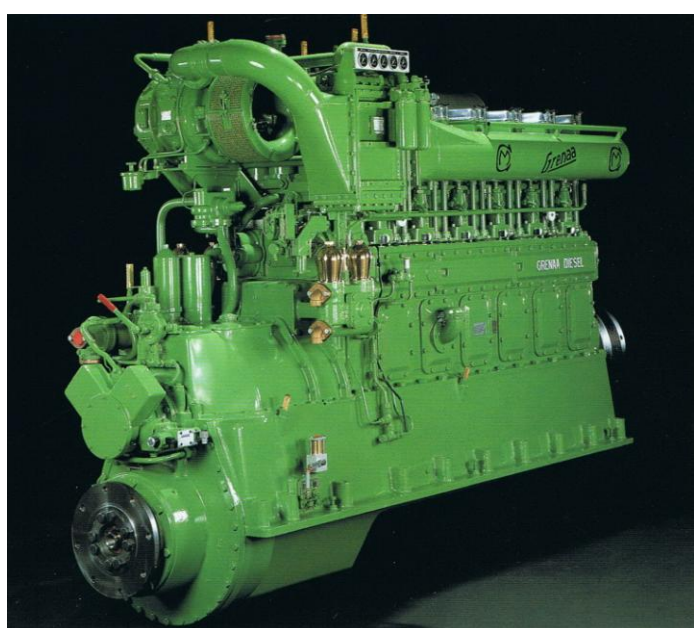




## Technical Library

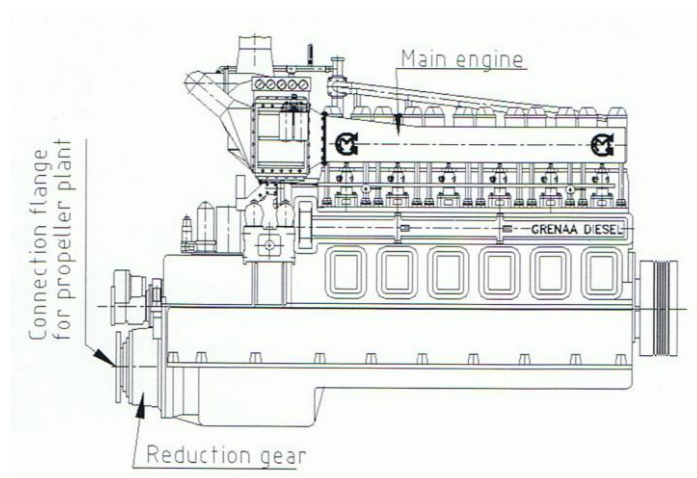
<http://engine.od.ua>



# Grenaa

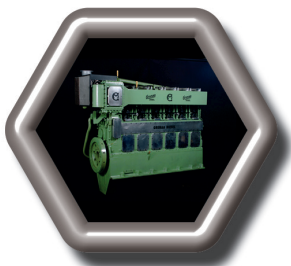
Diesel Engines

*Data Catalogue*



<http://engine.od.ua/grenaa>

# GRENAA DIESEL



## Grenaa Marine Systems

### Products to last a lifetime

For more than a century A/S Grenaa Motorfabrik has been manufacturing high quality marine systems. Our philosophy is to incorporate the highest reliability into the design of all equipment.

### True heavy duty equipment

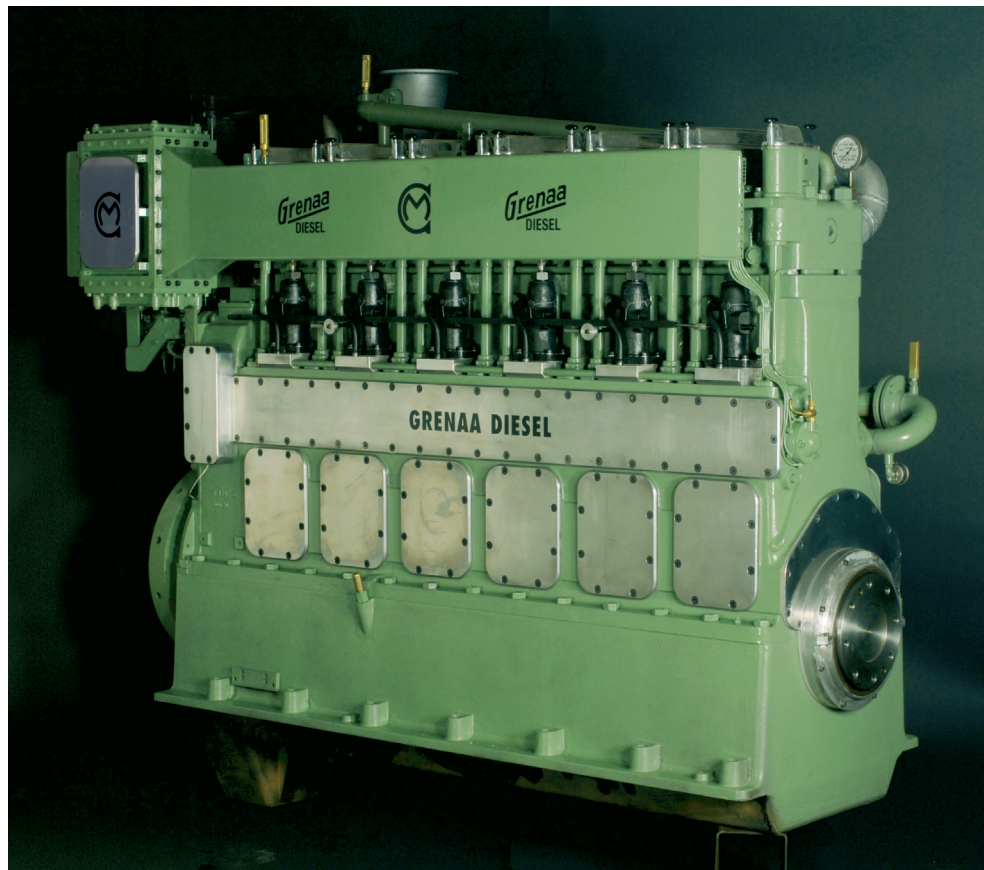
- \* Diesel engines
- \* Reduction gears
- \* CP-propeller systems
- \* Complete propulsion systems

Service intervals are long and all units can be cost effectively refurbished to as-new standard. Even design of new components is done bearing retrofits in mind so owners can update their equipment if desired.

We believe in solid engineering and classic craftsmanship.

## GRENAA DIESEL ENGINES

Heavy duty medium speed engines



### A no-nonsense mechanical concept

The Grenaa Diesel type LS24 engines are built with a keen dedication to the finest of mechanical engineering. Taking purely mechanical solutions into excellence is the core of this engine design. The result is a non-electronic and uncomplicated yet very efficiently performing machine. A/S Grenaa Motorfabrik's century long tradition of building long lived difficult-to-break and simple to repair engines is fully integrated in this range.

### Marine propulsion engines

The LS24 engines are designed for propulsion of professional vessels. The performance map is wide and flexible operation within a large speed/power map and at variable or constant high load is available at the operators discretion. No restrictions in the rating apply due to the load profile.

The Grenaa Diesel LS24 engines are well suited for installation in work vessels with many yearly operational hours and heavy load profiles.



**Based upon experience – made for the future**



# GRENAA DIESEL



## At your service

Grenaa equipment is sold by reputation and we do our utmost to supply a professional engineering and spare parts service on a world wide basis.

Standard spares are stocked and non-standard parts, e.g. propeller shafts are machined immediately upon order.

## A person to person relationship

Our organisation is flexible so responding to individual wishes is a matter of cause. And no customer needs to feel anonymous in our company.

## Survey of Grenaa LS24-engines

	6LS24TK60	6LS24TK75	6LS24TK90	6LS24TK100
Bore, mm	240	240	240	240
Stroke, mm	350	350	350	350
Rpm., max.	600	750	900	1000
Rpm., min.	200	250	250	250
Swept volume, l	95	95	95	95
MCR, HP	1060	1320	1520	1630
P <sub>me</sub> , bar	16.2	15.2	15.5	15.0
Piston speed, m/s	7.0	8.75	10.5	11.66
L, mm	2700	2700	2700	2700
W (max.), mm	1100	1100	1100	1100
H (CS to top), mm	1700	1700	1700	1700
Weight, kg.	8500	8800	8800	8800

An ideal application is propulsion of passenger ships where extreme demands to reliability and comfort is of the essence. The strong design combined with very low noise and vibration makes this engine type a perfect match.

