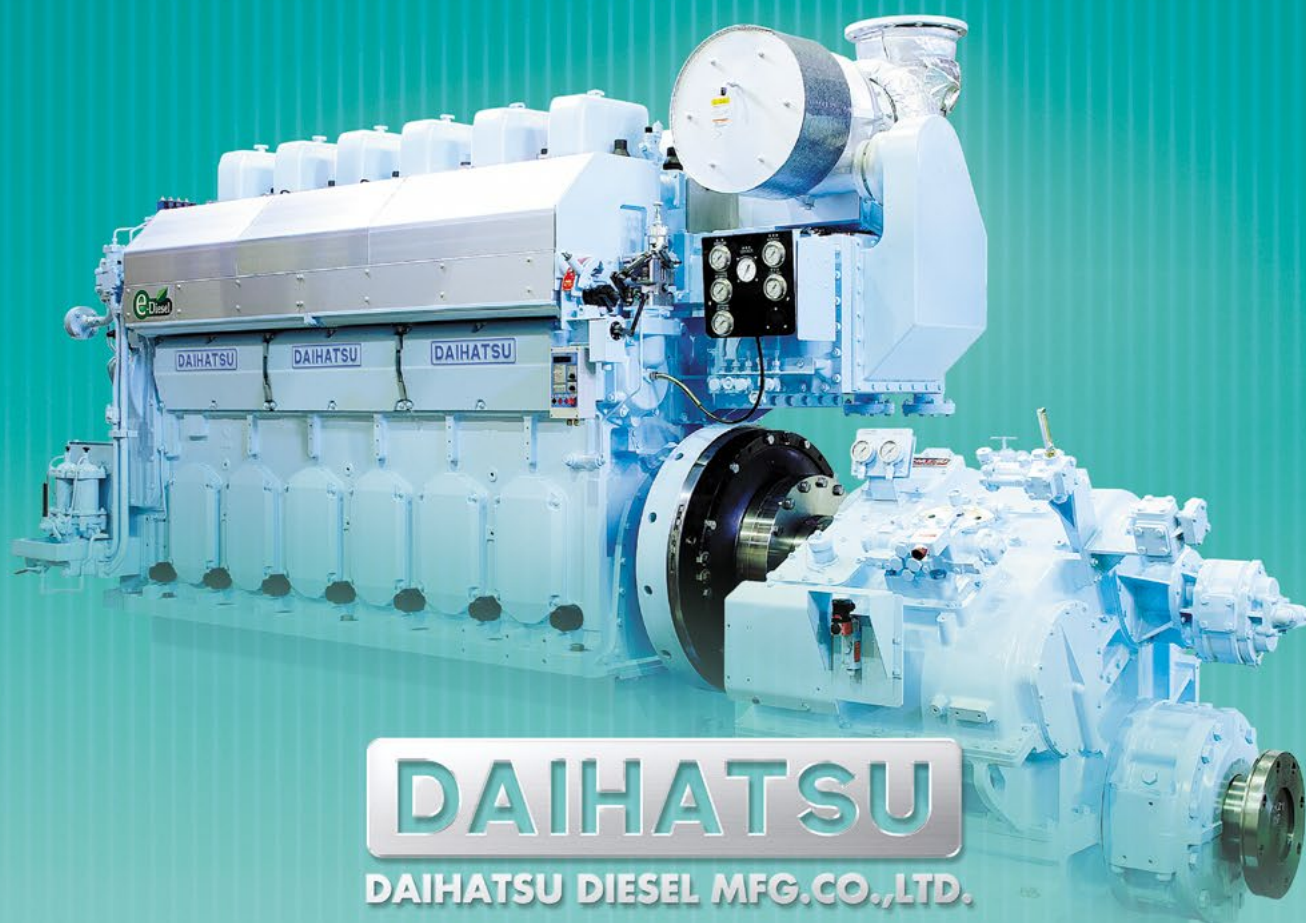


# MARINE PROPULSION DIESEL ENGINE

General Catalog



**DAIHATSU**  
DAIHATSU DIESEL MFG.CO.,LTD.

# Next Motion

## Creating next-generation propulsion systems

Our clean and powerful "e-Diesel" is packed with top-level quality and technologies that Daihatsu Diesel has accumulated and refined over many years since the foundation of the company in 1907.

Daihatsu Diesel's history is marked by relentless challenges toward achieving the engine performance demanded by the changing times and meeting new needs.

This challenging spirit is unchanged today and will continue into the future.

Daihatsu's e-Diesel is constantly advancing in order to deliver the ultimate performance that only the continually evolving company can attain.



6DEM-23

DAIHATSU DIESEL  
Since 1907



## Clean & Powerful

e-Diesel engines are gentle to the earth's environment. They boast reduced NOx emissions as well as high fuel efficiency





ABS



BV



CCS



DNV-GL



KR



LRS



NK



RS

## Certified by eight classification societies in the world

ABS(American Bureau of Shipping)

BV(Bureau Veritas)

CCS(China Shipping Classification Association)

DNV-GL(Det Norske Veritas-Germanischer Lloyd)

KR(Korean Register of shipping)

LRS(Lloyd's Register of Shipping)

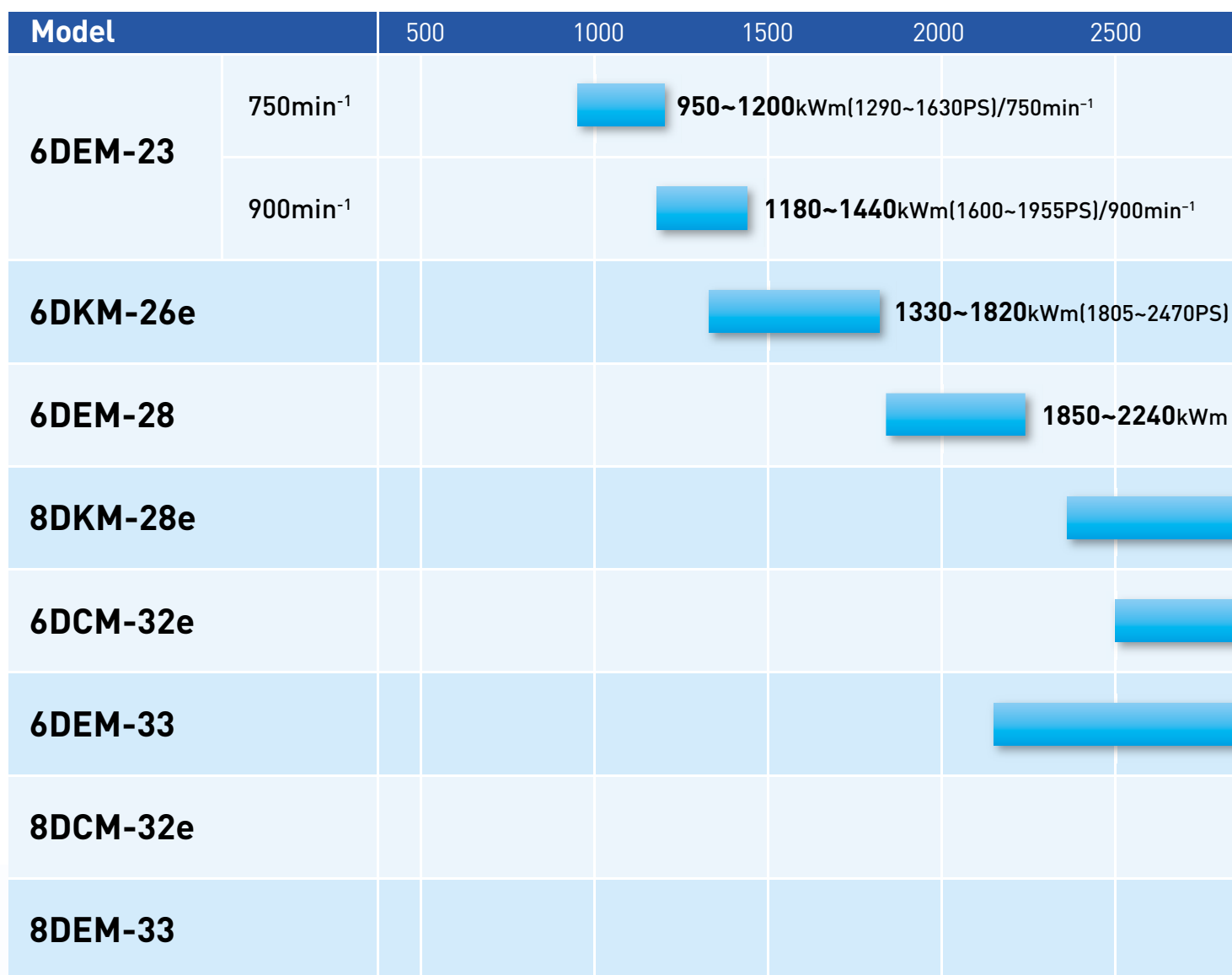
NK(Nippon Kaiji Kyokai)

RS(Russian Maritime Register of Shipping)



for reduced CO<sub>2</sub> emissions.

