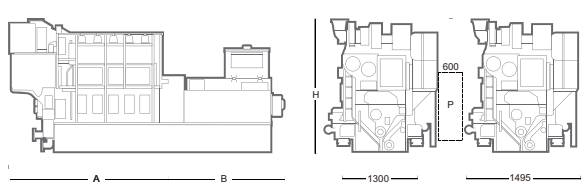
Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
900 rpm	5	2,791	2,200	4,991	2,314	7.7	13.6
	6	3,071	2,200	5,271	2,314	8.5	14.5
	7	3,351	2,200	5,551	2,314	9.4	15.6
	8	3,631	2,320	5,951	2,314	10.4	16.7

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
1000 rpm	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: HD Hyundai Electric).

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.



HYUNDAI HiMSEN

Marine Offshore Gensets

H17/28U(E) I 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

	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

Tier II, Tier III (with SCR)

Dimensions

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
900 rpm	6H17/28E	2,920	1,939	4,859	2,323	6.9	13.0
	6H17/28U	2,920	2,069	4,983	2,393	7.1	13.8

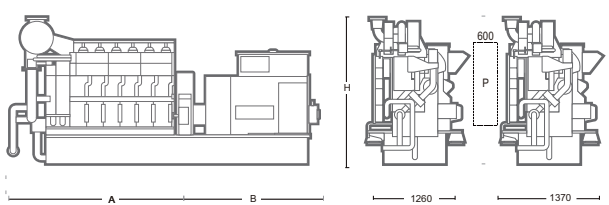
Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

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

H21/32 I 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

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 × 720/750 rpm is 188 g/kWh, 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 (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 Lub Oil Consumption (for Higher Power Rating)

Lub. Oil: 0.6 g/kWh

Tier II, Tier III (with SCR)

Dimensions

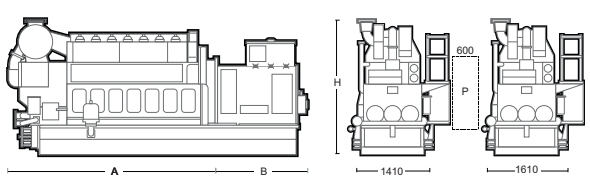
Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
720 / 750 rpm	5	3,405	1,926	5,331	2,712	14.0	22.4
	6	3,781	2,093	5,874	2,712	15.6	23.5
	7	4,111	1,923	6,034	2,781	17.1	26.5
	8	4,453	2,175	6,628	2,781	18.5	29.1
	9	4,783	2,265	7,048	2,911	19.9	31.7

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
900 / 1000 rpm	5	3,411	2,097	5,508	2,712	13.4	22.9
	6	3,781	1,896	5,677	2,781	15.1	26.1
	7	4,235	1,900	6,135	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: HD Hyundai Electric).

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.



HYUNDAI HiMSEN

Marine Offshore Gensets

H21C I Bore: 210 mm, Stroke: 330 mm

Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng.kW	Gen.kW	Eng.kW	Gen.kW
5H21C	1,200	1,140	1,200	1,140
6H21C	1,440	1,368	1,440	1,368
7H21C	1,680	1,596	1,680	1,596
8H21C	1,920	1,824	1,920	1,824
9H21C	2,160	2,052	2,160	2,052

Based on alternator efficiency of 94 ~ 95 %.

Specific Fuel Oil Consumption

Load	900 rpm	1000 rpm
85 %	180 g/kWh	182 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.5 g/kWh

Tier II, Tier III (with SCR)

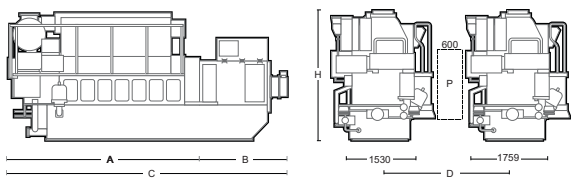
Dimensions

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
900 / 1000 rpm	5	3,735	2,249	5,984	2,600	14.3	22.1
	6	4,085	2,249	6,334	2,600	16.0	24.9
	7	4,435	2,305	6,740	2,600	17.8	28.3
	8	4,785	2,305	7,090	2,653	19.4	30.2
	9	5,135	2,450	7,585	2,653	21.0	33.6

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

D: Min. distance between engines 2,990 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

H21M I Bore: 210 mm, Stroke: 320 mm

Tier II, Tier III (with SCR)

Main Data

Speed	720 rpm		900 rpm	
Frequency	60 Hz		60 Hz	
	Eng.kW	Gen.kW	Eng.kW	Gen.kW
6H21M	800	752	1,050	987
	960	902	1,200	1,140
			1,320	1,254

Based on alternator efficiency of 94 ~ 95 %.

Specific Fuel Oil Consumption

	720 rpm			900rpm		
Load	Eng.kW	800	960	1,050	1,200	1,320
100%		185	183	185	183	187

Specific Lubricating Oil Consumption

SLOC : 0.5g/kWh

- Tolerance : +25% depending on the operating conditions
- Only MCR should be used to evaluate the lubricating oil consumption

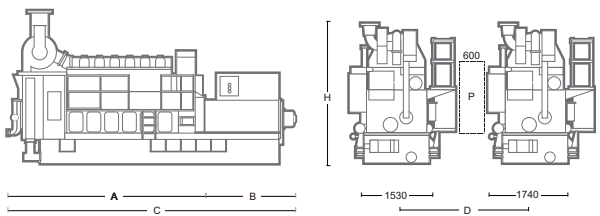
Dimensions

Speed	cyl.	Dimension (mm)					Dry Mass (ton)	
		A	B 1)	C 1)	D	H	Engine 2)	GenSet 1),3)
720 / 900 rpm	6	3,360	2,127	5,487	2,638	2,427	11.6	20

Remarks

1) Depending on a standard alternator.
2) Weight included a standard alternator.
3) Without common base frame.
4) With common base frame and alternator

D: Min. distance between engines.
P: Free passage between engines, width 600 mm and height 2,000 mm.
Note) All dimensions and weight are approximate value and subject to change without prior notice.



HYUNDAI HiMSEN

Marine Offshore Gensets

H25/33 I 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

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 (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

Tier II, Tier III (with SCR)

Dimensions

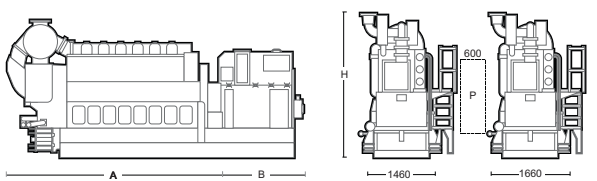
Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
720 / 750 rpm	6	4,414	2,262	6,676	2,961	20.2	29.8
	7	4,794	2,262	7,056	2,961	22.5	33.9
	8	5,311	2,340	7,651	3,241	24.1	39.5
	9	5,691	2,262	7,953	3,371	26.2	45.0

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
900 / 1000 rpm	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: HD Hyundai Electric).

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

H25/33V I Bore: 250 mm, Stroke: 330 mm

Tier II, Tier III (with SCR)

Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng.kW	Gen.kW	Eng.kW	Gen.kW
12H25/33V	4,080	3,876	4,080	3,876
14H25/33V	4,760	4,522	4,760	4,522
16H25/33V	5,440	5,168	5,440	5,168
18H25/33V	6,120	5,814	6,120	5,814
20H25/33V	6,800	6,460	6,800	6,460

Based on alternator efficiency of 96 %.

Specific Fuel Oil Consumption

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

Specific Lubricating Oil Consumption

Lub. Oil: 0.6 g/kWh

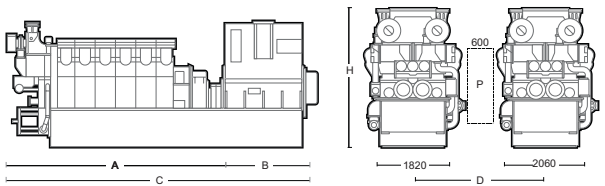
Dimensions

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
900 / 1000 rpm	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: HD Hyundai Electric).

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

H32/40 I Bore: 320 mm, Stroke: 400 mm

Tier II, Tier III (with SCR)

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

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

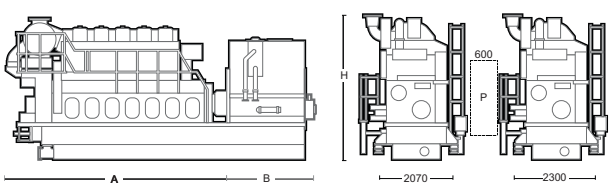
Specific Lubricating Oil Consumption

Lub. Oil: 0.5 g/kWh

Dimensions

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
720 rpm	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

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
750 rpm	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: HD Hyundai Electric).

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.

HYUNDAI HiMSEN

Marine Offshore Gensets

H32/40V I Bore: 320 mm, Stroke: 400 mm

Tier II, Tier III (with SCR)

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

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

Specific Lubricating Oil Consumption

Lub. Oil: 0.5 g/kWh

Dimensions

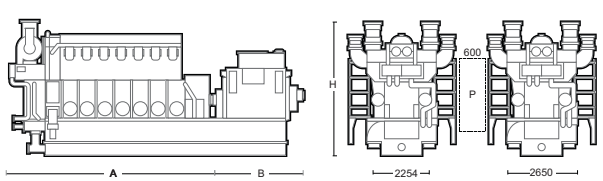
Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
720 rpm	12	6,624	3,760	10,384	4,723	56.0	108.8
	14	7,295	3,860	11,155	4,723	63.3	121.3
	16	7,914	3,860	11,774	4,723	69.1	130.9
	18	8,585	3,860	12,445	4,794	76.3	141.2
	20	9,344	3,860	13,204	4,794	84.0	153.9

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
750 rpm	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	3,860	11,774	4,723	69.1	130.9
	18	8,585	3,860	12,445	4,794	76.3	141.2
	20	9,344	3,860	13,204	4,794	84.0	153.9

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

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.



HYUNDAI HiMSEN

Marine Offshore Gensets

H32C I Bore: 320mm, Stroke: 450mm

Tier II, Tier III (with SCR)

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng.kW	Gen.kW	Eng.kW	Gen.kW
6H32C	3,600	3,474	3,600	3,474
7H32C	4,200	4,053	4,200	4,053
8H32C	4,800	4,632	4,800	4,632
9H32C	5,400	5,211	5,400	5,211

Based on alternator efficiency of 96.5 %.

Specific Fuel Oil Consumption

Load	720 rpm	750 rpm
75%	177.4 g/kWh	179.4 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.5 g/kWh

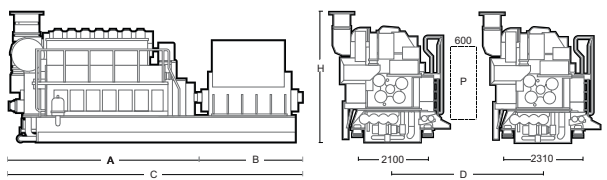
Dimensions

Speed	cyl.	Dimension (mm)					Dry Weight (ton)	
		A	B 1)	C 1)	D	H	Engine 2)	GenSet 1),3)
720 / 750 rpm	6	5,942	3,300	9,242	3,579	3,327	46.0	73.0
	7	6,452	3,600	10,052	3,579	3,327	50.0	80.8
	8	6,962	3,900	10,862	3,629	3,492	54.0	88.7
	9	7,472	4,100	11,572	3,629	3,492	58.0	96.5

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

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.



HYUNDAI HiMSEN

Marine Offshore Gensets

H32CV I Bore: 320mm, Stroke: 450mm

Tier II, Tier III (with SCR)

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng.kW	Gen.kW	Eng.kW	Gen.kW
12H32CV	7,200	6,948	7,200	6,948
14H32CV	8,400	8,106	8,400	8,106
16H32CV	9,600	9,264	9,600	9,264
18H32CV	10,800	10,422	10,800	10,422

Based on alternator efficiency of 96.5 %.

Specific Fuel Oil Consumption

Load	720 rpm	750 rpm
75%	177.4 g/kWh	179.4 g/kWh

Based on applying 2 stage Turbochargers.

Specific Lubricating Oil Consumption

Lub. Oil: 0.5 g/kWh

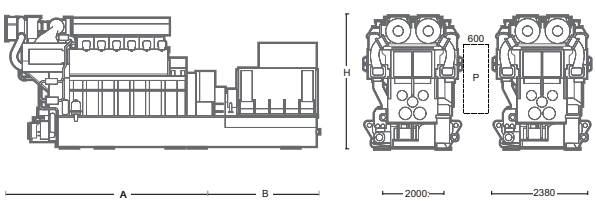
Dimensions

Speed	cyl.	Dimension (mm)				Dry Weight (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
720 / 750 rpm	12	7,526	3,900	11,426	4,362	78.0	121.2
	14	8,126	4,100	12,226	4,362	88.0	137.9
	16	8,726	4,300	13,026	4,448	96.0	152.6
	18	9,326	4,500	13,826	4,448	106.0	169.3

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

D: Min. distance between engines 4,760 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

Dual Fuel Engine
Tier II, Tier III

H22CDF I Bore: 220mm, Stroke: 330mm

Main Data

Speed	900 rpm		1,000 rpm	
Frequency	60 Hz		50 Hz	
	Eng.kW	Gen.kW	Eng.kW	Gen.kW
5H22CDF	1,075	1,011	1,100	1,034
6H22CDF	1,290	1,220	1,320	1,248
7H22CDF	1,505	1,423	1,540	1,463
8H22CDF	1,720	1,634	1,760	1,672
9H22CDF	1,935	1,839	1,980	1,881

Based on alternator efficiency of 94~95 %.

