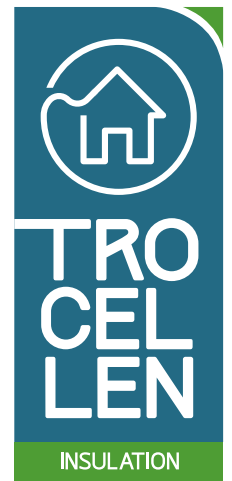


Trocellen DUCT

HVAC Applications

Thermal Acoustic Insulation



DUCT

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.

Ordinary Supplement to the (Italian) Gazzetta Ufficiale n° 242 dated 14th October 1993, Annex B

DECREE OF THE PRESIDENT OF THE ITALIAN REPUBLIC
26th August, n° 412.

Rules 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 (λ) of the insulating material (expressed in $W/m^{\circ}C$) at the temperature of 40 $^{\circ}C$.

Useful thermal conductivity of the insulating material ($W/m^{\circ}C$)	Outside diameter of the pipe (mm)		
	< 20	Da 20 a 39	Da 40 ...
0,030	19	....
0,032	21	....
0,034	23	....
0,036	25	....
0,038	28	....
0,040	30	....
0,042	32	....
0,044	35	....
0,046	38	....
0,048	41	....
0,050	44	....

Table 1

...
The hot air ducts used to heat the building during the Winter and run in non-heated rooms 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 Handicraft 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 ALU.S 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.



* TC CLASS product range

THERMAL INSULATION WITH MAXIMUM PERFORMANCE



THE NEW TROCELLEN RANGE

The success of the Troc ellen Class product range and the continuous need to evolve in the HVAC insulation market has led to the development of a new range of products with an innovative and revolutionary character, called **TROCELLEN CLASS G-PRO**.

TROCELLEN CLASS G-PRO continues the great success of the Class collection with a renewed recipe that has made possible to achieve even more exceptional performance in terms of thermal conductivity while maintaining durability, fire safety and other technical characteristics already typical of the Troc ellen Class.

Furthermore, the combination of the Troc ellen Class foam and the patented G-Pro technology based on expandable graphite, has generated the extraordinary result of the classification B-s1, d0 (EN 14313) up to thicknesses of 40mm.

This product range is also identified with the CE marking, further proof of the maintained quality.

TROCELLEN CLASS G-PRO ADHESIVE

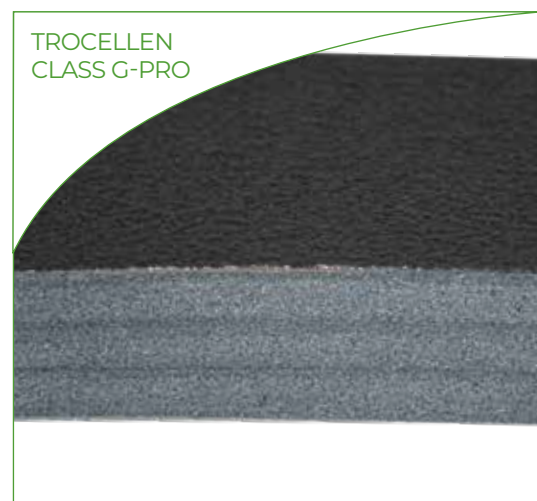
Chemically cross-linked polyethylene foam of grey color, with closed cells, with low thermal conductivity (0.0379 W/mK at 10 C °) and with high fire resistance performance. Covered with expandable graphite based coating.

- Euroclass B-s1, d0 - BL-s1, d0 for thicknesses 3-40 mm.

