

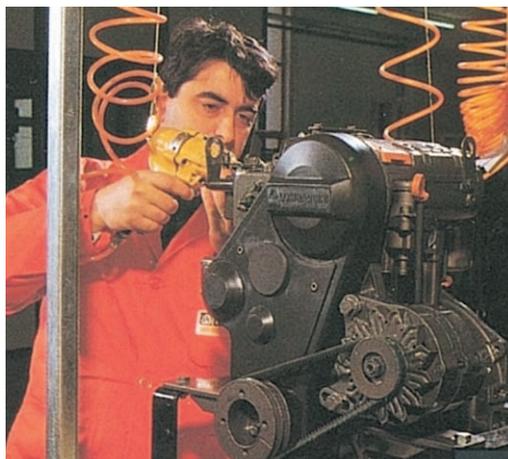


# LOMBARDINI *Marine*

# The company

Lombardini Marine, a division of the Lombardini Group, was set up with the objective of preparing and marketing engines for marine applications based on well-established and reputed FOCS and CHD families.

Lombardini Marine is a very modern structure managed by a group of persons highly experienced in the marine engine field and capable of applying to this specific sector the most advanced available technology.



# The product

This series of exceptionally light and compact engines, features very high reliability in every condition; furthermore, this specific project has been carried out in order to optimize durability and low fuel consumption without reducing the performance of the engine.

Finally, the engines fully conform to the new EC, BSO and EPA regulations on pollution and noise.

Particular attention has been paid to simplifying the installation and maintenance operations as well as the specific processes that have been applied to the metals to preserve them against the salt corrosion, which place this line of engines among the technologically most advanced ones today available.

Lombardini Marine have one of the most efficient and qualified technical assistance organizations offering a fast and highly professional service which has been developed by the Lombardini Group as a long-term commitment towards its customers.



## Technical features FOCS

### **Robustness, sturdiness and minimum weight**

The original design concept as the pearlitic grey cast iron cylinder head with integral reborable "twin" arranged liners, with cross flow intake and exhaust pipes, has allowed the reduction of the engine length assuring at the same time an exceptional sturdiness. The LDW 502 M, which has been built with an aluminium engine block and reborable liners is the lightest of the FOCS series.

### **Low noise**

Excellent results have been obtained in reducing noise emission thanks to the location of the injection system in the cylinder head, to a ribbing system along all the engine structure and to the complete absence of gears.

The overhead camshaft is driven through a cogged belt, especially designed for heavy duty applications to ensure longevity of belt life.

The lubrication system is fed by a "gerotor" oil pump driven directly by the crankshaft.

### **High performances**

The utilization of newly developed and "Lombardini patented" pump-injector units, in place of a conventional system, incorporating separate fuel injection pumps and injectors, allows the elimination of fuel pipes and consequently provides a better injection timing with the result of great performance advantages.

### **Low exhaust emissions**

The "Lombardini patented" injection system has been tested for exhaust emission levels to the lowest limits. FOCS engines achieved high acclaim with regard to exhaust emissions being well below the EEC requirements.

### **Absence of vibrations**

The very accurate balancing of the moving components together with optimum combustion allows low vibration levels at all engine speeds.

### **Low servicing costs**

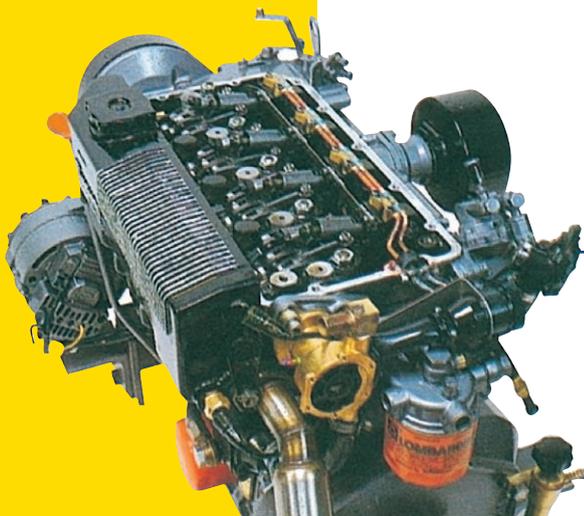
Components subject more frequent checking are located in the upper part of the engine, just under the cover. This allows easy and low cost equipment maintenance.



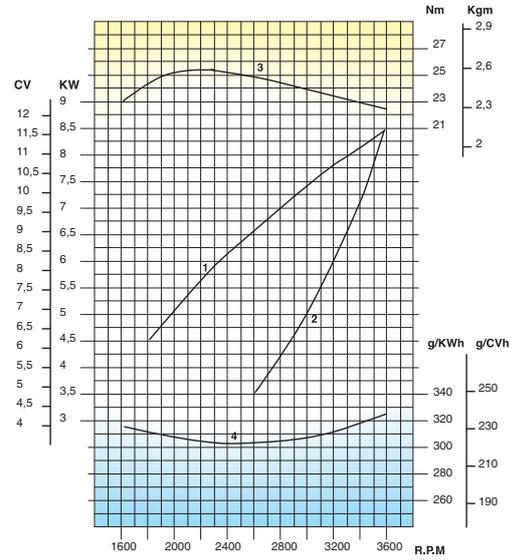
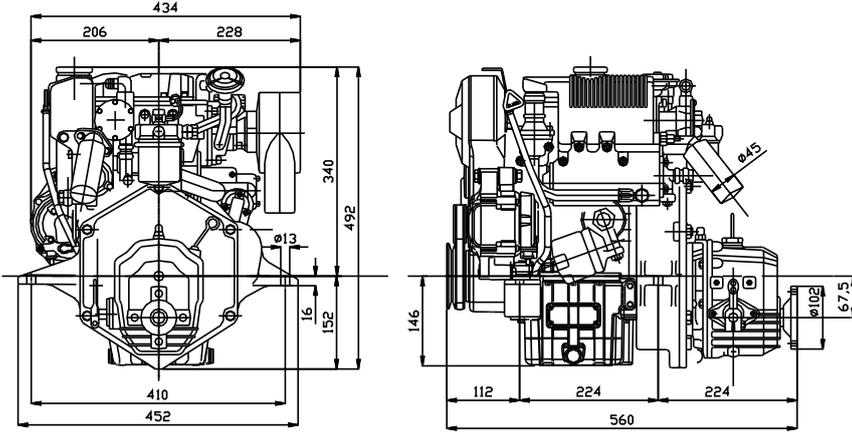
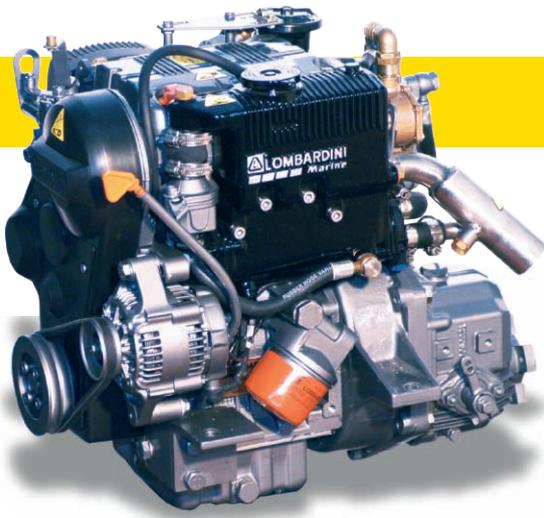
# FOCS project

Fully overhead controlling system

4 stroke diesel engines, fresh water cooled via heat exchanger, complete with zinc anode protection; cast-iron engine block (aluminium for LDW 502 M); reborable liners; one piece aluminium cylinder head; indirect injection with unit injector pump in the cylinder head; overhead camshaft with timing belt; vane type lubrication pump on crankshaft; fresh water cooling pump in the engine block; stainless steel water injected exhaust elbow; self-priming sea water pump; air filter; anti-corrosion surface treatment.