Heat Rate & SFOC (100% Load)

Load	900 rpm	1,000 rpm
Heat Rate@Gas mode	8,120 kJ/kWh	8,172kJ/kWh
SFOC@Diesel mode	191.5 g/kWh	193.0 g/kWh

Specific Lubricating Oil Consumption

Gas mode : 0.25 g/kWh
Diesel mode : 0.4 g/kWh

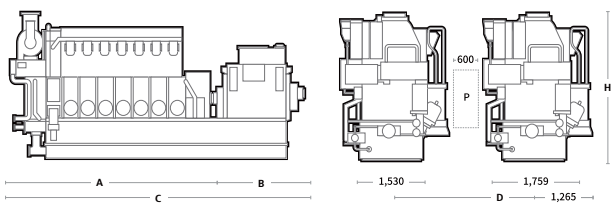
Dimensions

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
900 / 1,000 rpm	5	3,735	2,249	5,984	3,056	16.5	25.4
	6	4,085	2,249	6,334	3,056	18.2	27.6
	7	4,435	2,305	6,740	3,056	19.9	29.3
	8	4,785	2,305	7,090	3,056	21.6	31.2
	9	5,135	2,450	7,585	3,056	23.3	34.6

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

D: Min. distance between engines 2,990 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.



HYUNDAI HiMSEN

Marine Offshore Gensets

Dual Fuel Engine
Tier II, Tier III

H27DF I Bore: 270 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
6H27DF	1,368	1,300	1,422	1,351	1,710	1,625	1,860	1,767
7H27DF	1,596	1,516	1,659	1,576	1,995	1,895	2,170	2,062
8H27DF	1,824	1,733	1,896	1,801	2,280	2,166	2,480	2,356
9H27DF	2,052	1,949	2,133	2,026	2,565	2,437	2,790	2,651

Based on alternator efficiency of 95 %.

Heat Rate & SFOC (100% Load)

Load	720 rpm	750 rpm	900 rpm	1000 rpm
Heat rate @ Gas mode	7,900 kJ/kWh			
SFOC @ Diesel mode	190 g/kWh			

Specific Lubricating Oil Consumption

Gas mode : 0.25 g/kWh
Diesel mode : 0.4 g/kWh

Dimensions

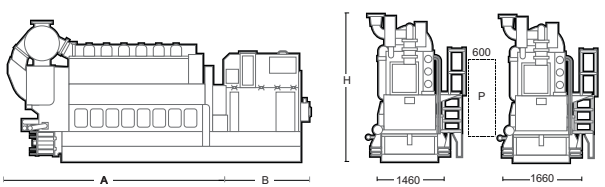
Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
720 / 750 rpm	6	4,414	2,262	6,676	2,835	21.2	30.8
	7	4,794	2,262	7,056	2,835	23.5	34.9
	8	5,311	2,340	7,573	3,241	25.1	40.5
	9	5,691	2,262	7,953	3,371	27.2	46.0

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
900 / 1000 rpm	6	4,414	2,262	6,676	2,835	21.2	30.8
	7	4,794	2,262	7,056	2,835	23.5	34.9
	8	5,311	2,340	7,651	3,371	25.1	40.5
	9	5,691	2,490	8,181	3,371	27.2	46.0

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

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.



HYUNDAI HiMSEN

Marine Offshore Gensets

Dual Fuel Engine

Tier II, Tier III

H35DF I 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
6H35DF	2,880	2,779	2,880	2,779
7H35DF	3,360	3,242	3,360	3,242
8H35DF	3,840	3,706	3,840	3,706
9H35DF	4,320	4,169	4,320	4,169

Based on alternator efficiency of 96.5 %.

Heat Rate & SFOC (100% Load)

	720 rpm / 60 Hz	750 rpm / 50 Hz
Heat rate @ Gas mode	7,270 kJ/kWh	7,270 kJ/kWh
SFOC @ Diesel mode	183 g/kWh	185 g/kWh

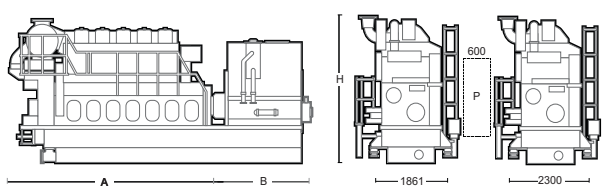
Specific Lubricating Oil Consumption

Gas mode : 0.25 g/kWh
Diesel mode : 0.4 g/kWh

Dimensions

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
720 rpm	6	5,760	3,130	8,890	4,367	34.7	69.6
	7	6,112	3,374	9,486	4,538	39.6	78.1
	8	6,602	3,594	10,196	4,538	42.5	83.0
	9	7,092	4,097	11,189	4,538	45.6	90.1

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
750 rpm	6	5,760	3,130	8,890	4,367	34.7	69.6
	7	6,112	3,374	9,486	4,538	39.6	78.1
	8	6,602	3,594	10,196	4,538	42.5	83.0
	9	7,092	4,097	11,189	4,538	45.6	90.1



Remarks

1) Depending on alternator.
2) Weight included a standard alternator (Maker : HD Hyundai Electric)
3) With Common base frame

D: Min. distance between engines : 3,037 mm (with gallery).
P: Free passage between the engines : 600 mm x 2,000 mm.
Note) All dimensions and weight are approximate value and subject to change without prior notice.

HYUNDAI HiMSEN

Marine Offshore Gensets

Dual Fuel Engine

Tier II, Tier III

H35DFV I 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
12H35DFV	5,760	5,587	5,760	5,587
14H35DFV	6,720	6,518	6,720	6,518
16H35DFV	7,680	7,449	7,680	7,450
18H35DFV	8,640	8,381	8,640	8,380
20H35DFV	9,600	9,312	9,600	9,312

Based on alternator efficiency of 97 %.

Heat Rate & SFOC (100% Load)

	720 rpm / 60 Hz	750 rpm / 50 Hz
Heat rate @ Gas mode	7,270 kJ/kWh	7,270 kJ/kWh
SFOC @ Diesel mode	183 g/kWh	185 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.4 g/kWh

Dimensions

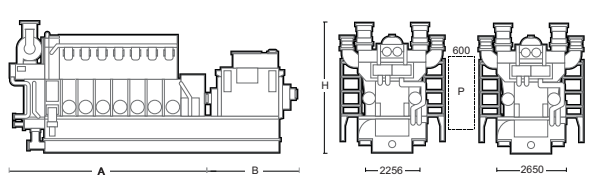
Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
720 rpm	12	6,624	3,760	10,384	4,723	57.0	109.8
	14	7,295	3,860	11,155	4,723	64.3	122.3
	16	7,914	3,860	11,774	4,723	70.1	131.9
	18	8,585	3,860	12,445	4,794	77.3	142.2
	20	9,344	3,860	13,204	4,794	85.0	154.9

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
750 rpm	12	6,624	3,760	10,384	4,723	57.0	109.8
	14	7,295	3,860	11,155	4,723	64.3	122.3
	16	7,914	3,860	11,774	4,723	70.1	131.9
	18	8,585	3,860	12,445	4,794	77.3	142.2
	20	9,344	3,860	13,204	4,794	85.0	154.9

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

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.



HYUNDAI HiMSEN

Marine Offshore Gensets

H54DF I Bore: 540mm, Stroke: 600mm

Dual Fuel Engine

Tier II, Tier III

Main Data

Speed	600 rpm	
Frequency	50 Hz / 60 Hz	
	Eng.kW	Gen.kW
6H54DF	8,820	8,555
7H54DF	10,290	9,981
8H54DF	11,760	11,407
9H54DF	13,230	12,833

Based on alternator efficiency of 97 %.

Heat Rate & SFOC (100% Load)

Speed	600 rpm
Heat Rate@Gas mode	7,280 kJ/kWh
SFOC@Diesel mode	179 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.5 g/kWh

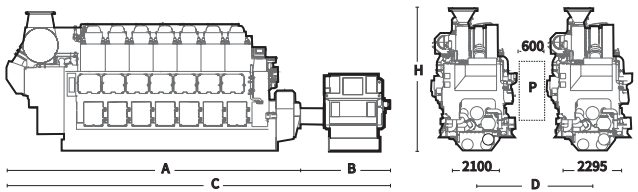
Dimensions

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
600 rpm	6	9,840	4,202	14,042	5,563	135.0	171.0
	7	10,780	4,487	15,267	5,563	153.0	191.0
	8	11,720	4,661	16,381	5,761	174.0	215.0
	9	12,660	4,407	17,067	5,761	192.0	241.0

Remarks

1) Depending on alternator.
2) With dry sump.
3) With alternator (Maker: HD Hyundai Electric).

D: Min. distance between engines 4,500 mm.
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

Dual Fuel Engine

Tier II, Tier III

H54DFV I Bore: 540mm, Stroke: 600mm

Main Data

Speed	600 rpm	
Frequency	50 Hz / 60 Hz	
	Eng.kW	Gen.kW
12H54DFV TSTC	17,640	17,111
14H54DFV TSTC	20,580	19,963
16H54DFV TSTC	23,520	22,814

Based on alternator efficiency of 97%.

Heat Rate & SFOC (100% Load)

Speed	600 rpm
Heat Rate@Gas mode	7,090 kJ/kWh
SFOC@Diesel mode	176 g/kWh

Specific Lubricating Oil Consumption

Lub. Oil: 0.5 g/kWh

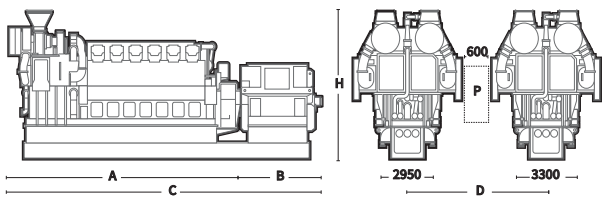
Dimensions

Speed	cyl.	Dimension (mm)				Dry Mass (ton)	
		A	B 1)	C 1)	H	Engine 2)	GenSet 1),3)
600 rpm	12	12,511	4,425	16,936	7,717	303.0	390.8
	14	13,661	4,377	18,038	7,717	334.8	431.2
	16	15,086	4,562	19,648	8,013	373.2	479.5

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

D: Min. distance between engines 7,000 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.



HYUNDAI HiMSEN

Marine Offshore Gensets

H22CDF-LM I Bore: 220mm, Stroke: 330mm

Main Data

Speed	900 rpm		1,000 rpm	
Frequency	60 Hz		50 Hz	
	Eng.kW	Gen.kW	Eng.kW	Gen.kW
6H22CDF-LM	1,440	1,368	1,440	1,368
7H22CDF-LM	1,680	1,596	1,680	1,596
8H22CDF-LM	1,920	1,824	1,920	1,824
9H22CDF-LM	2,160	2,052	2,160	2,052

Based on alternator efficiency of 94~95 %.

Heat Rate & SFOC (75% Load)

	900 rpm / 60 Hz	1,000 rpm / 50 Hz
Heat rate @ Methanol mode	7,833.8 kJ/kWh	7,920.9 kJ/kWh
SFOC @ Diesel mode	184.6 g/kWh	186.7 g/kWh

Lubricating Oil Consumption

Methanol mode : 0.5g /kWh + 1.7~2.4 liter / 24hrs per cylinder
Diesel mode : 0.5g / kWh

Dual Fuel Engine
Tier II, Tier III

Dimensions

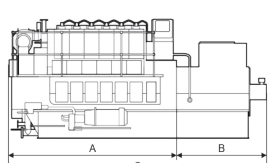
Speed	cyl.	Dimension (mm)			Dry Mass (ton)	
		A	B 1)	C 1)	Engine 2)	GenSet 1,3)
900 rpm	6	4,057	2,118	6,175	19.0	29.1
	7	4,407	2,230	6,637	21.1	32.9
	8	4,757	2,340	7,097	23.0	35.6
	9	5,107	2,632	7,739	24.9	40.7

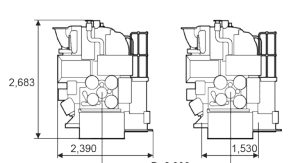
Speed	cyl.	Dimension (mm)			Dry Mass (ton)	
		A	B 1)	C 1)	Engine 2)	GenSet 1,3)
1,000 rpm	6	4,057	2,118	6,175	19.0	29.1
	7	4,407	2,230	6,637	21.1	32.9
	8	4,757	2,340	7,097	23.0	35.6
	9	5,107	2,632	7,739	24.9	40.7

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

D: Min. distance between engines.
P: Free passage between engines, width 600mm and height 2,000mm.
Note) All dimensions and weight are approximate values and subject to change without prior notice





HYUNDAI HiMSEN

Marine Offshore Gensets

Dual Fuel Engine
Tier II, Tier III

H32DF-LM I 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
6H32DF-LM	3,000	2,880	3,000	2,880
7H32DF-LM	3,500	3,360	3,500	3,360
8H32DF-LM	4,000	3,840	4,000	3,840
9H32DF-LM	4,500	4,320	4,500	4,320

Based on alternator efficiency of 96 %.