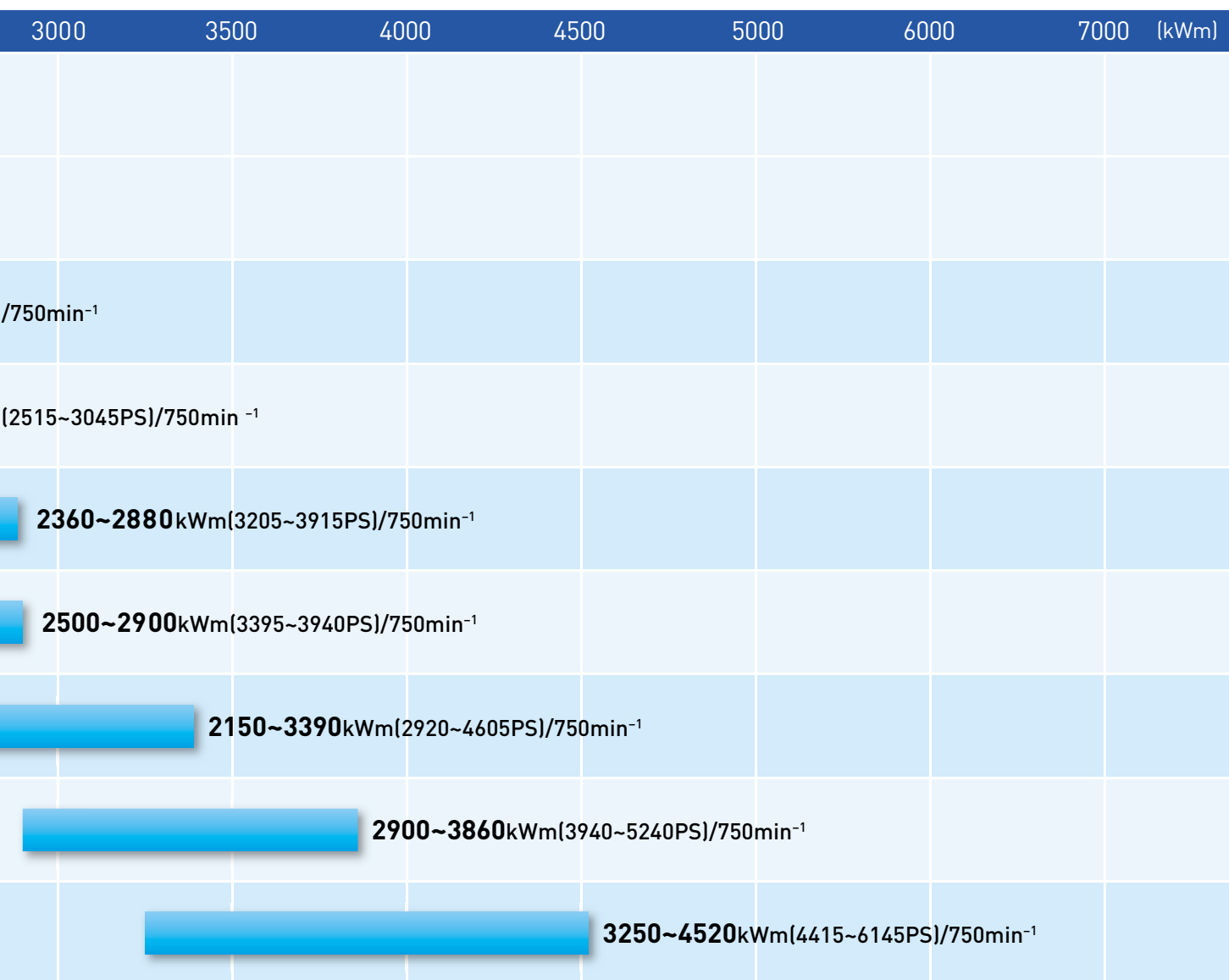
## Output chart



Model (600min <sup>-1</sup> )	500	1000	1500	2000	2500
6DKM-36e					
8DKM-36e					







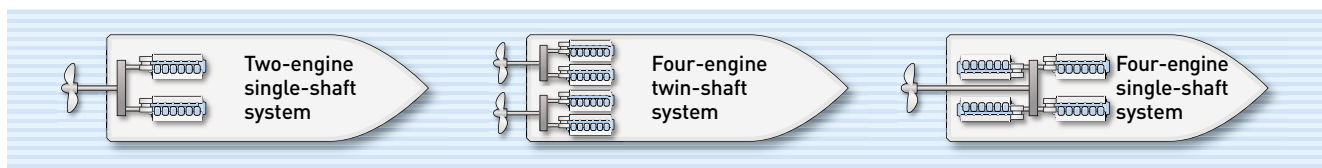
# Multiple-Geared Diesel Engine

## A Wide Variation to Meet a Wide Range of Needs

Daihatsu's geared diesel engines come in a wide line-up from single-engine single-shaft systems to large multiple-input systems. Customers can choose the best system based on ship size, fuel, usage, etc.

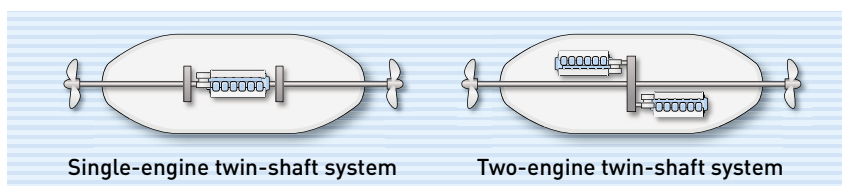
### Multiple-Geared Configuration

Daihatsu Diesel's multiple-geared configuration is ideal for ships with twin-shaft propellers or low ceiling engine rooms. We offer a wide selection to choose from including the twin-engine single-shaft system, single-engine twin-shaft system, four-engine twin-shaft system, four-engine single-shaft system, and eight-engine twin-shaft system. Selective engine cut-off is also possible for various power requirements.



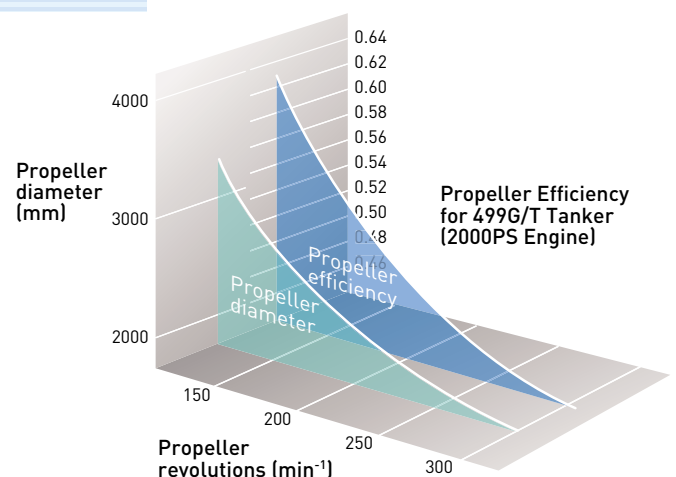
### Single-Engine Twin-Shaft System for Double-Bow Ships

Daihatsu Diesel engines are at work onboard double-bow ships navigating narrow channels or short routes, or which operate as sightseeing boats on river cruises, etc. A single engine drives the propellers on the bow and stern. Any combination of single-engine twin-shaft system and Daihatsu's remote control system can be selected according to steering demands and guarantees improved navigation.



### Optimal propeller for various hull designs

With an optimal sized propeller rotating at an rpm 10% lower than conventional propellers, fuel consumption can be decreased by as much as 3%. Daihatsu Diesel's geared diesel engine sets can utilize the propeller that best matches the hull design thus offering greatly improved propulsion efficiency.



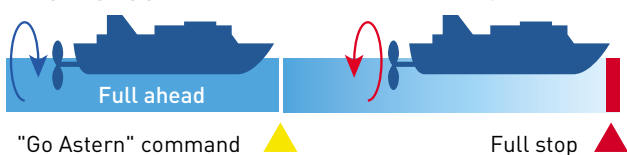




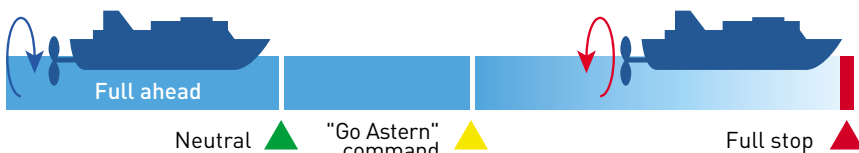
## CRASH ASTERN System

With a low-rpm large-diameter propeller, engine stalling is always a problem when moving astern because of increased torque and engine overload. For this reason, Daihatsu geared diesel engines employ our own CRASH ASTERN system. It can also be effectively operated from the bridge.

### Ship equipped with CRASH ASTERN system



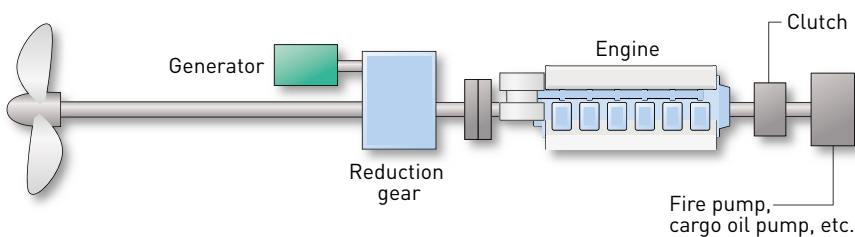
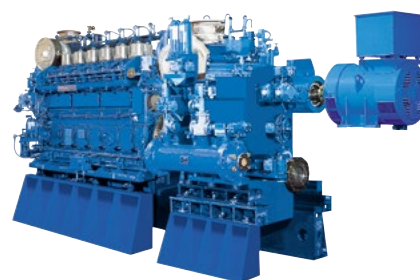
### Ship not equipped with CRASH ASTERN system



\* Performance will vary according to ship speed, type of vessel and sea conditions.

## Power Take-Off & Engine Layout

With Daihatsu's geared diesel engines, generators, cargo oil pumps and other machinery can be driven using power drawn through the front engine block and reduction gear. This system greatly reduces fuel consumption. What's more, one of the generators used in conventional systems can be omitted, which enables more effective use of dead space. In addition, this kind of system reduces labor and costs in running and maintenance.

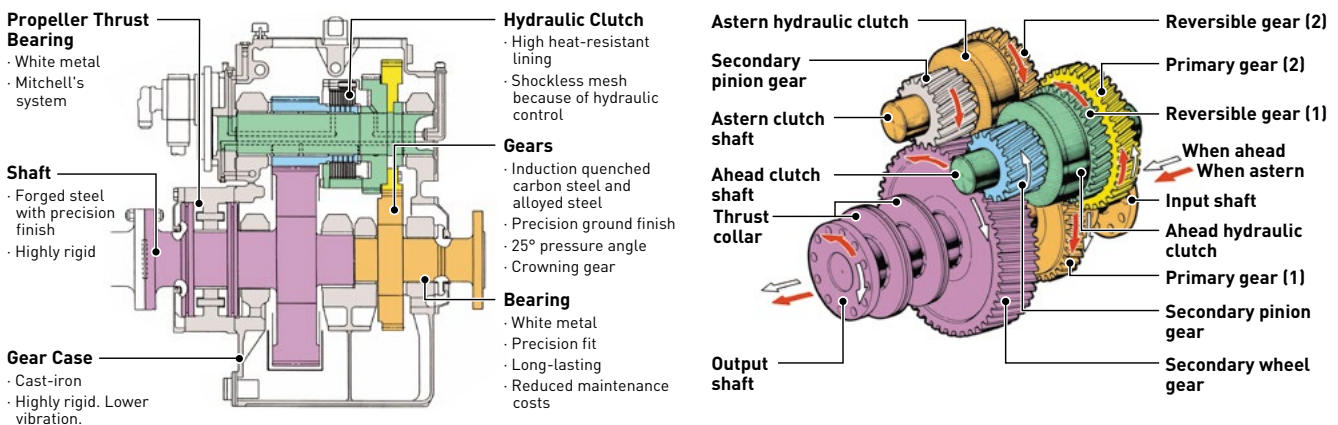


# Daihatsu's Reduction Gears

## One Supporting Element of High-Reliability Engines

Our reduction gears have a built-in main thrust bearing and wet hydraulic clutch, and can be incorporated in the CRASH ASTERN system. We also have a wide selection of speed-increasing and reduction gears for driving any type of machinery, which can be used on the engine front end block.