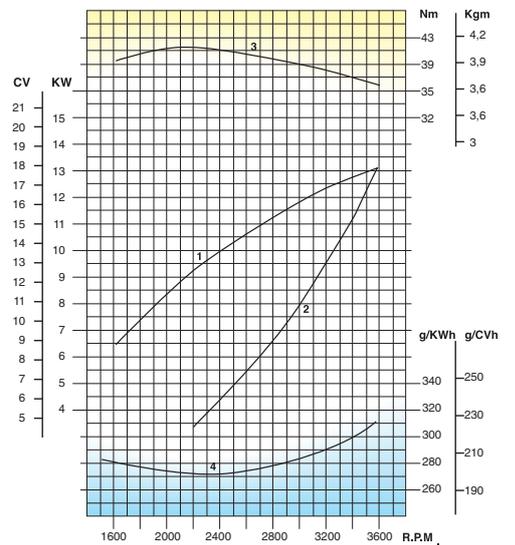
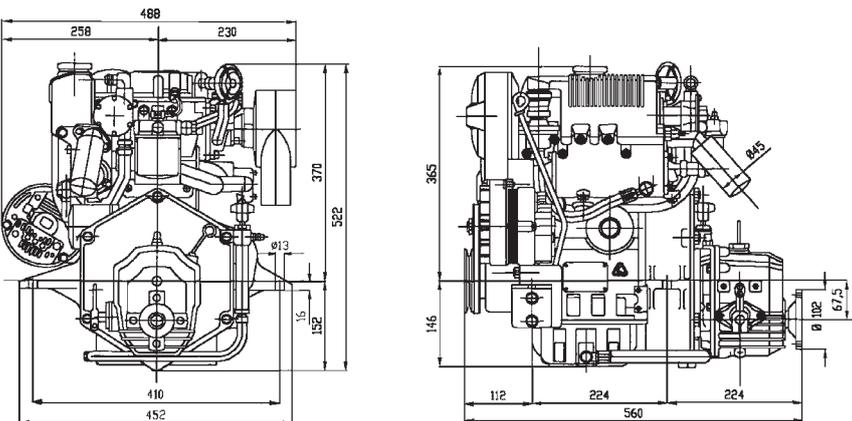


# LDW 502 M



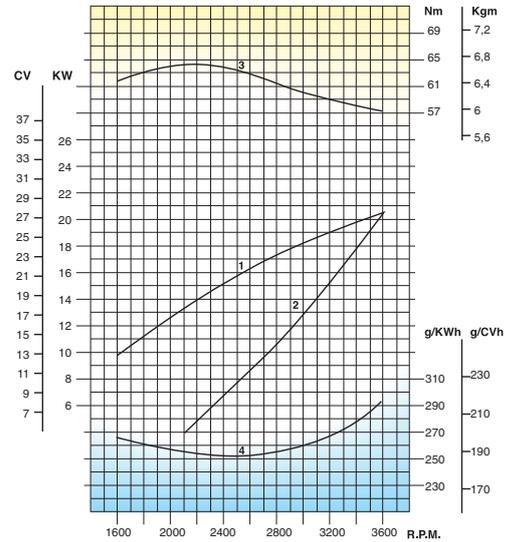
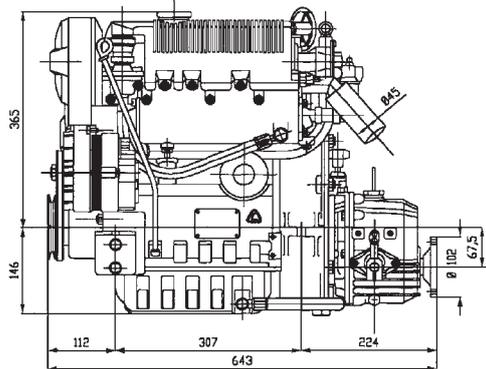
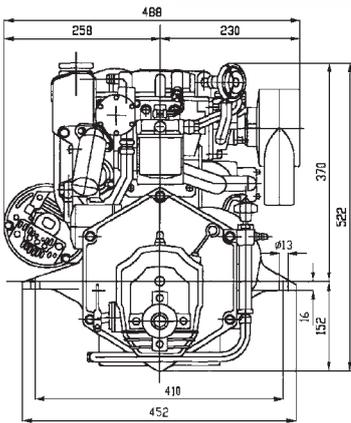
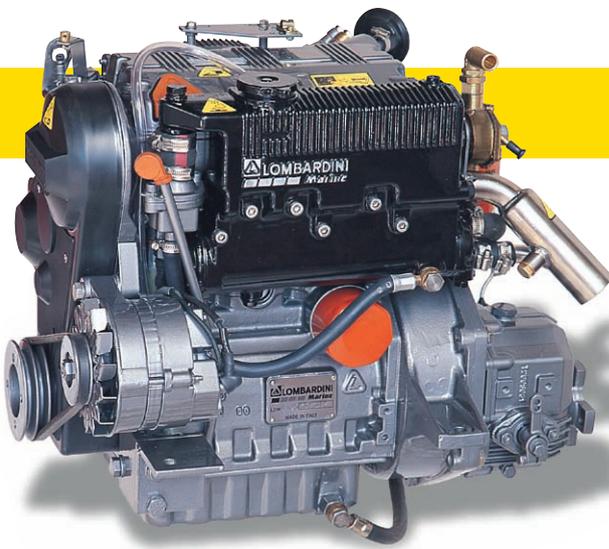
BSO, EPA 2006 and EU compliant

# LDW 702 M



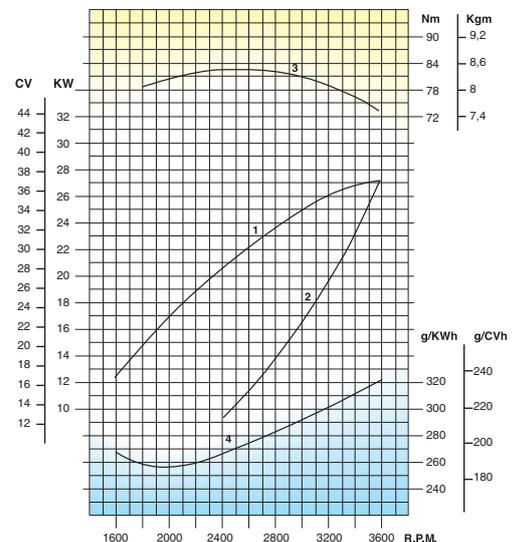
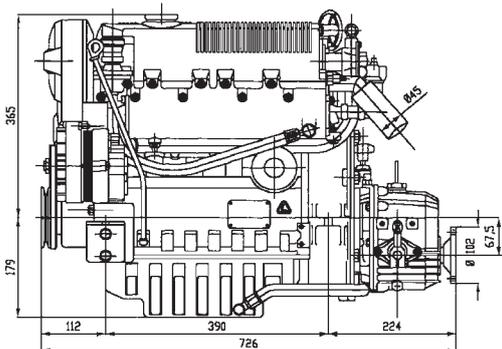
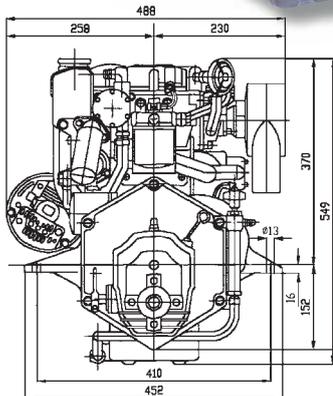
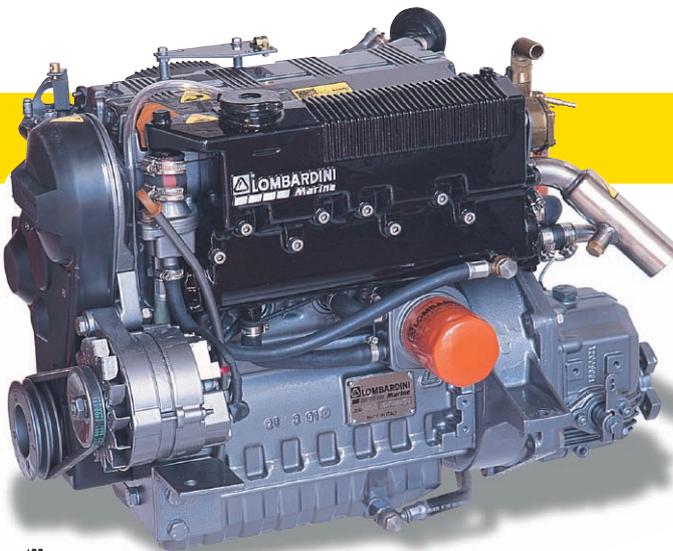
BSO, EPA 2006 and EU compliant

# LDW 1003 M



BSO, EPA 2006 and EU compliant

# LDW 1404 M



BSO, EPA 2006 and EU compliant

### Performances curves

- 1. Power at propeller shaft
- 2. Propeller demand curve
- 3. Maximum torque
- 4. Fuel consumption

Rating refers to engine after running in with reversing gear, air cleaner and water injected stainless steel exhaust elbow under environment conditions of 20°C. Max. rating certified within 5%. Derating 1% approx. every 100 mt. altitude and 2% approx. every 5°C beyond 20°C.

