Solutions for Marine Insulation

Technical Insulation
Marine ins./Product usage
3 - 6.0
February 2011
Replaces: May 2008
The information in this brochure represents the sole and comprehensive description of the condition of the product and its technical properties. However, the content of this brochure does not mean granting a commercial guarantee. In so far as the product is used in an area of use which is not provided for in this brochure, we cannot warrant its suitability for said area of use unless the suitability was expressly confirmed by us upon request. This brochure replaces all previous brochures. As a result of constant further development of our products we reserve the right to make alterations to brochures.

PAROC and red and white stripes are registered trademarks of Paroc Oy Ab.

© Paroc Group 2011.
PAROC® Marine insulations meet all requirements

The shipbuilding industry sets very high requirements for safety and comfort on board. Products and constructions to be used for fire protection must be tested and approved according to the rules and regulations of IMO (International Maritime Organisation).

Ships sail in very different conditions, which sets high requirements for thermal insulations. Different kinds of machinery and equipment, passenger facilities, restaurants etc. need sufficient sound insulation to guarantee conformity. Paroc offers economical and safe solutions.

Highly developed products, manufactured for the current needs of the shipbuilding industry and its subcontractors, are already widely used.

PAROC Marine insulations meet requirements
PAROC Marine insulations meet the requirements of their users in the following areas:
- Fire protection of constructions and components
- Heating economy of ships and comfort of their passengers, heat and cold insulations
- Good acoustic properties of constructions and devices
- Insulation materials used as surface materials are functional and easy to clean
- Meeting the requirements of Classification Institutes and National Marine Authorities in accordance with the rules and regulations of IMO and the Marine Equipment Directive (modules B and D).

PAROC – The expert in insulation materials
Through market knowledge and research conducted alongside our customers, Paroc has secured its strong position as a manufacturer of insulating materials.

All Paroc factories have a certified quality system.

Non-combustibility
PAROC Marine insulations are manufactured from stone. Stone wool has excellent properties as a passive guarantee of the fire safety of ships.

PAROC stone wool products are capable of withstanding high temperatures. The binder starts to evaporate when its temperature exceeds approximately 200°C, and while the insulating properties remain unchanged, the compressive stress weakens. The stone wool products’ softening temperature is over 1,000°C.

The determination of non-combustibility in accordance with IMO FTP Code Part 1 has been performed for all PAROC Marine insulations. Continuous quality control of the products is performed by VTT (Technical Research Centre of Finland).

Construction approvals
Fire constructions used within shipbuilding must be tested for their fire resistance, in accordance with the rules and regulations of the IMO (International Maritime Organisation). Based on the approved test result, the Classification Institutes and National Marine Authorities grant the required approvals.

For this purpose, the products have been tested in various A-class and H-class deck and bulkhead constructions and in numerous fire door and panel constructions.
Fire insulation on ships must meet very high requirements. Furthermore, functionality together with easy and fast installation has become more and more important. To meet these requirements, alternative solutions for different fire applications are needed.

Paroc has tested several A-class constructions for decks and bulkheads, for steel and aluminium. We can offer two alternatives: PAROC Marine Wired Mats or PAROC Marine Fire Slabs, with or without facings.

**Fire insulation with facing**
A functional insulation solution for car decks and engine rooms can be achieved using precoated slab and preformed insulations. Coated products ensure a clean and easily maintained final surface. The range of facings includes glass fibre cloths 50-400 g/m² and aluminium foils.

The quick and easy installation of coated fire insulation ensures considerable cost savings. Coated products also enable insulating facilities using more lightweight overall solutions than before. For the user, this means quieter and more comfortable working facilities than before.

**Plain fire insulation**
Plain fire insulation is made of stone wool intended as basic material for the fire insulation solutions in shipbuilding constructions.

Plain insulation is used in facilities where they lie behind other constructions or as insulations in rooms, where they must be protected by steel sheets (i.e. against mechanical stress).
PAROC Marine Fire Slab 100
- Fire insulation of decks and bulkheads in steel and aluminium constructions
- Fire doors
- Wall cassettes
- Air-conditioning devices and ducts
- Coated products specially for car decks, engine rooms and air-conditioning machine rooms

Preformed blocks made of PAROC Marine Fire Slab 100
- Insulation for different kinds and sizes of beams in combination with PAROC Marine Fire Slab 100.

Different types of preformed blocks:
- HPL (with facing)
- HP (with facing)
- L (with facing)
- T
- Pulb

See our Fire protection and applications brochure as well as order examples for further information.

