Diesel Engines 16V 4000 M93/M93L for Fast Vessels with Low Load Factors (1DS)

### Dimensions and Masses

<table>
<thead>
<tr>
<th>16V 4000</th>
<th>Dimensions (LxWxH) mm (in)</th>
<th>Mass, dry kg (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M93</td>
<td>3480x1465x2450 (137.0x57.7x96.5)</td>
<td>9600 (21164)</td>
</tr>
<tr>
<td>M93L</td>
<td>3480x1465x2450 (137.0x57.7x96.5)</td>
<td>9600 (21164)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>16V 4000 - with Gearbox type</th>
<th>Dimensions (LxWxH) mm (in)</th>
<th>Mass, dry kg (lbs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M93 - ZF 9000</td>
<td>4645x1465x2605 (182.9x57.7x102.6)</td>
<td>11085 (24438)</td>
</tr>
<tr>
<td>M93L - ZF 9050</td>
<td>4645x1465x2605 (182.9x57.7x102.6)</td>
<td>10985 (24218)</td>
</tr>
</tbody>
</table>

Typical applications: Fast yachts, fast patrolboats, police craft and fire-fighting vessels

<table>
<thead>
<tr>
<th>Engine Model</th>
<th>16V 4000 M93</th>
<th>16V 4000 M93L</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rated power ICFN kW (bhp)</td>
<td>3120 (4185)</td>
<td>3440 (4615)</td>
</tr>
<tr>
<td>Speed rpm</td>
<td>2100</td>
<td>2100</td>
</tr>
<tr>
<td>No. of cylinders</td>
<td>16</td>
<td>16</td>
</tr>
<tr>
<td>Bore/stroke mm (in)</td>
<td>170/190 (6.7/7.5)</td>
<td>170/190 (6.7/7.5)</td>
</tr>
<tr>
<td>Displacement, total l (cu in)</td>
<td>69.0 (4211)</td>
<td>69.0 (4211)</td>
</tr>
<tr>
<td>Flywheel housing</td>
<td>SAE 00</td>
<td>SAE 00</td>
</tr>
<tr>
<td>Gearbox type</td>
<td>ZF 9000</td>
<td>ZF 9050</td>
</tr>
<tr>
<td>Optimization of exhaust emissions</td>
<td>IMO II/EPA 2</td>
<td>IMO II/EPA 2</td>
</tr>
</tbody>
</table>

1) IMO - International Maritime Organization (MARPOL)
EPA - US marine directive 40 CFR 94
2) gearbox variants "Down Angle (A)" and "V-Drive" available on request

**Fuel Consumption**

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<tr>
<th></th>
<th>16V 4000 M93</th>
<th>16V 4000 M93L</th>
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</thead>
<tbody>
<tr>
<td>at rated power g/kWh</td>
<td>224</td>
<td>230</td>
</tr>
<tr>
<td>l/h</td>
<td>842.0</td>
<td>953.3</td>
</tr>
<tr>
<td>gal/h</td>
<td>222.5</td>
<td>251.9</td>
</tr>
</tbody>
</table>

* Tolerance +5% per ISO 3046, Diesel fuel to DIN EN 590 with a min L.H.V. of 42800kJ/kg (18390 BTU/lb)

### Standard Equipment

**Starting system**
- Electric starter 24 V, 2 pole

**Oil system**
- Gear driven lube oil pump, duplex lube oil filter with diverter valve, automatic lube oil filter with centrifuge lube oil heat exchanger, pump for lube oil extraction

**Fuel system**
- Fuel delivery pump, duplex lube fuel filter with diverter valve, common rail fuel injection system with high-pressure pump, pressure accumulator and electronic fuel injection with cylinder cutout system, jacketed HP fuel lines,
- flame-proof hose lines, leak-off fuel tank level monitoring, fuel pre-filter with water separator

**Cooling system**
- MTU-split-circuit coolant system, electronically controlled thermostats, coolant-to-raw water plate core heat exchanger, self priming centrifugal raw water pump, engine mounted coolant expansion tank, gear driven coolant circulation pump, raw-water connection for gearbox cooling

**Combustion air system**
- Water cooled charge air manifolds, engine coolant temperature-controlled intercooler, sequential turbocharging with 2 water-cooled turbochargers, on-engine seawater-resistant air filters

**Exhaust system**
- Triple-walled, liquid-cooled, on-engine exhaust manifolds, exhaust bellows, horizontal discharge

**Mounting system**
- Resilient mounts

**Auxiliary PTO**
- Charging generator, 120A, 28V, 2 pole

**Engine management system**
- Engine control and monitoring system (ADEC), interface to gearbox control, interface to remote control and monitoring system, local operating panel (LOP)

**Engine safety system**
- The scope of delivery for the engine fulfills SOLAS requirements for admissible surface temperature without additional insulation

### Optional Equipment

**Starting system**
- Coolant preheating system, air starter

**Oil system**
- Lube oil priming system, oil level monitoring, automatic oil replenishment system, automatic lube oil filter, main and connecting rod bearing temperature monitoring

**Cooling System**
- Engine version for sealed engine cooling system in conjunction with ship’s side recooling system

**Exhaust System**
- Vertical discharge

**Auxiliary PTO**
- Bilgepump, PTOs at free end of engine

**Engine management system**
- Expansion in compliance with classification society regulations

**Monitoring / Control system**
- Fuel consumption measurement device, MTU-monitoring and control systems MCS, remote control systems RCS

**Gearbox Options**
- Various reserve reduction gearbox models, elec. actuated, gearbox mounts, PTO for hydraulic pump at driving shaft or at mediate shaft, trolling, trailing pump, propeller shaft flange

**Classification**
- ABS, BV, CCS, CR, DNV, GL, KR, LR, NK, RINA including necessary extensions to scope of supply.

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> Power definition according ISO 3046
> Intake air temperature: 25°C/Sea water temperature: 25°C;
> Intake air depression 15 mbar/Exhaust back pressure 30 mbar
> Power reduction at 45°C/32°C: 3%
> Barometric pressure 1000 mbar

We reserve the right to change technical data. All data represent approximate values, refer to the installation drawing for full details. Contact your MTU distributor/dealer for more information.

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Rolls-Royce Power Systems Companies

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