Although the megayacht owner will usually only operate his ship relatively few hours yearly, he will in particular appreciate the significance of the outstanding aesthetics of the engine. The appearance and the classic sound adds that atmosphere to the vessel which is the very core of pleasure sailing.

## Appearance and comfort in a class of its own

The exterior is clean and reflects the engines performance. Practically all pipework has been integrated into the engine itself and in the auxillary module. The engine is thus easily accessible for inspections and maintenance.

The engines are only available in 6-cylinder versions in perfect balance. All rotating components are fully machined and the special Grenaa Diesel firing order provides minimal crankshaft stresses and at the same time gives a unique harmonic sound

adding to the atmosphere in the ship. Turbo noise is efficiently muffled and the total noise emission is at an absolute minimum.

The bedframe is designed for resilient mounting whereby structure borne vibrations are isolated. Further all installations are analyzed and optimized to minimize vibrations onboard. The crankshaft is fitted with a vibration damper further reducing shafting vibrations and the flywheel is carefully matched to obtain the most regular running.

## Low operational costs

The long stroke medium speed engine with the carefully designed combustion chamber and the optimized fuel injection and turbo charging systems has a low fuel consumption. Lube oil and filter change intervals are long and the specific consumption low which further sustains a very economical operation.

Long intervals between overhauls and low component wear rates ensures that the service costs are kept low. The basic components have a virtually infinite service life and a refurbishment to as new condition can thus be performed on board at any point.



## A/S GRENAA MOTORFABRIK

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# GRENAA DIESEL



## Grena Marine Systems

### Products to last a lifetime

For more than 80 years A/S Grena Motorfabrik has been manufacturing high quality marine and industrial systems. Our philosophy is to incorporate the highest reliability into the design of all equipment.

### True heavy duty equipment

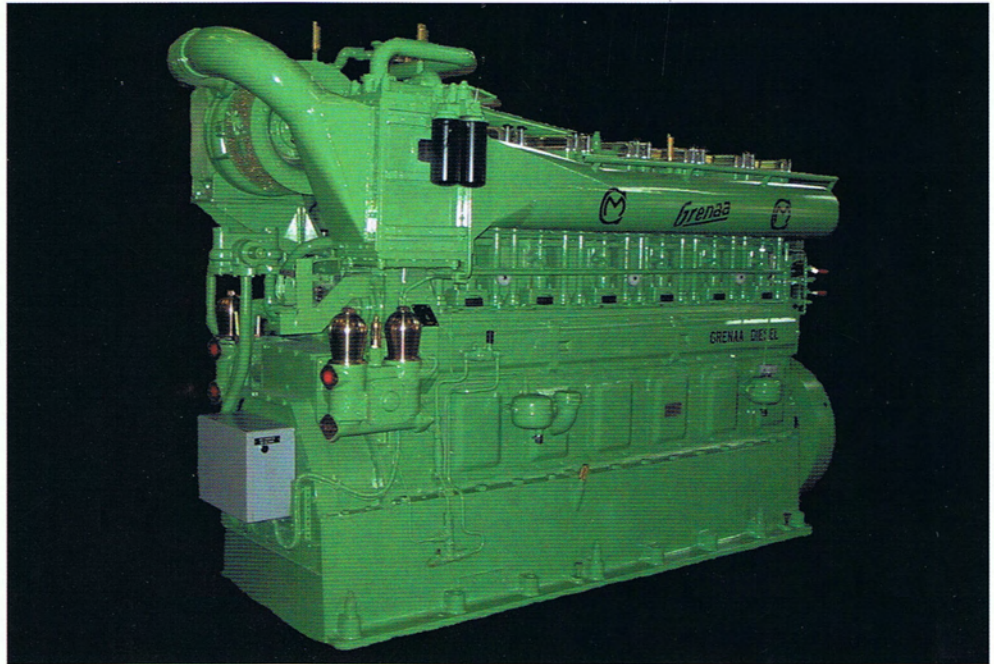
- Diesel engines
- Reduction gears
- CP-propeller systems
- Keel coolers
- Generating sets
- Full propulsion systems

Service intervals are long and all units can be cost effectively refurbished to as-new standard. Even design of new components is done bearing retrofits in mind so owners can update their equipment if desired.

We do not believe in the "use and scrap" mentality.

## GRENAA DIESEL ENGINES

Heavy duty medium speed engines



### Engines built on experience

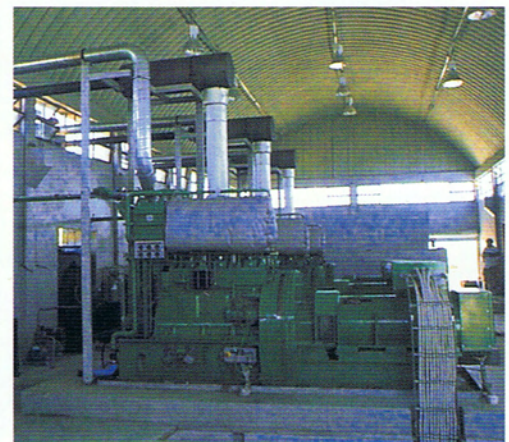
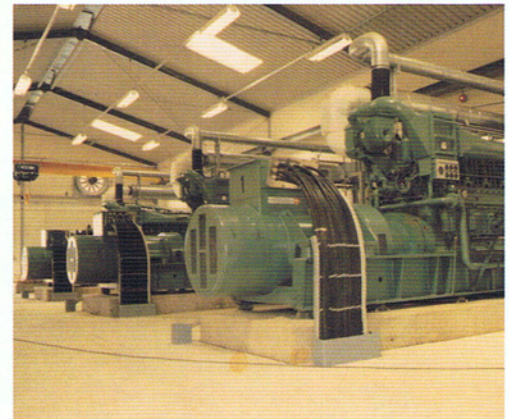
The Grena Diesel engines are backed by decades of operational experience in the most demanding applications. Grena engines are serving reliably under all climatic conditions from arctic Greenland to tropical Africa and Australia.

### Simple and reliable baseload engines

The Grena Diesel engines are designed bearing simplicity in mind. This gives engines which can be maintained with a minimum of tools and facilities. The design parameters are based upon continuous baseload duty. Time limited load profiles such as „Prime power“ or „Limited time power“ are not applicable. Our policy is only to produce heavy duty engines which can supply the true full load power without harmful overload.

### Meeting future upgrades

The compatibility of the engines makes upgrades possible. The power rating of an engine may thus be increased by mounting a conversion kit supplied by the factory. Identical parts for all engine sizes also minimizes the spare parts stock. The ample factory stock of spares for immediate shipment reduces the requirement for stocking by the operator.



**Based upon experience – made for the future**



# GRENAA DIESEL



## At your service

Grenaa equipment is sold by reputation and we do our utmost to supply a professional engineering and spare parts service on a world wide basis.

Standard spares are stocked and non-standard parts, e.g. propeller shafts are machined immediately upon order.

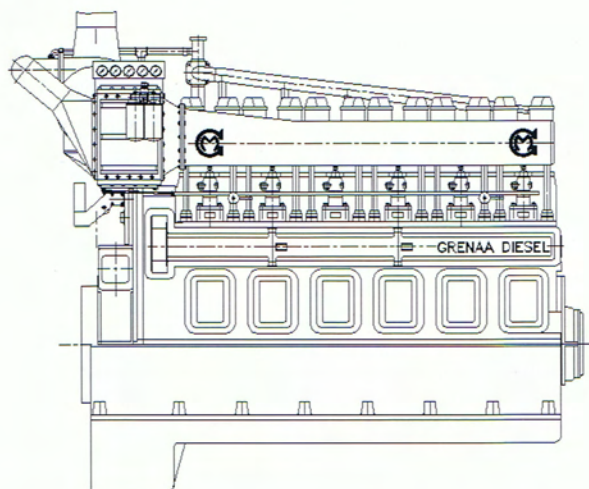
## A person to person relationship

Our organisation is flexible so responding to individual wishes is a matter of course. And no customer needs to feel anonymous in our company.

