Thermal-Acoustic Insulation

TROCELLEN DUCT

HVAC Applications

Thermal-Acoustic Insulation
The function of air-conditioning plant is to guarantee the correct exchange of air and the maintenance of the best temperature in order to ensure our physical and psychic wellbeing in a comfortable environment.

The air is distributed within a building by means of ducts that need to be suitably insulated in order to avoid heat loss/increase and low energy consumption in line with current legislation.

Any condensation that may form on the air ducts also needs to be prevented to minimise energy loss and noise levels due to pumps and/or fans must be kept to the minimum.

Noise from air-conditioning plant need to be absorbed and reduced to avoid compromising environmental comfort. This is done by means of specific solutions adopted at the design stage.

**TROCELLEN DUCT** is easily applied to the metal ducts through a process of pre-adhesion. It significantly reduces wall vibrations and thus satisfies the requirement to keep noise levels down; we have found that this system makes for potential reductions in noise levels of roughly 30-40 dB.

The formation of condensation on the ducts must be avoided at all cost since, as well as compromising the efficiency of the plant, it can also create the perfect conditions for the proliferation of mold and bacteria and damage the false-ceilings owing to constantly dripping water.

To design the perfect system, you have to calculate the right thickness of insulation needed to avoid the formation of condensation and reduce the energy loss in line with legal requirements, bearing in mind the technical performance of the insulating material under the envisaged working conditions.

To the side, for example, is an extract of Italian Law n° 10/91 concerning the insulation of ventilation ducts.

**TROCELLEN DUCT** is the new brand-name for a new line of air duct insulation material.

**TROCELLEN** is a closed cell, chemically cross-linked, polyolefin resin foam offering high performance in terms of flame retardant protection in the event of fire, plus lasting constant thermal performance and soundproofing.

**TROCELLEN DUCT** can be coated and adapted to offer a series of advantages:

- Closed cells
- Constant lasting thermal/sound performance
- Ultra low toxicity and opacity of fumes in the event of fire
- Easy to clean
- Self-adhesive for easy installation
- When all’s said and done, the product offering the best value for money on the market today.

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**Ordinary Supplement to the Italian Gazzetta Ufficiale n° 241 dated 14th October 1993, Annex B**

**DECRETO OF THE PRESIDENT OF THE ITALIAN REPUBLIC 29th August, n° 412.**

Rule bearing the standards for the design, installation, running and maintenance of thermal plant for buildings in order to limit energy consumption, implementing paragraph 4 of Art. 4 of Law n° 10 dated 9th January 1991.

**INSULATION OF HEAT DISTRIBUTION NETWORKS IN THERMAL PLANT**

They must be insulated with insulating material whose minimum thickness is determined by the data in table 1 below to suit the diameter of the pipes (expressed in mm) and the thermal conductivity (h) of the insulating material (expressed in W/m *°C) at the temperature of 40 °C.

<table>
<thead>
<tr>
<th>Useful thermal conductivity of the insulating material (W/m°C)</th>
<th>Outside diameter of the pipe (mm)</th>
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</thead>
<tbody>
<tr>
<td>0.010</td>
<td>&lt; 20</td>
</tr>
<tr>
<td>0.012</td>
<td>20 - 30</td>
</tr>
<tr>
<td>0.014</td>
<td>&gt; 30</td>
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<tr>
<td>0.016</td>
<td>19 - 25</td>
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<tr>
<td>0.018</td>
<td>26 - 35</td>
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<td>0.018</td>
<td>26 - 35</td>
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<tr>
<td>0.040</td>
<td>30 - 39</td>
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<tr>
<td>0.042</td>
<td>30 - 39</td>
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<tr>
<td>0.044</td>
<td>&gt; 35</td>
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<td>0.046</td>
<td>36 - 44</td>
</tr>
<tr>
<td>0.048</td>
<td>&gt; 35</td>
</tr>
<tr>
<td>0.050</td>
<td>41 - 49</td>
</tr>
<tr>
<td>0.010</td>
<td>&gt; 44</td>
</tr>
</tbody>
</table>

Table 1

The hot air ducts used to heat the building during the Winter and run in non-heated areas must be insulated with an insulating material whose min thickness must not be less than that shown in table 1 in the case of pipes with an outside diameter of 20 - 39 mm.

*As for values of insulation actual thermal conductivity other than those listed in table 1, the minimum thickness of the insulating material is obtained through linear interpolation of the data of the same table 1.

The vertical frame of the pipes shall be placed towards the inside of the building, and the insulation minimum thickness, as resulting from table 1, are to be multiplied by 0.5.

