

# VOLVO PENTA IPS INBOARD PERFORMANCE SYSTEM IPS 400/500

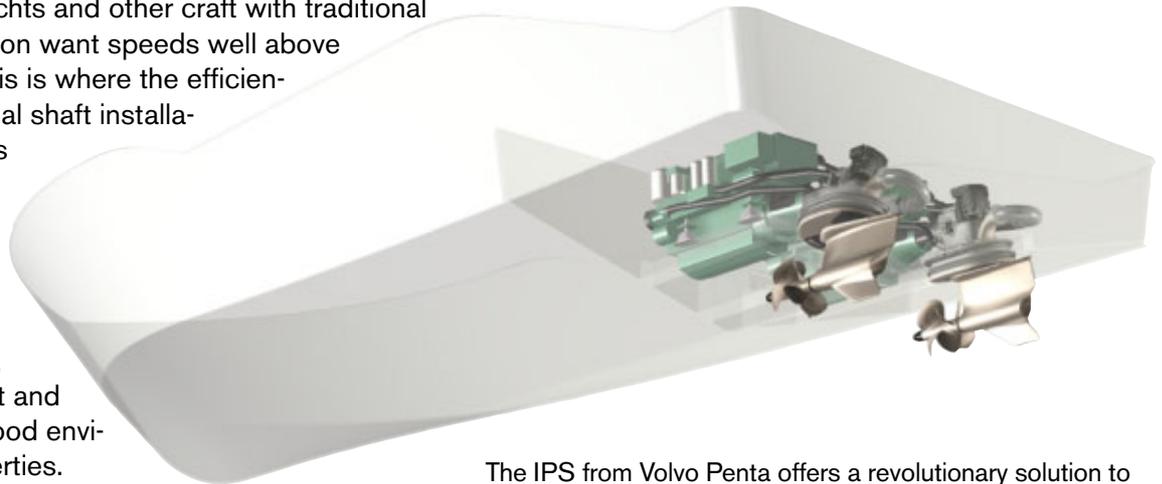
228/272 kW (310/370 hp) crankshaft power acc. to ISO 8665

**NEW!**

## A revolutionary marine propulsion system

There is an ever-increasing demand for higher speed, improved handling, enhanced onboard comfort and reduced emissions. Buyers of sports cruisers, sport fishing, flybridge yachts and other craft with traditional inboard propulsion want speeds well above 30 knots. But this is where the efficiency of conventional shaft installations really starts to drop.

Something new is required to combine performance for driving pleasure, onboard comfort and reliability with good environmental properties.



### Volvo Penta IPS overview

We are now responding to the demand with the introduction of **IPS – Inboard Performance System**.

IPS is setting a new standard:

- Much improved efficiency, higher top speed, reduced fuel consumption/extended range, and great acceleration
- Low-speed maneuvering is easier than ever before, and high speed handling is a dream
- Onboard comfort is greatly enhanced thanks to much lower levels of sound and vibrations
- Installation is greatly simplified
- More space available for accommodation
- Improved safety and quality
- Ease of service, and a complete system supported by one supplier
- Improved overall environmental care

All this is combined with the usual benefits of a traditional inboard such as a robust, high strength construction, excellent corrosion resistance and the propellers under the hull.

### Efficiency and performance

Around 30 knots, the conventional propeller shaft system starts to lose efficiency (see the lower curve in below diagram). Low efficiency means that more installed power is needed, which, in turn, results in increased fuel consumption, reduced cruising range and more exhaust emissions.

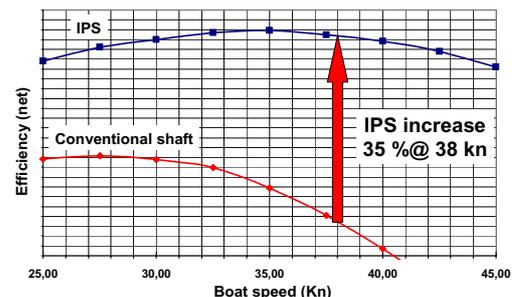
The IPS from Volvo Penta offers a revolutionary solution to this, with outstanding efficiency over the whole speed range 25–45 knots (see the upper curve in below diagram).