PAROC Marine Wired Mat 80 and PAROC Marine Wired Mat 100
- Fire insulation of decks and bulkheads in steel and aluminium constructions
- Fire insulation for round ducts
- Coated products for fire insulations above suspended ceilings and in maintenance facilities
Thermal insulation

Insulation plays a major role in indoor climate and comfort on board. By choosing the right thermal insulation solutions, the optimum temperature and energy savings can be achieved. In addition, the excellent noise reduction properties of PAROC stone wool can be utilized at the same time. Thermal insulation together with fire and sound insulation create the basis for overall comfort.

Paroc offers very lightweight as well as rigid products for thermal insulation. The benefits of facings and preformed blocks can also be utilized.

The facing alternatives allow for the selection of the right product for different applications. Coated products make installation easier and faster. They also offer an opportunity to use a more lightweight overall insulation solution.

**Thermal insulation with facing**

Coated slabs and mats are used in facilities where they remain visible and above suspended ceilings.

The range of facings includes several alternatives, from aluminium foil to glass fibre cloths.

**Plain thermal insulation**

In shipbuilding, plain thermal insulation is used in facilities where it lies behind other constructions.

Mats as thermal insulation products enable multiformed constructions to be insulated with a good final result in terms of the heating technique.
PAROC Marine Wired Mat 28
- Thermal insulation of ships, outboards, decks and bulkheads
- Coated products in facilities where they remain visible and also above suspended ceilings. Thermal insulation for machinery and devices when temperatures are below 200 °C

PAROC Marine Slab 22
- As underlaying insulation for fire panels, when lightweight constructions are required
- Multilayer insulations
- Extremely lightweight thermal insulation slab (22 kg/m³)

PAROC Marine Slab 40
- Various thermal insulations for shipbuilding
- Sound and fire insulations for suspended ceilings
- Coated products for thermal insulation, where the insulation material remains visible and has to be flush and clean
- Thermal insulation of devices and tanks with flat surfaces
- Sound insulation above suspended ceilings
- With aluminium foil as condensation insulation and in applications where thick insulation is required

PAROC Marine Slab 40, HP
- Thermal insulation of decks, bulkheads and outboards combined with coated PAROC Marine Slab 40

PAROC Marine Slab 60
- Rigid stone wool slab as demanding thermal insulation for machinery and devices
Air ducts and pipe insulations

PAROC products ensure the comfort, safety and economic efficiency of duct and pipe insulations on board. Several facing options, fit to size pipe sections and a wide range of mats enable easy and fast installation and prepare the way for the optimum end solution.

PAROC Marine Wired Mats are made of stone wool and are used as thermal insulation for smoke ducts and chimneys on ships. If required, the wire net can also be made of stainless steel with a higher temperature resistance than galvanized wire netting. Depending on the application of the PAROC Section, it can also be produced with aluminium foil or glass fibre cloth.

Thermal and condensation insulations for air-conditioning devices are coated with aluminium foil reinforced with glass fibre. These products are ideal for the insulation of rectangular and round ducts.
PAROC Hvac Section AluCoat T
- Pipes and ducts requiring condensation control
- Cold water pipes
- Cooling pipes
  Tape applied longitudinally enables fast fixing. Due to the light density the product is optimized for applications with service temperature $\leq 250 \, ^\circ\text{C}$.

PAROC Pro Section 100
- Steam pipes
- Heating pipes
- Fuel oil pipes
- Exhaust gas pipes
- Sprinkler pipes
- Deck pipes
- Sewage pipes
  Due to a higher density the product has a maximum service temperature of 750 °C. The product can also be manufactured with a density of 140 kg/m$^3$ (PAROC Pro Section 140).

PAROC Hvac Section G4
PAROC Pro Section 100 G4
For applications requiring excellent durability from the facing
- Car decks
- Engine rooms
- Air conditioning machine rooms
- Restaurants
- Cabins and residential facilities
- Passages
  Facing offers condensation control. Product is also manufactured with aluminum foil on top (facing G7). The overlapping of these facings can be heat sealed.

PAROC Marine Wired Mat 100 and PAROC Marine Wired Mat 100 AluCoat
- Insulation of smoke ducts and chimneys
- Sound insulation of exhaust gas dampers
- Large pipe elbows
- Penetrations of air ducts

PAROC Pro Lamella Mat AluCoat
- Ducts requiring condensation control
- Thermal insulation of air ducts
- Thermal insulation, where higher compressive strength is required

PAROC Marine Mat 35 AluCoat
- Cooled air ducts and devices requiring condensation control
- Thermal insulation of air ducts
General insulation objects

Many kinds of prefabricated products, for example insulations for cabins, panels, fire doors, ventilation machinery etc. are used in the shipbuilding industry. Manufacturers of these products often require customer-specified and tailored solutions.

