



APPLICATION GUIDE

EXTERNAL THERMAL
INSULATION SYSTEMS

CLIMAPLUS

We build together.

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THRAKON GROUP

THRAKON is a dynamically developing company activating in the research, production and marketing of ready building products and mortars, thus fully covering all kinds of building works. By exploiting its long experience and its knowhow in the sector of building materials and works, THRAKON has committed itself to developing a wide range of new, high-quality and innovative products and services in order to help both professionals and customers in their everyday life with its integrated top-quality solutions.



Environmental Awareness

Large production capacity, state-of-the-art technology of modern means and the use of "green" energy sources of THRAKON, in combination with the exceptional support it provides before, during and after sales, produce excellent performance results, savings and respect for the environment. Moreover, our main concerns are to promote environmental care, minimize our environmental footprint and provide specialized training in environmental issues to our people.





At the same time, the group builds an international identity with powerful national roots, since it has also rapidly spread outside the country, with significant exports to several countries all over the world, such as Cyprus, Serbia, Romania, Bulgaria, Kosovo, Malta, Ethiopia, Eritrea, UAE, Cameroon, Lebanon, Albania and Georgia.

The group aims at providing knowhow and integrated technical solutions to all our international customers.

Professional Knowhow



μ.α.θ.ε.
Μάθηση-Αξιολόγηση-Θεωρία-Εφαρμογή
σύγχρονη πρόκληση



THRAKON Group offers CE-certified products and systems that meet the needs of new and already existing buildings of modern era, thus providing professionals with technical solutions and applications. Therefore:

A

It holds seminars in order to present in detail all its systems at theoretical and practical level.

B

THRAKON technical experts are always ready to provide support and solutions in all implementation phases of the project.

C

Every time a question or a problem arises, our technical experts shall be there to help you.

Trained and experienced engineers provide technical support free of charge with regard to THRAKON products to professionals and individuals. In every part of Greece, they can provide building design details, cost analyses as well as direct supervision of projects.

ETICS COMPETITION

THRAKON is classified among the most reliable producers of building materials in Greece, with a guaranteed steady supply from:

5 

Five production plants, including three in Orestiada, one in Thessaloniki and one in Oinofyta, Viotia.

200.000 tn

Annual production over 200,000 tons and facilities covering an area of 110,000m²



The present complete technical guide of the CLIMAPLUS external thermal insulation system of THRAKON presents an overview of the system, the materials, systems and production processes certified, while certain issues causing confusion in the market are clarified.

THRAKON Group produces high-quality products, which are accompanied by the relevant certifications granted by

recognized laboratories and EU certification bodies. The careful study of every application, the knowledge of the specific characteristics of every type of thermal insulating materials and its final selection, depending on the requirements of each project, classify the CLIMAPLUS integrated external thermal insulation system as one of the most reliable systems in the Greek market.

WHAT IS THERMAL INSULATION?



Thermal insulation is one of the main parameters of modern architectural design. Thermal insulation is the protection of a building against heat and cold. It is the method that allows us to restrict the loss of heat lost in the house in winter, but also the heat entering the house in summer. The correct design and the use of the appropriate materials can provide good and proper thermal insulation, thus significantly reducing heating and cooling costs.

Buildings in Greece started being equipped with thermal insulation in 1979, when the regulation on thermal insulation of buildings came into effect. Before that, the regulation on thermal insulation had only some minimal requirements for the buildings and, as a result, buildings constructed after 1980, which followed the new regulation on thermal insulation, were more pleasant, cozier and more economical.

The provision for thermal insulation in buildings requires that the appropriate measures be taken so that thermal energy cannot escape from a space to another or to the atmosphere.

Nowadays, when buildings are more complex and lighter than the traditional stone houses of the past, protection against thermal changes is provided by a number of technical control systems, such as central heating and air-conditioning. Energy consumed for their operation had never been an issue before the energy crisis. Energy sources, especially, oil, ceased to be inexpensive, thus making thermal insulation indispensable and necessary for energy saving.

WHY SHOULD BUILDINGS BE THERMALLY INSULATED?

The problem of improving the thermal performance of the building shell is not novel. Designers and manufacturers should minimize both unexpected loss of heat from the interior of the house in the winter and any overheating in the summer. Requirements for thermal insulation of buildings have increased, in accordance with the new Greek Regulation for the Energy performance of Buildings (REPB/ KENAK)- Government Gazette 2367B/12.07.2017. Thermally insulated constructions have become increasingly more valuable than other constructions.