## Technical features CHD

### Dimensions

The camshaft is located in the upper part of the crankcase to allow a reduced width in the lower area of the engine.

The innovative design of the gear train, the injection system design and location, and the reduced cylinder pitch, shorten the engine length.

### Operational comfort

The special crankshaft balancing gives exceptional low vibrations and ensures an excellent operational performance during use.

### Reduction in noise emission

The innovative design of the fuel injection system, as well as the utilization of hyper-eutectic pistons which reduce piston slap, and the utilization of a heavy-duty block, assist in greatly reducing noise levels that are normally associated with diesel engines.

### Performance

The QLC pump, offers high performances on all engine speed. Compared to the conventional injection pump, QLC features a one way flow and a unique delivery fuel system that prevents unwanted variations on injection pressure and timing, eliminating gas bubbles.

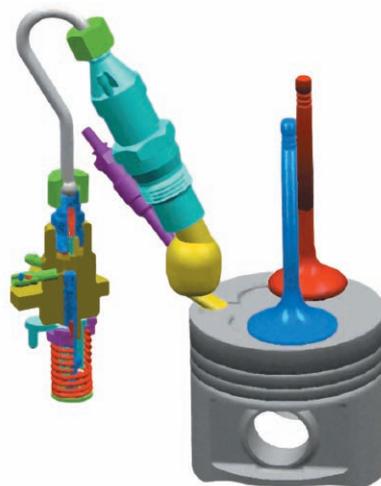
### Environmental behaviour

This line of engines, due to their advanced design of the injection and combustion systems results in improved environmental behaviour in conformity with expected pollution limits.

These exhaust emissions and the engines performances are checked with dedicated test rigs on 100% of the Lombardini Marine production.

### Easy maintenance

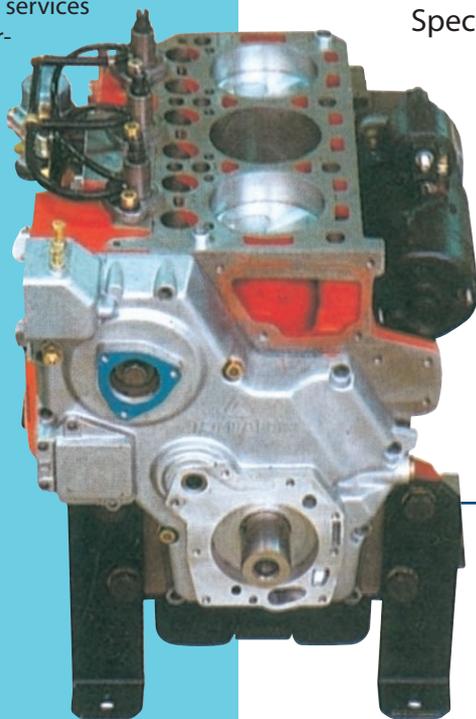
All maintenance operations are made easier due to the simple construction of the product. Also for maintenance of the QLC pump it is not strictly necessary to involve the services of a pump specialist, but the servicing of parts can be completed by any qualified workshop.



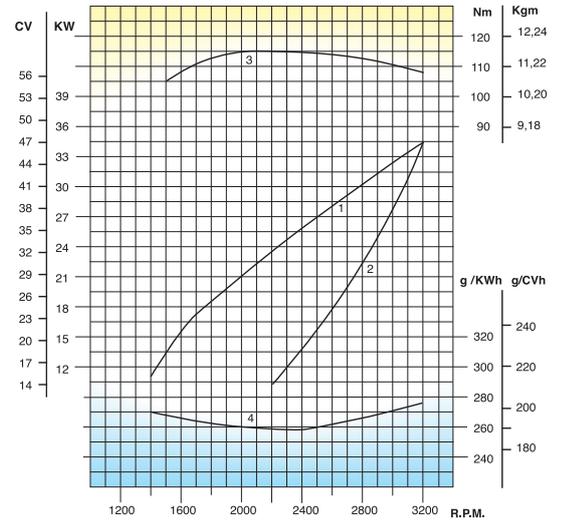
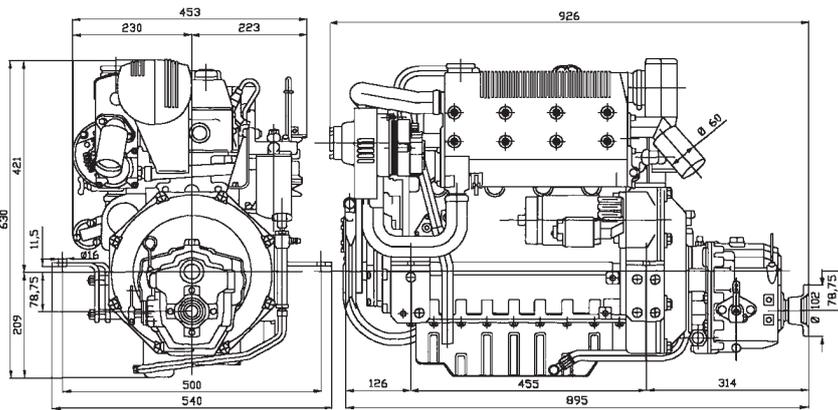
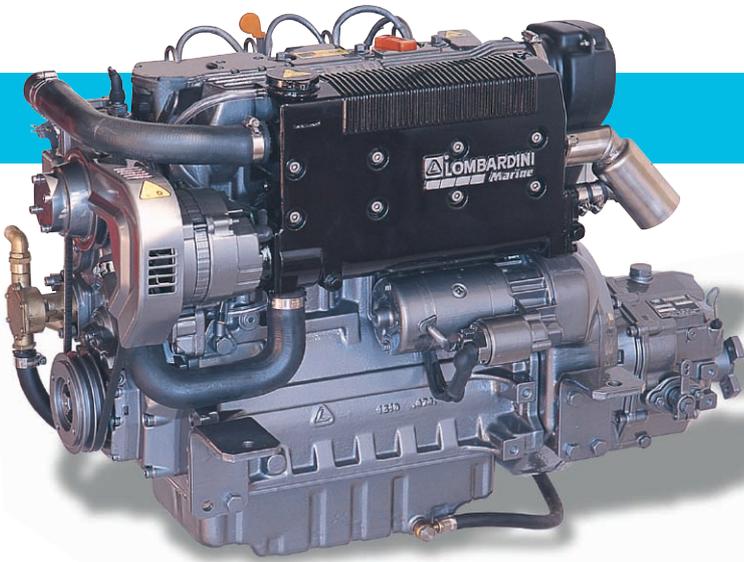
# CHD project

Compact heavy duty

4 stroke diesel engines, fresh water cooled via heat exchanger with zinc anode protection; cast-iron engine block; one piece cast-iron cylinder head, reborable liners; indirect injection; gear driven single shaft with push rod valve operation; hydraulic tappet; crankshaft mounted vane type lubrication pump; water injected stainless steel exhaust elbow; self-priming sea water pump; air filter. Special anti-corrosion treatment.