## Survey of Grenaa FS24-engines

	3FS24TK	6FS24	6FS24TK	6FS24TKII
Bore, mm	240	240	240	240
Stroke, mm	300	300	300	300
Engine rpm	750	750	750	750
Swept volume, l	40,7	81,4	81,4	81,4
Piston speed, m/s	7,5	7,5	7,5	7,5
Cont. rating, HP	450	450	900	1030
Cont. rating, KW	331	331	662	758
Genset Rating, KW**	318	318	636	728
Genset Rating, KVA	397	397	795	910

\*\* Alternator efficiency 0,96



## The heavy duty concept

All Grenaa equipment is designed for continuous heavy duty operation and only materials of the highest quality are used. Component suppliers are all well recognized ones. Reliability and long time between service intervals make the Grenaa Diesel engines the optimum choice for professional marine and power generation applications.

## Low operational costs

The long stroke of the medium speed engine combined with the carefully designed combustion chamber and the best fuel injection and turbo charging systems ensure low fuel consumption. The lube oil change intervals and low specific consumption further sustains a very eco-

nomical performance of the diesel engine.

Service intervals are long, component wear rates are moderate and the work required is simple. All this contributes to keep the overall maintenance costs low. The basic components have a virtually infinite service life which makes it possible and economically feasible to refurbish the engine to as new condition even after many years of operational life.

## Green environmentally friendly engines

The Grenaa Diesel engines fulfill the strict emission limits set by IMO. The outlet of Nitrogen Oxides and Hydro-carbons are well below the permitted values. In some countries this is rewarded by the right to buy fuel excl. pollution related taxes.



## A/S GRENAA MOTORFABRIK

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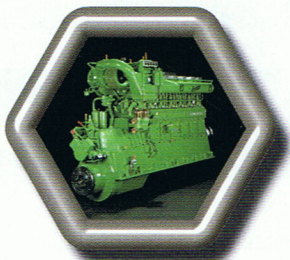
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# GRENAA DIESEL

## GRENAA COMPLETE PROPULSION SYSTEMS

Heavy duty medium speed propulsion plants



### Grenaa Marine Systems

#### Products to last a lifetime

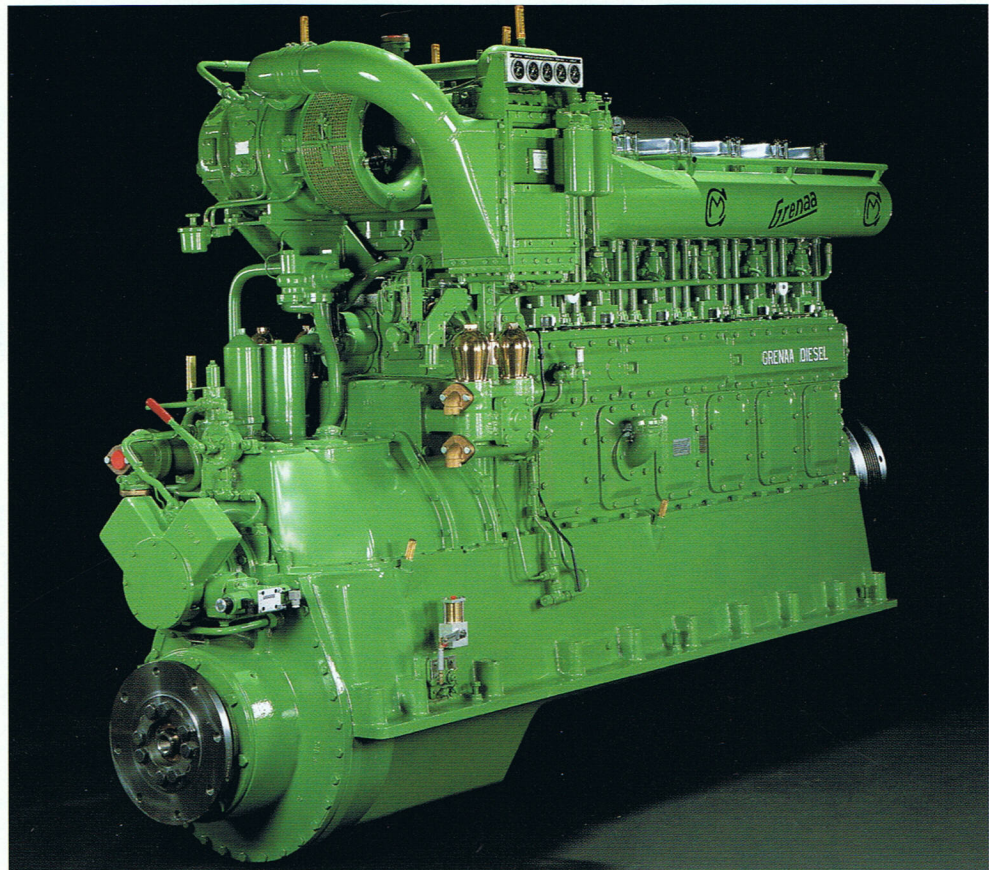
For more than 80 years A/S Grenaa Motorfabrik has been manufacturing high quality marine systems. Our philosophy is to incorporate the highest reliability into the design of all equipment.

#### True heavy duty equipment

- Diesel engines
- Reduction gears
- CP-propeller systems
- Keel coolers
- Generating sets
- Full propulsion systems

Service intervals are long and all units can be cost effectively refurbished to as-new standard. Even design of new components is done bearing retrofits in mind so owners can update their equipment if desired.

We do not believe in the "use and scrap" mentality.



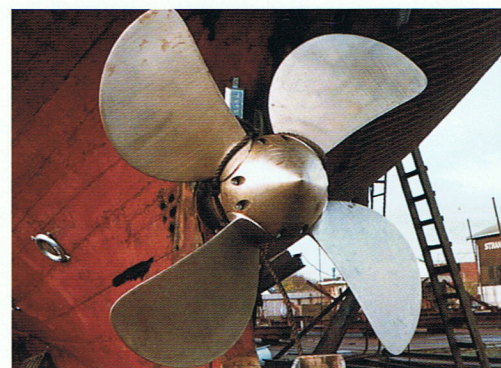
#### One supplier of the full genuine package

Grenaa Motorfabrik has specialised in manufacture of complete propulsion systems covering: diesel engine, reduction gear with CP-controls and the controllable pitch propeller system. This system integration with practically all ancillaries ready fitted to the units gives significant advantages:

- Single source supply ensures equipment compatibility.
- One partner for all after sales service and spare parts.
- Easy installation with an extensive installation equipment package included.

#### Compact medium speed design

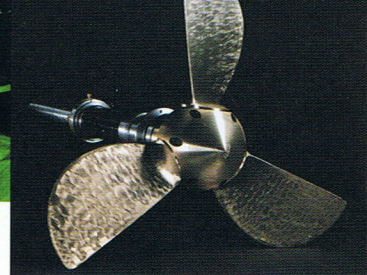
The Grenaa propulsion systems are designed as compact units with engine and reduction gear integrated. This makes the installation length short compared to other medium speed propulsion systems. At the same time it makes installation work uncomplicated since only a minimum of connections and alignment work has to be performed by the shipyard.



**Based upon experience – made for the future**



# GRENAA DIESEL



## At your service

Grenaa equipment is sold by reputation and we do our utmost to supply a professional engineering and spare parts service on a world wide basis.

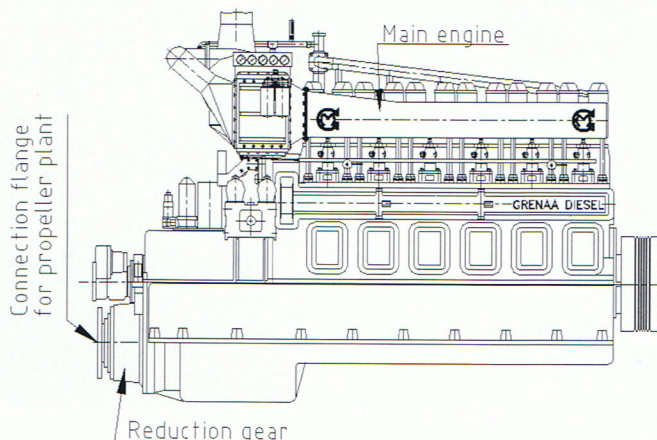
Standard spares are stocked and non-standard parts, e.g. propeller shafts are machined immediately upon order.