Heat Rate & SFOC (100% Load)

	720 rpm / 60 Hz	750 rpm / 50 Hz
Heat rate @ Methanol mode	7,998 kJ/kWh	8,197 kJ/kWh
SFOC @ Diesel mode	187 g/kWh	189 g/kWh

Lubricating Oil Consumption

Methanol mode : 0.5g /kWh + 1.1 liter / 24hrs per cylinder
Diesel mode : 0.5g / kWh

Dimensions

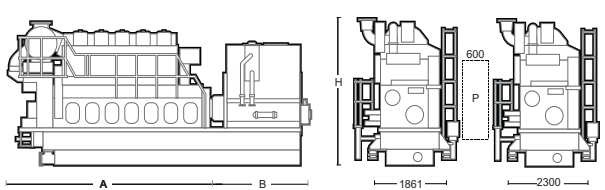
Speed	cyl.	Dimension (mm)					Dry Mass (ton)	
		A	B 1)	C 1)	D 4)	H	Engine 2)	GenSet 1,3)
720 rpm	6	5,765	3,415	9,180	3,677	4,520	40.2	62.5
	7	6,255	3,669	9,924	3,677	4,684	43.5	70.2
	8	6,881	3,923	10,804	3,677	4,684	46.7	77.8
	9	7,008	4,063	11,071	3,677	4,684	51.4	85.0

Speed	cyl.	Dimension (mm)					Dry Mass (ton)	
		A	B 1)	C 1)	D 4)	H	Engine 2)	GenSet 1,3)
750 rpm	6	5,765	3,415	9,180	3,677	4,520	40.2	62.5
	7	6,255	3,669	9,924	3,677	4,684	43.5	70.2
	8	6,881	3,923	10,804	3,677	4,684	46.7	77.8
	9	7,008	4,063	11,071	3,677	4,684	51.4	85.0

Remarks

1) Depending on alternator.
2) Without common base frame
3) With common base frame & alternator (Maker : HD Hyundai Electric)
4) Depending on methanol pipe connection

D: Min. distance between engines 3,677 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.



HYUNDAI HiMSEN

Marine Offshore Gensets

Dual Fuel Engine

Tier II, Tier III

H22CDF-LA I Bore: 220mm, Stroke: 330mm

Main Data

Speed	900 rpm		1,000 rpm	
Frequency	60 Hz		50 Hz	
	Eng.kW	Gen.kW	Eng.kW	Gen.kW
6H22CDF-LA	1,440	1,368	1,440	1,368
7H22CDF-LA	1,680	1,596	1,680	1,596
8H22CDF-LA	1,920	1,824	1,920	1,824
9H22CDF-LA	2,160	2,052	2,160	2,052

Based on alternator efficiency of 94~95 %.

Heat Rate & SFOC (75% Load)

	900 rpm / 60 Hz	1,000 rpm / 50 Hz
Heat rate @ Ammonia mode	7,833.8 kJ/kWh	7,920.9 kJ/kWh
SFOC @ Diesel mode	184.6 g/kWh	186.7 g/kWh

Lubricating Oil Consumption

Ammonia mode : 0.5g /kWh + 1.7~2.4 liter / 24hrs per cylinder
Diesel mode : 0.5g / kWh

Dimensions

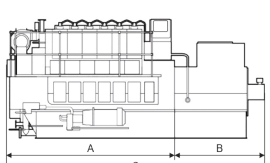
Speed	cyl.	Dimension (mm)			Dry Mass (ton)	
		A	B 1)	C 1)	Engine 2)	GenSet 1,3)
900 rpm	6	4,057	2,118	6,175	19.0	29.1
	7	4,407	2,230	6,637	21.1	32.9
	8	4,757	2,340	7,097	23.0	35.6
	9	5,107	2,632	7,739	24.9	40.7

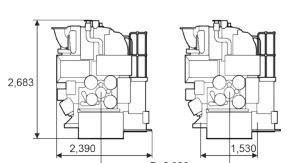
Speed	cyl.	Dimension (mm)			Dry Mass (ton)	
		A	B 1)	C 1)	Engine 2)	GenSet 1,3)
1,000 rpm	6	4,057	2,118	6,175	19.0	29.1
	7	4,407	2,230	6,637	21.1	32.9
	8	4,757	2,340	7,097	23.0	35.6
	9	5,107	2,632	7,739	24.9	40.7

Remarks

1) Depending on alternator.
2) Without common base frame.
3) With common base frame & alternator (Maker: HD Hyundai Electric).

D: Min. distance between engines.
P: Free passage between engines, width 600mm and height 2,000mm.
Note) All dimensions and weight are approximate values and subject to change without prior notice





Marine 2-Stroke Engine

Products

HYUNDAI-MAN B&W / HYUNDAI-WÄRTSILÄ / Engine Components

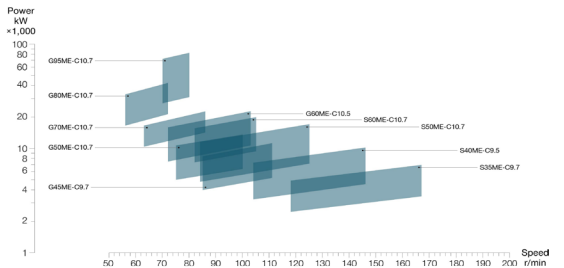
2-Stroke Engine

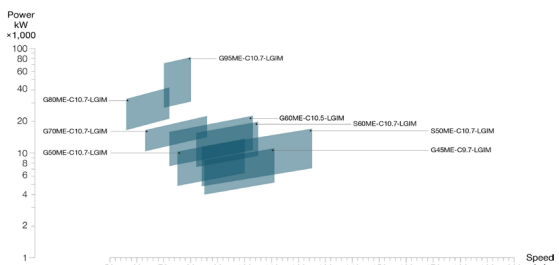
HHI-EMD has been supplying "One out of Three" of the world's 2-stroke engines for marine propulsion and power generation in pursuit of providing our valuable customers with high quality and more economical products.
HHI-EMD's established reputation is supported by its superb performance in marine and stationary engines along with its state-oftheart facilities such as foundry, forging, machining, crankshaft, and assembly & test shops specializing in manufacturing engines.

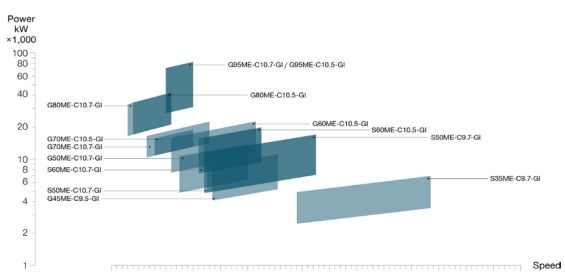
HYUNDAI HiMSEN

HYUNDAI-MAN ES

Power range

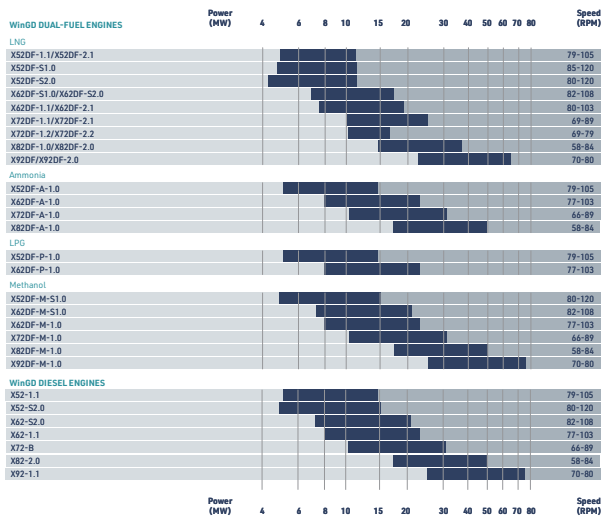




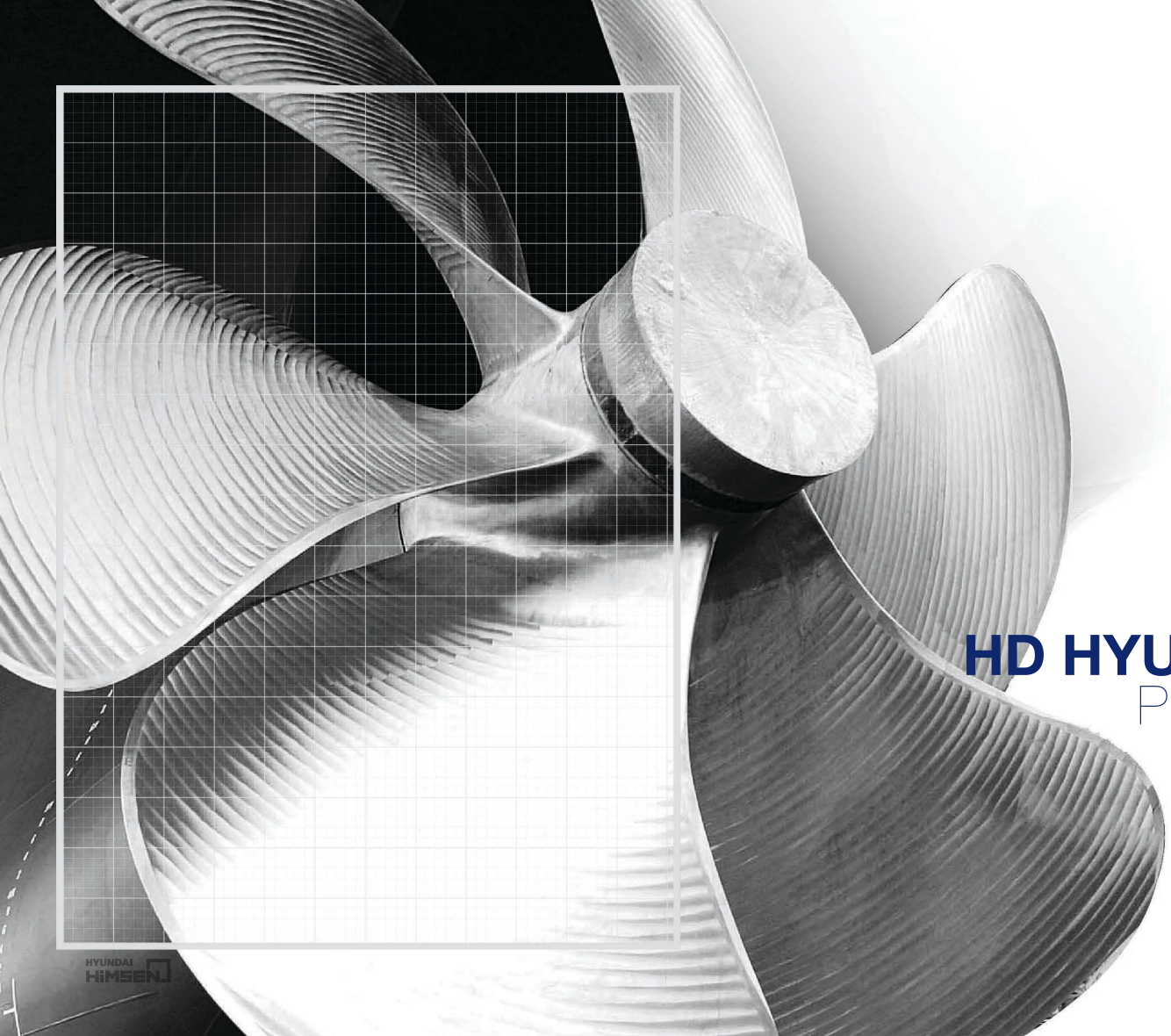


HYUNDAI-WinGD

Power range



HYUNDAI HiMSEN



HD HYUNDAI
Propeller

Hi-EcoPel

Propeller shop

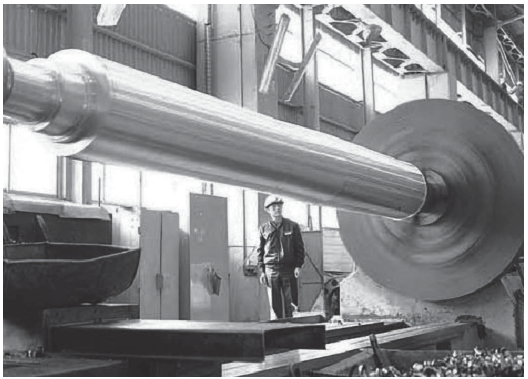
HD Hyundai Heavy Industries produces a wide variety of marine propellers. Our propellers have a diameter up to 11,000 mm, with maximum unit weight of 114,000 kg, and are typically made of manganese bronze and nickel-aluminum bronze.
We employ a comprehensively computerized design, manufacturing, and inspection system for these products.

Production Capacity

Max. | 114 ton in Weight, 11 m in Diameter
Min. | 10 ton in Weight, 3 m in Diameter

World's Largest Propeller
Weight 110.2 ton
Diameter 10.4 m
Blade 5
Ship type 18,800 TEU Container

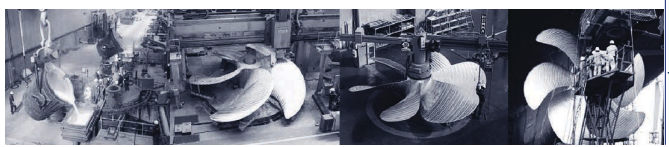
Shaft Propeller Shaft / Intermediate
Shaft Rudder Stock Straight Type



Production Capacity

Max. | 120 ton in Weight
| 2,200 mm in Diameter
| 18,000 mm in Length

Min. | 300 mm in Diameter
| 2,000 mm in Length



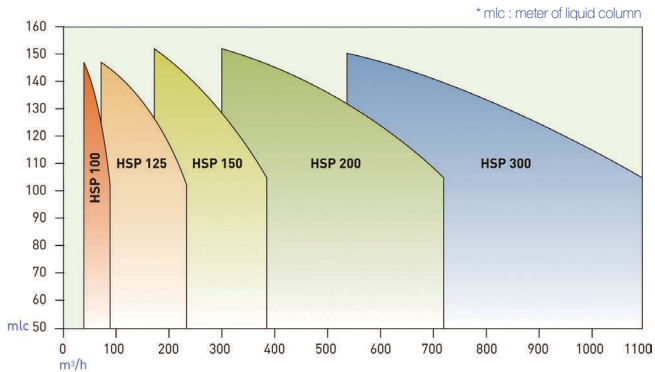
Marine Eco Machinery

HD Hyundai Heavy Industries

Hi-Well
Cargo Pump

Pump Selection Chart

Optimum pump capacities are achieved by selecting high efficiency models for the customer's requirements of flow rates, heads and others.
We provide customers with a proposal for a complete **Hi-Well Cargo Pumping System** based on customer's information about total tank volume, total discharge rates, total head and others.



