TOTAL SERVICE

WÄRTSILÄ ENGINES

CHARACTERISTICS
- Medium speed (water cooled) 6-, 8- and 9-cylinder in-line engines, 12-, 16-, 18- and 20-cylinder 40° V-engines.
- Four stroke, direct fuel injection.
- Cylinder head with two exhaust valves and one or two inlet valves.
- Uni-directional or directly reversible engine.
- Designed for operation on heavy fuel with specifications meeting ISO 8217:2005(E), ISO-F-RMH 700.

BENEFITS
- Proven design.
- Low wear and long component life.
- Total engine output can be taken off at either end.
- Reliable.

TM410
2200-11160 kW at 500-600 min⁻¹
**ENGINE DESCRIPTION**

**Bed plate**
Rigid U-shape bed plate which is made of laminar or nodular cast iron.

**Cylinder block**
The cylinder block is made of cast iron, incorporating the camshaft casing and individual cylinder water jackets. Bed plate and cylinder block are connected by tie bolts.

**Crankshaft**
The crankshaft is a one piece forging with counterweights fitted on each crank web.

**Torsional vibration damper**
A torsional vibration damper is fitted at the free end of the engine, if required.

**Cylinder liner**
The cylinder liner is made of pearlitic cast iron. The collar is equipped with bores to cool the upper liner part.

**Connecting rod**
The old type connecting rods are made of high-tensile steel forging. The big end has three serrated joints, enabling easy removal of the bearing caps along a horizontal slide.

**Piston**
One-piece and two-piece piston types have been applied.

**Cylinder head**
The cylinder head is made of pearlitic cast iron, with double bottom in order to withstand high thermal and mechanical loads. The cylinder head is provided with two exhaust valves in cooled exhaust valve cages, one large inlet valve (TM410-A) or two inlet valves (TM410-B, C and D). It also accommodates a fuel injector and a starting valve. Rotocaps can be fitted on the exhaust valves, if needed.

**Camshaft**
The camshaft with hardened steel cams is gear driven. The cams are hydraulically shrunk on the shaft. The directly reversible engine is provided with double cams with a hydraulic reversing gear, which moves the camshaft in the axial direction.

**Injection pump**
Each cylinder has an individual high-pressure fuel pump.

**Governor**
The engine has a governor of the hydraulic type with pneumatic or electric speed setting device.

**Fuel system**
The fuel system consists basically out of high-pressure fuel pumps, protected or double-walled high-pressure fuel lines and fuel injectors with water-cooled nozzle tips.

**Lubricating oil system**
One lubricating oil system for bearing lubrication and piston cooling. Separate lubricating oil system for cylinder liners and overhead valve gear. Dry sump, engine driven pumps, lubricating oil filter and lubricating oil cooler.

**Starting system**
The engine is started by compressed air led to the starting air valve on each cylinder of an in-line engine or to the cylinders of one bank of a V-engine. Marine engines have starting air valves on both banks.

**Cooling system**
The cooling water system is designed for fresh (treated) cooling water and comprises a low temperature (LT) circuit and a high temperature (HT) circuit. Two stage charge air cooler. Separate water cooling system for injector nozzles.

**Exhaust gas system**
Pulse or compact exhaust gas system.

**Charge air system**
The engine is equipped with a two stage charge air cooler consisting of a HT- and LT-water section.

**Turbocharging**
The turbocharger(s) can be located at flywheel side, free end or both sides.

**Safety equipment**
The majority of the engines has a mechanical/pneumatic overspeed system. Some engines have an electronic/pneumatic overspeed system, by using an electronic safety module (ESM 10).

**Classification**
By all established classification societies.

**EIAPP**
The engine can be issued with an EIAPP certificate if it complies with the NOX Technical Code according IMO regulations MARPOL 73/78 - annex VI.
## TECHNICAL DATA

<table>
<thead>
<tr>
<th>Engine type</th>
<th>6TM410</th>
<th>8TM410</th>
<th>9TM410</th>
<th>12TM410</th>
<th>16TM410</th>
<th>18TM410</th>
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<tbody>
<tr>
<td>Model</td>
<td>in-line</td>
<td>in-line</td>
<td>in-line</td>
<td>40º V</td>
<td>40º V</td>
<td>40º V</td>
<td>40º V</td>
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<tr>
<td>Number of cylinders</td>
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<td>9</td>
<td>12</td>
<td>16</td>
<td>18</td>
<td>20</td>
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<td>Bore / stroke</td>
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<td>410 / 470</td>
<td>410 / 470</td>
<td>410 / 470</td>
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<td>496</td>
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### Maximum power ratings

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<tr>
<th>Engine speed</th>
<th>min⁻¹</th>
<th>500-600</th>
<th>500-600</th>
<th>500-600</th>
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<th>500-600</th>
<th>500-600</th>
<th>530</th>
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<tbody>
<tr>
<td>Engine output (MCR ¹)</td>
<td>kW</td>
<td>2200-3720</td>
<td>2940-4960</td>
<td>3300-5580</td>
<td>4400-7440</td>
<td>5880-9920</td>
<td>6600-11160</td>
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<td>14.2-20.0</td>
<td>14.2-20.0</td>
<td>14.2-20.0</td>
<td>14.2-20.0</td>
<td>14.2-20.0</td>
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<tr>
<td>Mean piston speed</td>
<td>m/s</td>
<td>7.8-9.4</td>
<td>7.8-9.4</td>
<td>7.8-9.4</td>
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<td>Specific fuel consumption ²</td>
<td>g/kWh</td>
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<td>184-212</td>
<td>183-210</td>
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<td>212</td>
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<td>at 100% load</td>
<td>g/kWh</td>
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<td>185-208</td>
<td>184-207</td>
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<td>at 75% load</td>
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¹) Maximum Continuous Rating.

²) According to ISO 3046/1, lower calorific value 42,700 kJ/kg. at nominal engine speed. Tolerance +5%.

³) Lubricating oil consumption at 100% load. Tolerance approximately 25%.

**Note:**
The values given in this document are for information purposes only and not binding.
### PRINCIPAL ENGINE DIMENSIONS (mm) AND WEIGHTS (t)

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<tr>
<th>Engine type</th>
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<th>A**</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
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* Turbocharger(s) installed at one side of the engine. ** One turbocharger at each side of the engine.