IPS has as much as 35 % better efficiency at 38 knots. This means that engine power is transmitted much more efficiently into the water resulting in:

- Increased speed
- Reduced fuel consumption
- Faster acceleration
- Less emissions per nautical mile

In a comparison between two identical boats with the same installed diesel power we have achieved 6 knots faster top speed with IPS, a reduced fuel consumption at 30 knots cruise by > 30 % (from 140 l/h (37 US gal/h) down to 95 l/h (25 US gal/h)), and, finally, an improved acceleration by 15 % quicker out of the hole.

Because of this superior efficiency, the product designations 400 and 500 communicate performance level compared to a conventional shaft installation.



**VOLVO  
PENTA**

# IPS 400/500

## Why is IPS so superior?

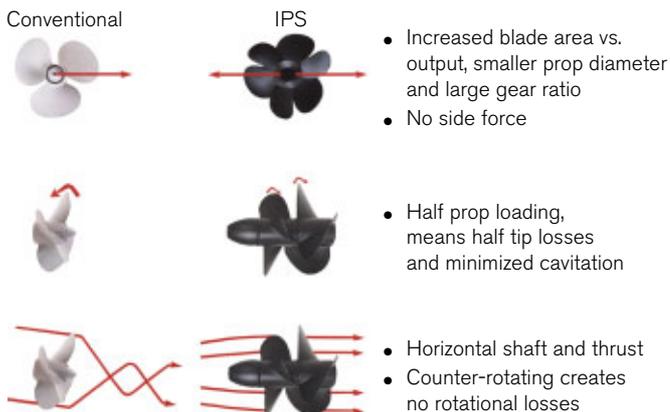
Part of the improvement in efficiency is due to the fact that the IPS system has a state-of-the-art engine – the Volvo Penta D6 – but almost all is due to the IPS propulsion unit. If we look at what happens beneath the surface, we get the explanation:

- IPS patented propellers means increased blade area, half the load on each propeller, and smaller propeller diameter with minimized tip losses and cavitation.
- Furthermore, the propeller system prevents rotational losses and does not create any side forces.
- The thrust the propellers produce is horizontal with all the force driving the boat forward.
- The propellers are at the front of the IPS unit, working in undisturbed water with a minimum of pressure pulses affecting the hull.

A conventional shaft system loses efficiency with the thrust angled downward and the propellers working in water disturbed by the propeller bracket and shaft.

Selecting propellers is also very easy, since Volvo Penta provides optimized gear ratios and a complete and systematic series of propellers developed for the IPS system.

## Volvo Penta IPS propeller advantages



## Maneuvering and handling

Maneuvering, handling and driving pleasure is where IPS truly sets a completely new standard. Forget everything you know about complicated docking maneuvers – with IPS it is easy and safe even with one engine. At higher speeds you will enjoy immediate response to driver commands with safe and predictable handling. Driving the boat is both safe and fun!

The reason for this amazing maneuverability is:

- The IPS units are steerable, turning and pointing the entire thrust in the desired direction. This results in much higher efficiency and far greater response to driver commands.
- Two counter-rotating propellers on each propulsion unit means that there are no lateral forces to consider and that tracking is completely straight.

- Electronic controls give a distinct and precise feeling, and shifting is immediate. Thanks to the progressive electronic steering, the wheel spins easier at low speed, further reducing driver effort.

## Comfort

Onboard comfort is one of the main factors for boating enjoyment. Minimal amounts of sound, vibration and exhaust fumes make life aboard that much more pleasant. IPS new technology leads to major improvements for all comfort enhancing factors.