### DRA Type Reversible Reduction Gear



		Model
Single-engine single-shaft	Coaxial	Reversible reduction gear — DRA
		2-speed reversible reduction gear (2-speed ahead, 1-speed astern) — DR2A
		Non-reversible reduction gear — RCA
	Offset (Vertically offset, Horizontally offset)	Reversible reduction gear — DRB, DRBH
		2-speed reversible reduction gear (2-speed ahead, 1-speed astern) — DR2B
Multiple engine single-shaft	Coaxial	Non-reversible reduction gear — RCB, RCBH
		Reversible reduction gear — DRD (Two-engine single-shaft), DRF (Four-engine single-shaft)
		2-speed reversible reduction gear (2-speed ahead, 1-speed astern) — DR2B
	Offset (Vertically offset, Horizontally offset)	Non-reversible reduction gear — RCB, RCBH
		Reversible reduction gear — DRD (Two-engine single-shaft), DRF (Four-engine single-shaft)
Special speed-increasing/reduction gear	Clutchless reduction gear	Reversible reduction gear — DRD (Two-engine single-shaft), DRF (Four-engine single-shaft)
		2-speed reversible reduction gear (2-speed ahead, 1-speed astern) — DR2B
		Non-reversible reduction gear — RCB, RCBH
Special speed-increasing/reduction gear	Front-end speed-increasing/reduction gear	Clutchless reduction gear — RG
		Front-end speed-increasing/reduction gear — FG
		Front-end off set type — AGP

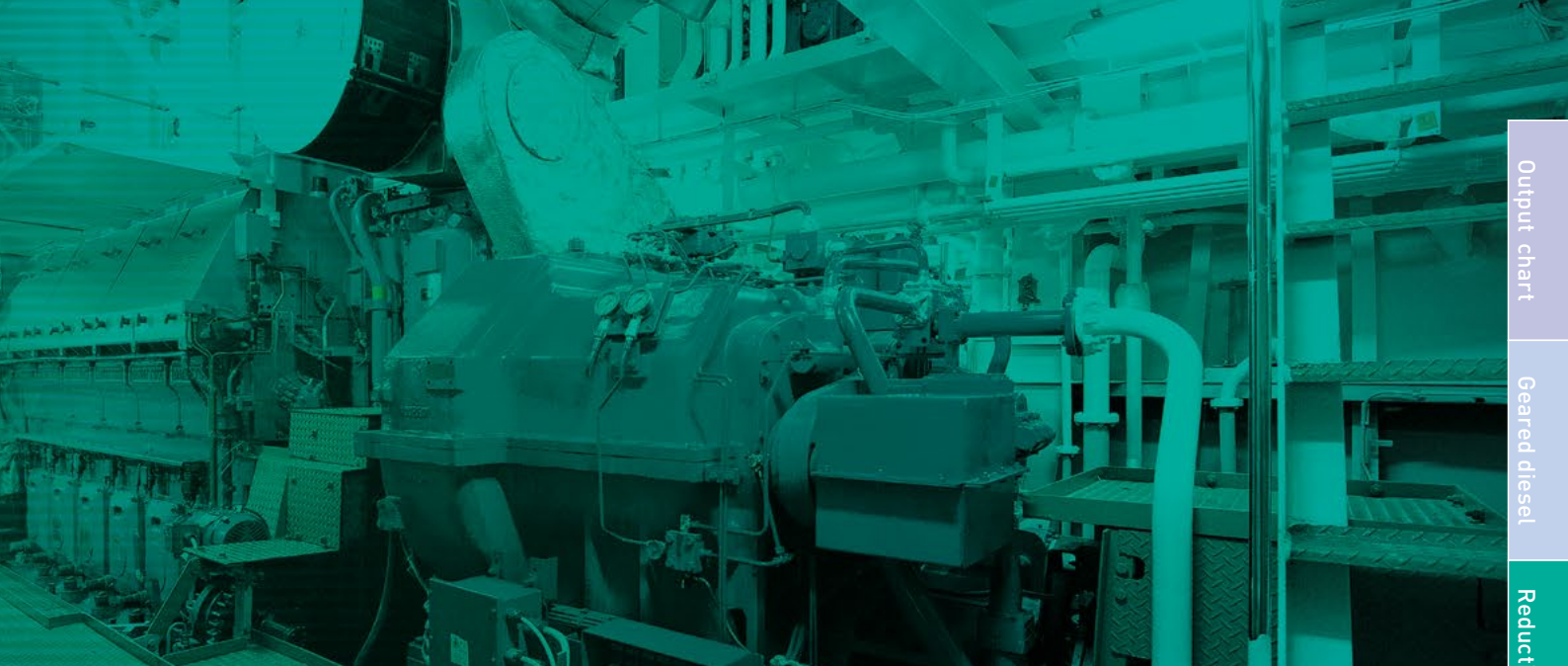


DRA-80F

### 2-Speed Reduction Gears

The 2-speed reduction gear enables ordinary high-speed ocean travel when both low-speed power and high propulsion are required. Meeting these two conditions, Daihatsu offers a line-up of 2-speed reduction gears (2 speeds forward, 1 speed reverse) that provide highly efficient operation. A special handle for smooth clutch switching of these gears is also available for single-lever, 1 or 2-speed forward or reverse operation. Combined with an electronic clutch control system, this enables shockless clutch operation. These speed reducers are extremely popular for various ships, including merchant and fishing vessels.



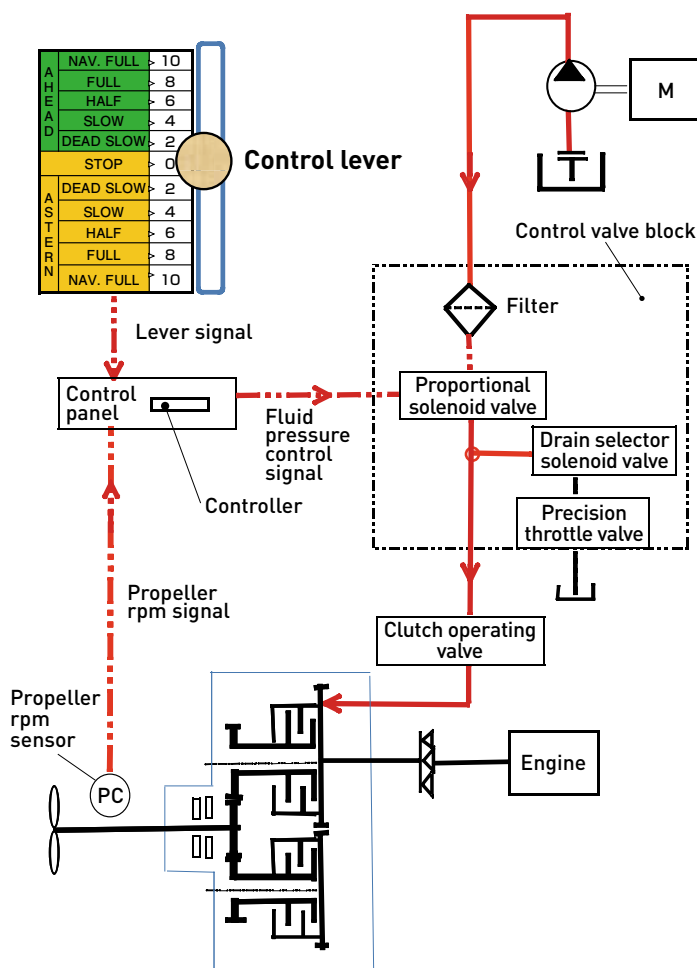


## Electronic clutch control system

The electronic clutch control system performs optimal control of the clutch fluid to achieve shockless clutch meshing and to slip the clutch for dead-slow sailing.

### Features

1. Raises the clutch fluid pressure in an optimal pattern for clutch meshing to reduce shocks and black smoke formation during transient stages of the main engine.
2. Slips the clutch to enable dead-slow sailing and improved navigation at a desired propeller rpm below the idling rpm.



## Main Engine Vibration Reduction

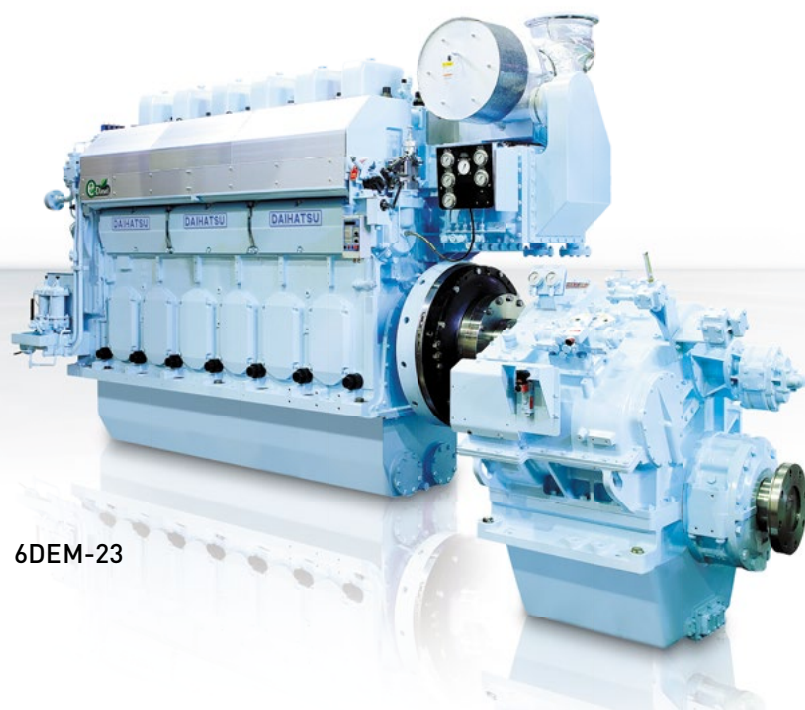
Daihatsu began the in-house development and marketing of main engine vibration reduction systems in the 1970s. In addition to lowering noise in the ship's crew quarters and reducing vibration in various sections, we aimed to reduce underwater sound radiation. Rather than ordinary single-layer vibration resistance, we offer a variety of vibration-reducing systems, including 2-layer systems. Vessels using these systems presently include research ships, training ships, fishing ships, and ferries. The systems are highly acclaimed.