As for pipes within the structure, not protruding outdoor, nor to non heated areas, the thickness, as resulting from table 1, are to be multiplied by 0.3.

In case of pre-insulated pipes with heterogeneous materials or systems, or in case the system thermal conductivity is not directly measurable, the installation procedure and insulation limits are set by UNI technical standards, published before October 31, 1993 and received by the Ministry of Industry, Commerce and Handcraft activities within the following 30 days.

Hot air ducts for winter heating, placed in non heated areas, shall be insulated with thickness not lower than the values listed in table 1, for external pipe diameter ≥ 20 to 39 mm*.

Extract of Italian Law n° 10/91 concerning the insulation of ventilation ducts...
THE LINE OF INSULATION MATERIALS FOR VENTILATION DUCTS

Within Trocellen world for duct insulation, TROCELLEN CLASS means CE marked and Euroclass product portfolio, according to EN 14313.

By CLASS product range, Trocellen provides the answer in relation to the “new European approach” to customers of the professional application.

**Main advantages:**
- Excellent condensation barrier ability
- Excellent μ value - it can be even 15000 (depends on type)
- Constant and long lasting λ
- Fire reaction, flammability classification can be B-s2,d0*; no fire dripping
- Ultra low toxicity and opacity of fumes in case of fire (F1 classification, according to FR F 16-101)
- Safe, non-toxic, non-allergen, mould resistant and reusable.

**Types:**

**TROCELLEN CLASS ADHESIVE**
Chemically cross-linked, closed cell polyethylene foam.
- Euroclass B-s2,d0 - BL-s1,d0 for thickness range 3-12 mm.

**TROCELLEN CLASS ALU ADHESIVE**
Chemically cross-linked, closed cell polyethylene foam, laminated with aluminium sheet.
- Euroclass B-s2,d0 - BL-s1,d0 for thickness range 3-14 mm
- Euroclass C-s2,d0 - BL-s1,d0; thickness range: 15-24 mm.

**TROCELLEN CLASS ALUS ADHESIVE**
Chemically cross-linked, closed cell polyethylene foam, laminated with aluminium sheet. With improved performances.
- Euroclass B-s2,d0 - BL-s1,d0; thickness range: 3-16 mm
- Weather tolerant insulation and usable even outdoor.

Other not CE marked types available, according to the old Italian fire reaction classification:

**TROCELLEN DUCT CL1** - plain

**TROCELLEN DUCT CLO-2 ALU** - type N, laminated with smooth or embossed aluminium 50 μm

**TROCELLEN DUCT CL1 ALU** - type CL1, laminated with smooth or embossed aluminium 50 μm

**TROCELLEN DUCT AL CL1** - type CL1, lined with embossed scratch-proof metallic PE film

**TROCELLEN DUCT AL CL1 REF** - type CL1, laminated with a metallic polyester film

**TROCELLEN DUCT CL1 ALU-NET** - type CL1, laminated with a thin netted aluminium foil. It is also a “Class 0 surface” according to British standard BS 476-Part 6/7 (thickness 13 mm).

* TC CLASS product range
INSTALLATION ON VENTILATION DUCTS

Hot air heating plant, where temperatures may reach 60-80 °C: we recommend using the specific MATIBLOCK glue on both of the surfaces to be joined.

When using adhesive rolls to insulate such ducts, you must bear in mind a few rules to avoid the risk of the insulation peeling off the metal:

- Do not use on particularly cold metals
- The glues used are pressure-sensitive, meaning that you must apply suitable and an even pressure across the whole surface
- The actual pressure applied (roughly 0.2-0.5 kg/cm² is enough) is not as crucial as the need to apply the same pressure across the surface to avoid the formation of air bubbles
- The best way to join the insulation material and the metal is calendaring, pressing the two layers together
- The insulation material must not be stretched: if used for external insulation of a duct, the insulation material must not be wrapped around this, but cut to size for each section (see installation diagrams)
- The metal must be clean, without any traces of oil or dust. Do not use solvents, but you can use dry cloths or naked flames to clean the metal.
- Never use self-adhesive materials to insulate ducts installed outdoors: direct sunlight may heat the surfaces and can cause the insulation material to peel off the metal duct. We recommend using the specific MATIBLOCK glue, spread on both surfaces to be joined.