TROCELLEN CLASS RANGE

THICKNESS mm	ROLL SIZE m ²	SHEET SIZE m ²	TC CLASS ADHESIVE	TC CLASS ALU ADHESIVE	TC CLASS ALU.S ADHESIVE	TC CLASS G-PRO* ADHESIVE
03	75		X	X	X	
06	75		X	X	X	
08	75		X	X	X	
10	60		X	X	X	
12	45		X	X	X	
13	57,5	1,72				X
14	45			X		
15	45 (57,5 for G-PRO)	1,72 for G-PRO		X	X	X
16	30				X	
19		1,72				X
20	30	3		X		
24	22,5			X		
25		1,72				X
32		1,72				X
40		1,72				X

Roll width: 1500 mm ± 10 mm - *: Roll Width: 1150 mm ± 10 mm



ENVIRONMENTAL SUSTAINABILITY

Sustainability is a very delicate and extremely important topic that is becoming increasingly popular in the developments of most of the industrial sectors (and not only) of the world.

Trocellen has great sensitivity on the topic and in last years has implemented a sustainable development policy regarding its plants/offices and also its products.

To guarantee and certify the sustainability of the Trocellen Class/Class G-Pro range, several studies have been carried out, listed below.

LCA/EPD

The LCA (Life Cycle Assessment) study is a quantitative analysis that evaluates the environmental footprint of a product throughout its **life cycle**, from the extraction of its raw materials to its final disposal.

Through this analysis it is possible to photograph the impact of the product on the environment, identifying which phases can be further improved in order to increase its sustainable aspect.

Starting from the LCA, which can be carried out voluntarily, it is possible to obtain a document called **EPD (Environmental Product Declaration)**, which takes up and expresses the environmental impact values obtained from the study itself by using different indicators (eg: Kg CO₂ emitted, ODP, etc.).

As evidence of its sensitivity to the sustainable aspect, Trocellen has operated in recent years to carry out an LCA/EPD study on various products, including the Class range.

The related EPD can be downloaded from the Environdec portal and allows you to use Class products in all those projects where environmental sustainability is a focal point required in the execution of the works.

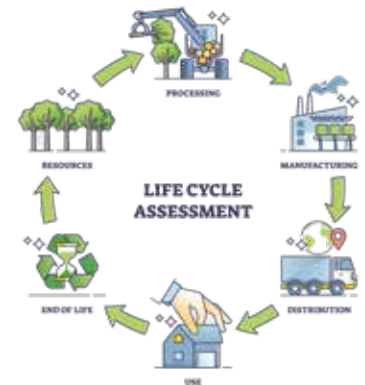


LEED

LEED® - Leadership in Energy and Environmental Design - is a voluntary building certification system born in America by the U.S. Green Building Council (USGBC) and currently applied in over 140 countries around the world.

The purpose of the certification is the promotion and development of a global approach to sustainability, giving recognition to virtuous performance in key areas of human and environmental health.

More and more projects in Italy and Europe are moving to obtain LEED certification and Trocellen was not caught unprepared; after several studies with expert consultants, the LEED categories for which the Trocellen Class ranges participate in the achievement of credits that identify the building classification (eg: Energy & Atmosphere, Material and Resources, etc.) have been defined.



CAM

The CAM (Minimum Environmental Criteria) are identified requirements that must be met by public and private infrastructures built on Italy in order to reduce the environmental impact of buildings.

Multiple Trocellen products are in line with CAM requirements and among these there is also the Trocellen Class range, thus allowing to satisfy the Italian legislation on new public and private building constructions



HEALTH AND WELLNESS

Trocellen has always been attentive to people's health and well-being. For this reason, the products of the Trocellen Class range have been tested to evaluate two important health aspects:

- VOC (Volatile Organic Compound).
- Resistance to mold and bacteria growth.

VOC

VOCs (Volatile Organic Compounds) are extremely volatile organic chemical compounds (low boiling point) capable of being released into the environment in the form of gas.

Many of these VOCs are harmful to human health if present above certain concentrations.

Some examples are benzene or formaldehyde, which are extremely harmful if inhaled through the respiratory tract.

Trocellen Class products have been tested for VOC emission and have reached the maximum classification A + with infinitesimal values and close to zero according to the French classification EN ISO 16000.