## Specifications

Engine model		Output		Engine revs. min <sup>-1</sup>	Bore mm	Stroke mm
		kWm	PS			
<b>6DEM-23</b>	<b>750min<sup>-1</sup></b>	<b>950~1200</b>	<b>1290~1630</b>	750	230	320
	<b>900min<sup>-1</sup></b>	<b>1180~1440</b>	<b>1600~1955</b>	900	230	320
<b>6DKM-26e</b>		<b>1330~1820</b>	<b>1805~2470</b>	750	260	380
<b>6DEM-28</b>		<b>1850~2240</b>	<b>2515~3045</b>	750	285	390
<b>8DKM-28e</b>		<b>2360~2880</b>	<b>3205~3915</b>	750	280	390
<b>6DCM-32e</b>		<b>2500~2900</b>	<b>3395~3940</b>	750	320	400
<b>8DCM-32e</b>		<b>2900~3860</b>	<b>3940~5240</b>	750	320	400
<b>6DEM-33</b>		<b>2150~3390</b>	<b>2920~4605</b>	750	330	440
<b>8DEM-33</b>		<b>3250~4520</b>	<b>4415~6145</b>	750	330	440
<b>6DKM-36e</b>		<b>2950~3500</b>	<b>4010~4755</b>	600	360	480
<b>8DKM-36e</b>		<b>4400~4650</b>	<b>5980~6320</b>	600	360	480

Maximum output varies depending on usage conditions.



6DEM-23

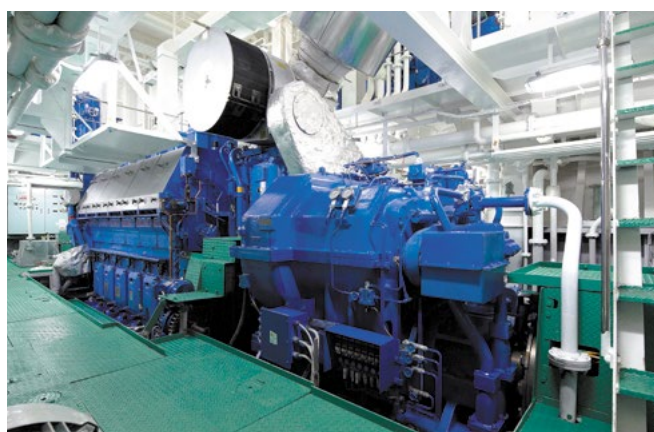


No. of cylinders	R/G model	Gear ratio	Propeller revs. min <sup>-1</sup>	Propeller diam. (4-blade) mm	Propeller diam. (5-blade) mm	Intermediate shaft diam. mm	Propeller shaft diam. mm
6	DRA-25J	2.840	264	2500	2420	155	200
	DRB-19J	2.703	277	2420	2350		
6	DRA-25J	3.198	281	2500	2430	165	210
	DRB-25J	3.258	276	2530	2460		
6	DRA-30J	2.837	264	2740	2660	180	230
	DRB-35J	3.030	248	2850	2760	185	235
6	DRA-40J	3.266	230	3070	2970	200	255
	DRB-45J	3.294	228	3080	2990		
8	DRA-80J	3.720	202	3510	3410	230	290
	DRB-80J	3.273	229	3290	3200	220	280
6	DRA-80J	3.720	202	3510	3410	230	290
	DRB-80J	3.273	229	3290	3200	220	280
8	DRA-100J	3.995	188	3880	3770	255	325
	DRB-100J	2.972	252	3250	3150	230	295
6	DRA-100J	3.544	212	3350	3200	245	310
	DRB-100J	3.014	249	3050	2900	235	290
8	DRA-120J	4.256	176	3950	3750	285	360
	DRB-120J	3.722	202	3650	3450	275	340
6	DRA-80J	3.023	198	3670	3560	245	310
	DRB-80J	3.273	183	3850	3740	250	315
8	DRA-100J	3.188	188	3990	3870	270	340
	DRB-100J	2.972	202	3820	3710	260	335

The values above are reference values.



6DKM-26e



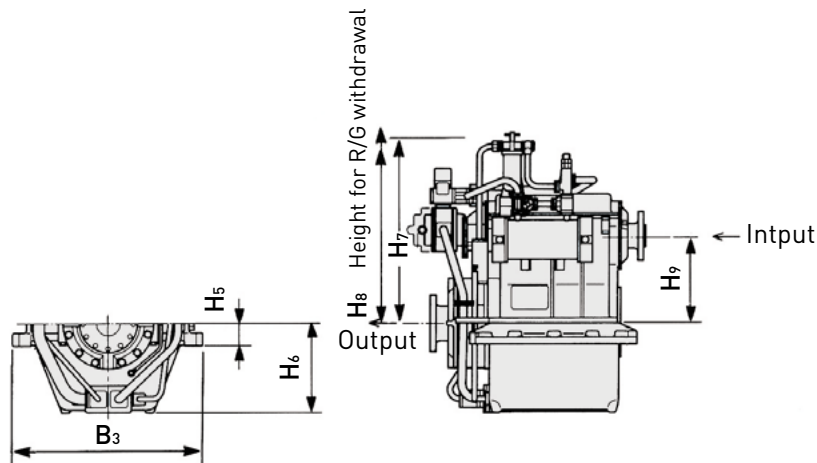
6DCM-32eF

## Dimensions and Mass

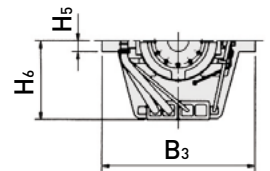
Engine model		R/G model	L	L1	L2	B	B1	H1	H2	
6DEM-23	750min <sup>-1</sup>	DRA-25J	5203	3233	2070	1727	1050	1870	350	
		DRB-19J	5098	3233	1865	1727	1050	1870	350	
	900min <sup>-1</sup>	DRA-25J	5303	3233	2070	1727	1050	1870	350	
		DRB-25J	5253	3233	2020	1727	1050	1870	350	
6DKM-26e		DRA-30J	5735	3395	2340	1961	1180	2338	400	
		DRB-35J	5485	3395	2090	1961	1180	2338	400	
6DEM-28		DRA-40J	5985	3545	2440	2002	1220	2532	430	
		DRB-45J	5980	3545	2435	2002	1220	2532	430	
8DKM-28e		DRA-80J	7502	4467	3035	2018	1220	2532	430	
		DRB-80J	7437	4467	2970	2018	1220	2532	430	
6DCM-32e		DRA-80J	7054	4189	2865	1993	1450	3042	500	
		DRB-80J	6889	4189	2700	1993	1450	3042	500	
8DCM-32e		DRA-100J	8852	5189	3663	2669	1450	3077	500	
		DRB-100J	8164	5189	2975	2669	1450	3077	500	
6DEM-33		DRA-100J	8350	4480	3870	2680	1550	2750	500	
		DRB-100J	8150	4480	3670	2680	1550	2750	500	
8DEM-33		DRA-120J	9240	5540	3700	2830	1550	2950	500	
		DRB-120J	8800	5540	3260	2830	1550	2950	500	
6DKM-36e			DRA-80J	7895.5	4595	3300.5	1994	1680	3070	605
			DRB-80J	7845	4595	3250	1994	1680	3070	605
8DKM-36e			DRA-100J	9422.5	5722	3700.5	2245	1680	3267	605
			DRB-100J	8982	5722	3260	2245	1680	3267	605

The values above are reference values.