<table>
<thead>
<tr>
<th>TROCELLEN CLASS RANGE</th>
</tr>
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<tbody>
<tr>
<td><strong>THICKNESS</strong></td>
</tr>
<tr>
<td>mm</td>
</tr>
<tr>
<td>03</td>
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<td>06</td>
</tr>
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<td>08</td>
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<td>10</td>
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<td>16</td>
</tr>
<tr>
<td>20</td>
</tr>
<tr>
<td>24</td>
</tr>
</tbody>
</table>

Roll width: 1500 mm ± 10 mm

Installation diagram: seal edges and joints with suitable adhesive tape.
**SEALS – TAPES – STRIPS – GLUE**

**TROCELLEN SEALS, THICKNESS 3-6 mm**
These seals should be used to join metal elements (duct flanges, the edges of refrigeration cell doors and ventilation vents) to guarantee hermetic sealing and vibration damping. Acrylic self-adhesive.

Range:
- thickness 3-6 mm, types N and CL1

**EPDM SEALS**
The material used for this type of sealant is EPDM/other polyolefin resin foam, offering superior compressive strength and excellent spring.

Range:
- thickness 3-4-5 mm

**AL/CL1, AL/CL1 HR TAPES AND ALUMINIUM TAPES (adhesive)**
To guarantee a good aesthetic finishing, the product range also contains a series of AL/CL1 and AL/CL1 HR tapes (50 mm wide, <1 mm thick, 25 mm long), protected by siliconized paper or siliconized PE film.

Aluminium tapes:
- thickness 50 μm, types embossed, smooth, self-adhesive (smooth or embossed), Duplex (with polyester film, improved tensile strength and adhesiveness).

**TROCELLEN CLASS STRIPS**
Suitable for the technical and aesthetic finishing of the insulation, they can be used for sections of piping where it is difficult to apply insulating sleeves and for joints between insulation sleeves and sheets which must be first glued with MATIBLOCK glue.

Range:
- thickness 3 mm, types **TROCELLEN CLASS** adhesive plain and **TROCELLEN CLASS ALU** adhesive.

Other types available: AL, CL1, AL/CL1, AL/CL1 HR, CL1 ALU/L, rubber.
To guarantee correct storage of the adhesive rolls, you must follow the recommendations below:

• The ideal storage temperature should always be kept within 10 °C and -25 °C. Adhesives are sensitive to jumps in temperature and may lose their adhesive properties (too hot) or become brittle (too cold), leading to the risk of peeling-off after installation;
• For no reason whatsoever should the adhesive rolls be stored outdoors: humidity, water and sun will seriously alter the behaviour of the adhesion;
• Avoid storing the rolls near windows and doors, where at all possible, for the above reasons;
• The rolls should not be stored for more than period of storage 60 days in warm weather (spring and summer) or 30 days in cold weather (autumn and winter) before use;
• The rolls may, however, be exposed to higher or lower temperatures for brief periods (a few hours): this should not create problems, provided the exposure is proportional to the temperature limits and, in any case, the temperatures during actual installation must not fall outside of 2°C - 35 °C;
• Matiblock glue: properly sealed in a warehouse for a few years. However, we recommend you use it within 2 years from purchase.

ITEM SPECIFICATIONS

TROCELLEN CLASS ADHESIVE
Chemically cross-linked, closed cell polyethylene, density 28 kg/m³, light green, adhesive.
• CE marked (CPR), according to the European Standard (PEF) EN 14313
• Euroclass B-s2,d0 - BL-s1,d0 for thickness range 3-12 mm
• Classified F1, toxicity and opacity of fumes in case of fire, according to NF F 16-101
• Thermal conductivity coefficient at 10°C (λ, D-value) = 0.0373 W/mK (0.0321 kcal/mh°C)
• Water vapour diffusion factor (μ-value) ≥ 1000.

TROCELLEN CLASS ALU ADHESIVE
Chemically cross-linked, closed cell polyethylene, density 28 kg/m³, light green, adhesive, multilayer, laminated with a smooth aluminium sheet.
• CE marked (CPR), according to the European Standard (PEF) EN 14313
• Euroclass B-s2,d0 - BL-s1,d0 for thickness range 3-14 mm
• Euroclass C-s2,d0 - BL-s1,d0; thickness range: 15-24 mm
• Classified F1, toxicity and opacity of fumes in case of fire, according to NF F 16-101
• Thermal conductivity coefficient at 10°C (λ, D-value) = 0.0386 W/mK (0.0332)
• Water vapour diffusion factor (μ-value) ≥ 15000.
**TROCELLEN CLASS ALUS ADHESIVE**

Chemically cross-linked, closed cell polyethylene, density 28 kg/m³, light green, adhesive, multilayer, laminated with a smooth aluminium sheet. With improved performances.