The purpose of PAROC Marine insulations is to offer a solution for every part of the ship where some kind of insulation is needed.

Our range of products also covers the insulating materials needed by subcontractors within shipbuilding.

Noise reduction and fire protection of the cabin has been achieved by using PAROC stone wool insulation.

In fire doors as well as wall and ceiling panels, PAROC fire and thermal insulation is used.
PAROC Marine Slabs
- Wall panels and cassettes
- Suspended ceiling panels
- Floating floors
- As lamellas in wall and floor panels
- Fire doors

Products:
- PAROC Marine Slab 130
- PAROC Marine Floor Slab 140
- PAROC Marine Slab LO 150
- PAROC Marine Fire Slab 150
- PAROC Marine Slab 160
- PAROC Marine Slab 180

PAROC Marine Slab 220 and PAROC Marine Slab 250
- Ship cabin constructions and cassettes
- Sound reduction panels
- Draught barriers
- Doors, wall and ceiling panels
Sound absorption

The Laboratory of Building Technology at VTT (Technical Research Centre of Finland) has made the following sound attenuation measurements:

**PAROC Marine Slab 40**

- **Absorption ratio**
  - **Frequency:** 125 250 500 1k 2k 4k Hz
  - **Materials:**
    - 50 mm
    - 100 mm

**PAROC Marine Slab 40 G3**

- **Absorption ratio**
  - **Frequency:** 125 250 500 1k 2k 4k Hz
  - **Materials:**
    - 50 mm
    - 100 mm

**PAROC Marine Fire Slab 100**

- **Absorption ratio**
  - **Frequency:** 125 250 500 1k 2k 4k Hz
  - **Materials:**
    - 25 mm
    - 40 mm
    - 60 mm

**PAROC Marine Fire Slab 100 G1**

- **Absorption ratio**
  - **Frequency:** 125 250 500 1k 2k 4k Hz
  - **Materials:**
    - 25 mm
    - 40 mm
    - 60 mm

**PAROC Marine Wired Mat 100**

- **Absorption ratio**
  - **Frequency:** 125 250 500 1k 2k 4k Hz
  - **Materials:**
    - 60 mm
    - 80 mm

**PAROC Marine Wired Mat 100 G1**

- **Absorption ratio**
  - **Frequency:** 125 250 500 1k 2k 4k Hz
  - **Materials:**
    - 60 mm
    - 80 mm

**PAROC Marine Slab 130**

- **Absorption ratio**
  - **Frequency:** 125 250 500 1k 2k 4k Hz
  - **Materials:**
    - 25 mm
    - 50 mm
    - 100 mm

**PAROC Marine Slab 160**

- **Absorption ratio**
  - **Frequency:** 125 250 500 1k 2k 4k Hz
  - **Materials:**
    - 25 mm
    - 50 mm
    - 100 mm
**PAROC Marine Fire Slab 100 G3**

**PAROC Marine Floor Slab 140**

**PAROC Marine Slab 220**
# Technical data

January 2011

## Stone wool mats

<table>
<thead>
<tr>
<th>Product</th>
<th>Nominal density</th>
<th>Compressive stress (10% deformation) kPa</th>
<th>Maximum operating temperature °C</th>
<th>Thermal conductivity (WmK)</th>
<th>Mean temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAROC Marine Wired Mat 28</td>
<td>28</td>
<td>250</td>
<td>10 °C</td>
<td>0.034</td>
<td>0.050</td>
</tr>
<tr>
<td>PAROC Marine Wired Mat 35</td>
<td>35</td>
<td>250</td>
<td>100 °C</td>
<td>0.034</td>
<td>0.050</td>
</tr>
<tr>
<td>PAROC Marine Wired Mat 80</td>
<td>80</td>
<td>750</td>
<td>200 °C</td>
<td>0.035</td>
<td>0.047</td>
</tr>
<tr>
<td>PAROC Marine Wired Mat 100</td>
<td>100</td>
<td>750</td>
<td>300 °C</td>
<td>0.034</td>
<td>0.046</td>
</tr>
<tr>
<td>PAROC Pro Lamella Mat AluCoat</td>
<td>50</td>
<td>6</td>
<td>250 ²)</td>
<td>0.039</td>
<td>0.053</td>
</tr>
<tr>
<td>PAROC Marine Mat 30</td>
<td>30</td>
<td>250</td>
<td></td>
<td>0.034</td>
<td>0.050</td>
</tr>
<tr>
<td>PAROC Marine Mat 35 AluCoat</td>
<td>35</td>
<td>250 ²)</td>
<td></td>
<td>0.034</td>
<td>0.050</td>
</tr>
</tbody>
</table>

1) PAROC stone wool products are capable of withstanding high temperatures. The binder starts to evaporate when its temperature exceeds approximately 200 °C. While the insulating properties remain unchanged, the compressive stress weakens. The softening temperature of stone wool products is over 1000 °C.