## A person to person relationship

Our organisation is flexible so responding to individual wishes is a matter of course. And no customer needs to feel anonymous in our company.

## Survey of Grenaa 6FR24-engines

	6FR24	6FR24TK-214	6FR24TK-264	6FR24TK-322	6FR24TKII-264	6FR24TKII-322
Bore, mm	240	240	240	240	240	240
Stroke, mm	300	300	300	300	300	300
Engine rpm	750	750	750	750	750	750
Swept volume, l	81,4	81,4	81,4	81,4	81,4	81,4
Cont. rating, HP	420/465	900/1000	900/1000	900/1000	1000/1100	1000/1100
Piston speed, m/s	7,5	7,5	7,5	7,5	7,5	7,5
Propeller rpm	351	351	284	232	284	232
Diameter, nozzle	-	1760	1950	2250	1950	2250
Diameter, open	1700	1880	2300	2500	2300	2500



## The heavy duty concept

All Grenaa equipment is designed for continuous heavy duty operation and only materials of the highest quality are used. Component suppliers are all well recognized ones. Reliability and long time between service intervals make the Grenaa propulsion system the optimum choice for professional work vessel applications.

## Low operational costs

The long stroke of the slow running engine combined with the carefully designed combustion chamber and the best fuel injection and turbo charging systems ensure low fuel consumption. The lube oil change intervals and low specific consumption further sustains a very economical performance of the diesel engine.

The fuel consumption of the total propulsion system is kept low by careful matching of propeller characteristics to the rest of the

plant. The controllable pitch propeller system allows good performance at all loads and speeds.

Service intervals are long, component wear rates are moderate and the work required is simple. All this contributes to keep the overall maintenance costs low. The basic components have a virtually infinite service life which makes it possible and economically feasible to refurbish the engine to as new condition even after many years of operational life.

## Green environmentally friendly engines

The Grenaa Diesel engines fulfill the strict emission limits set by IMO. The outlet of Nitrogen Oxides and Hydro-carbons are well below the permitted values. In some countries this is rewarded by the right to buy fuel excl. pollution related taxes.



## A/S GRENAA MOTORFABRIK

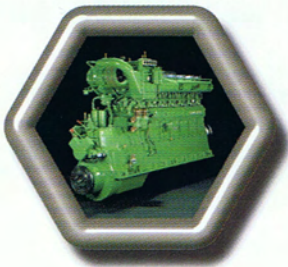
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# GRENAA DIESEL

## GRENAA COMPLETE PROPULSION SYSTEMS

Heavy duty slow speed propulsion plants type F24



### Grenaa Marine Systems

#### Products to last a lifetime

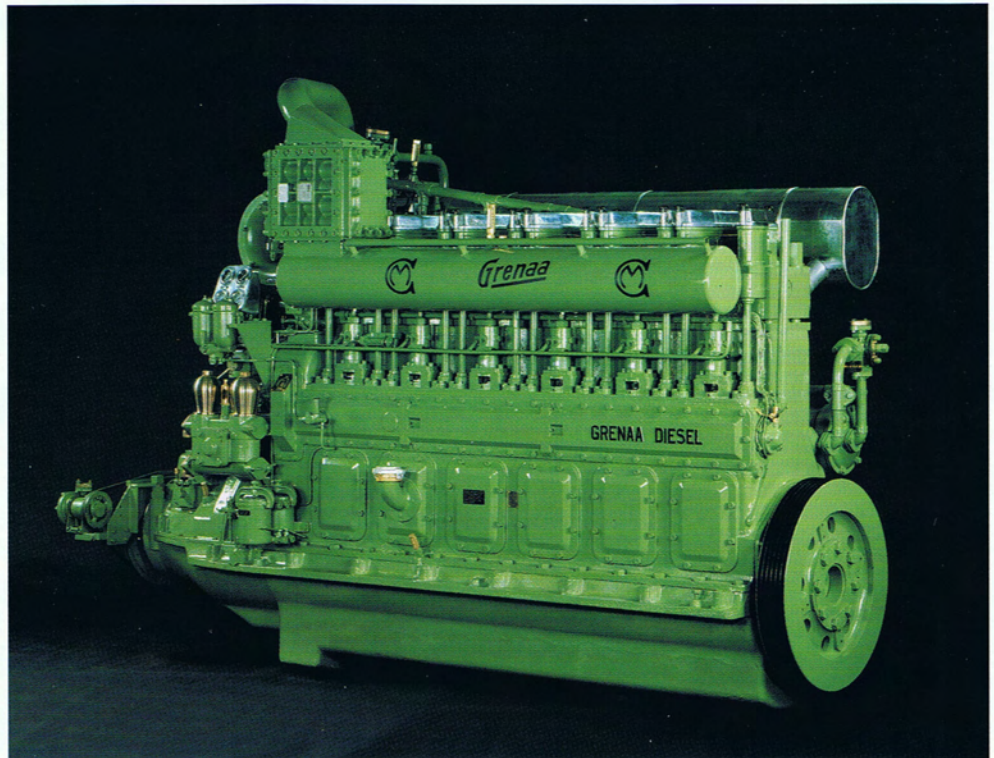
For more than 80 years A/S Grenaa Motorfabrik has been manufacturing high quality marine systems. Our philosophy is to incorporate the highest reliability into the design of all equipment.

#### True heavy duty equipment

- Diesel engines
- Reduction gears
- CP-propeller systems
- Keel coolers
- Generating sets
- Full propulsion systems

Service intervals are long and all units can be cost effectively refurbished to as-new standard. Even design of new components is done bearing retrofits in mind so owners can update their equipment if desired.

We do not believe in the "use and scrap" mentality.



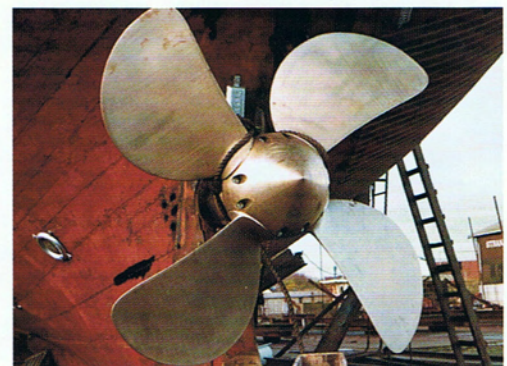
#### One supplier of the full genuine package

Grenaa Motorfabrik has specialised in manufacture of complete propulsion systems covering: diesel engine, transmission unit with CP-controls and the controllable pitch propeller system. This system integration with practically all ancillaries ready fitted to the units gives significant advantages:

- Single source supply ensures equipment compatibility.
- One partner for all after sales service and spare parts.
- Easy installation with an extensive installation equipment package included.

#### Compact slow speed design

The Grenaa propulsion systems are designed as compact units with engine and transmission unit integrated. This makes the installation length short compared to other slow speed propulsion systems. At the same time it makes installation work uncomplicated since only a minimum of connections and alignment work has to be performed by the shipyard.



**Based upon experience – made for the future**



# GRENAA DIESEL



## At your service

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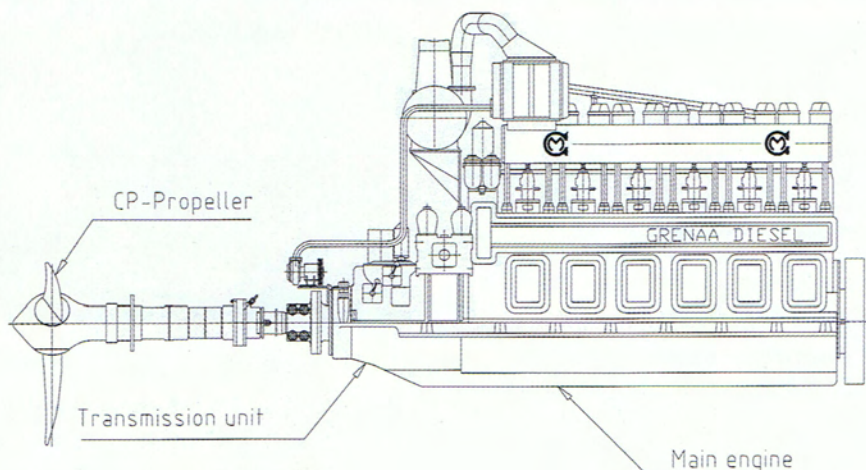
Standard spares are stocked and non-standard parts, e.g. propeller shafts are machined immediately upon order.