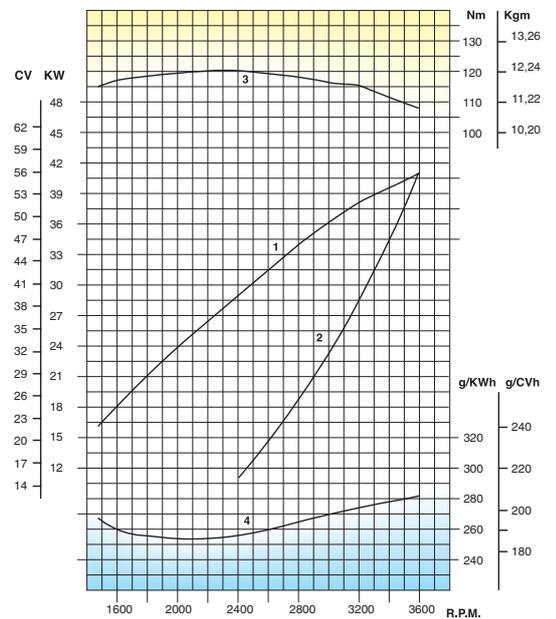
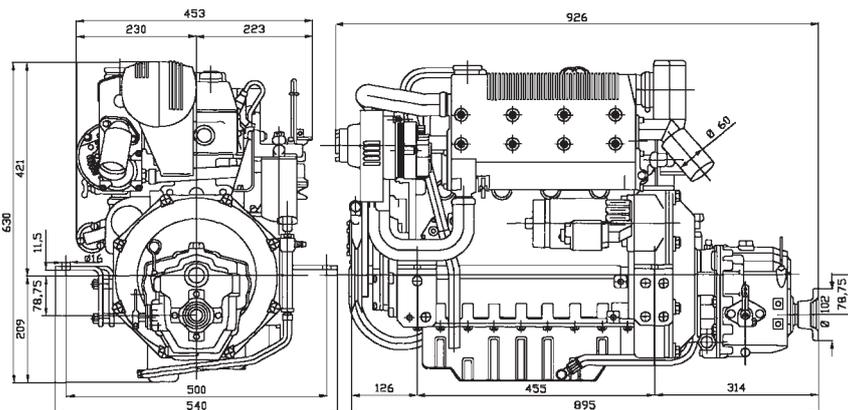
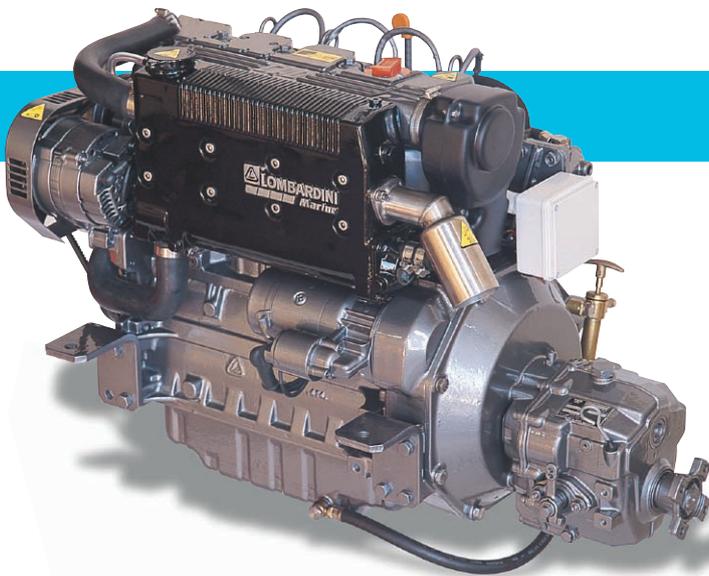


# LDW 1904 M



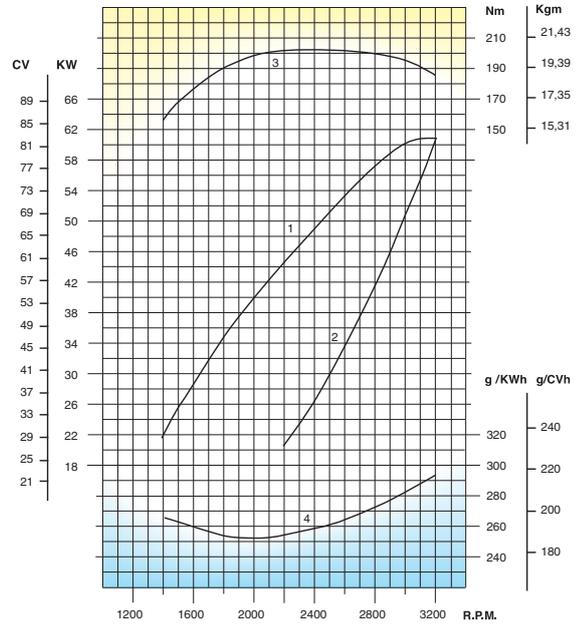
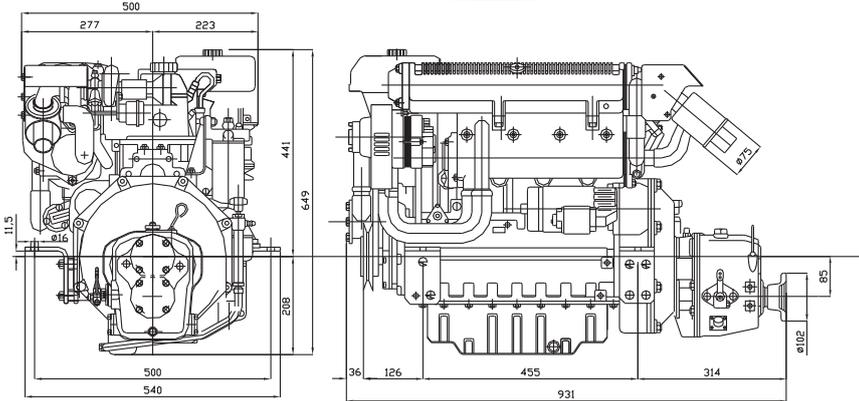
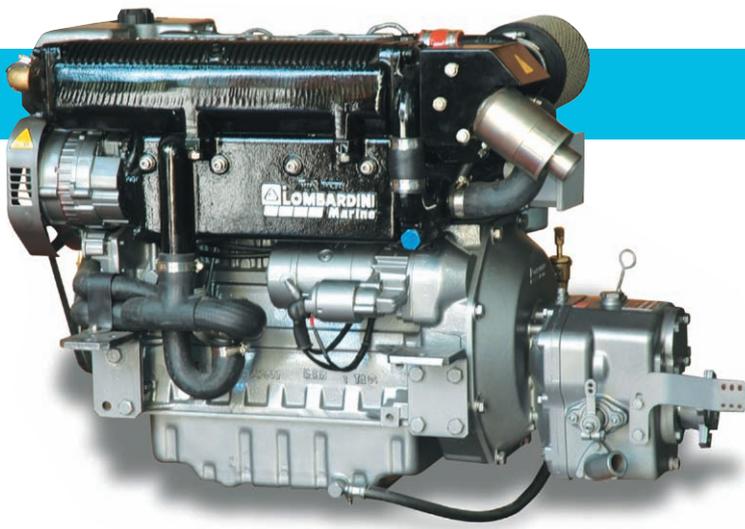
BSO and EU compliant

# LDW 2204 M



BSO, EPA 2006 and EU compliant

# LDW 2204 MT



BSO and EU compliant

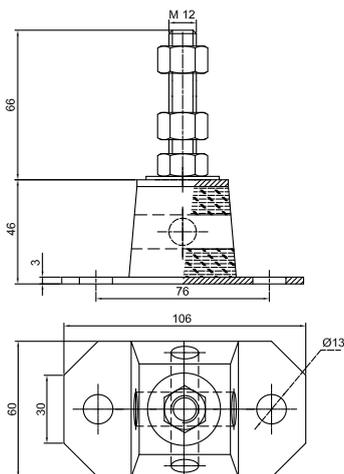
## Performances curves

1. Power at propeller shaft
2. Propeller demand curve
3. Maximum torque
4. Fuel consumption

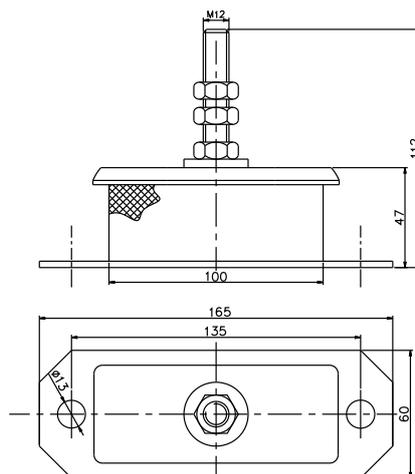
Rating refers to engine after running in with reversing gear, air cleaner and water injected stainless steel exhaust elbow under environment conditions of 20°C. Max. rating certified within 5%. Derating 1% approx. every 100 mt. altitude and 2% approx. every 5°C beyond 20°C.