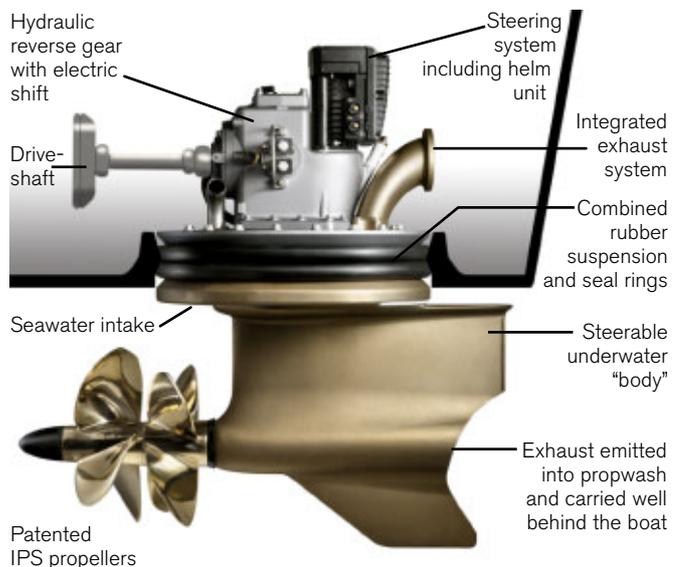
- The propulsion forces and vibrations are absorbed by the combined rubber suspension and sealing.
- A U-joint in the drive shaft makes it possible to have the engine soft suspended, which efficiently reduces engine vibrations.
- The propellers are working in undisturbed water with no cavitation, and have good clearance from the hull.
- There is an increased number of propeller blades to distribute the forces. This means that the pressure pulses created by the propellers have very little effect on the hull.
- Exhaust fumes are truly minimized. First of all, the new engine has very low exhaust emissions, and secondly, the exhausts are emitted through the propulsion unit into the prop wash and carried well behind the boat.

A sound test has been carried out with two identical boats, one with IPS and one with conventional shaft system

- sound aboard the IPS boat was much lower, reduced by up to 50 %.

## Installation

### “All included” in a robust design



The IPS has been developed and is manufactured as a complete system with everything included – engine, propulsion unit incl. gear box, propellers, exhaust and seawater system, steering, and controls.

Installing IPS is easy. Our own tests show reduced installation time by well over 50 per cent.

The IPS system can be installed in various ways, either as a compact system or with an extended jackshaft, giving opportunities for different boat designs.

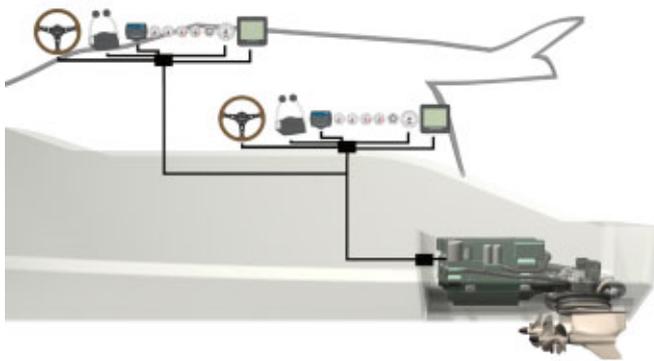
**The system is always used in twin engine installation configuration.**

A special mounting collar is integrated in the hull construction. The propulsion unit is lifted in place from beneath the hull, with the combined rubber suspension and sealing in place.

The clamp ring is positioned and attached with standard bolts.

No time-consuming alignment is needed.

Steering, shift and throttle plus instrumentation are connected in the simplest way possible.



## Safety and quality

Heavy duty material throughout means excellent corrosion resistance. Everything in contact with seawater is either made from a specially formulated nickel-aluminum-bronze alloy or stainless steel. Propulsion unit, bearings, couplings, etc. are all robustly dimensioned to cope with the unexpected and ensure a really long and trouble-free service life.

Volvo Penta EVC, Electronic Vessel Control, links the system components together, as well as being the user interface. This CAN-bus based network has been developed by Volvo Penta for marine use with heavy duty connectors and cables. It is based on the same technology as is used in airplanes, ships and cars today. EVC handles all communication and monitoring including shift, throttle and steering. Several safety functions in the system minimize the risk of damage to engine or propulsion unit.

The IPS system is designed with full redundancy, i.e. even if you have a total breakdown in one driveline, the remaining one will bring you home safely.