MOLD AND BACTERIA RESISTANCE

Molds and bacteria are microorganisms capable of proliferating in environments where the ideal environmental conditions are found for their growth (quantity of oxygen, temperature, humidity, etc.).

However, their presence, in addition to ruining the functioning of the product itself, is also harmful to the health of the people in contact with it.

The products of the Trocellen Class range have been tested according to VDI 6022, obtaining maximum results regarding resistance to the growth of mold and bacteria.

In this way, performance is guaranteed for a long time, while maintaining people's health and well-being.

WELL

WELL is a voluntary certification system for buildings similar to LEED, but with a greater focus on the well-being and health of the building occupants.

Just like for LEED, Trocellen Class products comply with various WELL requirements and contribute to the achievement of the credits necessary to have the building's classification level.



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

ALUMINIUM TAPES (adhesive)

Aluminium tapes:

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

G-PRO TAPES (adhesive)

G-PRO technology expandable graphite tapes that are used to improve the technical and aesthetic finish of the insulation with Troc ellen Class G-PRO in areas where the insulation is difficult to apply.

Range:

- 1 mm thick, self-adhesive

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 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).

SEALS



TROCELLEN CLASS STRIPS



ITEM SPECIFICATIONS

TROCELLEN CLASS G-PRO ADHESIVE

Chemically cross-linked polyethylene, closed cell, density 28 kg/m³, color grey, adhesive, with improved thermal conductivity, externally finished with an expandable graphite layer of patented G-PRO technology.

- CE marked (CPR), according to the European Standard (PEF) EN 14313
- Euroclass B-s1,d0 – BL-s1,d0 for thicknesses 3-40 mm
- Thermal conductivity coefficient at 10°C (λ_D -value) = 0,0379 W/mK
- Water vapour diffusion factor (μ -value) \geq 12500

TROCELLEN CLASS ADHESIVE

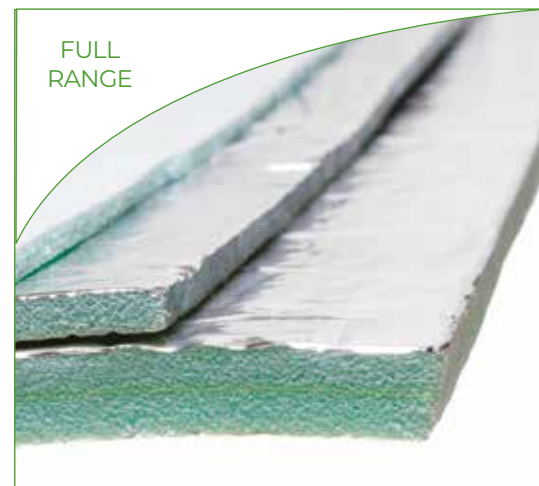
Chemically cross-linked, closed cell polyethylene, density 28 kg/m³, light green, adhesive.

- 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) \geq 1000
- A + classification for the emission of VOCs according to EN ISO 16000.
- Contributes credits to the achievement of the Silver-Gold-Platinum classifications for the LEED & WELL protocols.
- Complies with the requirements indicated in the CAM (Minimum Environmental Criteria) for public and private buildings.
- Inert to the growth of fungi and bacteria after tests according to VDI 6022.
- EPD declaration made after LCA study according to ISO 14025 and EN 15804: 2012 + A2: 2019 (c-PCR-005) for thicknesses 3 and 12mm.