## A person to person relationship

Our organisation is flexible so responding to individual wishes is a matter of course. And no customer needs to feel anonymous in our company.

## Survey of Grenaa F24 slow speed engines

	3F24	3F24TK	4F24	6F24D	6F24	6F24TK
Bore, mm	240	240	240	240	240	240
Stroke, mm	300	300	300	300	300	300
Engine rpm, max	500	500	500	500	500	500
Swept volume, l	40,7	40,7	54,3	81,4	81,4	81,4
Cont. Rating, HP	165/183	300/330	220/242	125	330/366	600/660
Piston speed, m/s	5,0	5,0	5,0	5,0	5,0	5,0
Propeller rpm	500	500	500	500	500	500
Diameter, nozzle	1200	1200	1200	1200	1200	1440
Diameter, open	1300	1350	1300	1470	1470	1520



## The heavy duty concept

All Grenaa equipment is designed for continuous heavy duty operation and only materials of the highest quality are used. Component suppliers are all well recognized ones. Reliability and long time between service intervals make the Grenaa propulsion system the optimum choice for professional work vessel applications.

## Low operational costs

The long stroke of the slow running engine combined with the carefully designed combustion chamber and the best fuel injection and turbo charging systems ensure low fuel consumption. The lube oil change intervals and low specific consumption further sustains a very economical performance of the diesel engine.

The fuel consumption of the total propulsion system is kept low by careful matching

of propeller characteristics to the rest of the plant. The controllable pitch propeller system allows good performance at all loads and speeds.

Service intervals are extremely long, component wear rates are moderate and the work required is simple. All this contributes to keep the overall maintenance costs low. The basic components have a virtually infinite service life which makes it possible and economically feasible to refurbish the engine to as new condition even after many years of operational life.

## Green environmentally friendly engines

The Grenaa Diesel engines fulfill the strict emission limits set by IMO. The outlet of Nitrogen Oxides and Hydro-carbons are well below the permitted values. In some countries this is rewarded by the right to buy fuel excl. pollution related taxes.



## A/S GRENAA MOTORFABRIK

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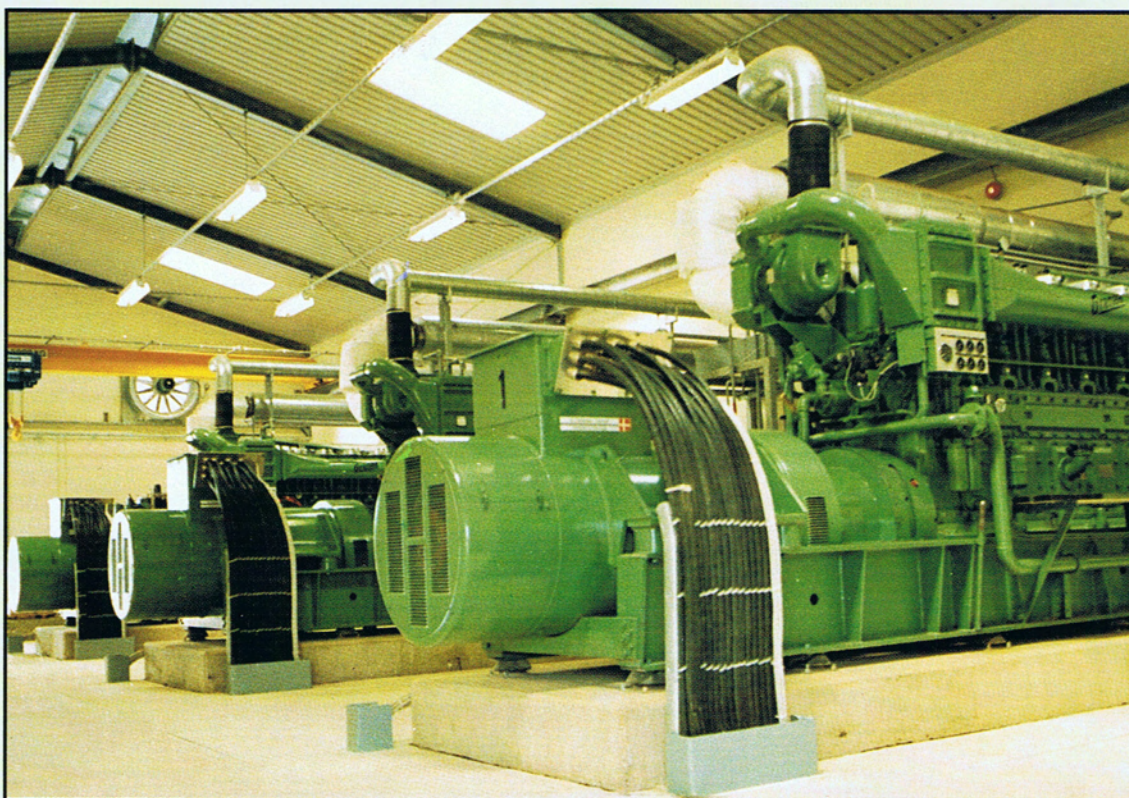
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e-mail: info@grmo.dk · www.grmo.dk



# **GRENAA DIESEL**

## **Energy Systems & Gen-Sets 100-6000 kWe**



**Power station with 3 pcs. 600 kWe Grena Diesel generating sets supplying electricity to an African town.**

### **Customer focused engineering – we supply solutions**

The power systems supplied by A/S Grena Motorfabrik may be standard emergency generator sets, heavy duty power stations, black-start generators or complex combined utility supply stations.

We go one essential step further than most manufacturers: We supply solutions, not just products. It means that we calculate and match the plant performance to the demand of each project. We make calculations of voltage and frequency drop during starting of your electromotors and help you to select the optimum starting sequence of all equipment. Only thereby we can select the perfect generator and save investment costs.

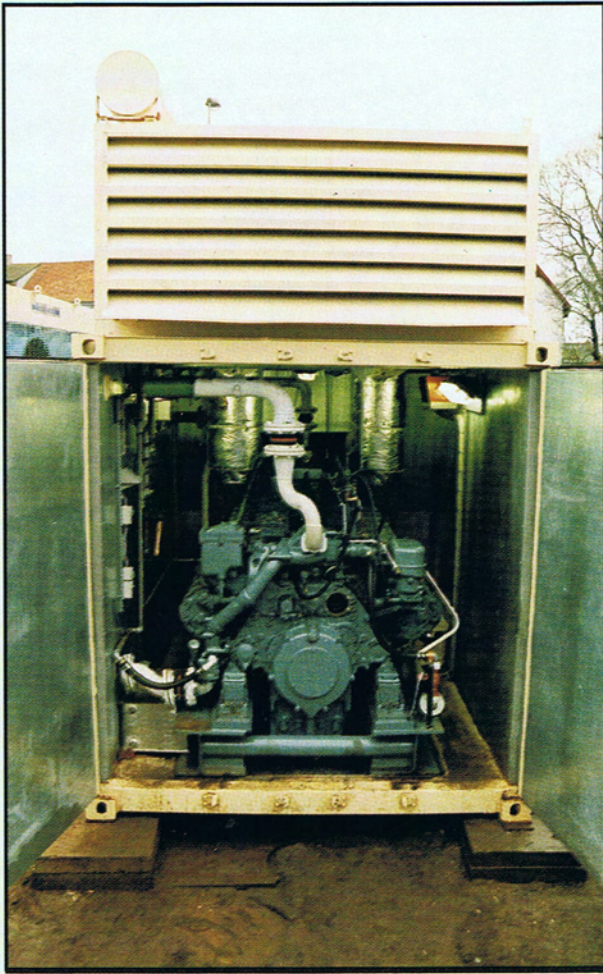
For more complex plants we analyse and balance all delivered equipment so that the required output is matched: electricity, heat, water, ice etc. Optimum solutions through careful design – there is no other way.