Hi-Well Cargo Pump

Hyundai Hydraulic Hi-Well Cargo Pumping System

Major Supply Equipment
- Submerged cargo pump
- Hydraulic power package
- Control system
- Ballast pump
- Portable pump with winch
- Tank cleaning pump
- Hydraulic oil transfer pump

Optional Equipmentv
- Cargo heater
- Diffuser
- Hydraulic piping and fittings
- Side thruster

Other Consumer

Hydr. Oil Press Line
Hydr. Oil Line
Pilot Line

HD HYUNDAI ENVIRONMENTAL TECHNOLOGIES against IMO NOx Tier III as one of solutions, NoNOx™ SCR (Selective Catalytic Reduction) system

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

• SCR principal

SCR is a well proven technology in the various industries, which can reduce NOx in exhaust gas by a chemical reaction process.
Urea solution is commonly adopted as reductant, and it is decomposed into ammonia and carbon dioxide in hot gas stream.

$(NH_2)_2CO + H_2O > 2NH_3 + CO_2$
[Urea] [Water] [Ammonia] [Carbon dioxide]

The ammonia decomposed from urea, is chemically re-acted with NOx at the surface of catalyst, which is converted to molecular nitrogen and water.

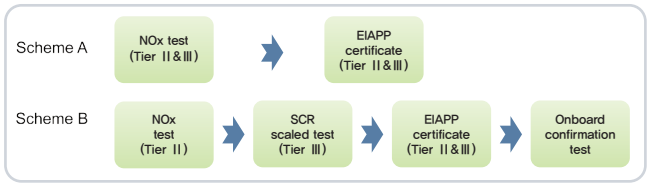
$4NO + 4NH_3 + O_2 > 4N_2 + 6H_2O$
$6NO_2 + 8NH_3 > 7N_2 + 12H_2O$

Application for various DF engines (Methanol, Ammoonia, Biofuel, etc.)
NoNOx™ SCR can be applied for various DF engines, and has optimized design in order to be able to operate with not only diesel oil but also alternative fuels such as Methanol, Ammonia, Biofuel, Especially, SCR for Ammonia fueled engine has a multi-function to reduce unburned ammonia and NOx emission simultaneously.

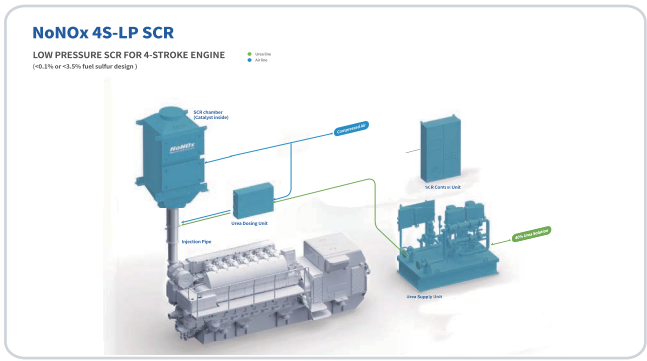
• Certification of NoNOx SCR System

SCR system and relevant certification procedure for marine application is defined by IMO. According to resolution MEPC.291(71), SCR system is considered as an engine component. Therefore, instead of separate certification of SCR system, IMO NOx verification in combination with engine is required according to Scheme A and Scheme B. NoNOx SCR system can be verified and receive IMO NOx Tier III certification at HHI-EMD test-bed according to Scheme A.

Resolution MEPC.291(71)



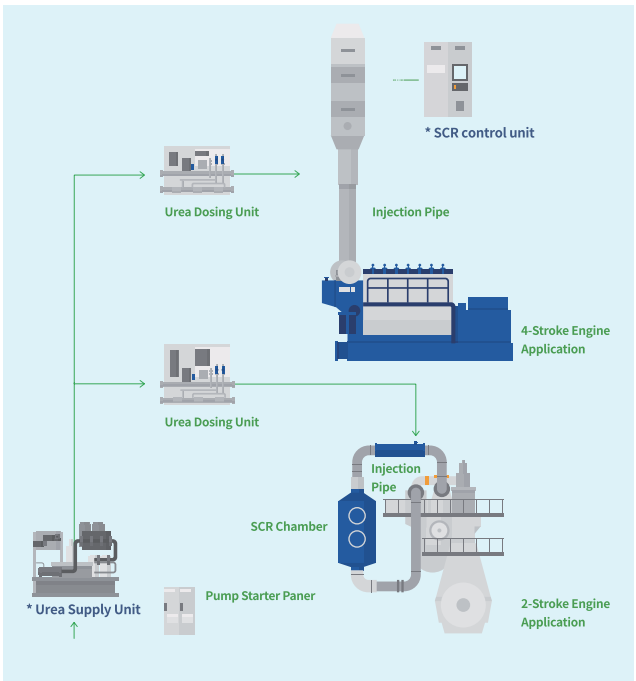
• Main Components of NoNOx SCR System



SCR INTEGRATION DESIGN
FOR 2-stroke & 4-stroke Engine Application

COMMON USE COMPONENTS

* Urea supply unit & Pump starter
* SCR control unit



Size & Weight of NoNOx™ standard SCR Chamber

2-Stroke HP SCR(MGO 0.1% S)

Engine power[kW]	Dimension of SCR chamber		Weight of SCR chamber Incl. Catalyst[kg]
	Diameter(Ø)[mm]	H[mm]	
~5,220	1,940	5,500	11,200
~8,340	2,340	5,800	15,100
~10,320	2,540	5,900	17,000
~16,080	3,040	6,300	25,500
~21,840	3,240	6,700	30,300
~28,260	3,540	7,000	35,900
~33,500	3,840	7,200	41,000

4-Stroke SCR(HFO 3.5% S)

Engine power[kW]	Dimension of SCR chamber			Weight of SCR chamber Incl. Catalyst[kg]
	D[mm]	W[mm]	H[mm]	
~1,100	730	1,044	3,250	1,900
~1,650	1,044	1,044	3,250	2,300
~2,200	1,044	1,358	3,500	3,050
~3,270	1,358	1,358	3,660	3,650
~5,100	1,672	1,672	4,310	5,420
~7,350	1,986	1,986	4,640	7,300
~10,010	2,310	2,310	4,890	9,450
~13,080	2,630	2,630	5,140	11,800

NoNOx™ can meet customer's requirement for tailor made of SCR chamber if optimized size of chamber is required, besides standard dimension shown above table. Please contact us for more information.

HYUNDAI HIMSEN

HiEMS

Hyundai intelligent Equipment Management Solution

Introduction

HD Hyundai intelligent Equipment Management Solution, HiEMS, offers a real-time engine status monitoring, trouble-shooting guidance to marine engineers and provides connectivity between engines and on shore monitoring center.
With HiEMS, HiMSEN customers can get our experts of engine and service close to you.
with intuitive UI, engine operators can figure out the root cause of a certain alarm and get the technical advice and trouble shooting guide.
When detecting the abnormalities in engine, HiEMS transfers alarm/fault information and sensor data to onshore for the detail analysis.
Also, HiEMS keeps long term data for fleet and engine managements.

Main features

On Ship,
Real-time Status Monitoring of the HiMSEN engine
- Status of the engine, indicator of sub systems, trend and surveillance with FAT

Analysis tools for engine data
- Performance, Deviation, Correlation Analysis and Statistics

Maintenance and Guidance based on the instruction guide
- Alarm Manager, Maintenance Manager, Part-list Manager

On Shore,
Status Monitoring of the Fleet of HiMSEN engines
- Overall status of alarm and running hour
- Long Term Data management and Reporting service

Benefits

On ship, HiEMS provides guidance for the engine operator, maintenance function with engineering based instruction guide and integrated trouble shooting guide, which enables engine operators to run and maintain HiMSEN Engine at optimal condition.

On shore, Ship managers can manage the Fleet of HiMSEN engines with HiEMS, accessible 24*7 through the Digital Innovation(DI) Center of HGS (HD Hyundai Global Service). Ship managers can get real-time remote diagnostics, qualified advices and services from our engineers and service experts.(on reporting service version)

License Policy

Standard version
- All main features for "On ship" is available, data of a specific time interval is sent to on shore, such as alarm, statistics and operational data.

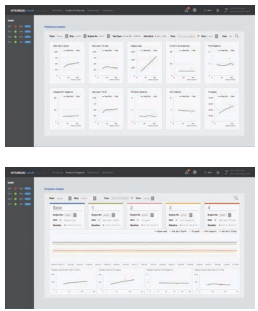
Reporting service version
- Including "Standard version" features, regular reporting service is available through HGS.
- contact HGS service manager.

Monitoring

Real-Time Status Monitoring of the HiMSEN engine
- indicators of sub systems, running information
- Status information by location through P&ID(DF only)

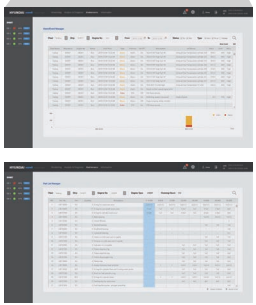
Analysis & Diagnosis

Analysis tools for engine data
- Performance, Deviation, Correlation Analysis and Statistics
- Compare FAT data with Current State



Maintenance

Maintenance and Guidance based on the Instruction Guide
- Alarm Management, Maintenance Management, Part-list Manager

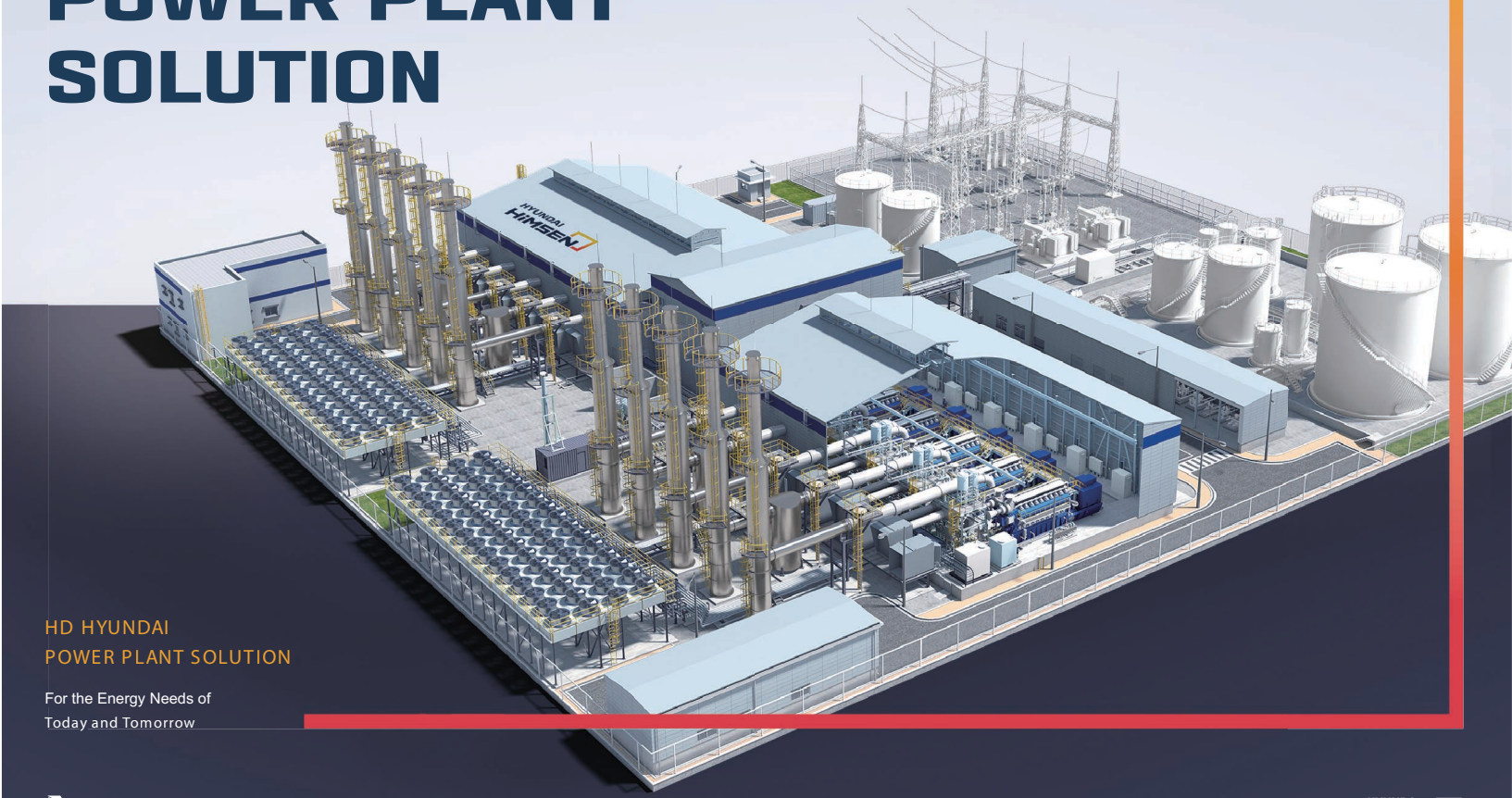


Fleet managemet(Option)

On Shore, Status Monitoring of the Fleet of HiMSEN engines
- Overall status of alarm, running hour and Reporting service

HYUNDAI HiMSEN

POWER PLANT SOLUTION



HD HYUNDAI
POWER PLANT SOLUTION

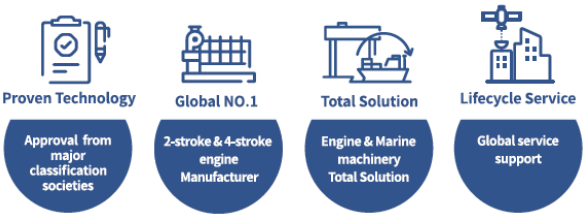
For the Energy Needs of
Today and Tomorrow