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) \geq 15000
- A + classification for the emission of VOCs according to EN ISO 16000.
- Contributes credits to the achievement of the Silver-Gold-Platinum classifications for the LEED & WELL protocols.
- Complies with the requirements indicated in the CAM (Minimum Environmental Criteria) for public and private buildings.
- Inert to the growth of fungi and bacteria after tests according to VDI 6022.
- EPD declaration made after LCA study according to ISO 14025 and EN 15804: 2012 + A2: 2019 (c-PCR-005) for thicknesses 12 and 20mm



TROCELLEN CLASS ALU.S 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 (λ_b -value)= 0,0387 W/mK (0,0333 kcal/mh°C)
- Water vapour diffusion factor (μ -value) \geq 15000
- Weather tolerant insulation and usable even outdoor
- A + classification for the emission of VOCs according to EN ISO 16000.
- Contributes credits to the achievement of the Silver-Gold-Platinum classifications for the LEED & WELL protocols.
- Complies with the requirements indicated in the CAM (Minimum Environmental Criteria) for public and private buildings.
- Inert to the growth of fungi and bacteria after tests according to VDI 6022.
- EPD declaration made after LCA study according to ISO 14025 and EN 15804: 2012 + A2: 2019 (c-PCR-005) for thickness 16mm



TECHNICAL DATA

TECHNICAL CHARACTERISTICS	NORM	UNIT	TROCELLEN CLASS ADHESIVE	TROCELLEN CLASS ALU ADHESIVE	TROCELLEN CLASS ALU.S ADHESIVE	TROCELLEN CLASS G-PRO ADHESIVE
Reaction to fire	EN 13501-1	Euroclass	B-s2,d0 – BL-s1,d0 for thickness range 3-12 mm	B-s2,d0 – BL-s1,d0 for thickness range 3-14 mm C-s2,d0 – BL-s1,d0 for thickness range 15-24 mm	B-s2,d0 – BL-s1,d0	B-s1,d0 – BL-s1,d0 for thickness range 3-40 mm
Smoke index value	NF F 16 - 101	-	F1	F1	F1	TBD
Thermal conductivity coefficient at 0 °C (λ -value) (12 mm)	EN 12667	W/mK kcal/mh°C	0,0352 0,0303	0,0358 0,0308	0,0355 0,0305	0,0353 (40 mm) 0,0303 (40 mm)
Thermal conductivity coefficient at 40 °C (λ -value) (12 mm)	EN 12667	W/mK kcal/mh°C	0,0429 0,0369	0,0435 0,0374	0,0424 0,0365	0,0415 (40 mm) 0,0357 (40 mm)
Water vapour diffusion factor (μ -value)	EN 12086 EN ISO 12572	-	\geq 1000 (1270)	\geq 15000	\geq 15000	\geq 12.500
Density	EN ISO 845	kg/m ³	28	28	28	28
Thickness	EN ISO 1923	mm	from 3 to 12(see base specifications)	from 3 to 24 (see base specifications)	from 3 to 16 (see base specifications)	from 3 to 40 (see base specifications)
Colour	BASE spec.	-	light green	light green + aluminium sheet	light green + aluminium sheet	silver grey cover G-PRO
Compression stress at 10%	EN ISO 3386/1	kPa	12	10	12	13
Water absorption after 28 days	ISO 2896	Vol. %	<3	<3	<3	<3
Dimensional stability (< 5%)	ISO 2796	°C	90	90	90	100
Maximum operative temperature range		°C	-80 ÷ +90	-80 ÷ +100	-80 ÷ +100	TBD
Maximum operative temperature range with mechanical stress		°C	-40 ÷ +90	-40 ÷ +100	-40 ÷ +100	TBD

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TROCELLEN*

Trocellen is a multinational company owned by Furukawa Electric Co. Ltd, internationally renowned for the design and manufacture of cross-linked polyolefin foam.

Through its different Business Units, the company is able to meet the specific needs of the market with a wide range of products and solutions.

It manufactures both semi-finished and finished products. The Trocellen products stand out for their manufacturing processes and the many industrial sectors in which they can be used: Insulation, automotive, footwear, sport and leisure, adhesive tapes and packaging. Trocellen makes safety a lifestyle and turns safety into a lifestyle.

Insulation Business Unit

The Insulation Business Unit mainly specialises in Sound and Thermal insulation for the building industry. The goal is to create comfortable environments for people or rather to "help people live better!".

*Trocellen is the member of Furukawa Group.



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