## Service

The IPS has extremely low service requirements; actually, even lower than in the case of a traditional inboard installation – no need for shaft alignment. With the propulsion

units placed under the hull, and all components exposed to seawater are made of either nickel-aluminum-bronze or stainless steel, giving excellent corrosion resistance and minimal marine growth.

The yearly service only consists of conventional maintenance items, change of anode, and a visual inspection. The oil and filter in the propulsion unit is replaced every second year or 400 hrs.

Since the installation is connected to EVC – Electronic Vessel Control – there is no need for cable adjustments. Diagnostics and fault tracing is easily performed by any authorized Volvo Penta service dealer.

## Environmental care

The IPS from Volvo Penta has been developed as a complete system with excellent environmental performance as one of the main design targets. The very high efficiency of the IPS system gives greatly reduced overall emissions.

Volvo Penta's new D6 in-line engines have been developed from the latest design in modern diesel technology. The engines have common rail fuel injection system, double overhead camshafts, 4 valves per cylinder, turbocharger, compressor (IPS 500), and aftercooler. The interaction of these, the large swept volume, and the EVC system results in exceptional diesel performance combined with low emissions.

The D6 engines have emission levels that meet the forthcoming, stringent US and EU regulations due in 2006.

## Engine technical description:

- Cylinder block and cylinder head made of cast-iron
- Ladder frame fitted to engine block
- 4-valve technology with hydraulic lash adjusters
- Double overhead camshafts
- Integrated cylinder liners
- Seven-bearing crankshaft
- Flexible engine mounting
- Easily replaceable separate full-flow and by-pass oil filter
- Seawater-cooled tubular oil cooler
- Common rail fuel injection system
- Control unit for processing the injection
- Fine filter with water separator
- Belt-driven compressor with silencer (IPS 500 only)
- Air filter with replaceable insert
- Crankcase gases vented into the air inlet
- Exhaust elbow or exhaust riser
- Turbocharger, freshwater-cooled
- Thermostatically regulated freshwater cooling
- Tubular heat exchanger with separate large volume expansion tank
- Connections for hot water outlet
- Seawater strainer and easily accessible impeller pump
- 115A marine alternator with Zener-diodes to protect the system from peak voltage, and integrated charging regulator with battery sensor cable for maximum use of alternator
- Engine reset fuses
- Auxiliary stop button
- Complete instrumentation including key switch and interlocked alarm
- EVC monitoring panels
- Electronic remote control for throttle, shift and steering
- Plug-in connections

# IPS 400/500

## General Data

Engine displacement, l (in<sup>3</sup>) .....  
 Configuration .....  
 Crankshaft power, kW (hp) @ 3500 rpm.....  
 Propshaft power, kW (hp) @ 3500 rpm.....  
 Aspiration.....  
 Rating .....  
 Package weight, kg (lb).....  
 Propeller series.....  
 Voltage.....  
 Application.....  
 Speed range .....  
 Driveshaft.....

| IPS 400            | IPS 500                                 |
|--------------------|---|
| 5.5 (336)          | 5.5 (336)                               |
| In-line 6          | in-line 6                               |
| 228 (310)          | 272 (370)                               |
| 217 (295)          | 259 (352)                               |
| Turbo, aftercooler | Turbo, compressor, aftercooler          |
| 4 & 5              | 5                                       |
| 880 (1940)         | 900 (1984)                              |
|                    | T2-T10                                  |
|                    | 12V or 24V                              |
|                    | Twin installation in planing hulls only |
|                    | 25 to 45 knots                          |
|                    | Compact (standard), jackshaft as option |