# Accessories

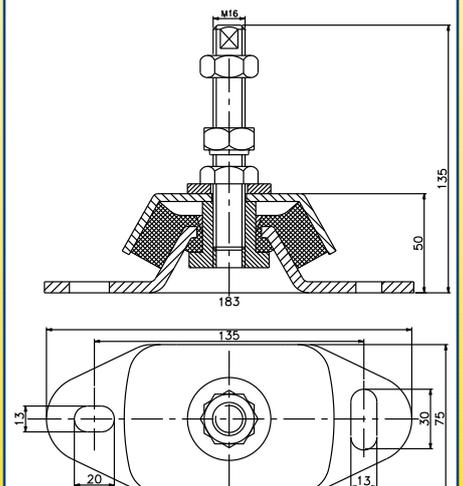
Rubber mounts for:  
LDW 502 M



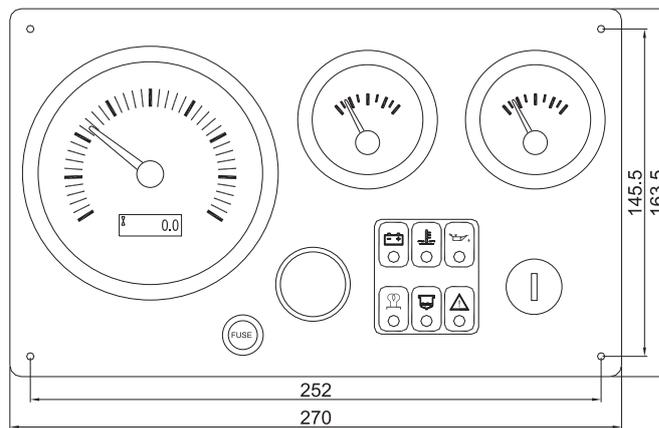
Rubber mounts for:  
LDW 702 M - LDW 1003 M - LDW 1404 M



Rubber mounts for:  
LDW 1904 M - LDW 2204 M - LDW 2204 MT

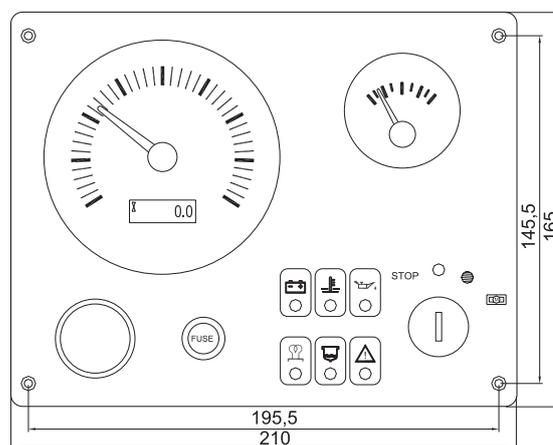


### De Luxe Maxi instrument panel



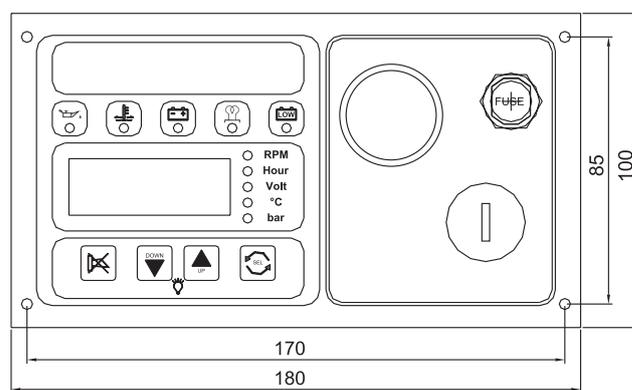
Key, start button, acoustic alarm, analogue instruments (revolution counter, water temperature, oil pressure), LCD display alternating voltmeter and hour counter, warning lamps (oil pressure, water temperature, alternator charger, glow plugs, water presence in the fuel, generic alarm), fuse.

### De Luxe instrument panel



Key, start button, acoustic alarm, analogue instruments (revolution counter, water temperature), LCD display alternating voltmeter and hour counter, warning lamps (oil pressure, water temperature, alternator charger, glow plugs, water presence in the fuel, generic alarm), fuse.

### Standard Plus digital instrument panel



Key, start button, acoustic alarm, digital indicator (rpm counter, hour counter, water temperature, voltmeter), warning lamps (oil pressure, water temperature, alternator, glow plugs, low battery voltage), fuse.

# Specifications

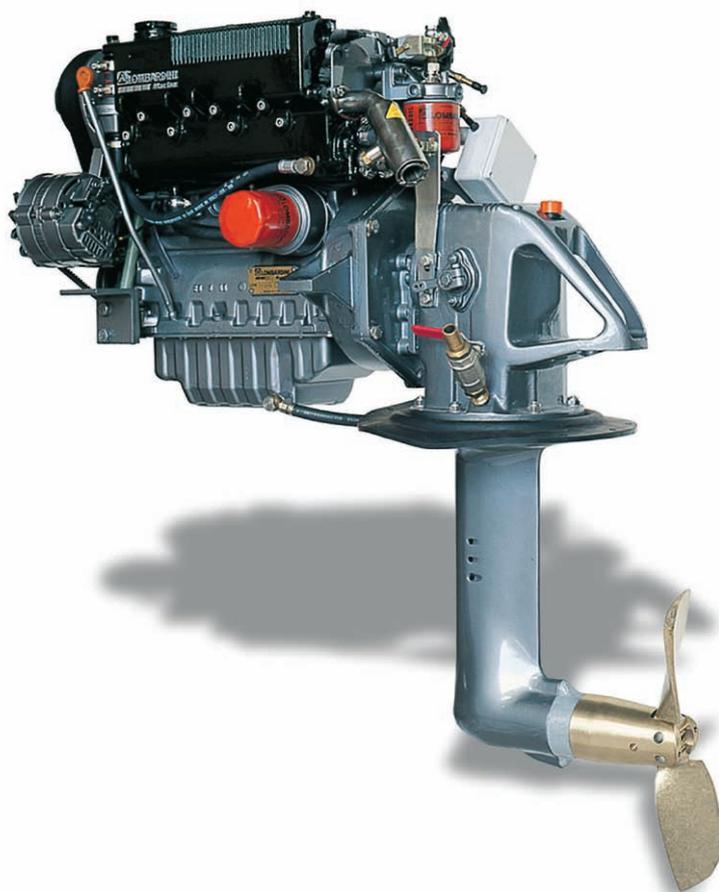
			LDW 502 M	LDW 702 M	LDW 1003 M	LDW 1404 M	LDW 1904 M	LDW 2204 M	LDW 2204 MT
Cylinders			2	2	3	4	4	4	4
Bore & stroke			72x62	75x77,6	75x77,6	75x77,6	88x82	88x90,4	88x90,4
Displacement cm <sup>3</sup>			505	686	1028	1372	1995	2199	2199
Power	Max	HP	13	20	30	40	50	60	87
		KW	9,5	14,7	22,1	29,4	36,8	44	64
	At the prop. shaft	HP	11,5	18	28	37	47	57	83
		KW	8,5	13,2	20,6	27,2	34,6	42	61
RPM			3600	3600	3600	3600	3200	3600	3200
Compression ratio			22,3:1	22,8:1	22,8:1	22,8:1	22:1	22:1	22:1
Weight kgs (dry)			82*	99*	115*	133*	230**	232**	253***
Height mm			492	522	522	549	630	630	649
Width mm			452	488	488	488	540	540	540
Length mm		*	-	553	636	778	895	895	982
		▲	560*	560*	643*	726*	926**	926**	931***

- \* with ZF-MARINE reversing gear
- ▲ with TECHNODRIVE reversing gear
- with TECHNODRIVE TMC 40 reversing gear
- \*\* with TECHNODRIVE TMC 60 reversing gear
- \*\*\* with TECHNODRIVE TMC 260 reversing gear

## Standard equipment on inboard engines

12V electric starter; 120A alternator (exception of LDW 502M with 40A alternator); sea water pump; fuel lift pump; sump oil extraction pump (exception of LDW 502M); dry air filter; fuel filter; 2:1 ratio for right hand rotation mechanical reversing gear (on request hydraulic for CHD series), further ratios available on request; cable end fittings for throttle, gear and engine stop; Standard Plus digital instrument panel (except for LDW 2204MT supplied with De Luxe instrument panel); 5 meters loom; tool kit; use and maintenance booklet.