**DRB Type**

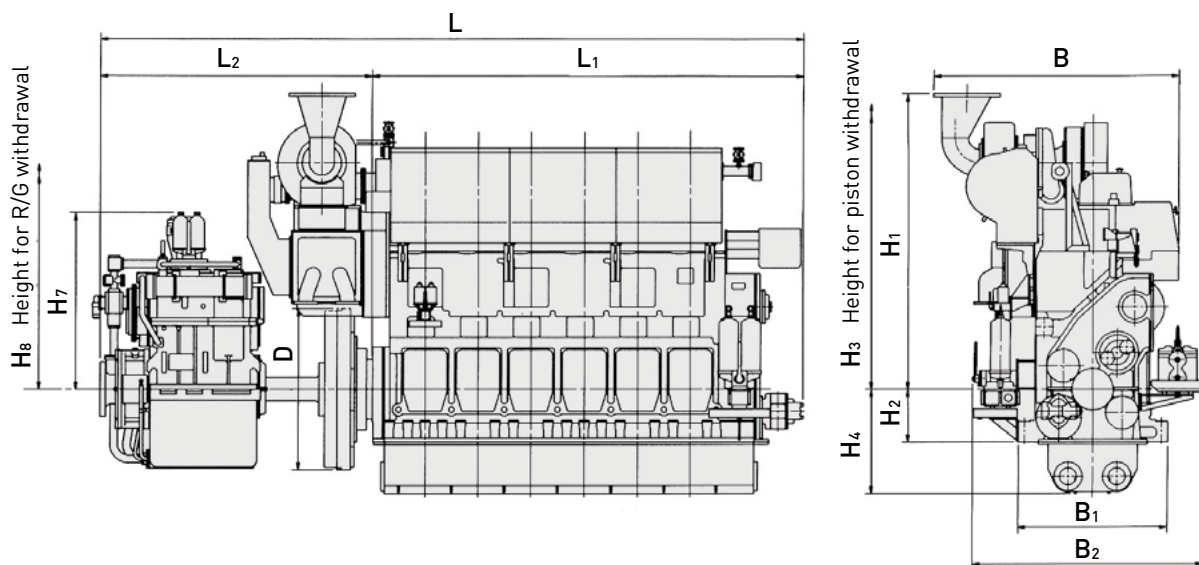


**DRA Type**





(mm)										(ton)	
H3	H4	D	H5	H6	H7	H8	H9	B2	B3	Engine mass	R/G mass
1660	820	1050	120	565	1224	1580	—	1620	1300	14	3.8
1660	820	1050	80	600	1225	1300	553	1620	1455		3.0
1660	820	1050	120	565	1224	1580	—	1620	1300	14	3.8
1660	820	1050	200	630	1096	1250	600	1620	1580		3.9
1970	830	1200	90	640	1279	1350	—	1950	1240	18	5.5
1970	830	1200	200	640	1286	1530	609	1950	1400		5.5
2065	875	1310	100	680	1387	1740	—	1820	1360	22	7.0
2065	875	1310	260	800	1321	1470	741	1820	1600		8.8
2065	875	1170	250	800	1532	1800	—	1820	1600	28	12
2065	875	1170	250	830	1583	1880	860	1820	2000		11
2295	1030	910	250	800	1532	1800	—	2020	1600	35	12
2295	1030	910	250	830	1583	1880	860	2020	2000		11
2295	1030	910	250	850	1696	2250	—	2020	1870	42	18
2295	1030	910	250	900	1648	2500	871	2020	2250		17
2570	1030	1580	250	850	1695	2250	—	1770	1870	38	21
2570	1030	1580	250	900	1750	2500	871	1770	1870		21
2570	1030	1580	250	900	1750	2300	—	1770	2050	47	23
2570	1030	1580	300	1000	1920	2500	1002	1770	2300		23
2930	1065	1300	250	800	1532	1800	—	2060	1600	51	12
2930	1065	1300	250	830	1583	1880	860	2060	2000		11
2930	1065	960	250	850	1696	2250	—	2060	1870	67	18
2930	1065	960	250	900	1648	2500	871	2060	2250		17



## Examples of delivered products



Nippon Maru, training ship, Japan agency of Maritime Education and Training for Seafarers  
6DSM-28N(L) × 2, Sumitomo Heavy Industries, Ltd.



Suou and Amakusa, support vessels, Ministry of Defense  
6DKM(L)-28 × 2, Keihin Shipyard, Universal Shipbuilding Co., Ltd.



Ryofu Maru, research vessel, Japan Meteorological Agency  
6DLM-40AL × 1, Ishikawajima-Harima Heavy Industries Co., Ltd.



Mizunagi, training ship, Kyoto Marine High School  
6DEM-23FL × 1, Niigata Shipbuilding & Repair, Inc.



Mirai, research vessel, Japan Marine Science & Technology Center  
6DKM-28F(L)S × 4, Shimomoseki Shipyard & Machinery Works, Mitsubishi Heavy Industries, Ltd.



Kaiyo, research vessel, Japan Coast Guard  
6DLM-24S(L) × 2, Shimomoseki Shipyard & Machinery Works, Mitsubishi Heavy Industries, Ltd.



Shioji Maru, training ship, Tokyo University of Marine Science and Technology  
6DLM-26SL × 1, Tokyo Works, Ishikawajima-Harima Heavy Industries Co., Ltd.



Yuge Maru, training ship, Yuge National College of Maritime Technology  
6DLM-24SL × 1, Mitsui Engineering & Shipbuilding Co., Ltd.



Hokuo Maru, fishery control boat, Hokkaido Government  
6DKM-28(L) × 2, Narasaki Shipbuilding Co., Ltd.



Fukae Maru, training ship, Kobe University  
6DLM-26S × 1, Mitsui Engineering & Shipbuilding Co., Ltd.



Kumamoto Maru, training ship, Kumamoto Prefectural Amakusa Takushin High School  
6DKM-26F × 1, Nagasaki Shipyard Co., Ltd.



Hamayu, ferry, Kampo Ferry Co., Ltd.  
8DLM-40A(L) × 2, Shimomoseki Shipyard & Machinery Works, Mitsubishi Heavy Industries, Ltd.





Ferry Tokashiki, ferry, Tokashiki village office, Okinawa  
6DKM-28e(L) × 2, Watanabe Shipbuilding Co., Ltd.



Manyo, ferry, Kyushu Shosen Co., Ltd.  
6DCM-32(L) × 2, Naikai Zosen Corporation



Asakaze 21, ferry, Seikan-Ferry Co., Ltd.  
6DKM-36(L) × 2, Yamanishi Corporation



Akatsuki Maru, ferry, Uwajima Unyu Ferries  
6DKM-36e(L) × 2, Naikai Zosen Corporation



Ferry Oki, ferry, Oki Kisen Co., Ltd.  
6DKM-36(L) × 2, Shimonoseki Shipyard & Machinery Works, Mitsubishi Heavy Industries, Ltd.



Emerald Karatsu, ferry, Kyushu Yusen K.K.  
8DKM-28L × 2, Kumamoto Dock Co., Ltd.



Saipia Soya, ferry, Heart Land Ferry Co., Ltd.  
8DKM-28(L) × 2, Naikai Zosen Corporation



New Koshiki, ferry, Koshikishima Shosen Co., Ltd.  
6DKM-28(L) × 2, Kanda Shipbuilding Co., Ltd.



Taiko, ferry, Nomo Shosen K.K.  
6DCM-32e(L) × 2, Usuki Shipbuilding Co., Ltd.



Ieshima, ferry, Ie village office, Okinawa  
6DKM-28e(L) × 2, Kumamoto Dock Co., Ltd.



Hayabusa, ferry, Kyoei Unyu Co., Ltd.  
6DKM-36e(L) × 2, Hakodate Dock Co., Ltd.



Hagioshima, ferry, Hagi City  
6DEM-18(L) × 2, Mitsubishi Heavy Industries, Ltd.



Ferry Ryukyu, ferry, Kume-Shousen Co., Ltd.  
8DKM-28e(L) × 2, Usuki Shipbuilding Co., Ltd.



Daiko Maru 21, pure car carrier, Kokoku Kaiun K.K.  
6DKM-36 × 1, Hashihama Dockyard, Co., Ltd.



Tokuyama Maru, cement tanker, Tokuyama Kairiku Unso K.K.  
6DEM-23F × 1, Yamanaka Shipbuilding Co., Ltd.



## Examples of delivered products



Mikage, container carrier, Imoto Lines. Ltd.  
6DKM-28eL × 1, Koike Shipbuilding & Shipping.CO.,Ltd.



Kinyo Maru No. 15, LPG tanker, Tada Shipping Co., Ltd.  
6DKM-26eL × 1, Hakata Shipbuilding Co., Ltd.



Morning Breeze, LPG tanker, Toda Kisen K.K.  
6DKM-36 × 1, Nakatani Shipbuilding Co., Ltd.



Koshu Maru No. 8, tanker, Fujiitsuna Kaiun K. K.  
6DCM-32F × 1, Yamanaka Shipbuilding Co., Ltd.



Ryunan III, cargo, MKKLINE Co., Ltd.  
6DKM-28eL × 1, Yamanaka Shipbuilding Co., Ltd.



Tensho Maru #2, tanker, Tanba Kisen K.K.  
6DKM-26L × 1, Maehata Shipbuilding Co., Ltd.



Kosei Maru, chemical tanker, Tabuchi Kaiun K.K.  
6DKM-28L × 1, Maehata Shipbuilding Co., Ltd.



Fukko Maru, liquid tanker, Nakaei Marine Co., Ltd.  
6DEM-23L × 1, Sasaki Shipbuilding Co., Ltd.



Koryu Maru, liquid tanker, Koryu Shipping Co., Ltd.  
6DKM-28eL × 1, Sasaki Shipbuilding Co., Ltd.



Yamatai, heavy cargo ship, NYK Bulk & Projects Carriers Ltd.  
6DKM-36e(L) × 2, Nagasaki Shipyard & Machinery Works, Mitsubishi Heavy Industries, Ltd.



Shouzan Maru, Ube-Mitsubishi Cement Corporation private ship, Yamaki traspotation Ltd.  
6DKM-36eF × 1, Miura Shipbuilding Co., Ltd.



Kiyoyasu Maru, Ube-Mitsubishi Cement Corporation private ship, Ube Shipping & Logistics, Ltd.  
8DKM-36eF × 1, Kyokuyo Shipyard Corporation





Hakuhou Maru, tug boat, Nitto Tugboat Co., Ltd.  
6DKM-26(L) × 2, Kanagawa Dockyard Co., Ltd.



Chang Jin 2, 8,000 m3 dredger, Chang Jiang  
Waterway Bureau  
12DKM-36 × 2



Hua Cai, supply boat, Shanghai Maritime Rescue  
and Salvage Bureau  
8DKM-28(L) × 2, Tung Hai Shipbuilding, China



Tianjing Hao, 4,500 m3 self-propelling dredger,  
Tianjing Waterway Bureau  
8DKM-36(L) × 2, pump-driving 8DK-36 × 2



Koyo Maru, ocean salvage tug boat, Japan Ocean  
Tug Co., Ltd. & Nippon Salvage Co., Ltd.  
8DLM-40A(L) × 2, Shimonoseki Shipyard &  
Machinery Works, Mitsubishi Heavy Industries,  
Ltd.



Houkou Maru, tug boat, Yoshinaga Kaiun Ltd.  
6DEM-23L × 1, Kanbara Shipbuilding Co., Ltd.



Seiyo Maru, tug boat, Shoyo Kisen K.K.  
6DKM-32(L) × 2, Kanagawa Dockyard Co., Ltd.



Jin Gang Shu 26, tug boat, Tianjin Shipping Co.,  
Ltd.  
8DKM-28eF × 2, Shanghai Fuxing Shipping  
Service Company



Ri You 668, offshore purse seiner, Ri You Fishery  
Corporation  
8DKM-28e × 1, Zhong Xin Shipbuilding  
Corporation



Yungang 16, tug boat, Lianyungang Port Group  
Co., Ltd.  
6DKM-26 × 2, Jiangsu Zhengjiang Dockyard LLC



Soho Maru #83, purse seiner, Fukushima Fishery  
Co., Ltd.  
6DKM-36L × 1, Miho Shipyard Co., Ltd.



Tenno Maru #81, purse seiner, Daiyu Fishery Co.,  
Ltd.  
6DKM-28F × 1, Izutsu Shipyard Co., Ltd.



Feng Guo 869, purse seiner, Feng Guo Fishery  
Corporation  
8DKM-28e × 1, Qing Fu Shipbuilding Corporation



Hayato, fishery control boat, Taishu Co., Ltd.  
6DKM-28e × 1, Miho Shipyard Co., Ltd.