Thermal insulation is a significant measure for energy saving. A large part of energy consumption results from construction patterns, as the majority of the already existing buildings are only partially or not at all insulated. In partially insulated buildings, heat escapes from the roof, the exterior walls and openings that are never properly sealed, e.g. uninsulated boards, pilotis, basements, rooms.

WHY CLIMAPLUS?



CLIMAPLUS is an integrated external thermal insulation system for buildings.

It consists of thermal insulating plates, adhesive for gluing the thermal insulating plates on the surface of the building, plastering material for the insulating plates, reinforcing mesh for the plaster, color primer, final color and decorative plaster and other complementary materials (supporting anchors, corner beads, guides, etc.).

CLIMAPLUS

THRAKON has always been a pioneering company. As it happens with the other products of the firm, the production of the system uses silica sand, which offers the product excellent properties. Moreover, THRAKON has employed in its production an integrated quality control system and ensures the client that the products it provides as well as the CLIMAPLUS system fully respond to the specifications of the European Technical Assessment ETAG 004.

The European Technical Assessment (ETAG 004), which refers to external thermal insulation systems, precisely specifies the minimum performance of the system and outlines in detail not only the specifications of the products but also the testing methods.

ETAG 004 includes a number of different tests and certifies the sufficiency of the system for at least 25 years. The tests on the system were successfully carried out by accredited European laboratories, while the respective certificate was issued by the European Organization for Technical Assessment (EOTA).

TECHNICKÝ A ZKUŠEBNÍ ÚSTAV STAVEBNÍ PRAHA, s.p. Rozvoje 311/118 CZ-190 00 Praha 9 Tel: +420 226 010 488 Internet: www.tuuz.cz		 ZÚS MEMBER OF EOTA
European Technical Approval ETA-12/0391 (English language translation, the original version in Czech language)		
Obchodní název Trade name	Clima PLUS	
Děitel schválení Holder of approval	THRAKON AEVE Syngryy Av. 130 17571 Athens Greece	
Druh a použití výrobku Product type and use of construction product	Vnější tepelná izolační kompozitní systém (ETICS) z pěnového polystyrenu s omítkou pro použití jako venkovní izolace stěn budov. External Thermal Insulation Composite Systems with rendering on polystyrene for the use as external insulation to the walls of buildings.	
Platnost od Valid from	16.10.2012	
Platnost do Valid to	15.10.2017	
Výrobce Manufacturer	THRAKON AEVE Syngryy Av. 130 17571 Athens Greece	
Toto Evropské technické schválení obsahuje This European Technical Approval contains	13 stran 13 pages	
 Evropská organizace pro technické schválování European Organization for Technical Approvals		

Following the procedure for obtaining European Technical Assessment (ETA)-TZUS (Czech Organization for Technical Assessment), member of EOTA (European Organization of Technical Approval), the system was CE-certified subject to the European Regulation 305/2011/EC.

CE marking on the system indicates conformity of the final product with minimum safety requirements for the safe use of the product on buildings.

It also ensures that the product available on the market is identical to the product certified by the laboratory in order to issue the ETA (European Technical Assessment). Absence of CE-marking invalidates ETA approval.



The above markings ensure the following:

Suitability of the system for the expected application



Safety of the system in normal use



Durability of the system throughout the building's life



Fire protection



**Healthy and safe
conditions in normal use
of the system**



Protection against noise pollution and compatibility of individual materials of the system with each other



The integrated external thermal insulation system CLIMAPLUS covers the exterior of the building with a shell, quickly and easily. CLIMAPLUS creates a protective enclosure around the building, which reduces heat transfer of from and to the interior. Hence, in the winter, it reduces the rate at which heat is lost from the building, while in the summer, it reduces the rate at which heat enters the building.