## Transmission S-Drive

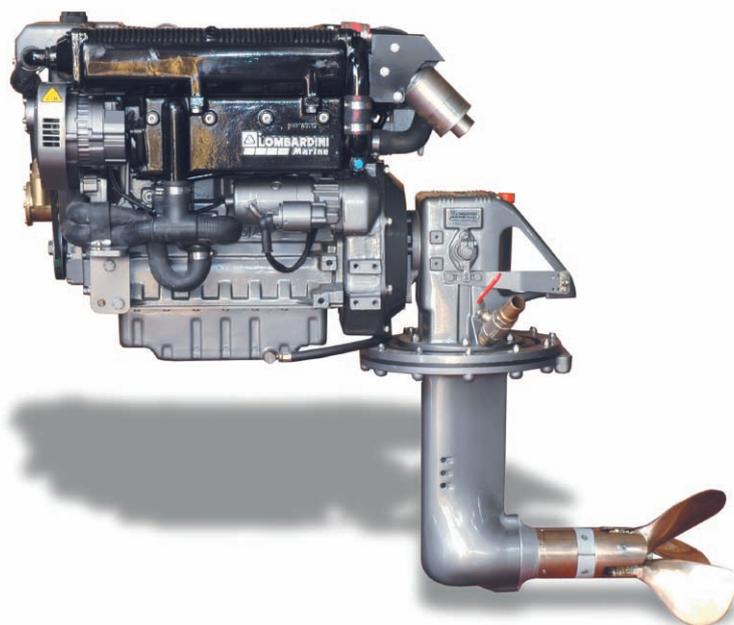


# S-DRIVE Project

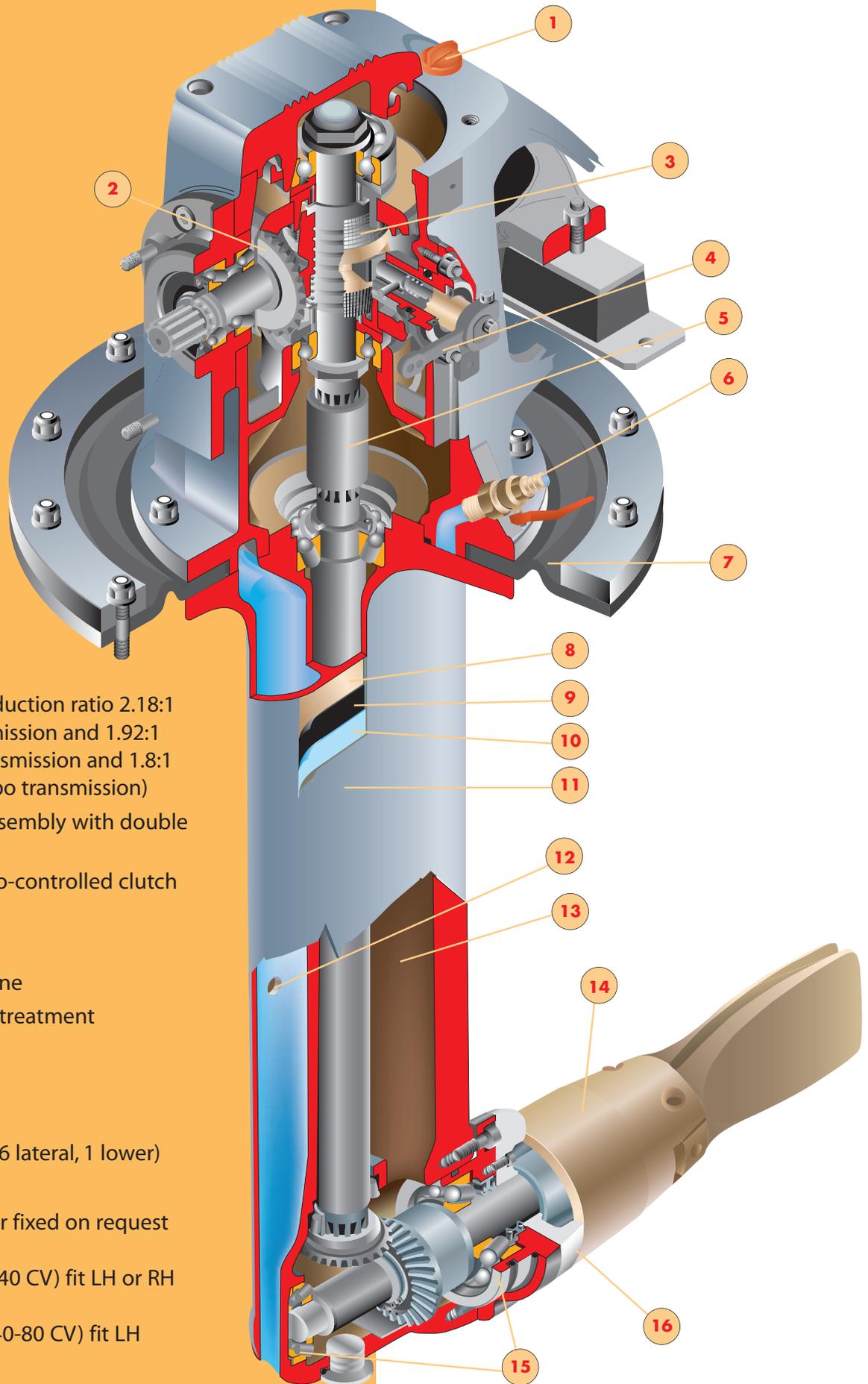
The Lombardini Marine S-Drive transmission (10÷40 cv) and S-Drive M transmission (40÷80 cv) have been developed from our experience gained from years of sailboat racing.

This experience in collaboration with many professional skippers helped us to devise two transmissions featuring the essential requirements of sturdiness and reliability whilst, at the same time, offering the minimum water resistance during sailing.

## Transmission S-Drive M



# Technical data

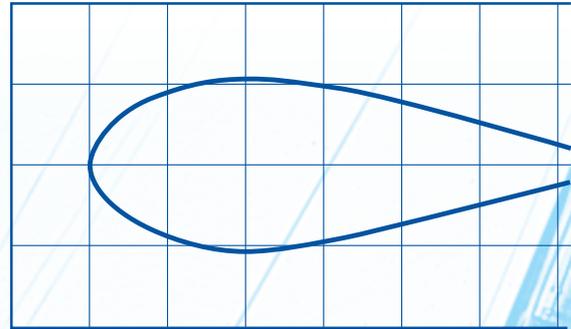


- 1 Oil Filler Cap
- 2 Helical gears (reduction ratio 2.18:1 in S-Drive transmission and 1.92:1 in S-Drive M transmission and 1.8:1 in S-Drive M Turbo transmission)
- 3 Bronze clutch assembly with double cone
- 4 Mechanical servo-controlled clutch
- 5 Coupling
- 6 Sea cock
- 7 Rubber membrane
- 8 Electrochemical treatment
- 9 Electroplating
- 10 Epoxy paint
- 11 Marine paint
- 12 Seawater inlets (6 lateral, 1 lower)
- 13 Oil reservoir
- 14 Folding blades or fixed on request propeller:
  - for S-Drive (10-40 CV) fit LH or RH propeller
  - for S-Drive M (40-80 CV) fit LH propeller
- 15 Thrust bearings
- 16 Zinc anode

# An edge to cut the sea

The shape of the submerged part of drive has been evolved to incorporate an excellent hydrodynamic profile with an extremely low drag coefficient, where the drive's section and chord are reduced to the minimum, for optimum boat speeds between 4 and 12 knots.

The axial thrust is handled by a special conical bearing arrangement. To make the installation easier, the drive has its own built-in sea water inlet and is supplied with a sea cock.