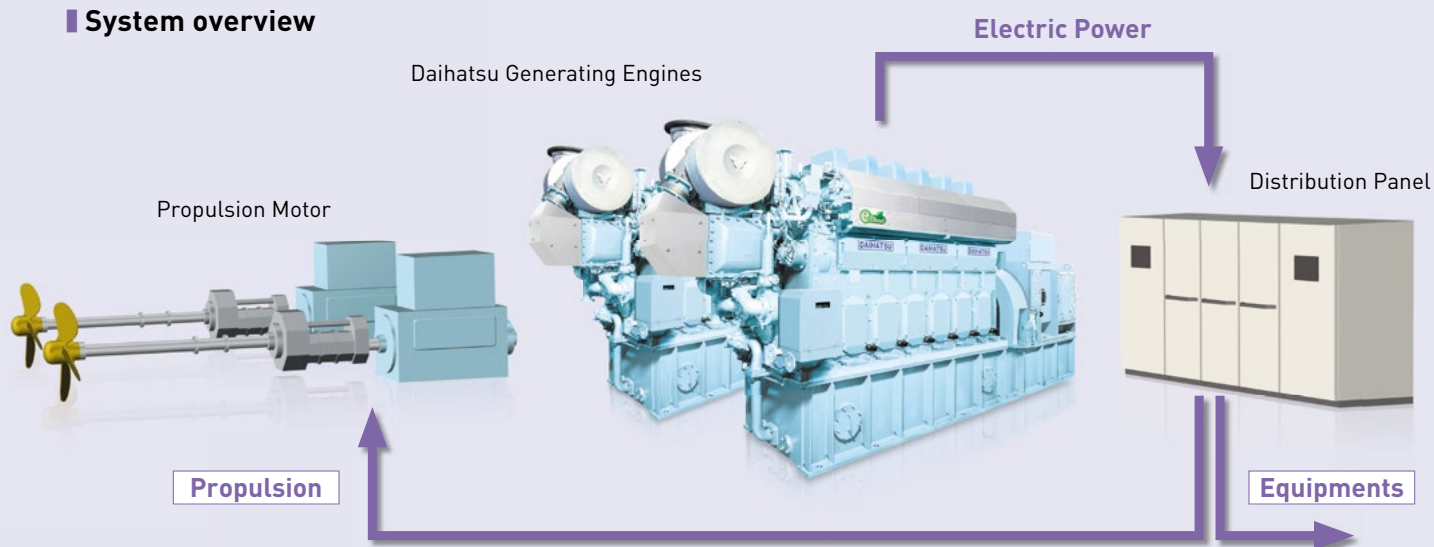


Daishimaru #11, seine accessory carrier,  
Daishimaru Fishery Co., Ltd., Nagashima Ltd.  
8DCM-32eL × 1, Izutsu Shipyard Co., Ltd.

## Environmentally friendly electric propulsion system — A proposal from Daihatsu Diesel

The electric propulsion system uses electric motors to drive the propellers, unlike the conventional system, which uses diesel engines to directly drive propellers. Thus, the electric propulsion system is superior in terms of economical efficiency, steerability and safety, and also boasts high energy-saving performance. The electric propulsion system proposed by Daihatsu Diesel is gentle to the ship, people and the global environment.

### System overview



### Examples of delivered electric propulsion systems



MV CBO ATLANTICA – PSV



Kaimei – Research vessel



Tachibana-maru – Ferry/Hybrid system



Futaba – Container carrier



## The DAIHATSU-DEC Marine SCR System engineered to achieve the highest levels of space saving and running cost reduction

Marine diesel engines installed on ocean-going vessels must be gentle to the global environment at all times. Daihatsu SCR system reduces NOx contained in the engine exhaust gas through chemical reactions, to produce a clean exhaust. Daihatsu Diesel adopted a patented bypass-integrated structure and optimized the electronic control and operation devices to enable easy onboard installation, save installation space and reduce running cost.

### 1 NOx removal performance compliant with IMO NOx Tier III standards

### 2 Compact design for easy onboard installation

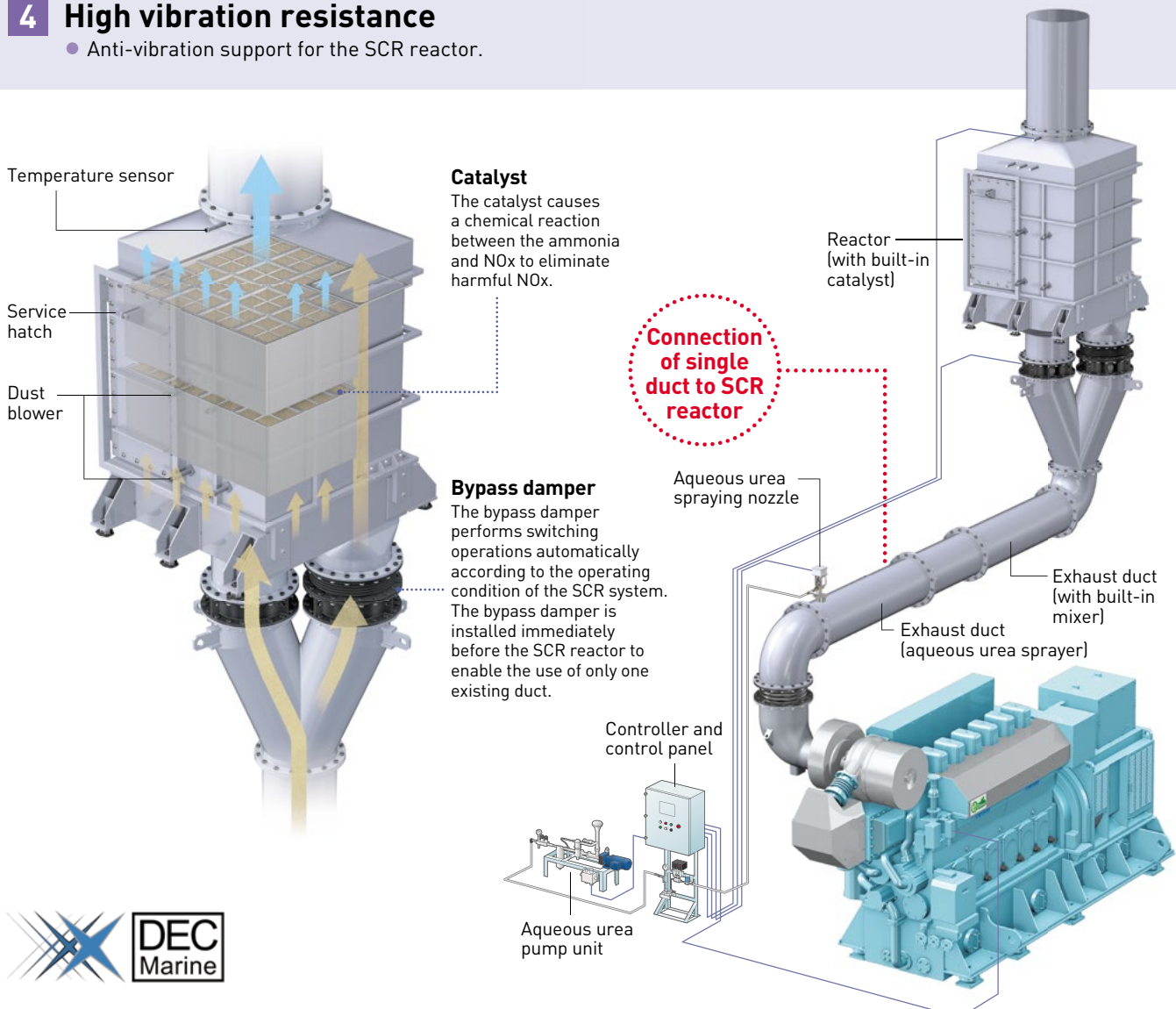
- The SCR reactor can be mounted vertically or horizontally.  
(\*Horizontal mounting is possible for models up to SCR81B.)
- A unique nozzle sprays aqueous urea microparticles to reduce the vaporization distance.
- A built-in auto-switching bypass damper reduces duct connection to only two locations: inlet and outlet.

### 3 Low running cost

- The unique nozzle and electronically controlled auto-operation optimize the amount of aqueous urea spraying.

### 4 High vibration resistance

- Anti-vibration support for the SCR reactor.



## Inboard production of high-purity urea water from urea powder and pure water

A device that produces on-board the aqueous urea solution that is required as a reducing agent for the SCR (Selective Catalytic Reduction) system has been developed. Since it generates only the necessary amount of aqueous urea solution at the necessary time from pure water and urea powder, there are no concerns about degradation, and a solution of consistently stable quality can be supplied. Also, because there is no need for large tanks to store the solution in liquid form, it offers space-saving storage, and the procurement of urea powder is economical.

### 1 Dispense with large, space-consuming AUS storage tanks

- Large on-board tanks storing the entire voyage's quota of AUS are no longer needed. Although a buffer tank will be required to provide AUS this tank is far smaller than the aforementioned storage tanks.

### 2 Save money on your AUS

- AUS produced from urea powder is cheaper than buying AUS already in its liquid form.

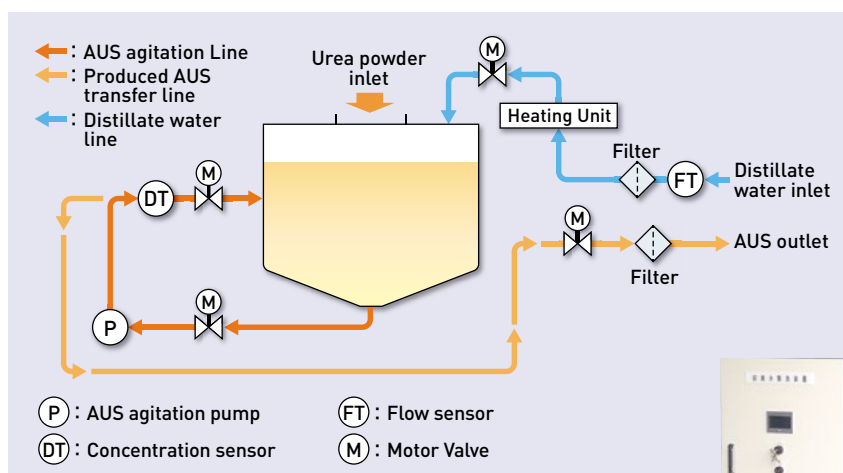
### 3 Loading urea powder is easier than loading AUS

- In order to load AUS, an Intermediate Bulk Container (IBC) and pump are required to transfer the AUS from the container to the tank. With powder these are not needed.