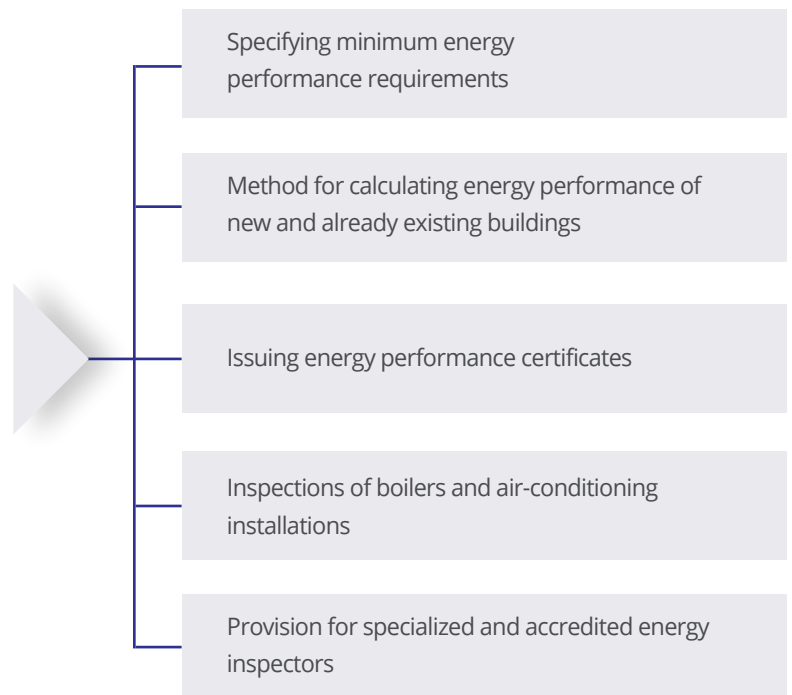
By reducing heat loss of the building, the energy that should be consumed for supplying the different cooling-heating systems is also reduced on average up to 60% on an annual basis. Furthermore, the initial construction cost of the central heating or air-conditioning system is also reduced. The depreciation period of the system is rather short, ranging between 4 and 6 years.

KENAK/REPB (Regulation for the Energy Performance of Buildings) – THE NEW ENVIRONMENTAL AWARENESS IN CONSTRUCTION



Energy performance of buildings, which was never taken into account in any of the building stages in former times, has now become a priority in the new ecological need for construction. In Greece, the percentage of energy consumption of buildings ranges between 60% and 70%, which means that Greek buildings are energy-intensive, and the economy and the energy security of the country are seriously affected due to old buildings and inefficient insulation.

This is what led to the introduction of Law 4342/2015 on “Issuing a Regulation for the Energy performance of Buildings” and the Ministerial Decision 174063/2017, which integrates all the requirements of Directive 27/2012/EC and classifies them into five modules, as follows:



It is also provided that after 31/12/2018 all new public sector buildings, and after 31/12/2020 all private sector buildings, shall be Nearly Zero-Energy Buildings (NZEB).

Following Recommendation 1318/2016/EC, the reference data for energy performance of NZEB buildings should be within the following range in the EU Mediterranean climatic zone (where Greece belongs):

Offices: 20-30 kWh/(m².year) net primary energy and 60 kWh/(m².year) on-site energy from recyclable sources for covering the typical use of primary energy of 80-90 kWh/(m².year).

New detached houses: 0-15 kWh/(m².year) net primary energy and 50 kWh/(m².year) on-site energy from renewable sources for covering the typical use of primary energy of 50-65 kWh/(m².year).

The implementation of the Regulation for the Energy performance of Buildings 2017 (KENAK/REPB) results in lower heating and electricity costs and saving money.

The Energy Performance Certificate classifies the buildings into energy categories from A to G, with category A representing buildings or building complexes of higher energy performance.

Furthermore, it provides the possibility to assess annual energy consumption, CO₂ emissions estimated to be distributed to the environment due to energy use, and finally the contribution of renewable energy sources to fulfilling the energy needs of the building.

The Energy Performance Certificate is necessary for every new building permit issued after 1/7/2010 and for every transfer authorization issued after 1/1/2011.



NEW CONSTRUCTION METHOD – ECOLOGICAL CONSTRUCTIONS



According to KENAK/REPB, the overall U-coefficient of opaque elements of the building shell (brickwork, walls, ceilings, floors) is calculated after taking into consideration all the coats of materials (plasters, bricks, light concrete elements, etc.).

The new way of calculating thermal insulation counts the surfaces presenting the highest U-coefficient. These new construction specifications determine that the construction shall be covered with thinner insulating materials. Single brickwork instead of double brickwork with an intermediate gap is now required. Thus, building costs are lower and the building is lighter.