***For Marine, Stationary and Special Purposes***

***Tailor made to suit Your purpose***



## Container mounted units



Units built into 20' or 40' ship containers is a speciality of A/S Grenaa Motorfabrik. These plants are made for a wide range of applications:

- Automatic mains failure units
- Black start tailor made generators
- Marine reefer container power packs
- Combined heat and power units
- Complete expandable power stations
- Client defined applications

The container plants are particularly practical in areas where working conditions are difficult since only a minimum of installation work is required. Further, a station can be moved from one location to another if the power demand changes.

The container mounted unit shown on the pictures is a black start generator for a turbine power plant in Greece. The supply was complete with high voltage alternator, switch gear and controls. It included design and delivery plus personnel training and commissioning on site.

The output of 1850 kWe at 11.000 volts was carefully calculated according to the starting characteristics of the turbine.





# Grenaa Generating Sets

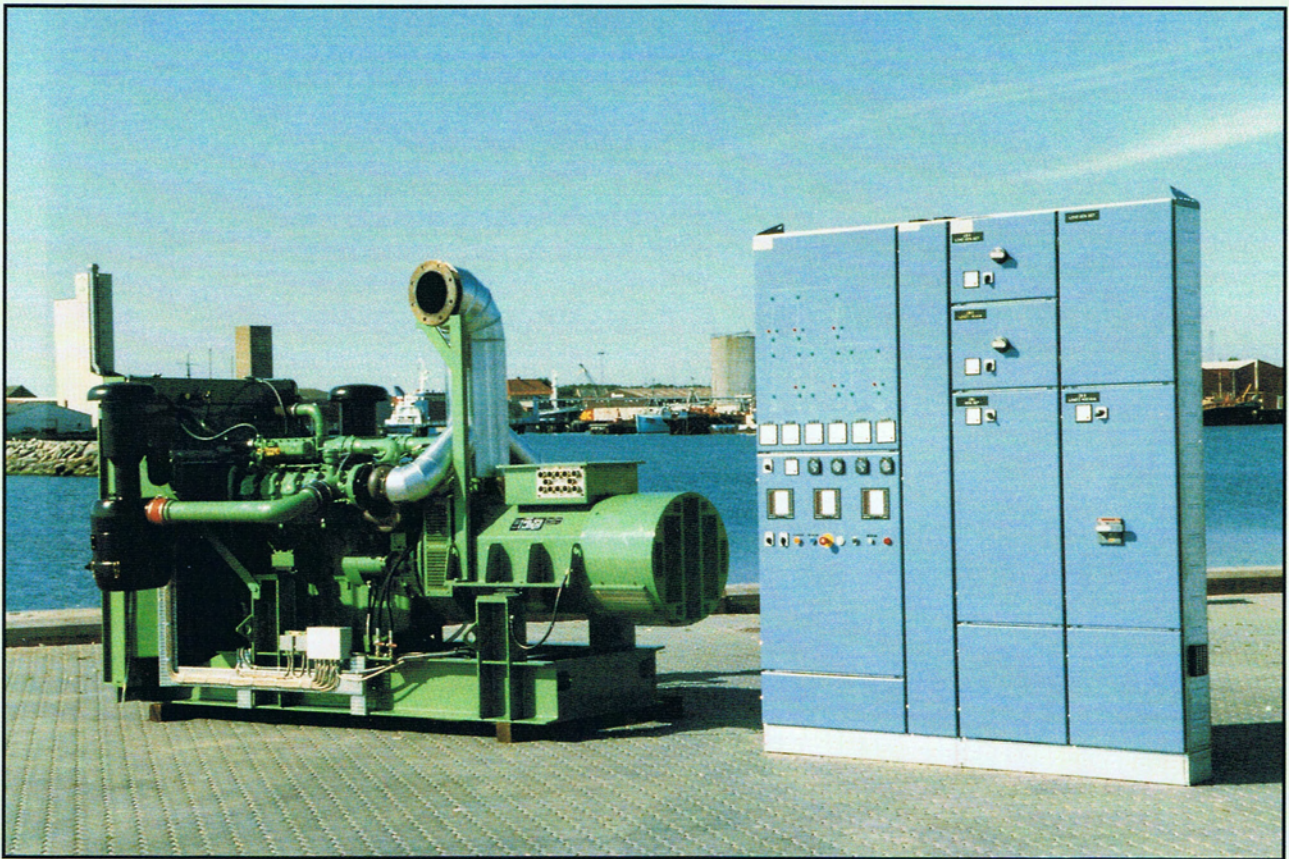
Generating sets are made for standard or customer defined purposes. All equipment for ready-to-run supply can be packaged so that installation is quick and easy.

Skid mounted or canopy versions with sound silencing can be provided in sizes from 100-2000 kW or even bigger upon request.

The sets are designed optimised for the purpose and will be based upon Grenaa Diesel engines for heavy-duty medium speed applications or high-speed diesels where this forms the best solution for the user. In all cases we co-operate with renowned manufacturers only so a high quality supply is guaranteed.

Alternators from worldwide recognized manufacturers are used: Stamford, A. van Kaick and Mecc Alte.

Our supply does not stop when the equipment is ready for shipment. We supply the complete package of installation, commissioning, training of operating and service personnel at our works or the operation site and last but not least: Our service department is always on stand-by to assist you with spare parts supply, technical advice or engineering assistance for carrying out repairs.



This 360 kWe Mercedes and A. van Kaick based unit was designed, built, installed and commissioned by A/S Grenaa Motorfabrik. Training of the operating personnel was carried out on site in Eritrea. The output was designed to match the requirements of Eritrea Cement Factory taking into consideration the special starting characteristics of a 85 metre long rotating kiln.



# Turn-key supplies

## Power stations

Complete electrical power stations with medium- or high-speed diesel engines are delivered including all design and projecting, construction and after sales services. Stations in buildings or in containers on a modular design are made on a turn-key basis.

## Combined utility stations

Combined utility stations is an entirely new concept. It is focused on the requirements of each client and is a modular system which can be tailored from the following modules (numbers refer to drawing):

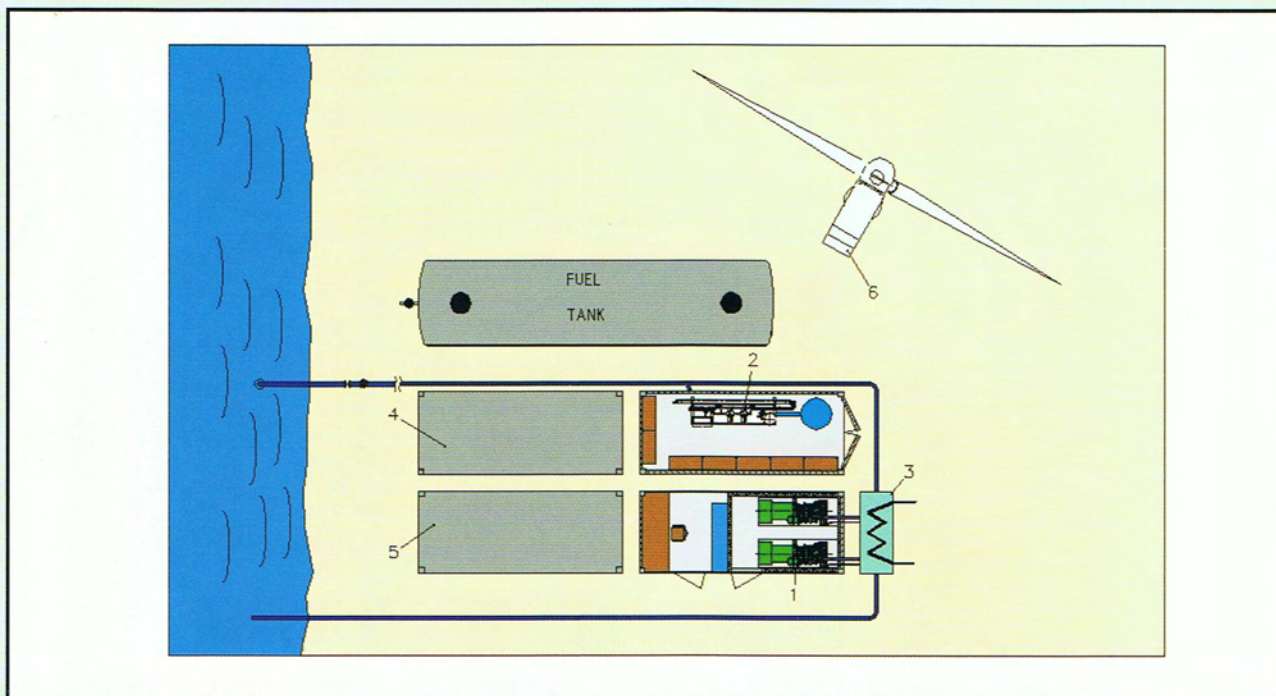
- Electrical power module (1)
- Fresh water generator module (2)
- Waste heat utilisation (3)

- Ice production module (4)
- Refrigeration module (5)
- Wind power module (6)

Based upon customer requirements the desired modules are selected and we calculate the capacity of each component by means of our own developed software.