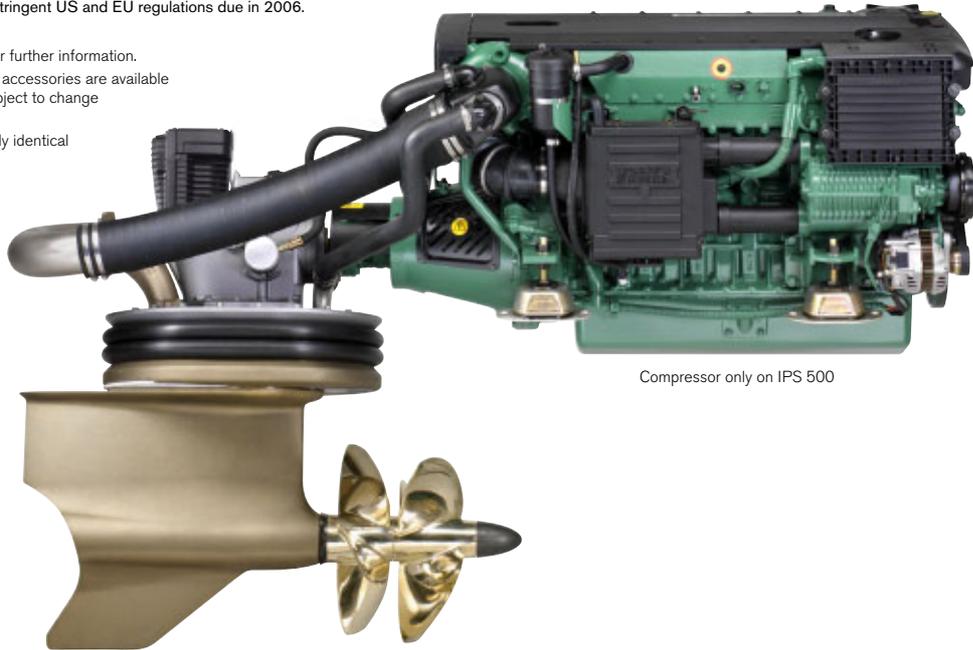
Technical data according to ISO 8665. With fuel having an LHV of 42,700 kJ/kg and density of 840 g/liter at 15°C (60°F). Merchant fuel may differ from this specification which will influence engine power output and fuel consumption.

The engine will meet the forthcoming, stringent US and EU regulations due in 2006.

Contact your local Volvo Penta dealer for further information.

Not all models, standard equipment and accessories are available in all countries. All specifications are subject to change without notice.

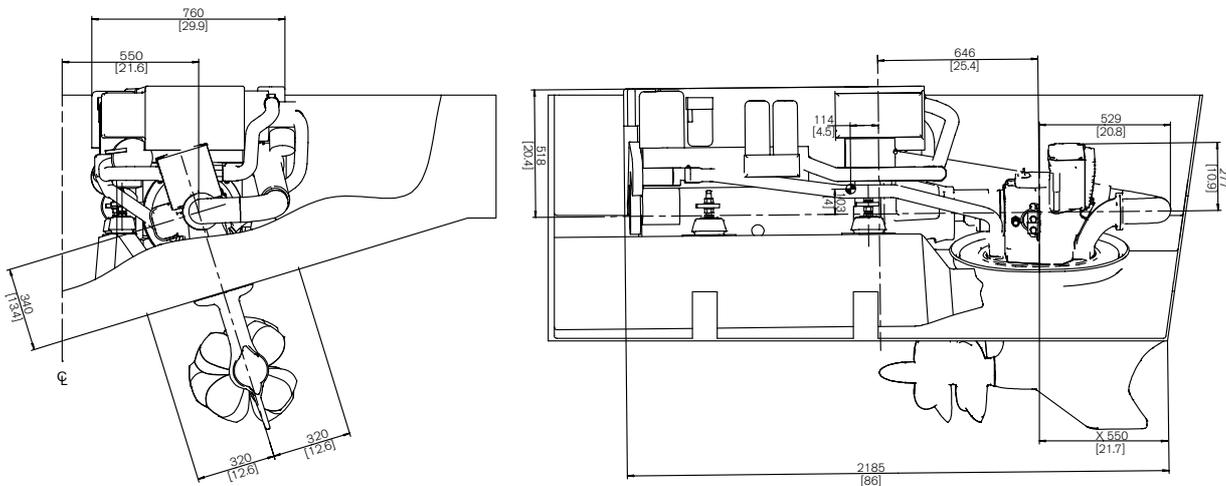
The engine illustrated may not be entirely identical to production standard engines.



Compressor only on IPS 500

## Dimensions IPS 400/500

Not for installation



# VOLVO PENTA

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