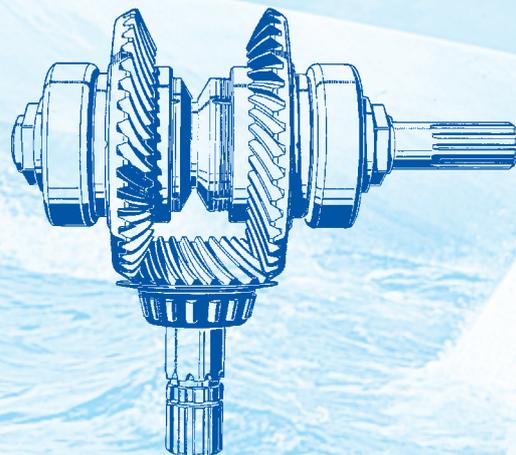
## Reversing gear: safety and reliability

The clutch assembly has been developed to ensure soft and precise gear engagement. A technologically advanced metal-spray surface treatment on the bronze clutch cone allows the oil to drain quickly from the clutch when maneuvering, ensuring smooth, positive shifts.

## Gears:

technology of the future  
for improved comfort

Particular attention has been paid to the design of the gear teeth since mechanical noise mostly depends on the profile of the gears adopted. Conical gears with helical teeth incorporating a special involute shape, which allows continuous contact between the gear tooth surfaces, reduce gear noise. The GLEASON method is used during manufacture to guarantee minimum tolerances on the special alloy steel teeth, which are carburized and hardened for maximum life.



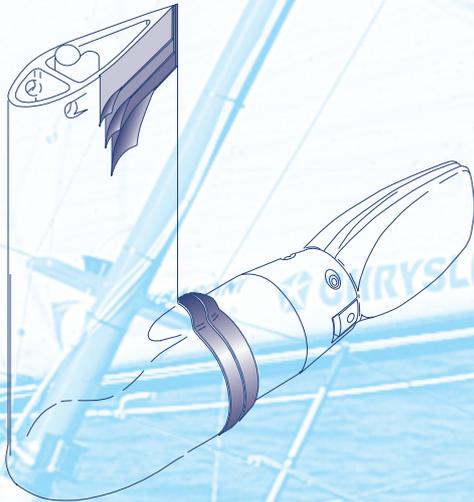
# Lubrication

Lubrication throughout both the upper gear mechanism and the lower part of the drive is assured by utilizing a single oil path.

The oil is circulated by the pumping effect of the special gear profile.

The large capacity of the oil sump in the drive allows longer intervals between servicing.

Oil cooling is assured by the contact of the drive with the sea water.

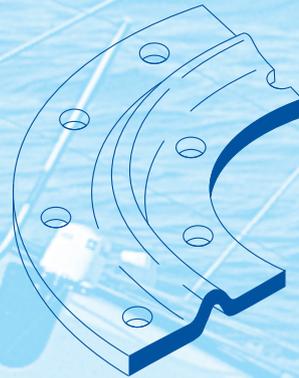


# Protection against corrosion and galvanic action

The drive is protected against corrosion by the use of a special aluminium alloy with a reduced copper content and stainless steel is employed for all shafts, nuts and bolts. Two electrochemical treatments, before and after machining, followed by an electro-deposition paint process and two coats of special marine paint protect the external surfaces. An extra large zinc, directly mounted on the drive provides protection against galvanic corrosion.

# Sealing membrane: reliability and sailing pleasure

The sealing gasket is made from a special rubber resistant to both hydrocarbons and sea water. Its special shape in combination with the strength of the rubber ensure maximum life and durability and allows the drive to move independently from the hull, which promotes a pleasant sailing with no vibration being transmitted to the boat.

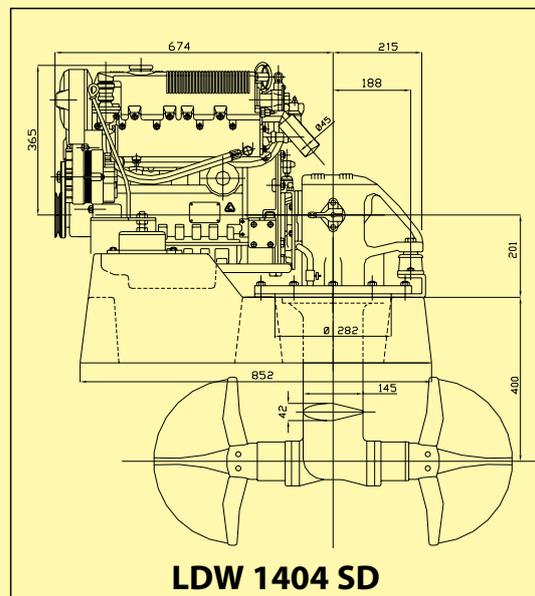
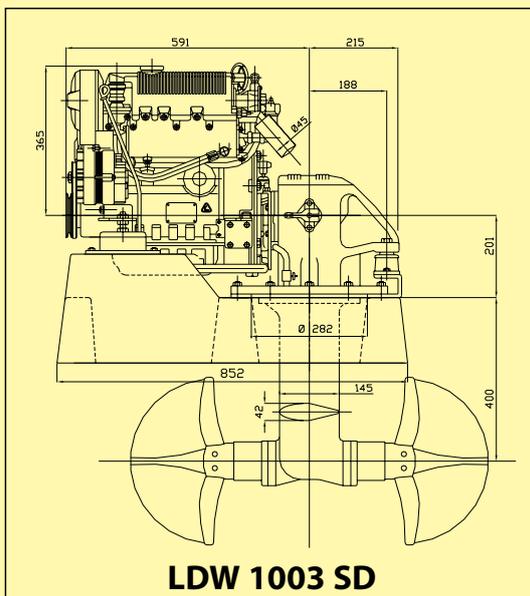
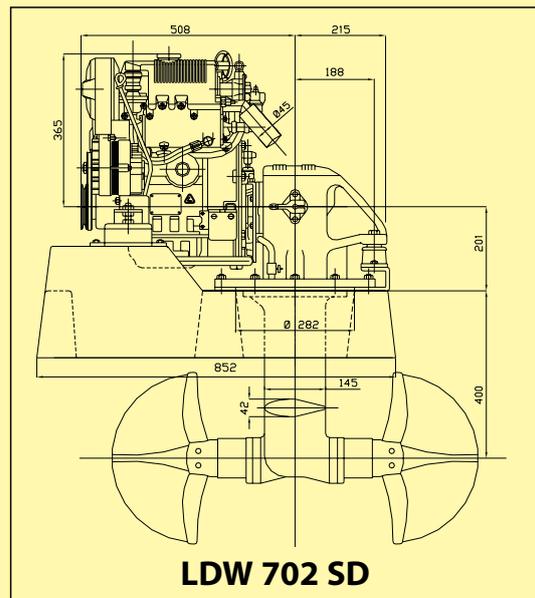
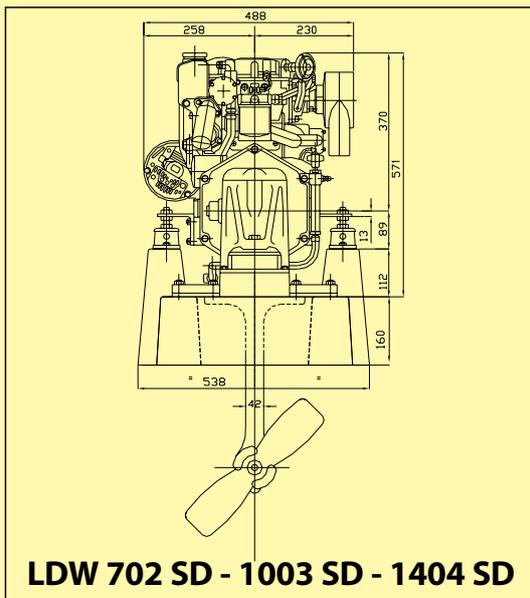
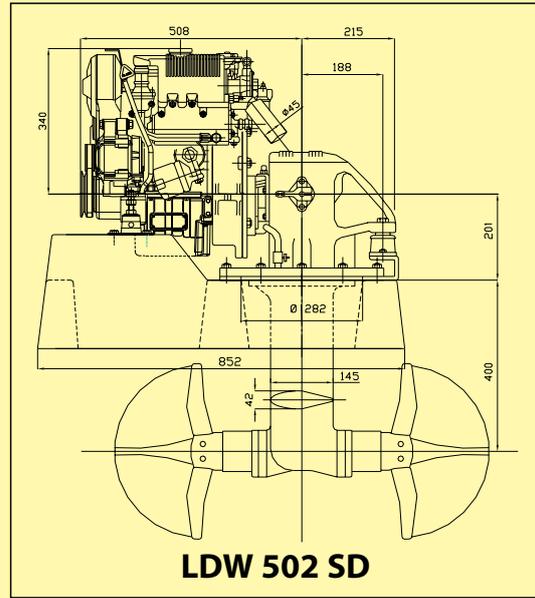
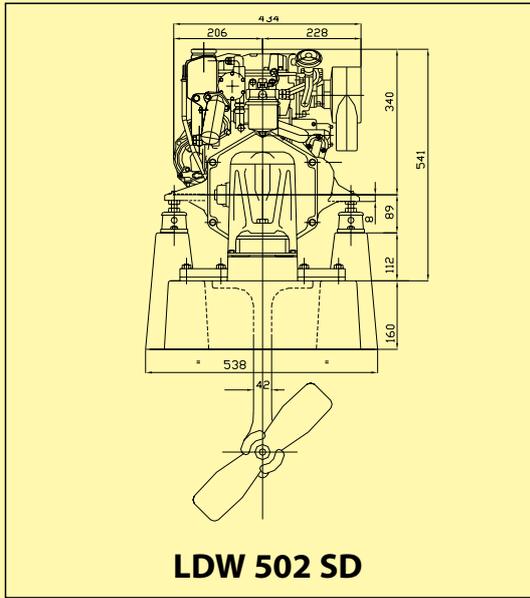