2) The surface temperature of the facing must not exceed +80 °C (temperature restriction determined in accordance with heat resistance of adhesive).

The measurement tolerances in the tables are in accordance with the Finnish standard SFS 5454. The technical information for other covered and preformed insulation products included in this brochure is the same as for the basic products in the table.

See product data sheets for dimensions and other information.

## Stone wool slabs

<table>
<thead>
<tr>
<th>Product</th>
<th>Nominal density</th>
<th>Compressive stress (10% deformation) kPa</th>
<th>Maximum operating temperature °C</th>
<th>Thermal conductivity (WmK)</th>
<th>Mean temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAROC Marine Slab 22</td>
<td>22</td>
<td>250</td>
<td>10 °C</td>
<td>0.036</td>
<td>0.053</td>
</tr>
<tr>
<td>PAROC Marine Slab 30</td>
<td>30</td>
<td>250</td>
<td>100 °C</td>
<td>0.034</td>
<td>0.050</td>
</tr>
<tr>
<td>PAROC Marine Slab 40</td>
<td>40</td>
<td>1</td>
<td>250 °C</td>
<td>0.034</td>
<td>0.048</td>
</tr>
<tr>
<td>PAROC Marine Slab 60</td>
<td>60</td>
<td>3</td>
<td>250 °C</td>
<td>0.033</td>
<td>0.043</td>
</tr>
<tr>
<td>PAROC Marine Slab 80</td>
<td>80</td>
<td>10</td>
<td>350 °C</td>
<td>0.034</td>
<td>0.046</td>
</tr>
<tr>
<td>PAROC Marine Fire Slab 100</td>
<td>100</td>
<td>10</td>
<td>750 °C</td>
<td>0.033</td>
<td>0.045</td>
</tr>
<tr>
<td>PAROC Marine Slab 130</td>
<td>130</td>
<td>20</td>
<td>750 °C</td>
<td>0.034</td>
<td>0.042</td>
</tr>
<tr>
<td>PAROC Marine Fire Slab 150</td>
<td>150</td>
<td>20</td>
<td>750 °C</td>
<td>0.033</td>
<td>0.040</td>
</tr>
<tr>
<td>PAROC Marine Slab 160</td>
<td>160</td>
<td>40</td>
<td>750 °C</td>
<td>0.034</td>
<td>0.040</td>
</tr>
<tr>
<td>PAROC Marine Slab 180</td>
<td>180</td>
<td>50</td>
<td>750 °C</td>
<td>0.034</td>
<td>0.040</td>
</tr>
<tr>
<td>PAROC Marine Slab 220</td>
<td>220</td>
<td>60</td>
<td>750 °C</td>
<td>0.035</td>
<td>0.041</td>
</tr>
<tr>
<td>PAROC Marine Slab 250</td>
<td>250</td>
<td>80</td>
<td>750 °C</td>
<td>0.035</td>
<td>0.040</td>
</tr>
</tbody>
</table>

## Stone wool pipe sections

<table>
<thead>
<tr>
<th>Product</th>
<th>Maximum operating temperature °C</th>
<th>Thermal conductivity (WmK)</th>
<th>Mean temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>PAROC Hvac Section AluCoat T</td>
<td>250 °C</td>
<td>0.034</td>
<td>0.042</td>
</tr>
<tr>
<td>PAROC Pro Section 100</td>
<td>750 °C</td>
<td>0.034</td>
<td>0.042</td>
</tr>
<tr>
<td>PAROC Pro Section 140</td>
<td>750 °C</td>
<td>0.037</td>
<td>0.043</td>
</tr>
</tbody>
</table>

1) While the insulating properties remain unchanged, the compressive stress weakens. The softening temperature of stone wool products is over 1000 °C.
Certified products

The need for different testing and certification in many markets and application sectors is great. PAROC products have been widely tested and certified.

PAROC products fulfil the requirements of numerous standards and directives such as EN, ASTM, BS and MED, as well as many local ones, such as DIN, SFS, GOST-R.

Health and safety

PAROC products are safe to use. No CFCs or HCFCs are used in the production of the products. PAROC products also fulfil NoteQ of EU Commission Directive 97/69/EC. This means that stone wool fibres are biodegradable and are not classified as a possible human carcinogenic. They do not contain asbestos.