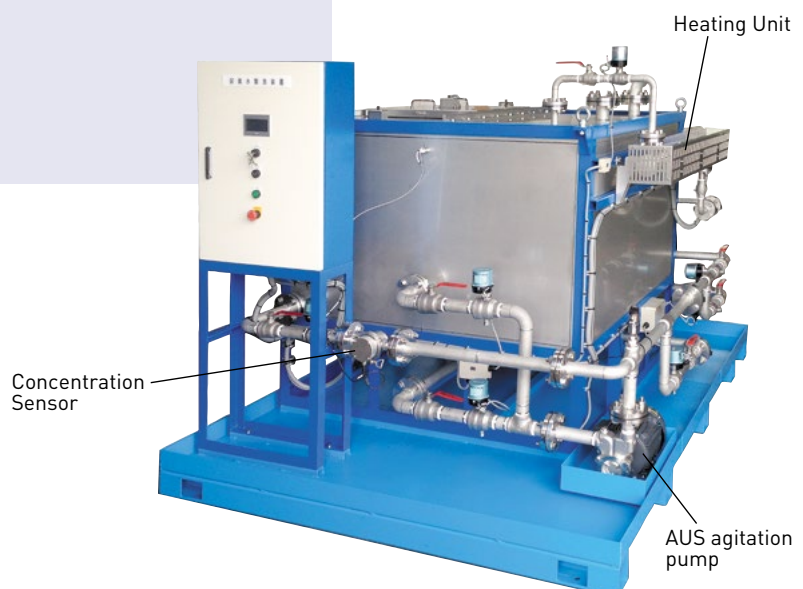
### 4 The same high quality AUS every time

- Storing AUS for extended periods risks exposing it to temperature fluctuations that decrease its quality and shelf-life. Producing AUS from powdered urea when it is needed maintains the AUS quality and helps to prevent the SCR's catalyst from becoming stained or obstructed.

#### Structure



The material of pipe, valve, and fittings shall be made of stainless steel from urea solution outlet to shipyard storage tank.



# Cloud-based engine condition monitoring and diagnostic solution

CMAXS LC-A is an abnormality diagnosis and maintenance assist system with a multiple capability for monitoring the main engine, power generator and auxiliary equipment in the main engine room. It achieves early detection of abnormal trends and prevents malfunctions by promoting proper maintenance. By utilizing cloud services, it makes it possible to grasp engine conditions at sea or on land.

## 1 Self-contained onboard engine support

- Early identification of potential faults through continuous engine diagnosis prevents serious engine failures.
- Troubleshooting guides assist with the customer's own maintenance work.

## 2 Simple and easy operation

- Integrated operation of the main engine, auxiliary engine and auxiliary devices.
- User-friendly operation through photographs, graphs, image data, alarm monitoring functions and an intuitive user interface.

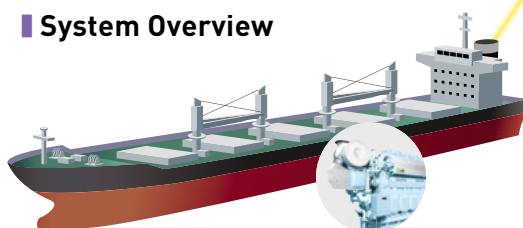
## 3 Onboard and onshore engine "visualization"

- Fleet overviews and targeted vessel monitoring through the CMAXS Web Service.
- Ascertain a vessel's condition and activate any measures necessary via the onshore "Ship Data Center".
- Retrieve a target vessel's data at any time thanks to safe Cloud storage.

## 4 A total support solution

- Direct analysis of engine data allows DAIHATSU to provide quick and relevant support.
- Periodic diagnostic reports provide reassurance for customers.

### System Overview



Data is obtained from sensors mounted to the engines and used to automatically diagnose the engine condition. This allows appropriate maintenance to be provided quickly to prevent engine trouble.

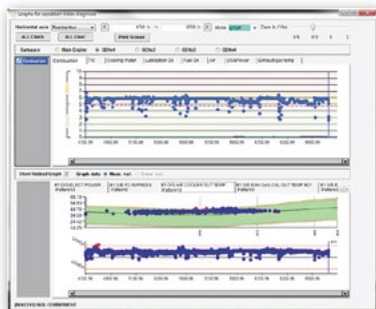
CMAXS Web Service



Daihatsu Diesel

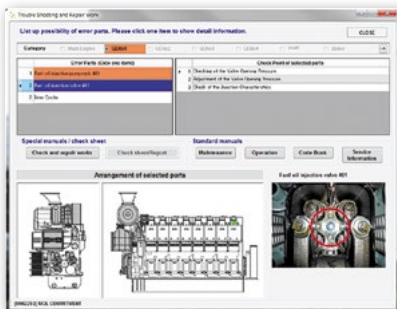
Vessel owner / vessel management company

### Diagnosis function



Check details of an engine's condition via the diagnosis screen.

### Troubleshooting function



Displays the part that is most likely to have caused a failure, as well as measures to be taken.

Parts Lists

Manuals

Service Info.

### CMAXS Web Service

The CMAXS Web Service home page can be accessed over the internet, enabling the ship's status to be determined from virtually anywhere in the world.



### CMAXS provides service as a member of the NK-CMAXS Alliance

CMAXS LC-A/e-GICSX alliance members: ClassNK Consulting Service Co., Ltd., Ship Data Center Co., Ltd., IHI Power Systems Co., Ltd., Mitsui E&S Machinery Co., Ltd., Makita Corporation, Hitachi Zosen Corporation, IMC Co., Ltd., and DAIHATSU DIESEL MFG. CO., LTD. (As of January 2023.)



# Engine Controller

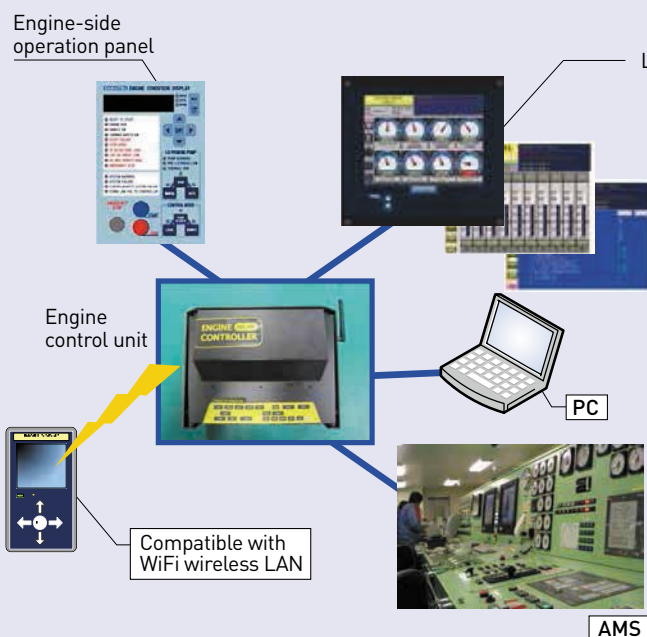
## Improving engine reliability

## An engine safety/control system for next-generation engines

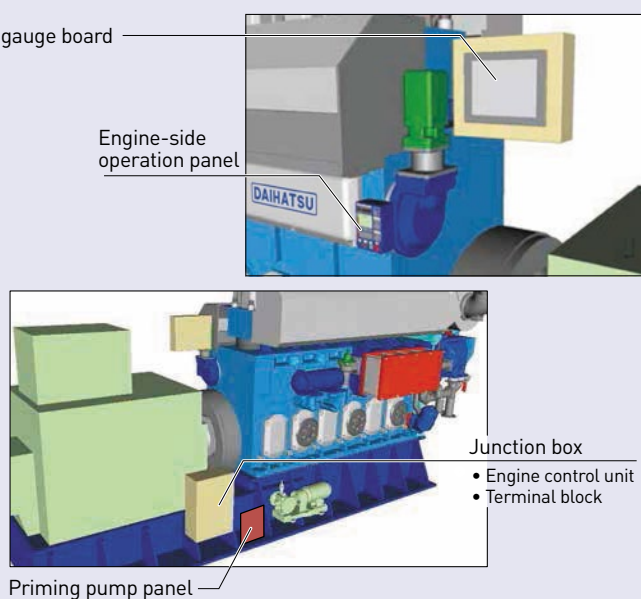
The engine safety/control system ensures safe and reliable engine operation based on the control/safety sequence verified by Daihatsu. The circuits are protected so as to prevent faulty operation even if a mistake is made in the installation. The system automatically saves the record of engine control device operations (events) and the trend data. This enables accurate understanding of symptoms when engine trouble occurs, thus allowing swift and efficient investigation of the problem causes.

Since the product was developed for a long-term use, there is no need for replacement parts.

### Links between the engine control unit and other devices



### Example installation on engine



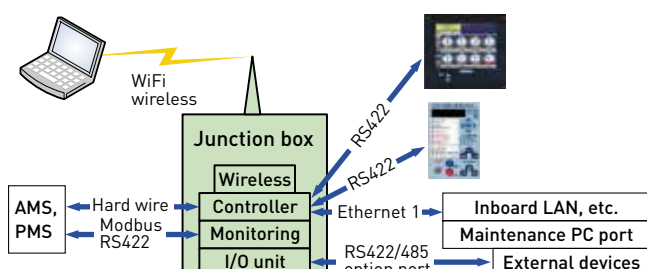
## Pursuit of safety, security, and ease of use for the owner and the crew

1. Ease of operation and safety circuits ensure security during engine operation.
2. If a problem occurs with the controller, recovery is simple and quick. Simply replace the main assembly and insert a new memory card.
3. A web server is provided as a standard feature. Connect a browser to the server for easy checking of the engine condition.
4. Engine condition data can be downloaded easily in the event of an engine problem. Sending the data to Daihatsu allows our service personnel to conduct a preliminary investigation before visiting the site.