- CE marked (CPR), according to the European Standard (PEF) EN 14313
- Euroclass B-s2,d0 - BL-s1,d0; thickness range: 3-16 mm
- Classified F1, toxicity and opacity of fumes in case of fire, according to NF F 16-101
- Thermal conductivity coefficient at 10 °C ($\lambda_{D}$-value)= 0,0387 W/mK (0,0333 kcal/mh°C)
- Water vapour diffusion factor ($\mu$-value) ≥ 15000
- Weather tolerant insulation and usable even outdoor.

### TECHNICAL DATA

<table>
<thead>
<tr>
<th>TECHNICAL CHARACTERISTICS</th>
<th>NORM</th>
<th>UNIT</th>
<th>TROCELLEN CLASS ADHESIVE</th>
<th>TROCELLEN CLASS ALU ADHESIVE</th>
<th>TROCELLEN CLASS ALUS ADHESIVE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reaction to fire</td>
<td>EN 13501-1</td>
<td>Euroclass</td>
<td>B-s2,d0 - BL-s1,d0 for thickness range 3-12 mm</td>
<td>B-s2,d0 - BL-s1,d0 for thickness range 3-14 mm</td>
<td>B-s2,d0 - BL-s1,d0</td>
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<tr>
<td>Smoke index value</td>
<td>NF F 16 - 101</td>
<td>-</td>
<td>F1</td>
<td>F1</td>
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<td>Trace quantities of water soluble ions</td>
<td>EN 13468</td>
<td>mg/lg</td>
<td>7,5</td>
<td>10</td>
<td>8</td>
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<tr>
<td>Thermal conductivity coefficient</td>
<td>EN 12667</td>
<td>W/mK/kcal/mh°C</td>
<td>0,0352</td>
<td>0,0358</td>
<td>0,0355</td>
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<tr>
<td>at 0 °C ($\lambda_{D}$-value) (12 mm)</td>
<td></td>
<td></td>
<td>0,0303</td>
<td>0,0308</td>
<td>0,0305</td>
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<tr>
<td>Thermal conductivity coefficient</td>
<td>EN 12667</td>
<td>W/mK/kcal/mh°C</td>
<td>0,0429</td>
<td>0,0435</td>
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<td>at 40 °C ($\lambda_{D}$-value) (12 mm)</td>
<td></td>
<td></td>
<td>0,0369</td>
<td>0,0374</td>
<td>0,0365</td>
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<tr>
<td>Water vapour diffusion factor ($\mu$-value)</td>
<td>EN 12086</td>
<td>-</td>
<td>≥ 1000 (1270)</td>
<td>≥ 15000</td>
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<tr>
<td>Density</td>
<td>EN ISO 845</td>
<td>kg/m³</td>
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<tr>
<td>Thickness</td>
<td>EN ISO 1923</td>
<td>mm (from 3 to 12 (see base specifications))</td>
<td>from 3 to 24 (see base specifications)</td>
<td>from 3 to 16 (see base specifications)</td>
<td>light green + aluminium sheet</td>
</tr>
<tr>
<td>Colour</td>
<td>BASE spec.</td>
<td>-</td>
<td>light green</td>
<td>light green + aluminium sheet</td>
<td>light green + aluminium sheet</td>
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<tr>
<td>Compression stress at 10%</td>
<td>EN ISO 3386/1</td>
<td>kPa</td>
<td>12</td>
<td>10</td>
<td>12</td>
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<tr>
<td>Water absorption after 28 days</td>
<td>ISO 2896</td>
<td>Vol.%</td>
<td>&lt;3</td>
<td>&lt;3</td>
<td>&lt;3</td>
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<tr>
<td>Dimensional stability (&lt; 5%)</td>
<td>ISO 2796</td>
<td>°C</td>
<td>90</td>
<td>90</td>
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<tr>
<td>Maximum operative temperature range</td>
<td>°C</td>
<td>-80 - +90</td>
<td>-80 - +100</td>
<td>-80 - +100</td>
<td>-80 - +100</td>
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<tr>
<td>Maximum operative temperature range with mechanical stress</td>
<td>°C</td>
<td>-40 - +90</td>
<td>-40 - +100</td>
<td>-40 - +100</td>
<td>-40 - +100</td>
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</table>
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TROCELLEN* is the first choice European polyolefin foam-solution provider. Through continuous innovations and successful partnerships we dedicate ourselves to one goal: protecting and providing comfort for people.

After more than 40 years, with 600 employees at seven sites and many cooperating companies, various partner universities, institutes and designers we offer solutions for our business partners in various industries such as construction and insulation, automotive, leisure and professional sport, adhesive tapes, footwear and packaging.

*Trocellen is the member of Furukawa Group.