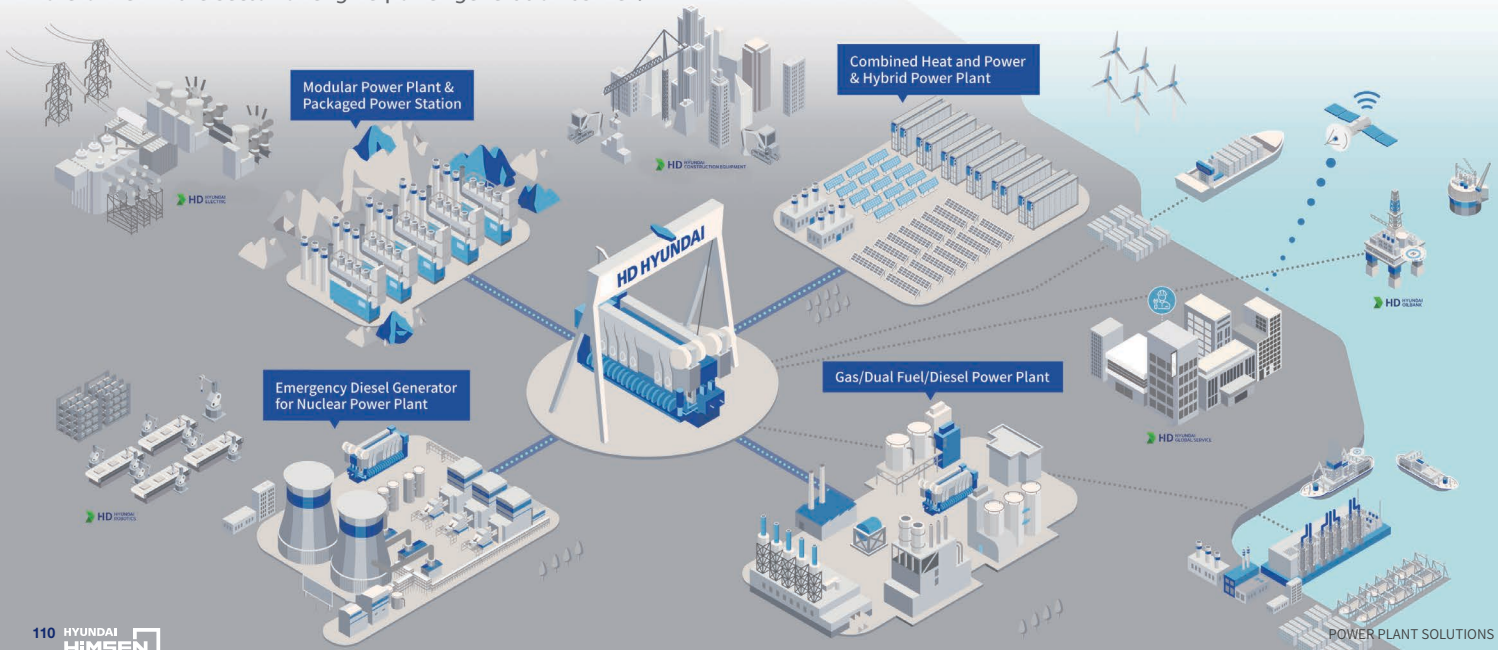
HD HYUNDAI HEAVY INDUSTRIES

HYUNDAI HiMSEN

HD HYUNDAI POWER GENERATION LANDSCAPE

HD Hyundai Heavy Industries Co., Ltd. (HHI) has been leaving a remarkable footprint in global shipbuilding industry since 1972. In 1978, as one of the business unit of HHI, the Engine & Machinery (HHI-EMD) was launched to manufacture marine and stationary engines and has enjoyed the dominant position as the world's leading engine manufacturer until now. HHI-EMD covers 35% of global 2-stroke engine market with superb performance and has become the forerunner in the sector of engine power generation as well.





01 ENGINE POWER PLANT OVERVIEW

WHAT WE DO OFFER FOR YOUR NEEDS

- Eco-friendly
- High-efficiency
- Fast Installation
- Easy Transportation
- High Reliability
- Easy Operation
- Low CAPEX
- Low OPEX

Solutions

- Gas Fuel Power Plant
- Dual Fuel Power Plant
- Diesel Power Plant
- 2-stroke Power Plant
- Hybrid Power Plant
- Emer'cy DG for Nuclear Power Plant
- Emer'cy BSDG
- Building Type Power Plant
- Enclosure Type Power Plant
- Modular Power Plant
- Aux. Master Seq. & Ready
- Auto Synchro. And Load Up
- Automatic Fuel Change-over
- Dynamic Monitoring Smart Early Warning System
- Adaptive Max Power Control
- Remote Diagnostic Service
- HAM Modules
- CHP Modules

Services

- Pre-sales Technical Consulting
- Logistics
- Conceptual Design
- Installation & Construction
- Basic Engineering Of Main Equipment
- Installation Supervision
- Civil & Architecture Design
- Commissioning Supervision
- Mechanical Process Design
- Noise & Emission Analysis
- I&C / Electrical System Design
- Operation Training
- Procurement
- Operation & Maintenance
- Performance Tests (Shop & Site)
- Remote Diagnostic
- Spare-Parts

02 ENGINE POWER PLANT SOLUTIONS

- Gas & Dual Fuel Power Plant
- Diesel Power Plant
- Modular Power Plant & PPS
- Emergency & Black Start Diesel Generator
- Emergency Diesel Generator for Nuclear Power Plant
- CHP & HYBRID

LOWEST CAPEX LOWER EMISSION AND HIGH EFFICIENCY

Gas & Dual Fuel Power Plant

In order to protect our natural habitat, HD HYUNDAI is always looking for improved technology for our products and services.
Our natural gas and dual fuel solutions with lower emission will help to maintain clean planet for our children and for the future.

GPP / DFPP

Who Is It For?

- For those who are looking for efficient and economical power plant.
- For those who want to follow environmental regulations.
- Dual fuel is often used for places where there is unstable gas supply and diesel can be used for backup.

Why Are They Good?

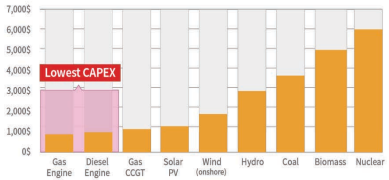
1. LOWER EMISSION

Gas engines have lower emission rates and high efficiency.
As emission regulations become stricter, gas operation has advantages such as low NOx / CO2, and no SOx / Particle emissions.

2. ECONOMICAL

Gas engines are one of the most economical options.
The operation and maintenance costs are especially lower than other power plant running on different fuels.

CAPEX For Various Power Sources



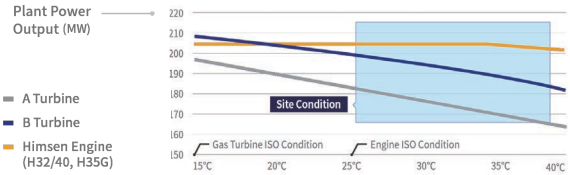
3. QUICK START TIME

Gas engines have a shorter start time compared to gas turbines. It takes 15 to 40 minutes for turbines to start, whereas gas engine only takes 2 to 7 minutes.

4. STABLE POWER OUTPUT

Gas engines are able to operate more stable than gas turbine under different ambient temperatures. While turbine power plant show around 10% derating, gas engine power plant shows only 1% derating. Gas Turbine is also more sensitive to part load.

Ambient Temperature Impact To Gas Turbine & Engine Plant Output



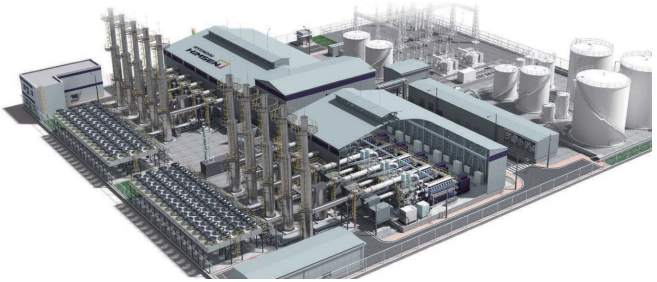
HD HYUNDAI'S GAS & DUAL FUEL POWER PLANT

"HD HYUNDAI's gas and dual fuel power plant ensures not only safety of the power plant but also eco-friendly environment. HD HYUNDAI's dual fuel power plant creates added value through offering true flexibility in fuel selection and in our ability to respond to various operational demands."

Safe System When using gas as the power source, safety is a crucial issue. The control/safety systems and sensors created by HD HYUNDAI, are installed and prepared for safe gas operation.

Eco-Friendly The gas/dual fuel power plant has the advantage of reducing the emission rate.
HD HYUNDAI's gas engines are credible for its low NOx emission rate, smoke-less operation range, low vibration, and less noise.

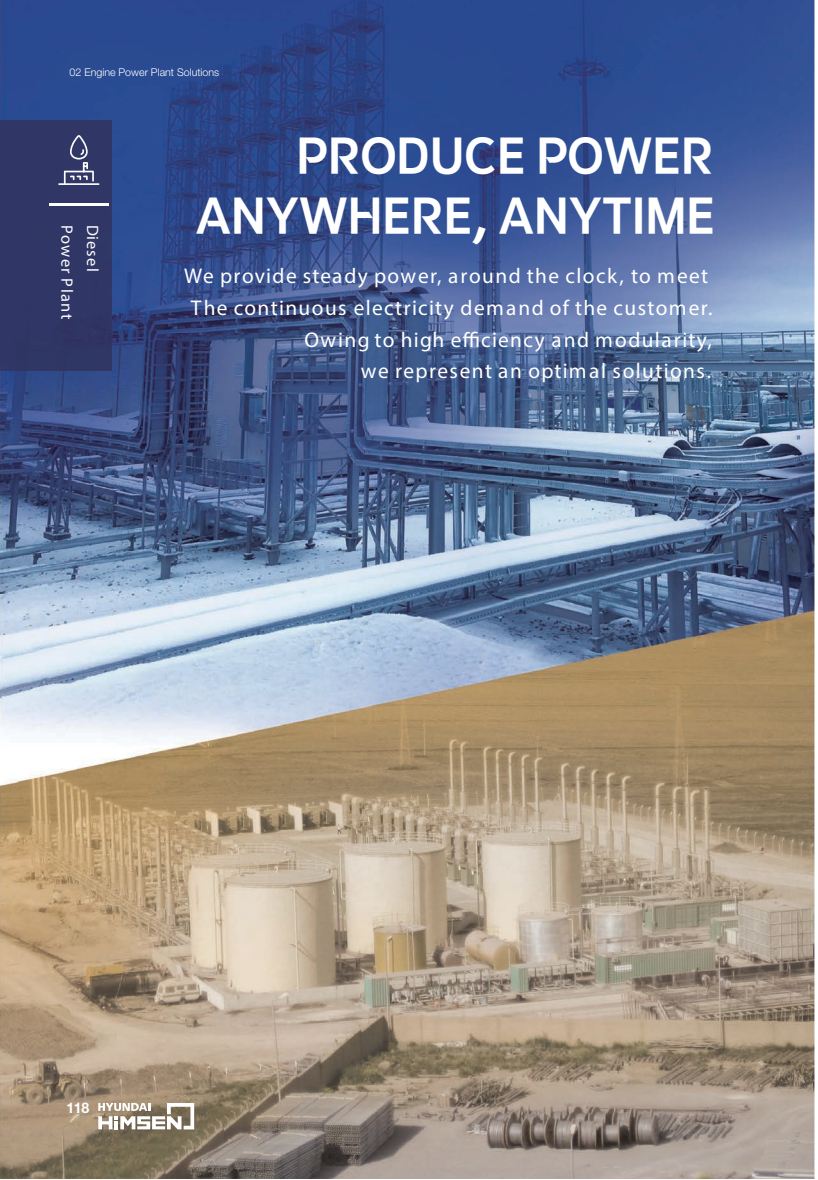
Fuel Flexibility The dual fuel power plant offers total fuel flexibility.
When gas operation is interrupted or gas shortage occurs, the system switches to diesel fuel operation seamlessly and swiftly.



Diesel Power Plant

PRODUCE POWER ANYWHERE, ANYTIME

We provide steady power, around the clock, to meet
The continuous electricity demand of the customer.
Owing to high efficiency and modularity,
we represent an optimal solutions.



Who is It For?

- For those who are looking for efficient, economical power plant.
- For those who are willing to run power plant on various fuel oil.
- For those who want low CAPEX.

Why Are They Good?

1. FUEL FLEXIBILITY

HD HYUNDAI's diesel engine power plant provides a variety of selection of fuels, ranging from HFO, LFO, Crude oil to Emulsified oil.

2. QUICK START TIME

Diesel engines have a shorter start time compared to turbines.
It takes up to 15 to 40 minutes for turbines to start,
whereas diesel engine only takes 2 minutes.

3. HIGH REALIABILITY

We provide robust, reliable engine generator set and auxiliary equipment, which are proven in the most challenging nations and environmental conditions.

Scope of Supply

❶ Diesel Generator set

❷ Mech. Aux. equipment

❸ Elec. Aux. equipment

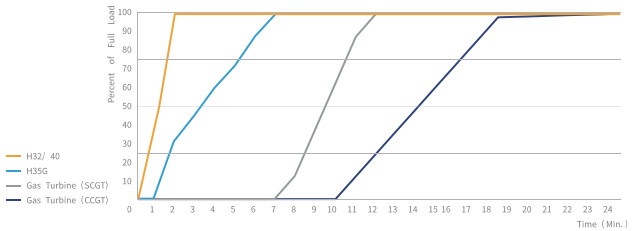
❹ I&C Aux. equipment

❺ Basic & Detail Engineering

❻ Construction

❼ Supervision of Installation & commissioning

Start -up time comparision (HiMSEN engine vs Turbine)



Modular Power Plant & PPS

SETTING NEW STANDARDS FOR 'FAST & EASY'

Enclosure and container-type power plant can shorten and simplify the construction process and make transportations easier for future needs.