This gives a number of advantages:

- Optimum matching and compatibility
- Lowest operational costs by system management
- Power planning from central PC
- Highest plant reliability
- One service partner for the complete station
- Turn-key supply saves projecting costs



The combined utility stations are designed for remote communities. Especially fishing towns or villages on islands can benefit from a combined station giving all utilities and supplies necessary for fishing and preserving the catch. The drawing shows a system supply for a fishing village on an island. It offers savings of logistics costs since all facilities are present and ships can operate using the island as base supplying: fuel, ice, fresh water, cold storage facility and electrical power. A periodical feeder boat service can pick up the catch and deliver fuel from the main land.

**For Optimum Solutions and Quality Products contact:**



**A/S GRENAA MOTORFABRIK**

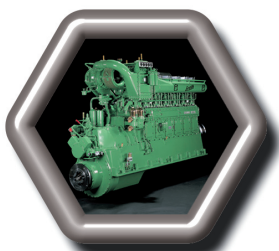
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# GRENAA DIESEL



## Grenaa Marine Systems

### Products to last a lifetime

For more than 80 years A/S Grenaa Motorfabrik has been manufacturing high quality marine systems. Our philosophy is to incorporate the highest reliability into the design of all equipment.

### True heavy duty equipment

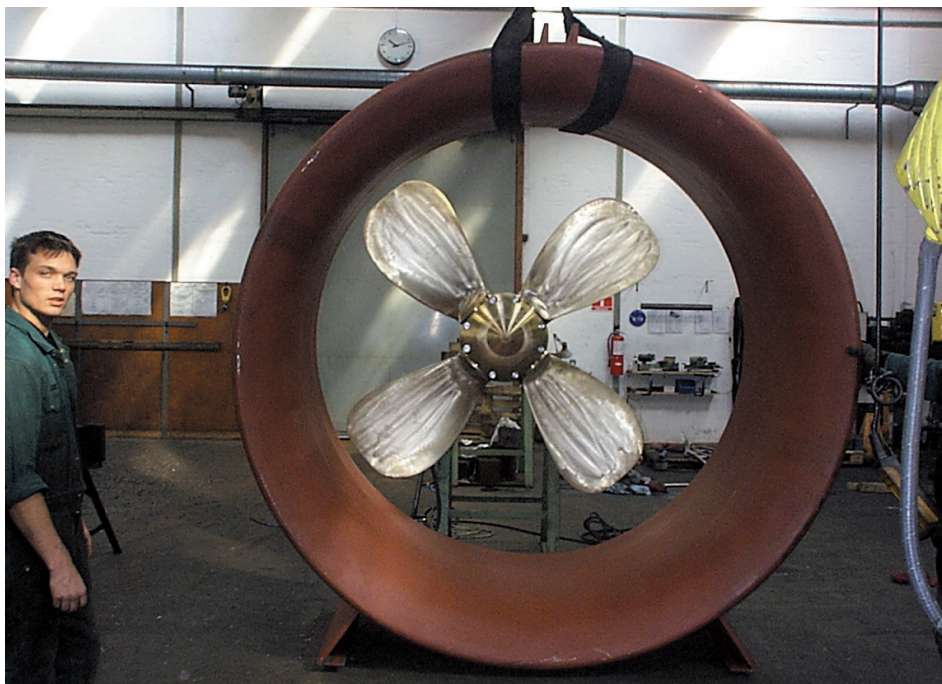
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- Reduction gears
- CP-propeller systems
- Keel coolers
- Generating sets
- Full propulsion systems

Service intervals are long and all units can be cost effectively refurbished to as-new standard. Even design of new components is done bearing retrofits in mind so owners can update their equipment if desired.

We do not believe in the "use and scrap" mentality.

## GRENAA CONTROLLABLE PITCH PROPELLER PLANTS

CP-propellers for fishing vessels, freighters and work boats



### The concept

The CP-propeller systems with their flexibility and fuel saving potential over traditional fixed pitch propellers has been part of Grenaa's product programme for more than 80 years.

We have focused on fishing vessels, freight ships smaller ferries and work boats operating at speeds below 15 knots. The programme thus contains propellers with a variety of blade shapes ensuring high efficiency at the typical operating conditions of this type of vessels.

### Heavy duty design

The design of Grenaa propellers match the harsh conditions under which the vessels are working be it in arctic or tropical waters. Only the best materials are used. Propeller blades are made in high grade bronze, shafts in normal or stainless steel, stern tubes in bronze or welded steel. Sealing arrangements are of the best brands and suitable for oil or grease lubrication. Systems suitable for steel or wooden ships are supplied.



Based upon experience – made for the future



# GRENAA DIESEL



## At your service

Grenaa equipment is sold by reputation and we do our utmost to supply a professional engineering and spare parts service on a world wide basis.

Standard spares are stocked and non-standard parts, e.g. propeller shafts are machined immediately upon order.

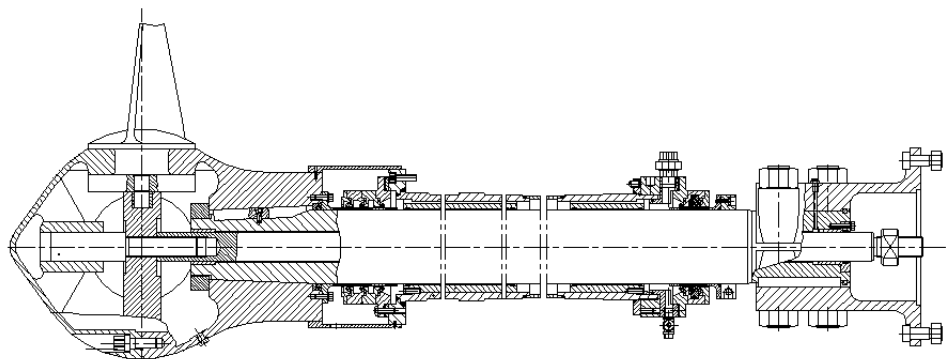
## A person to person relationship

Our organisation is flexible so responding to individual wishes is a matter of cause. And no customer needs to feel anonymous in our company.

## Survey of CP-propellers

Type	Prop.diam. Nozzle (mm)	Prop.diam. Open (mm)	Blades	Output HP/rpm	Stern-tube lubrication Grease	Stern-tube lubrication Oil
CP113	1150-1250	1200-1400	3	0,80	✓	
CP143	1200-1500	1300-1700	3	1,50	✓	✓
CP163	1700-1800	1750-1900	3	2,85	✓	✓
CP164	1300-1600	1750-1900	4	2,85	✓	✓
CP184	1900-2300	2000-2650	4	5,35		✓
CP204	2200-2600	2400-3000	4	7,35		✓

$$\text{Output} = \frac{\text{Propeller power}}{\text{Propeller rpm}}$$



Grenaa propeller system (typical lay-out)

Built into the design is reliability and repairability. All plants are engineered so that they can be reconditioned by machining and regain as-new properties. And all data of each plant is recorded at our database for future reference.

## Ease of installation

Grenaa supplies are packaged including necessary bolts, flanges and other fittings for ease of installation.

## Specialist consultancy saves fuel

Each Grenaa installation is based upon thorough analysis of the complete propulsion system in order to ensure good performance, low fuel consumption and the highest reliability. Hundred thousands litres of fuel are saved by making the right choice at the design stage.