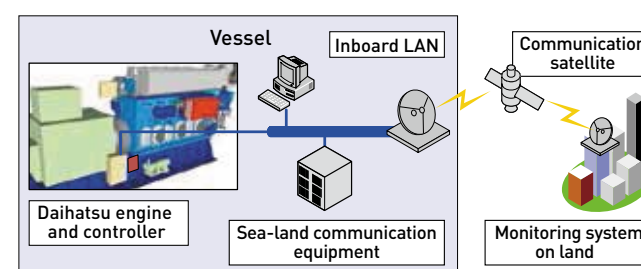
## Meeting the users' needs

1. The engine controller has an industry standard Modbus-RTU/RS422 communication port to connect to the Alarm Monitoring System (AMS) to reduce wiring.
2. The priming pump control panel is engine-mounted as a standard feature to eliminate the need for separate procurement.
3. The safety and control functions provided on the engine controller simplify commissioning. Simplified generator panels cut costs and reduce the installation space required.
4. An Ethernet port is provided as a standard feature to flexibly meet future needs of shipbuilders, such as connection with onboard LAN and server and interaction with sea-land communication systems.

### Engine controller input/output features

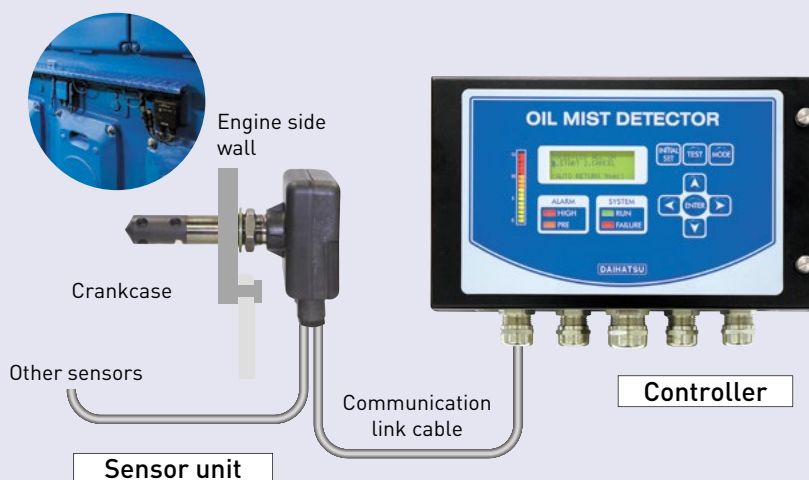


### Connection to inboard system



**Oil mist detector****MD-SX (Sensor type)**

Oil mist detectors for crankcase monitoring are required by classification societies as devices for the protection of internal combustion engines. Daihatsu Diesel's MD-SX oil mist detector is type-approved by NK, DNV GL, BV, LR, ABS, CCS, KR and LINA. The MD-SX responds better and is easier to install and maintain than the conventional pipe type. The standard model can be connected with up to 16 sensor points. The MD-SX II (connection of up to 9 sensor points) is designed exclusively for 4-stroke engines and provides excellent protection using a fewer sensor units.

**MD-SX II**

This product estimates the mist level in a crankcase not installed with a sensor unit from the data obtained from the sensors installed in the adjacent crankcases on both sides. Since it is highly responsive even with a reduced number of sensor units, installation costs can be minimized. The MD-SX II is also equipped with a self-diagnosis function to facilitate maintenance and provide extra safety assurance.

The optional sensor checker enables confirmation of the effectiveness of cleaning during maintenance and verification of proper operation of sensors. It is also possible to add a logging function to record oil mist concentration. Consequently, the MD-SX oil mist detector not only raises an alarm in a conventional manner when the oil mist concentration increases, but also enables the diagnosis and prediction of failure using log data.

**Oil mist monitor****DOMM**

The DOMM installed in an engine room detects oil mist leakage at an early stage. It helps prevent fire resulting from the ignition of oil mist and also helps keep inboard environment safe and clean by preventing oil mist from adhering to equipment and walls to cause oil stains. The International Organization for Standardization (ISO) established the inspection standard for inboard oil mist detectors, "Atmospheric oil mist detectors for ship," in August 2012.



The DOMM can also be used any place in a ship where oil mist is generated. Since the sensors and controller are equipped with a self-diagnosis function just like our oil mist detector, the DOMM facilitates maintenance and provides extra safety assurance.

**Sensor unit****Controller**





Moriyama Factory

## From Moriyama and Himeji to the world

Daihatsu Diesel's Moriyama Factory manufactures products using a production system that takes full advantage of our expertise and experience accumulated over many years, in order to assure high levels of quality and performance in engines that will set out on journeys around the world. On the environmental front, we take all possible environmental measures commensurate with our environmentally friendly engines, such as the use of gas engines for generating the electricity used inside the factory and complete recycling of factory water. The high quality of the factory underlies the high quality of our products. The same quality has been inherited by a new factory in Himeji that faces the Seto Inland Sea and is being crowned as Daihatsu Diesel's Himeji Factory.



Photovoltaic power generation  
(Moriyama Factory)



Technology Development Center  
(Moriyama Factory)



Logistics Center  
(Moriyama Factory)



A view of the factory  
(Himeji Factory)

## The Training Center — Supporting Our Technologies

Mechanics in Training Centers worldwide conduct training in environments that allow trainees to disassemble and assemble actual engines in response to customer requests.



Training Scene (Moriyama Second Factory)



Reduction Gear (Moriyama Second Factory)



Training Room (Moriyama Second Factory)



Training Center (Himeji Factory)





Himeji Factory



Shipping Port (Himeji Factory)



Assembly Shop (Himeji Factory)



Trial Area (Himeji Factory)



Painting Area (Himeji Factory)



Himeji Factory)



Singapore Training Center



Hamburg / Germany Training Center



Dubai / UAE Training Center

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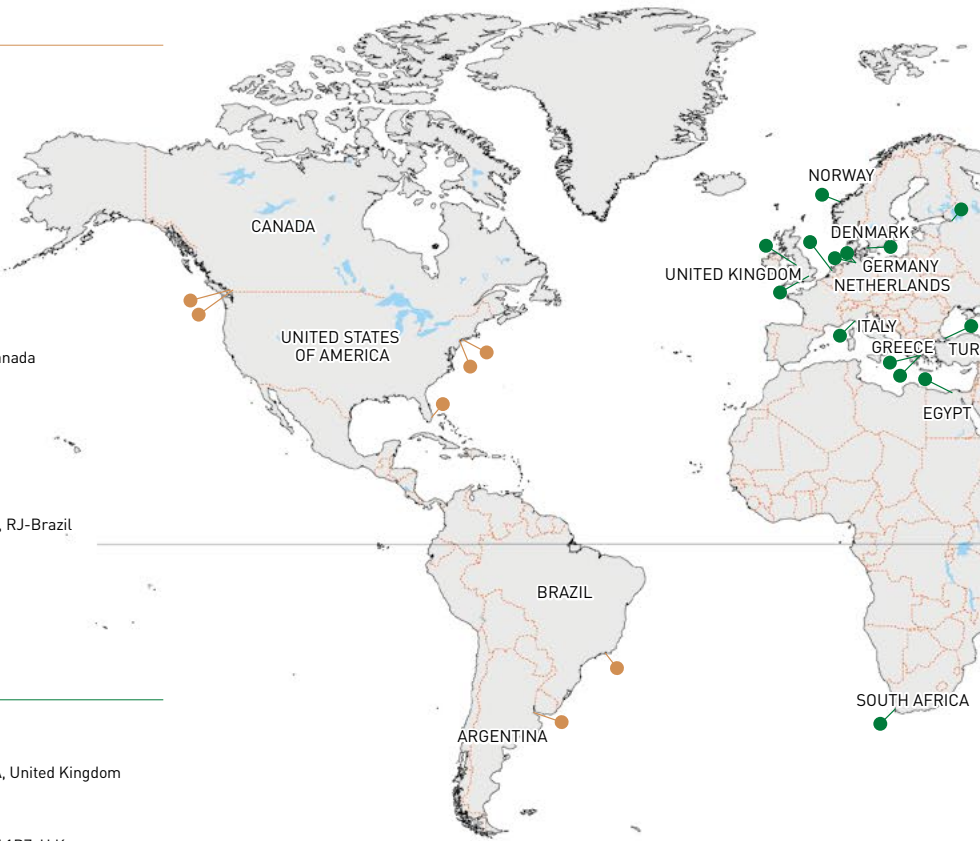
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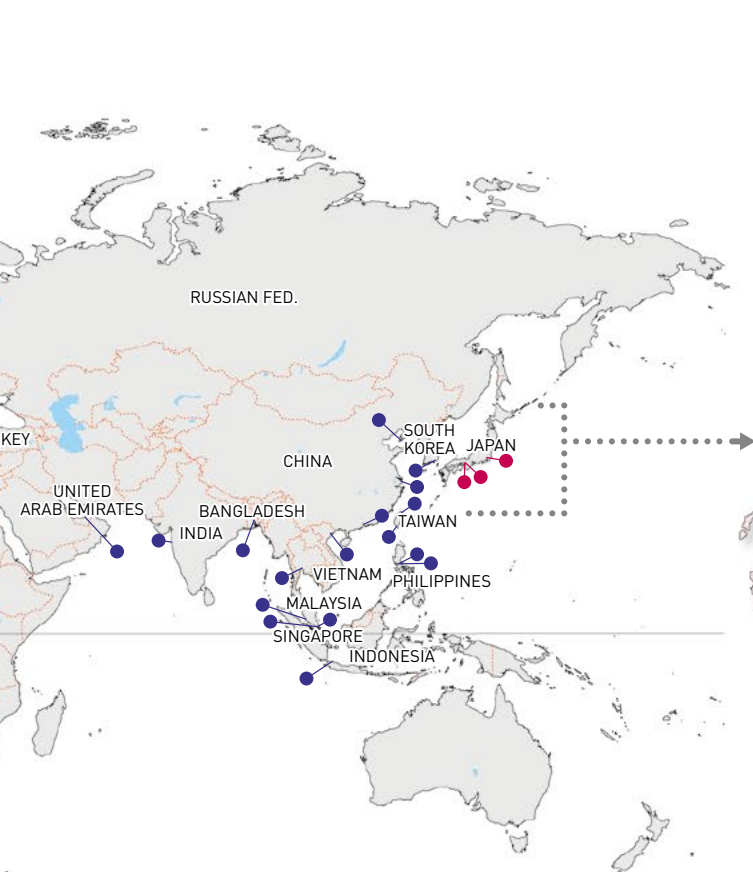
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