Who Is It For?

- Small IPPs Independent Power Producers) who can afford small investment to start their businesses
- Those who need power sources fast track
- Those who are not connected to the national grid
- Places where it is difficult to have infrastructure(e.g. high voltage transmission line)
- Small towns and isolated areas

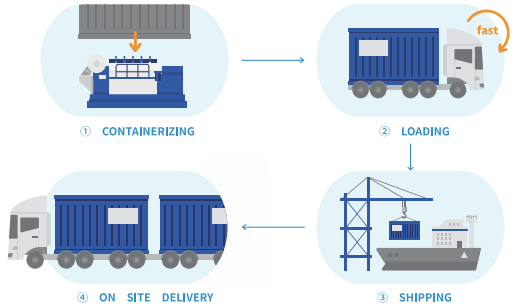
Why Are They Good?

1. FAST DELIVERY AND INSTALLATION

All the process of manufacturing, transportation, installation, and commissioning for a 20MW PPS takes just 9 months.

EASY TO TRANSPORT

The PPS can be installed in a 40 feet container, so it can be stacked on containerships at sea and be easily carried by trailers on land.



Simple installation steps give time savings.	5 months for manufacturing, 1.5 months for transportation, 1.5 months for installation, 1 months for commissioning.

2. EASILY TRANSFERABLE

Reinstallation of 1 PPS unit takes just 2 weeks. Even with more units, no additional time is required.

3. LOW OPERATION COST

30~70% lower operation cost compared to high speed gensets.

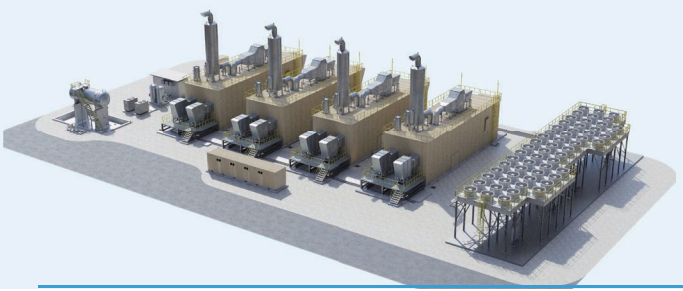
4. EASY OPERATION

The smart control system gives easy & efficient site operation for O&M managers.

Modular Power Plant

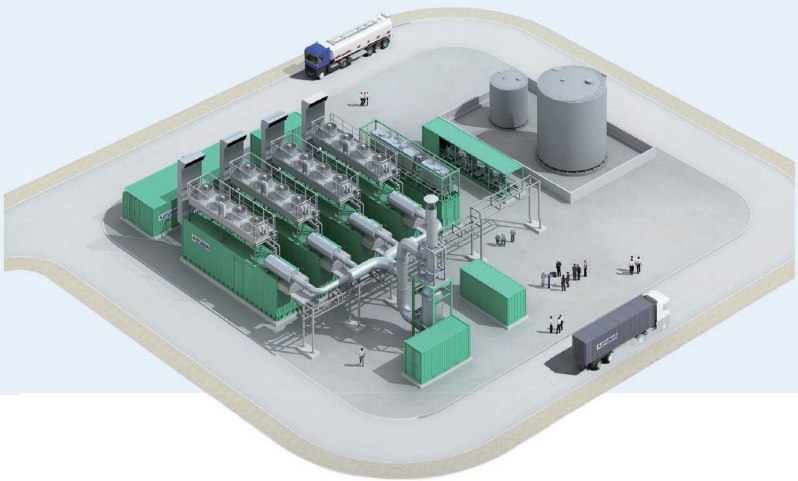
MODULAR POWER PLANT

Enclosure Type Power Plant

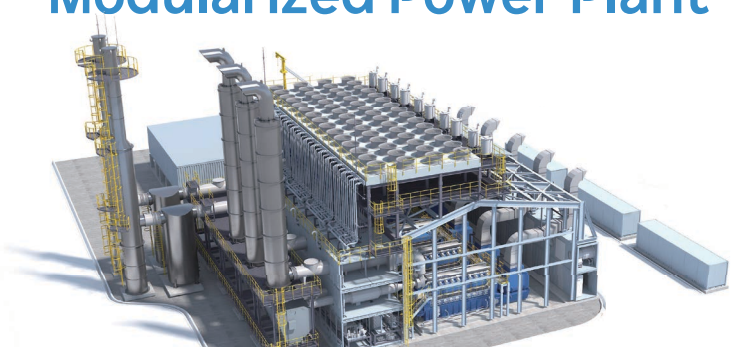


PPS

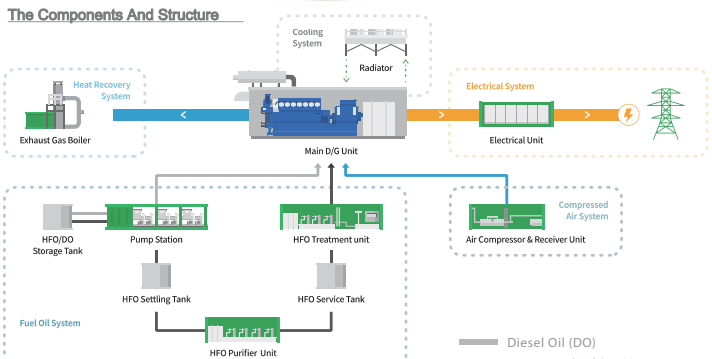
PACKAGED POWER STATION



Aux. Equipment Modularized Power Plant



The Components And Structure



System can be adjusted by (1) Scope of Supply (2) Detail Engineering

EDG for Nuclear Power Plant

WITH NO EXCEPTION ALWAYS STANDING BY

The EDG for nuclear power plant requires high - level in its quality and stability because electric power has to be immediately supplied when the nuclear power plant is stopped due to emergency accident. This solution requires such sophisticated engineering capability to design complicated logic that HD HYUNDAI is the very company accommodating the needs with massive experiences.

Reference List

Total Quantity of 51units

Total Deliver of 361MW

As of April, 2018

NO.	Project Name	Engine	Quantity	Country	Capacity(MW)	Year
1	32MW Shinhanul	20H32/40V	4	S.Korea	32	2024
2	60MW KKNPP	16H32/40V	10	India	63	2022
3	30MW SKN #5,6	18H32/40V	4	S.Korea	30	2017
4	83.7MW UK HPC	20H32/40V	9	UK	84	2016
5	48MW PAKISTAN K2/K3 NPP	20H32/40V	5	Pakistan	48	2015
6	78.3MW UAE BARAKAH	20H32/40V	9	UAE	78	2011
7	7MW KORI	9H32/40	2	S.Korea	7	2010
8	19.2MW EMERGENCY	12V240RVR	8	S.Korea	19	1987

5

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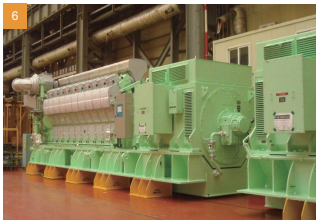

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8

OPTIMIZED, RELIABLE, PROVEN SOLUTION FOR EDG & BSDG

HD HYUNDAI engine is designed to provide backup power generation for unexpected incidents. This solution requires sophisticated engineering and the ability to model complicated logic, which HD HYUNDAI is very capable of.

Reference List

Total Quantity of 31units

Total Deliver of 174.9MW

NO.	Project Name	Engine	Quantity	Country	Capacity(MW)	Year
1	JEDDAH AIRPORT 18EDG	9H32/40V	5	Saudi Arabia	18	2023
2	HPCL 12MW EDG	12H32/40V	2	India	12	2019
3	HMEL 6.3MW EDG	16H32/40V	1	India	6.3	2019
4	DUBA 24MW BSEDG	18H32/40V	3	Saudi Arabia	24	2017
5	UHP 16MW BSEDG	9H32/40	4	Qatar	16	2016
6	QURAYAT III 6.3MW BSDG	16H32/40V	1	Saudi Arabia	6.3	2015
7	ARAR IV 6.3MW BSDG	16H32/40V	1	Saudi Arabia	6.3	2015
8	JEDDAH SOUTH 26MW EDG	20H32/40V	3	Saudi Arabia	26	2014
9	AZ-ZOUR North 15MW BSEDG	20H32/40V	2	Kuwait	15	2014
10	QURAYAT II 5MW EDG	12H32/40V	1	Saudi Arabia	5	2013
11	WADJH 5MW EDG	12H32/40V	1	Saudi Arabia	5	2013
12	SHAROURAH 4MW EDG	12H32/40V	1	Saudi Arabia	4	2012
13	AZZOUR WDC II 12MW EDG	14H32/40V	2	Kuwait	12	2012
14	RAFHA 5MW EDG	12H32/40V	1	Saudi Arabia	5	2012
15	HAIL 4MW EDG	12H32/40V	1	Saudi Arabia	4	2012
16	HYOSUNG 10MW EDG	14H32/40V	2	Iran	10	2011

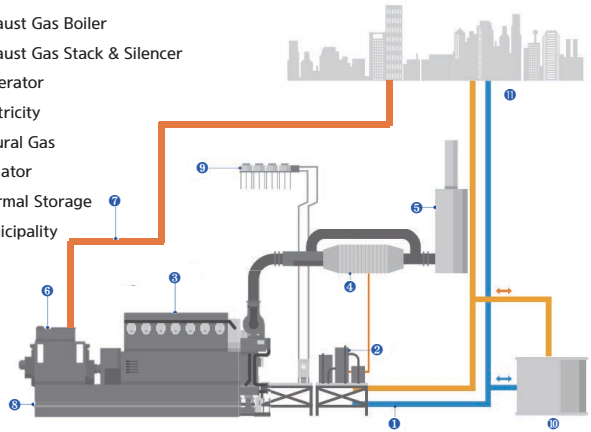
CHP & Hybrid

MAKE MORE PROFIT WITH TWICE THE EFFICIENCY

At sites with high temperature or low temperature, a lot of energy is wasted on heat recovery. HD HYUNDAI's Combined Heat & Power (CHP) Modules help the heat recovery and increase the efficiency up to twice as much.

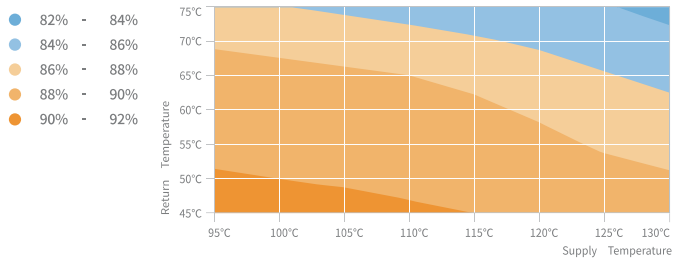
Operation Flow of CHP

1. District Heating Network
2. CHP Module
3. Engine
4. Exhaust Gas Boiler
5. Exhaust Gas Stack & Silencer
6. Generator
7. Electricity
8. Natural Gas
9. Radiator
10. Thermal Storage
11. Municipality



CHP takes the exhaust gas through the WHRB (Waste Heat Recovery Boiler) which has the Cooling Water compartment and Heat exchanger

The Return Temperature Depending On The Supply Temperature

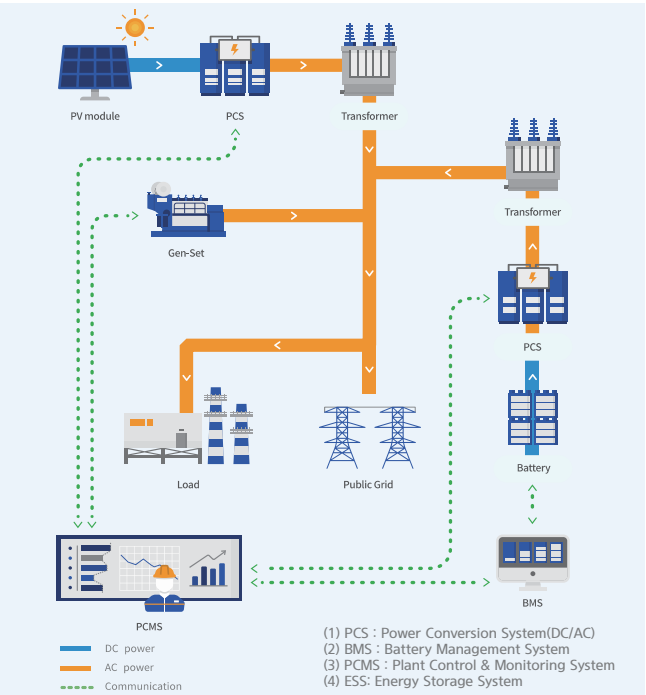


HYBRID

HYBRID POWER PLANT
SOLAR + ENGINE POWER

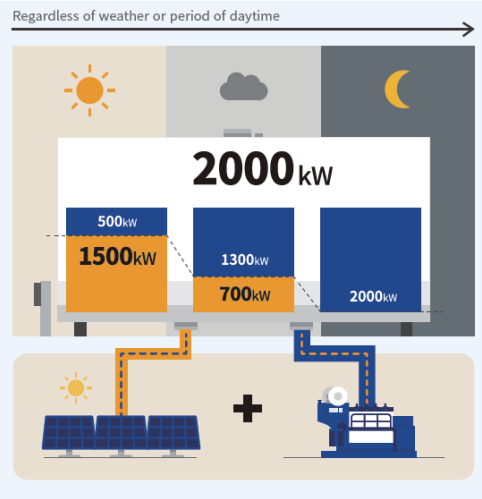
Hybrid power plant can supply stable power through balance between or among the power source. Regardless of weather or natural condition, it produces constant power.