The torsional vibration characteristics of the complete engine-gear-propeller system

are carefully analysed by computer models and matched to the strict requirements of the classification societies. Our experience as a supplier of complete propulsion plants enables us to evaluate all aspects of the total system and ensure optimum reliability.

## Classification approvals

The propeller systems are designed in compliance with the rules of the classification societies and may be supplied with classification approval or our works certificate.

## Service is part of the package

After sales service is part of our supply. We respond promptly to each inquiry for engineering assistance or spare parts. We maintain an ample stock of all standard parts even including propeller blades. Non-standard parts such as propeller shafts are produced from stocked materials and are delivered at very short notice.



## A/S GRENAA MOTORFABRIK

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# GRENAA DIESEL



## Grenaa Marine Systems

### Products to last a lifetime

For more than 80 years A/S Grenaa Motorfabrik has been manufacturing high quality marine systems. Our philosophy is to incorporate the highest reliability into the design of all equipment.

### True heavy duty equipment

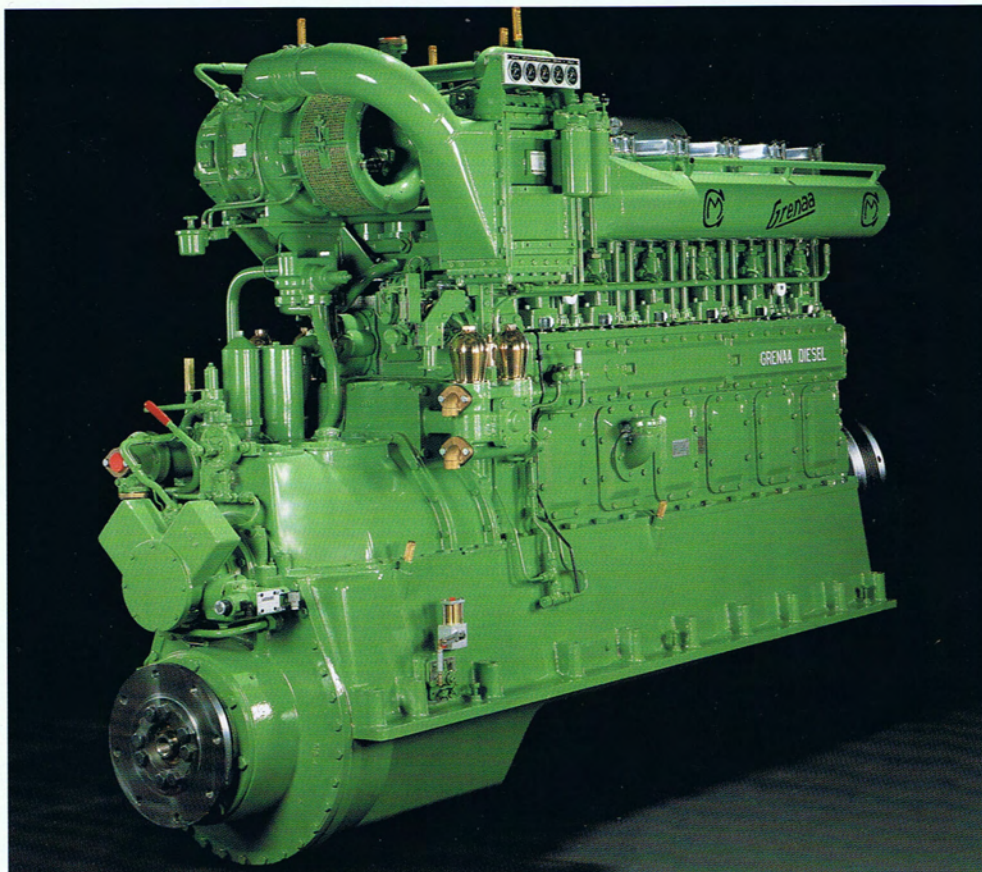
- Diesel engines
- Reduction gears
- CP-propeller systems
- Keel coolers
- Generating sets
- Full propulsion systems

Service intervals are long and all units can be cost effectively refurbished to as-new standard. Even design of new components is done bearing retrofits in mind so owners can update their equipment if desired.

We do not believe in the "use and scrap" mentality.

## GRENAA FACTORY RECONDITIONED PLANTS

Upgraded reconditioned propulsion systems



### Grenaa Diesel – a long life concept

All types of Grenaa Diesel plants are designed in a virtually everlasting quality. This is the case for our heavy duty diesels as well as for reduction gears and propeller systems. All major components are wear-free so a factory reconditioned Grenaa Diesel plant has a standard very close to as-new.

### Factory reconditioned systems – a competitive solution

A/S Grenaa Motorfabrik has for a number of years delivered factory reconditioned systems to new buildings as well as for re-powering projects.

During the reconditioning the machinery undergoes a complete dismantling, cleaning and inspection of all components. Following quality control according to factory specifications the machinery is rebuilt with new wear parts and fully tested on our test bed with participation of classification society if required.



## Based upon experience – made for the future



# GRENAA DIESEL



## At your service

Grenaa equipment is sold by reputation and we do our utmost to supply a professional engineering and spare parts service on a world wide basis.

Standard spares are stocked and non-standard parts, e.g. propeller shafts are machined immediately upon order.

## A person to person relationship

Our organisation is flexible so responding to individual wishes is a matter of course. And no customer needs to feel anonymous in our company.

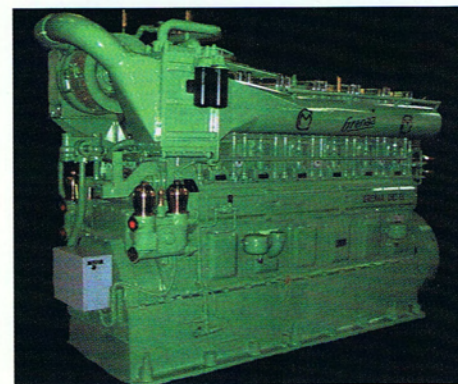
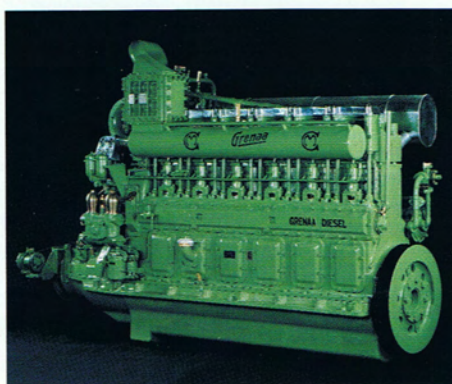
## Survey of Grenaa F24 slow speed engines

All engines are continuous heavy duty 4-stroke direct injection diesels with cylinder bore 240 mm and stroke 300 mm.

Type	RPM	HP	Turbo	Type	RPM	HP	Turbo
3F24	500	165/182	No	6FS24TKII	750	1030/1133	Yes
3F24TK	500	300/330	Yes	6FS24TK214	750	900/1000	Yes
4F24	500	220/242	No	6FS24TK264	750	900/1000	Yes
6F24	500	330/363	No	6FS24TK322	750	900/1000	Yes
6F24TK	500	600/660	Yes	6FS24TK264	750	1000/1100	Yes
6FS24TK	500	618/680	Yes	6FS24TK322	750	1000/1100	Yes
6FS24TK	700	927/1020	Yes				

Note: HP outputs are measured on the propeller.

For further technical specifications see data sheets.



The price of a reconditioned propulsion plant is about 50% of that of a new system. This makes these plants a very attractive investment.

## Upgraded and with full warranty

During the reconditioning process the Grenaa Diesels are upgraded with all the latest technology. Our clients thereby get a plant with the highest standard of efficiency and performance and a plant which fulfills all relevant requirements from classification societies, IMO and Solas.

Factory reconditioned Grenaa Diesels are covered by our full factory warranty under the same terms as apply to new units. And the life time of these plants is comparable to that of brand new equipment.

## Engines or propulsion plants

The units are supplied in 3 variants:

- 6FS: Slow- or medium-speed diesel engines without transmission and propeller system.
- 6F: Complete slow-speed propulsion systems including diesel engine with built-in transmission and CP-propeller system.
- 6FR: Complete medium-speed propulsion systems including diesel engine with built-in reduction gear and CP-propeller system.

Our experts are at disposal with calculations and analysis in order to select the optimum solution for each project.



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