Walls separate internal from external conditions. Therefore, walls are areas subject to heat transfer processes and humidity transfers. In detached houses, it is estimated at 40%. However, not only walls are responsible for the loss of heat. The remaining 15% is lost through ventilation, 20% through the roof, 15% through windows and door frames and 10% through the basement and the floors.

21-31%
loss through
the windows

30-35%
loss through
the ceiling

18-55%
loss through
the walls

12-14%
loss through
the floor



Picture 1
Detached house

Both pictures (Picture 1 and 2) clearly show that the walls significantly contribute to the overall heat loss in the building, regardless of type and size. It appears that the effective thermal insulation of external walls is absolutely necessary, resulting in large reduction in energy losses, which in turn leads to less energy required for heating the rooms.

30-35%
loss through
the ceiling

24%
loss through
the windows

37%
loss through
the walls

3%
loss through
the floor



Picture 2
Block of flats

In addition, in case of standardized, non-thermally insulated walls, the amount of energy required for maintaining the desired temperature inside the building is much higher and, therefore, costly. In thermally insulated walls, the biggest temperature differences occur only inside the building element.

The ETICS system offers more than lower cost of living. Lower demand for heat, resulting in lower energy consumption, is translated into a reduced emissions of greenhouse gases, mainly CO₂, which is the main target of EPBD Directive. In the European Union, the building sector is responsible for a large part of energy consumption.

Consequently, the suitable changes in legislation and the stricter criteria for the thermal performance of buildings have been introduced. Apart from the so-called EU's 20-20 directives, 20 targets for energy and climate have also been achieved. This is a package of regulations aiming at reducing the emissions of CO₂ contained in greenhouse gases by 20% (as compared to 1990 levels), increasing energy performance by 20% and reaching 20% of energy, based on the consumption of energy from renewable energy sources.

Despite the gradual improvement of the thermal performance of buildings and the reduced emissions of greenhouse gases by 2% annually, these targets are highly ambitious and require bigger efforts and investments. The ETICS estimate that only 3% of a new investment equals the cheapest material for the technology of thermal insulation. Taking both, as well as the expected advantages, into consideration, it is the most effective method for reducing energy losses.

In Poland, approximately 80% of energy comes from hard and brown carbon, i.e. sources mainly responsible for CO₂ emissions. It is alleged that the share of mined minerals in relation to other resources (natural gas, renewable energy sources) will not change significantly in the following years.

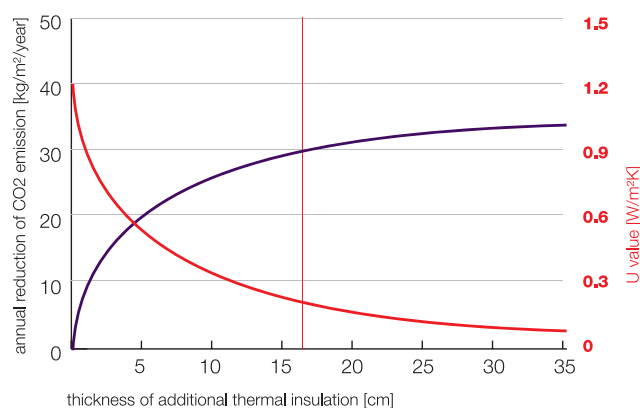
This means that the most effective way of reducing the emissions of carbon dioxide is the restriction of energy demands, which can be achieved through thermal insulation.

According to Ecofys Report, an additional layer of thermal insulation, in combination with a low coefficient of thermal conductivity, can reduce the annual emissions of CO₂ even by 30 kg/m². In case of a block of flats covering an area of 1000 square metres, the reduction in the emissions of carbon dioxide is estimated at 30 tons.

A worsening problem related to the environment, mainly with regard to the quality of air, is the threat of a smog outside the standards, with a concentration of particulate matter with a diameter of 2.5 µm and 10 µm.

According to the report of the Polish inspection for the environmental protection, the main ash-emitting source (83%) is fuel from households. The insufficient thermal insulation of buildings necessitates increased fuel demand. Increased fuel demand often makes the users seek for cheaper alternative solutions in the form of poor quality materials. This results in increased combustion of cheap fuel, which produces larger amounts of ash.