Hybrid power plant overall scheme

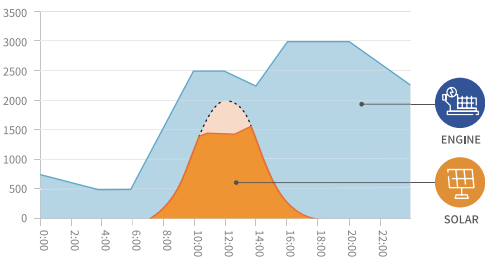


SOLAR PV POWER + GEN - SET PROFILE

How a typical day could look like



24h load and PV energy generation profile



ENGINES

HiMSEN Engine Line-up for Stationary Gensets

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

HYUNDAI Engine in Numbers

Total
200
Million hp
2-Stroke Engine

Total
16,200
Sets
HiMSEN Engines

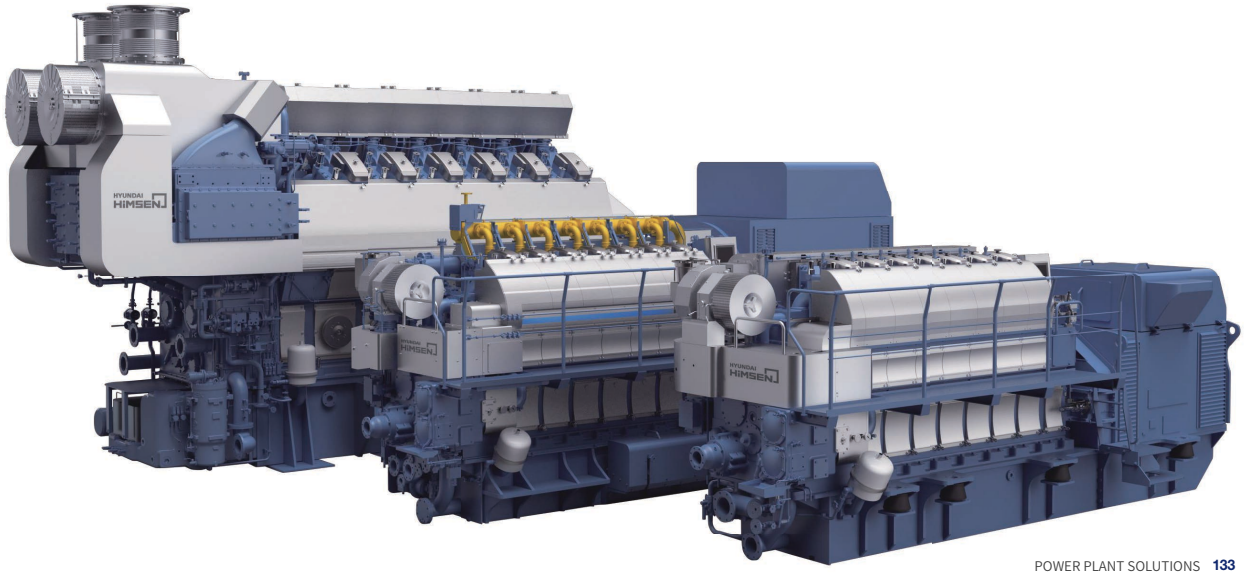
Max.
400
Units / 2-Stroke
Annual Production

Max.
1,600
Units / 4-Stroke
Annual Production

Power Line Up : Full Range Capacity, Fuel Flexibility

	Fuel	Model	Solution	Power Range
4-Stroke (HiMSEN)	Gas	H35G(V)	● ●	2.7~9.7MW
		H54GV	● ●	16.3~24.5MW
	Dual Fuel	H27DF	● ●	1.6~2.6MW
		H35DF(V)	● ●	2.7~9.3MW
		H54DFV	● ●	16.3~24.5MW
	Liquid Fuel	H21/32	● ● ●	1.1~1.7MW
		H21C	● ● ●	1.1~2.0MW
		H25/33(V)	● ● ●	1.6~6.6MW
		H32/40(V)	● ● ●	2.8~9.7MW
		H32CV	● ●	6.9~10.4MW
		H46/60V	● ●	13.4~20.1MW

● Engine Power Plant ● Packaged Power Station ● Modular Power Plant ● Emergency Generator



Gas Fuel

H35G I Bore: 350 mm, Stroke: 400 mm

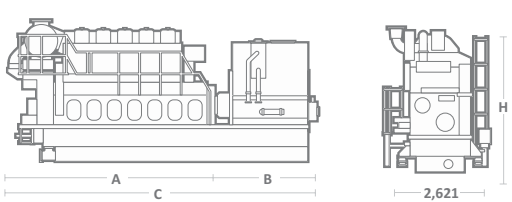
Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H35G	2,880	2,764	3,000	2,880
7H35G	3,360	3,225	3,500	3,360
8H35G	3,840	3,705	4,000	3,860
9H35G	4,320	4,168	4,500	4,342

Based on alternator efficiency of 96~96.5 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
6H35G	5,760	3,130	8,890	3,959	33.7	68.6
7H35G	6,112	3,374	9,486	4,130	38.6	77.1
8H35G	6,602	3,594	10,196	4,130	41.5	82.0
9H35G	7,092	4,097	11,189	4,130	44.6	89.1



H35GV I Bore: 350 mm, Stroke: 400 mm

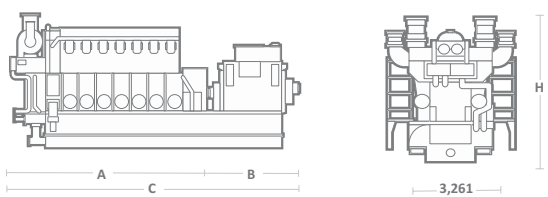
Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H35GV	5,760	5,558	6,000	5,790
14H35GV	6,720	6,518	7,000	6,790
16H35GV	7,680	7,449	8,000	7,760
18H35GV	8,640	8,380	9,000	8,730
20H35GV	9,600	9,312	10,000	9,700

Based on alternator efficiency of 96.5~97%.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
12H35GV	6,624	3,760	10,384	4,723	56.0	108.8
14H35GV	7,295	3,860	11,155	4,723	63.3	121.3
16H35GV	7,914	3,860	11,774	4,723	69.1	130.9
18H35GV	8,585	3,860	12,445	4,794	76.3	141.2
20H35GV	9,344	3,860	13,204	4,794	84.0	153.9



H54GV I Bore: 540 mm, Stroke: 600 mm

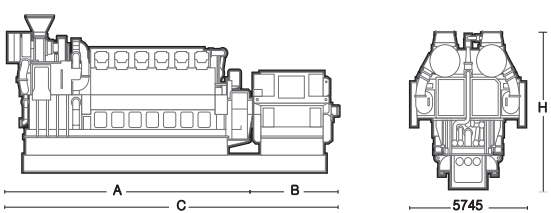
Main Data

Speed	600 rpm		600 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H54GV TSTC 1)	16,800	16,380	16,800	16,380
14H54GV TSTC	19,600	19,110	19,600	19,110
16H54GV TSTC	22,400	21,840	22,400	21,840

Based on alternator efficiency of 97.5 %.
1) TSTC : Two Stage Turbo Charger

Dimension & Weight

	Dimension (mm)					Dry mass (ton)	
	A	B	C	D	H	Engine	GenSet
12H54GV TSTC	12,511	4,638	17,149	7,000	7,994	294.0	381.0
14H54GV TSTC	13,661	4,582	18,243	7,000	7,994	324.0	421.0
16H54GV TSTC	15,086	4,757	19,843	7,000	8,383	361.0	467.0



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Dual Fuel

H27DF I Bore: 270 mm, Stroke: 330 mm

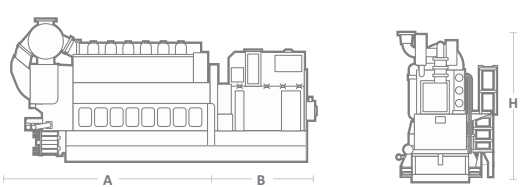
Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H27DF	1,710	1,624	1,860	1,767
7H27DF	1,995	1,905	2,170	2,072
8H27DF	2,280	2,177	2,480	2,368
9H27DF	2,565	2,462	2,790	2,678

Based on alternator efficiency of 95~96 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
6H27DF	4,414	2,262	6,676	2,835	21.2	30.8
7H27DF	4,794	2,262	7,056	3,241	23.5	34.9
8H27DF	5,311	2,340	7,651	3,371	25.1	40.5
9H27DF	5,691	2,490	8,181	3,371	27.2	46.0



H35DF I Bore: 350 mm, Stroke: 400 mm

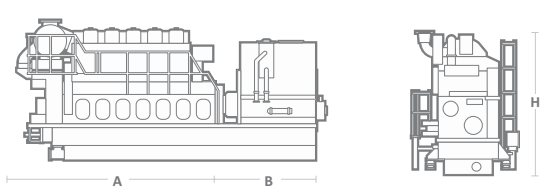
Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H35DF	2,880	2,764	2,880	2,764
7H35DF	3,360	3,225	3,360	3,225
8H35DF	3,840	3,705	3,840	3,705
9H35DF	4,320	4,168	4,320	4,168

Based on alternator efficiency of 96~96.5 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
6H35DF	5,760	3,130	8,890	4,367	34.7	69.6
7H35DF	6,112	3,374	9,486	4,538	39.6	78.1
8H35DF	6,602	3,594	10,196	4,538	42.5	83.0
9H35DF	7,092	4,097	11,189	4,538	45.6	90.1



H35DFV I Bore: 350 mm, Stroke: 400 mm

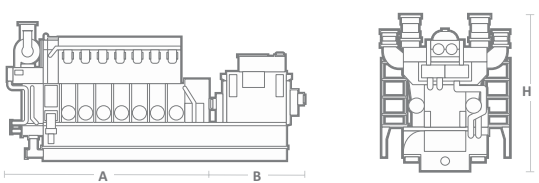
Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H35DFV	5,760	5,558	5,760	5,558
14H35DFV	6,720	6,518	6,720	6,518
16H35DFV	7,680	7,449	7,680	7,449
18H35DFV	8,640	8,380	8,640	8,380
20H35DFV	9,600	9,312	9,600	9,312

Based on alternator efficiency of 96.5~97 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
12H35DFV	6,624	3,760	10,384	4,723	58.0	110.8
14H35DFV	7,295	3,860	11,155	4,723	65.3	123.3
16H35DFV	7,914	3,860	11,774	4,723	71.1	132.9
18H35DFV	8,585	3,860	12,445	4,794	78.3	143.2
20H35DFV	9,344	3,860	13,204	4,794	86.0	155.9



H54DFV I Bore: 540 mm, Stroke: 600 mm

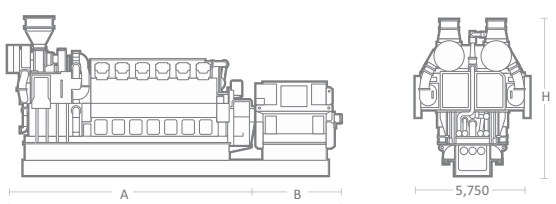
Main Data

Speed	600 rpm		600 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng.kW	Gen. kW
12H54DFV TSTC [1]	16,800	16,380	16,800	16,380
14H54DFV TSTC	19,600	19,110	19,600	19,110
16H54DFV TSTC	22,400	21,840	22,400	21,840

Based on alternator efficiency of 97.5 %.
1) TSTC : Two Stage Turbo Charger

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
12H54DFV TSTC	12,511	4,638	17,149	7,994	303.0	391.0
14H54DFV TSTC	13,661	4,582	18,243	7,994	335.0	431.0
16H54DFV TSTC	15,086	4,757	19,843	8,383	373.0	480.0



Liquid Fuel

H21/32 I Bore: 210 mm, Stroke: 320 mm

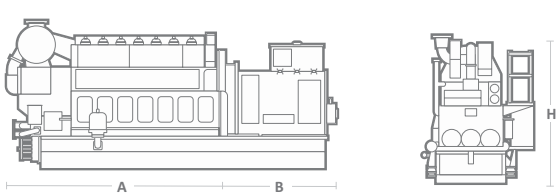
Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H21/32	1,200	1,128	1,200	1,128
7H21/32	1,400	1,323	1,400	1,323
8H21/32	1,600	1,512	1,600	1,512
9H21/32	1,800	1,710	1,800	1,710

Based on alternator efficiency of 94~95 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
6H21/32	3,781	1,896	5,677	2,781	13.4	26.1
7H21/32	4,235	1,900	6,135	2,781	15.1	28.6
8H21/32	4,453	2,175	6,628	2,911	16.7	29.1
9H21/32	4,783	2,265	7,048	2,911	18.4	31.7



H21C I Bore: 210 mm, Stroke: 330 mm

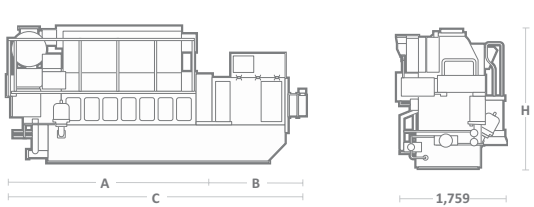
Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
5H21C	1,200	1,128	1,200	1,128
6H21C	1,440	1,360	1,440	1,360
7H21C	1,680	1,587	1,680	1,587
8H21C	1,920	1,824	1,920	1,824
9H21C	2,160	2,062	2,160	2,062

Based on alternator efficiency of 94~95.5 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
5H21C	3,735	2,249	5,984	2,600	14.3	22.1
6H21C	4,085	2,249	6,334	2,600	16.0	24.9
7H21C	4,435	2,305	6,740	2,600	17.8	28.3
8H21C	4,785	2,305	7,090	2,653	19.4	30.2
9H21C	5,135	2,450	7,585	2,653	21.0	33.6