Our health and safety data sheets are available on our web pages at www.paroc.com.
**Storage and handling**

PAROC stone wool products are made from a naturally robust material. They are easy to store and install, and safe to handle.

**Storage**

If the products are stored outdoors, they must be protected from rain. Stack the packages on a flat platform that doesn't touch the ground. Cover the stacks with a waterproof tarpaulin or plastic sheet if necessary. If the products get wet despite these measures, they can be dried and used as normal. Stone wool dries quickly and its becoming wet will not change its properties.

Our preformed insulation components are quick to install and do not need much cutting work on site. Handle the product packages in a manner that prevents damage. Care must be taken not to break the edges or corners of the packages, especially during unloading.

**Personal safety equipment**

Scientific studies show that stone wool fibres do not harm your health, but the use of protective equipment is recommended to avoid skin irritation.

Use personal protection equipment that meets your particular needs, and keep your work clothing separate from your other clothing. It is also advisable to wear protective goggles if your eyes are sensitive to dust. This is particularly important when working with overhead insulation. If you wear contact lenses, you should always wear close-fitting protective goggles. A dust mask is also necessary if the amount of dust is significant.

You can read more about personal safety in insulation work on our web pages at www.paroc.com.
Quality and environment

PAROC stone wool products are made from clean, natural material. They are environmentally friendly throughout their lifecycle, causing no harm to nature during or after use. Stone wool does not contain any ingredients or chemicals that prevent or impede recycling. The use of PAROC products increases both the comfort and safety of the environment in which they are installed, creating a better place to work – as well as a more efficient process.

Paroc factories have been certified according to the Quality Management System ISO 9001 and Environmental System ISO 14001. Because of these systems, you can be sure that products that emerge from our factories are of a consistently high quality and are produced in a way that emphasises environmental considerations.
At Paroc, we do more than produce high quality stone wool insulation products - we also supply the help and advice necessary to make your job as easy and straightforward as possible. We have developed a popular range of practical tools that are as valued by designers as they are by installers. Pocket guides, dimensioning software, simple explanations of laws and regulations, and a content-rich website are just some of the free resources that our customers benefit from. If any of your questions remain unanswered, please let us know – we are always grateful for any tips on how to make our service even better.

Insulation education
At Paroc, we want to share our knowledge in order to help you get the utmost out of our products. That’s why we can arrange specialised training on industrial insulation. In our seminars, you can learn, for example, about the purpose of insulation, the difference between insulation for pipes and flue ducts, and how to choose the right solution. We also cover the guidelines and regulations that apply to insulation in your area. Please contact us for further information.

Personal contacts for the best solution
Early contact with Paroc confers many advantages when it comes to identifying the optimal insulation solution for your particular requirements. At the designing and planning stage, it is important to consider what kind of properties the insulation solution should possess. Paroc’s specialists are always on hand to help and advice, and are experts on customising products and solutions to fit your specific requirements. It is often beneficial for us to come and visit the site personally so that together we can ascertain the best solution and installation method. This helps to maximise the performance and service life of the insulation.

Punctual logistics
Paroc is justifiably renowned for its punctual logistics operation. Under normal circumstances, you will receive the insulation you need shortly after placing the order. This is a service that our customers value highly and have come to rely on.

Technical advice
Every year we receive a lot of questions about insulation theory and products. No question is too big or too small for our insulation experts. We can advise on the need to insulate, the right products to choose, installation methods, and laws and regulations. If there’s a question that we can’t answer directly, we’ll ask for help from our wide network of contacts in all areas of the insulation field.
The latest information on our products and solutions is available on our web pages. As part of our service package for you, we keep our web pages constantly updated.

More information from www.paroc.com
Paroc Group Oy Ab is one of the leading manufacturers of mineral wool insulation products and solutions in Europe. PAROC® products and solutions include building insulation, technical insulation, marine insulation, structural stone wool sandwich panels and acoustics products. We have production facilities in Finland, Sweden, Lithuania and Poland. We have sales and representative offices in 13 countries in Europe.

**Building Insulation** produces a wide range of products and solutions for all traditional building insulation. The building insulation is mainly used for the thermal, fire and sound insulation of exterior walls, roofs, floors and basements, intermediate floors and partitions.

**Technical Insulation** is used for thermal, fire and sound insulation in building techniques, industrial processes and pipe work, industrial equipment and ship structures.

**PAROC Fire Proof Panels®** are steel-faced lightweight panels with a core material of stone wool. Paroc panels are used for façades, partition walls and ceilings in public, commercial and industrial buildings.