# Weight

Particular attention has been taken with regard to weight reduction, in anticipation of applications on board racing boats; reinforcement ribs have been employed to increase the mechanical strength of the drive housing without reducing reliability.

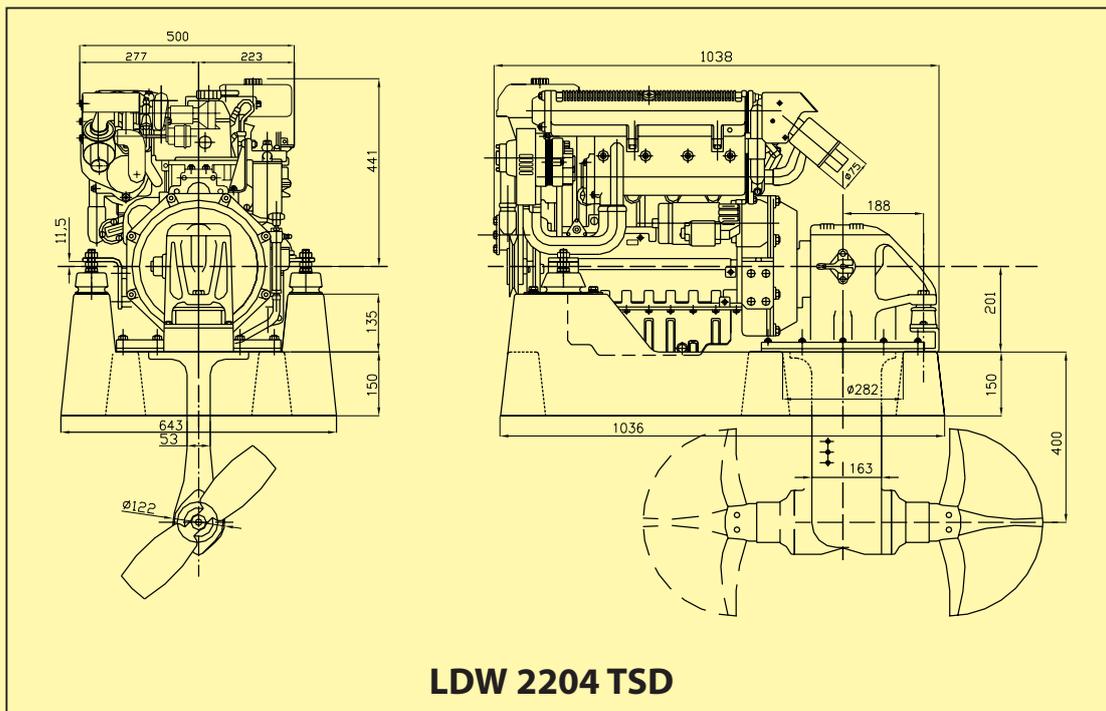
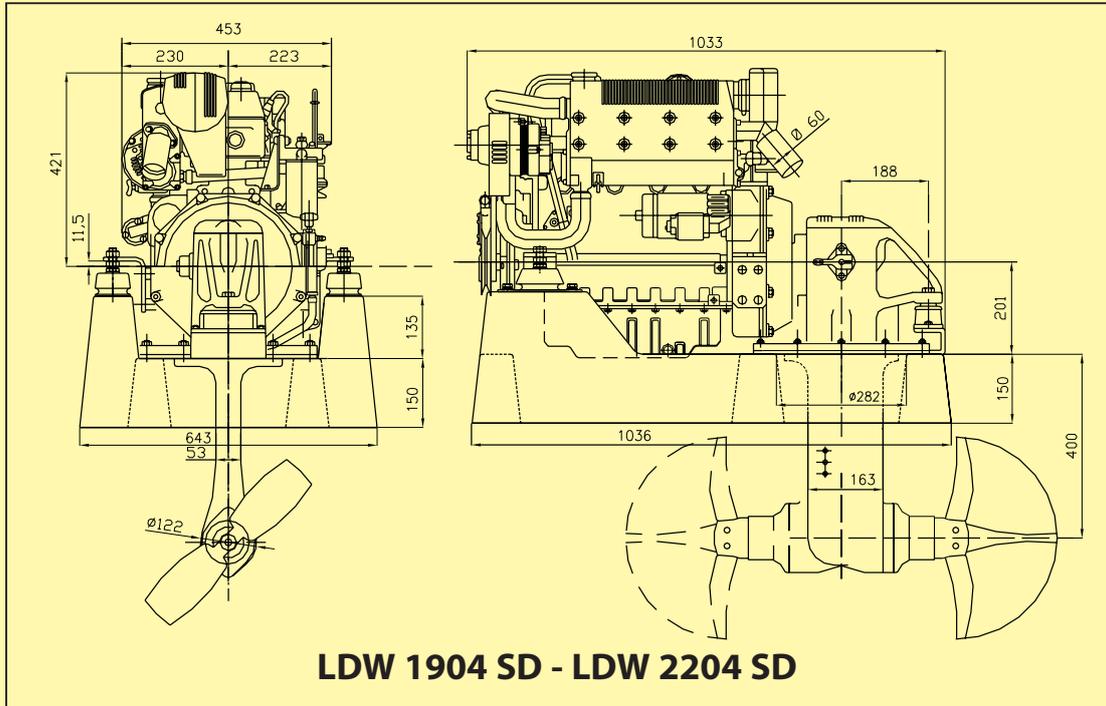
# Overall dimensions

## FOCS engines with S-Drive transmission



# Overall dimensions

## CHD engines with S-Drive M transmission



# Specifications

## S-Drive transmission

			LDW 502 SD	LDW 702 SD	LDW 1003 SD	LDW 1404 SD	LDW 1904 SD	LDW 2204 SD	LDW 2204 TSD
Cylinders			2	2	3	4	4	4	4
Bore & stroke			72x62	75x77,6	75x77,6	75x77,6	88x82	88x90,4	88x90,4
Displacement cm <sup>3</sup>			505	686	1028	1372	1995	2199	2199
Power	Max	HP	13	20	30	40	50	60	84
		KW	9,5	14,7	22,1	29,4	36,8	44	61,8
	At the prop. shaft	HP	11,5	18	28	37	47	57	80
		KW	8,5	13,2	20,6	27,2	34,6	42	59
RPM			3600	3600	3600	3600	3200	3600	3200
Weight kgs (dry)			108	125	141	160	257	257	278







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CEE code: IT 01829970357

Factory reserves the right to alter specifications  
without prior notice.