H25/33 I Bore: 250 mm, Stroke: 330 mm

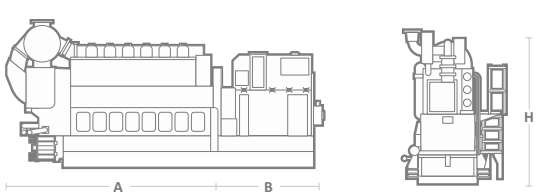
Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
6H25/33	1,740	1,661	1,800	1,719
7H25/33	2,030	1,938	2,100	2,005
8H25/33	2,320	2,215	2,400	2,292
9H25/33	2,610	2,505	2,700	2,592

Based on alternator efficiency of 95.5~96 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
6H25/33	4,414	2,262	6,676	2,961	20.2	29.8
7H25/33	4,794	2,262	7,056	3,241	22.5	33.9
8H25/33	5,311	2,340	7,651	3,371	24.1	39.5
9H25/33	5,691	2,490	8,181	3,371	26.2	45.0



H25/33V I Bore: 250 mm, Stroke: 330 mm

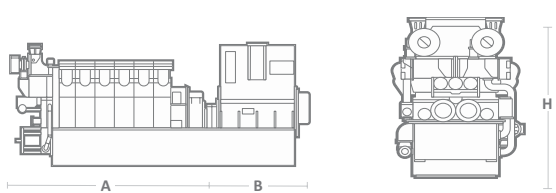
Main Data

Speed	900 rpm		1000 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H25/33V	3,840	3,705	3,840	3,705
14H25/33V	4,480	4,323	4,480	4,323
16H25/33V	5,120	4,940	5,120	4,940
18H25/33V	5,760	5,558	5,760	5,558
20H25/33V	6,400	6,208	6,400	6,208

Based on alternator efficiency of 96.5~97 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
12H25/33V	5,524	3,334	8,858	3,750	33.5	58.2
14H25/33V	5,944	3,504	9,448	3,750	36.5	63.4
16H25/33V	6,364	3,682	10,046	3,750	39.5	69.6
18H25/33V	6,784	3,772	10,556	3,750	42.5	77.5
20H25/33V	7,204	3,727	10,931	3,750	45.5	79.5



H32/40 I Bore: 320 mm, Stroke: 400 mm

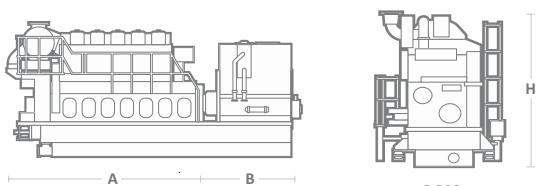
Main Data

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	3,860	4,000	3,860
9H32/40	4,500	4,342	4,500	4,342

Based on alternator efficiency of 96~96.5 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
6H32/40	5,055	3,490	8,545	3,759	33.7	65.2
7H32/40	5,545	3,490	9,035	3,882	38.6	72.6
8H32/40	6,035	3,785	9,820	4,132	41.5	78.6
9H32/40	6,525	3,685	10,210	4,132	44.6	82.7



H32/40V I Bore: 320 mm, Stroke: 400 mm

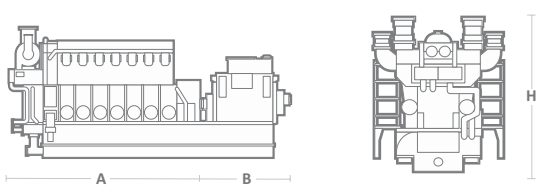
Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H32/40V	6,000	5,790	6,000	5,790
14H32/40V	7,000	6,790	7,000	6,790
16H32/40V	8,000	7,760	8,000	7,760
18H32/40V	9,000	8,730	9,000	8,730
20H32/40V	10,000	9,700	10,000	9,700

Based on alternator efficiency of 96.5~97 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
12H32/40V	6,624	3,760	10,384	4,723	56.0	108.8
14H32/40V	7,295	3,860	11,155	4,723	63.3	121.3
16H32/40V	7,914	3,860	11,774	4,723	69.1	130.9
18H32/40V	8,585	3,860	12,445	4,794	76.3	141.2
20H32/40V	9,344	3,860	13,204	4,794	84.0	153.9



H32CV I Bore: 320 mm, Stroke: 450 mm

Main Data

Speed	720 rpm		750 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H32CV	7,200	6,984	7,200	6,984
14H32CV	8,400	8,148	8,400	8,148
16H32CV	9,600	9,312	9,600	9,312
18H32CV	10,800	10,476	10,800	10,476

Based on alternator efficiency of 97 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
12H32CV	7,526	3,900	11,426	4,362	78.0	121.2
14H32CV	8,126	4,100	12,226	4,362	88.0	137.9
16H32CV	8,726	4,300	13,026	4,448	96.0	152.6
18H32CV	9,326	4,500	13,826	4,448	106.0	169.3

H46/60V I Bore: 460mm, Stroke: 600 mm

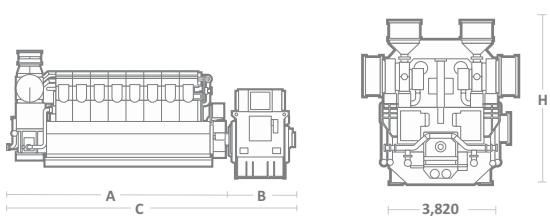
Main Data

Speed	600 rpm		600 rpm	
Frequency	60 Hz		50 Hz	
	Eng. kW	Gen. kW	Eng. kW	Gen. kW
12H46/60V	13,800	13,455	13,800	13,455
16H46/60V	18,400	17,940	18,400	17,940
18H46/60V	20,700	20,182	20,700	20,182

Based on alternator efficiency of 97.5 %.

Dimension & Weight

	Dimension (mm)				Dry mass (ton)	
	A	B	C	H	Engine	GenSet
12H46/60V	10,610	3,474	14,084	5,611	193.0	243.9
16H46/60V	12,610	3,724	16,334	5,611	235.2	296.7
18H46/60V	13,610	3,767	17,377	5,895	260.3	334.3



Quality Management

Approval Status of Quality Management System

Product or Service Ranges		Certifying Agency
Design and Manufacture of Two & Four-Stroke Marine and Stationary Diesel & Gas Engine with Components (Turbochargers, Blocks, Crankshafts, Cylinder Liners, Propellers, Forged Steel and Shafting etc.), Marine and Industrial Equipment, BWTS, SCR, Hydraulic Machinery (Pumps, Valves, Compressors, Steam & Gas Turbines, etc.), Industrial Machinery (Conveyors, Presses etc.)		DNV·GL • ISO 9001:2008 KS Q ISO 9001:2009 • ISO 14001:2004 KS I ISO 14001:2009 • OHSAS 18001:2007
Nuclear Diesel Generator (Class 1E), Pump (Class 2, 3)		KEPIC-MNVEN
Forging Shop	Works Approval	ABS, BV, CCS, DNV·GL, KR, LR, NK, RINA
Casting Shop		ABS, BV, CCS, DNV·GL, KR, LR, RINA
Propeller		ABS, BV, CCS, DNV·GL, KR, LR, NK, RINA, RS
Crankshaft		ABS, BV, CCS, DNV·GL, KR, LR, NK, RINA
The Classification Approval of Quality Assurance System		DNV·GL-MSA, KR-QAS, LR-QAM


Global Network
HD Hyundai Marine Solution Co., Ltd.

Voyage with confidence, we handle the rest

HD Hyundai Marine Solution Co., LTD

HD Hyundai Marine Solution(HD HMS) is a global aftermarket(AM) service provider in the shipbuilding and marine industries.
HD HMS supports clients to manage their vessels in efficient ways throughout their entire life cycle. By offering a variety of solutions for customers, HD HMS aims to lead a sustainable future for the shipbuilding and maritime industries through eco-friendly technology and digital innovation.

Furthermore, HD HMS strives to maximize customer satisfaction by not only providing timely on-request services and parts, but also providing customers long-term fleet management solutions. This includes scheduled deliveries of various parts supplies and services to preemptively minimize any customer inconvenience, and retrofit solutions to maintain vessel longevity and performance while complying with stricter environmental regulations.

As a sole solution provider for vessels built by the HD Group, HD HMS aims to improve customer experience while operating vessels all over the horizon.

HD Hyundai Marine Solution: Accessible to All Clients

HD Hyundai Marine Solution ensures its customers that it will provide comprehensive solutions to all vessel and equipment-related issues, regardless of time, location and situation.

Genuine Spare Parts Provision and Long Term Service Agreements (LTSA)

HD HMS's authorized sales agents are supplying clients with original and certified spare parts at competitive price, delivery time and quality. HD HMS also offers Long Term Service Agreements (LTSA) that provides spare parts & services under a predicted schedule set up by our experts which significantly decreases downtime. Our LTSA status can be monitored via the HD Voyage platform, informing clients of when and which parts & service is going to be supplied based on ship status.

Technical Support and Service

HD HMS provides technical support including supervision, reconditioning, conversion, retrofit, and technical consultancy. Extending from this, HD HMS provides a scheduled maintenance overhaul to prevent any potential problems that may arise. Through years of experience, HD HMS engineers have become masters of tending to not only conventional engines, but also to recent Dual Fuel engines such as ME-GI, ME-LGIP ME-LGIM ME-GIE, X-DF, and HiMSEN DF.

Retrofit Solutions for CII and IMO Regulation Compliance

HMS is a turnkey provider for re-engine solutions to meet CII, IMO standards and other GHG emission regulations. HD HGS's decarbonization solution package is a convenient, time saving and cost-efficient method to be in compliance with various environmental regulations.

Global Service Network

HD HMS is very proud of its well organized global service network which is systematically designed to efficiently meet client requirements. HD HMS's offices are located globally in Rotterdam, Hamburg, Athens, Dubai, Singapore, Houston and Taoyuan, enabling HD HMS to respond 24/7 on a global basis.

HYUNDAI HIMSEN

HD Hyundai Marine Solution

SUBSIDIARIES

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Taiwan R.O.C

HYUNDAI HIMSEN

List of Licensees

HiMSEN Engines (Licensee)
HYUNDAI-MAN B&W Engines (Sub-Licensee)
Hi-Well Cargo Pumping Systems (Licensee)

Saudi Arabia — **CountryCode: + 966**

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E-mail: info@makeen-ksa.com

Makeen : Joint Venture between Saudi Aramco, KSOE and Dussur

Family company

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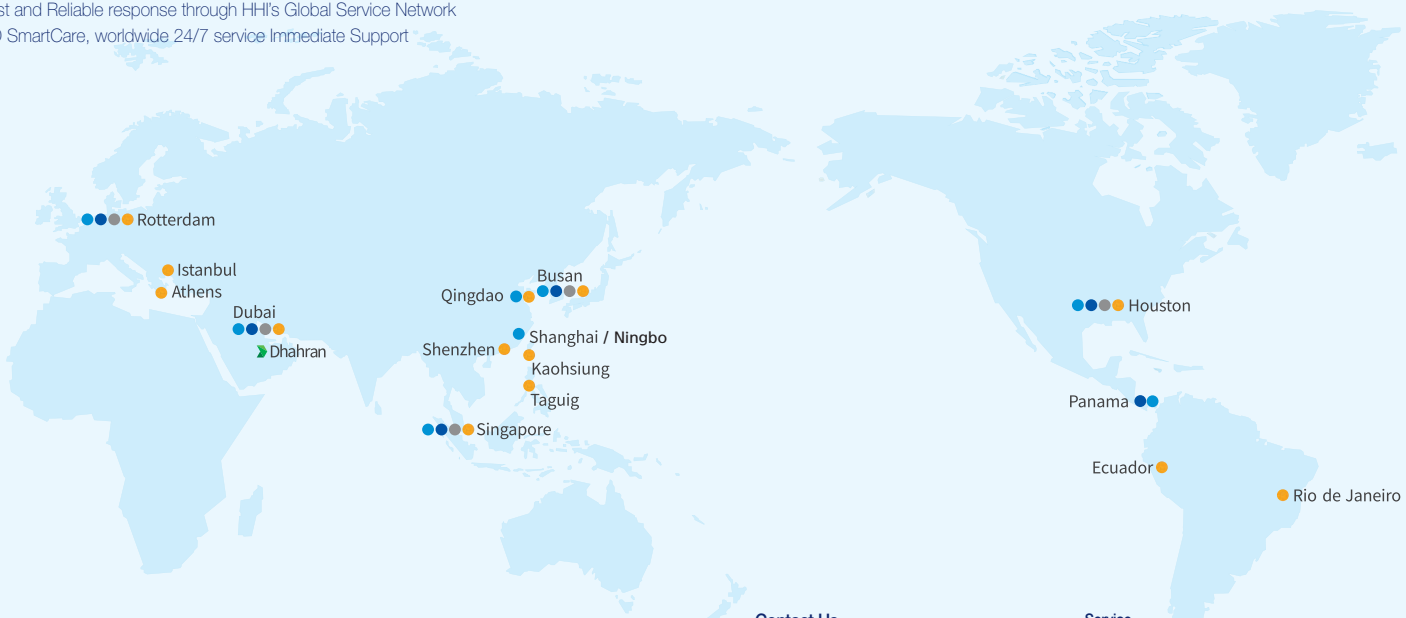
HYUNDAI HIMSEN

RELIABLE & POWERFUL SUPPORT AROUND THE WORLD

- Optimized solutions for every Customer's needs
- Genuine Spare Parts from the Original equipment manufacturer
- Fast and Reliable response through HHI's Global Service Network
- HD SmartCare, worldwide 24/7 service Immediate Support



- Service Station
- Spare Parts Depot
- Spare Parts Dealer
- Authorized Repairer
- Licensee (Makeen)

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