Thermal insulation leads to reduced fuel consumption, especially when combined with other thermal innovations (e.g. exchange of boilers, use of higher-quality fuel), and has an immediate effect on improving the quality of the air and eliminating the smog.



EXTERNAL THERMAL INSULATION COMPOSITE SYSTEMS (ETICS)



External Thermal Insulation Composite Systems known as ETICS are among the most widely used thermal insulation systems in Europe. EOTA, the European Organization of Technical Approvals, was informed by the European Commission about the preparation of the standardized European directive ETAG 004 intended for ETICS, in brickwork and concrete.

Most thermal insulating materials can be used in such a system, but the sufficiency and quality of ETICS systems should be documented by a European Technical Assessment (ETA), in accordance with Standard ETAG 004. Buildings thermally insulated with the ETICS system have the following specifications:

Lower energy consumption for heating the rooms



Enhanced thermal convenience of internal spaces



Reduces CO₂ emissions and protects the environment



Thermal renovation includes measures aiming to improve the energy level of a building. The ETICS system significantly contributes to reducing heating costs as well as to improving thermal convenience. The ETICS systems are also used for renovating a possibly defective shell of a poorly thermally insulated building. Moreover, due to the enhanced thermal insulation, the ETICS system improves the conditions of health and thermal convenience inside the building, while it also prevents the growth of mold.

Crews applying ETICS systems shall:

Control the products delivered to the construction site as to whether they belong to the system. The components of the system shall be indicated with the relevant special markings, which are attached to the building element itself, its package or the pallet wrappers.

Apply the system in accordance with the current technology, taking into consideration the instructions provided by the producer of the system.



NOTE

All ETICS provisions, not only those directly affected but also those that are necessary as a base or condition according to the applicable national requirements, shall meet the applicable national standards and regulations. The national special requirements and regulations of each country shall be taken into consideration in addition to the European Guideline.

APPLICATION FIELDS

The integrated external thermal insulation system CLIMAPLUS dramatically reduces heating and cooling costs (up to 60%) in new buildings as compared to conventional insulation. Because the building's brickwork is not significantly affected by outside temperatures, a convenient and pleasant atmosphere is created inside the house.

The cost of installing an insulation system by means of the ETICS method is depreciated after a few years because heating bills of the building will possibly dramatically be reduced.

Thermal insulation contributes to reduced emissions of carbon dioxide (CO₂) and, as a result, it protects the environment. The best quality of the building's insulation depends on the time and the technique followed for the

construction of external walls and are expressed by U-coefficient.

«The lower the U-value, the lower the amount of heat loss.»

However, a low U-value does not always guarantee a successful insulation. The quality of insulation is negatively affected by the presence of the so-called heat bridges.

Heat bridges are individual sectors or points of the external shell of the building, whose thermal resistance is significantly lower than the building elements of the rest of the shell. The problem with heat bridges usually appears at the edges of the boards, frame sills, etc.

Some basic definitions affect thermal insulation while it is analyzed and studied. More specifically:

THERMOPHYSICAL PROPERTIES OF BUILDING ELEMENTS

Coefficient of Heat Conductivity (λ)

It is the amount of heat, per time unit, that flows through the opposite sides of a uniform material 1m thick when the temperature difference between these surfaces is fixed and equal to one Kelvin degree 1°K. The coefficient of heat conductivity is a natural property of every material that specifies how easy or difficult is heat transfer inside the material, while its value is experimentally determined. The value of the coefficient of heat conductivity of a material depends on the nature of the material, its structure (porous, density), temperature and humidity.

Heat Transmission Rate (U-coefficient)

The amount of heat (in Watts) flowing through a square meter of a building element of a specific thickness d within one hour, when the two surfaces have a temperature difference of one degree Kelvin. In other words, it records how easily the heat flows through a material or system. The specific coefficient is affected by the thickness in combination with coefficient (λ) of the materials of a system.

Thermal Resistance (R)

It is the resistance of the elements of the material while heat flows through a homogeneous material with a temperature difference between the two sides equal to one Kelvin degree. Coefficient R is in square meters by degrees Kelvin 1°K per Watt (m² K/W) and is mathematically expressed by the formula $R=d/\lambda$, with d the thickness of the material and λ the heat transmission rate.

OVERVIEW AND ADVANTAGES OF ETICS SYSTEM



BRICKWORK



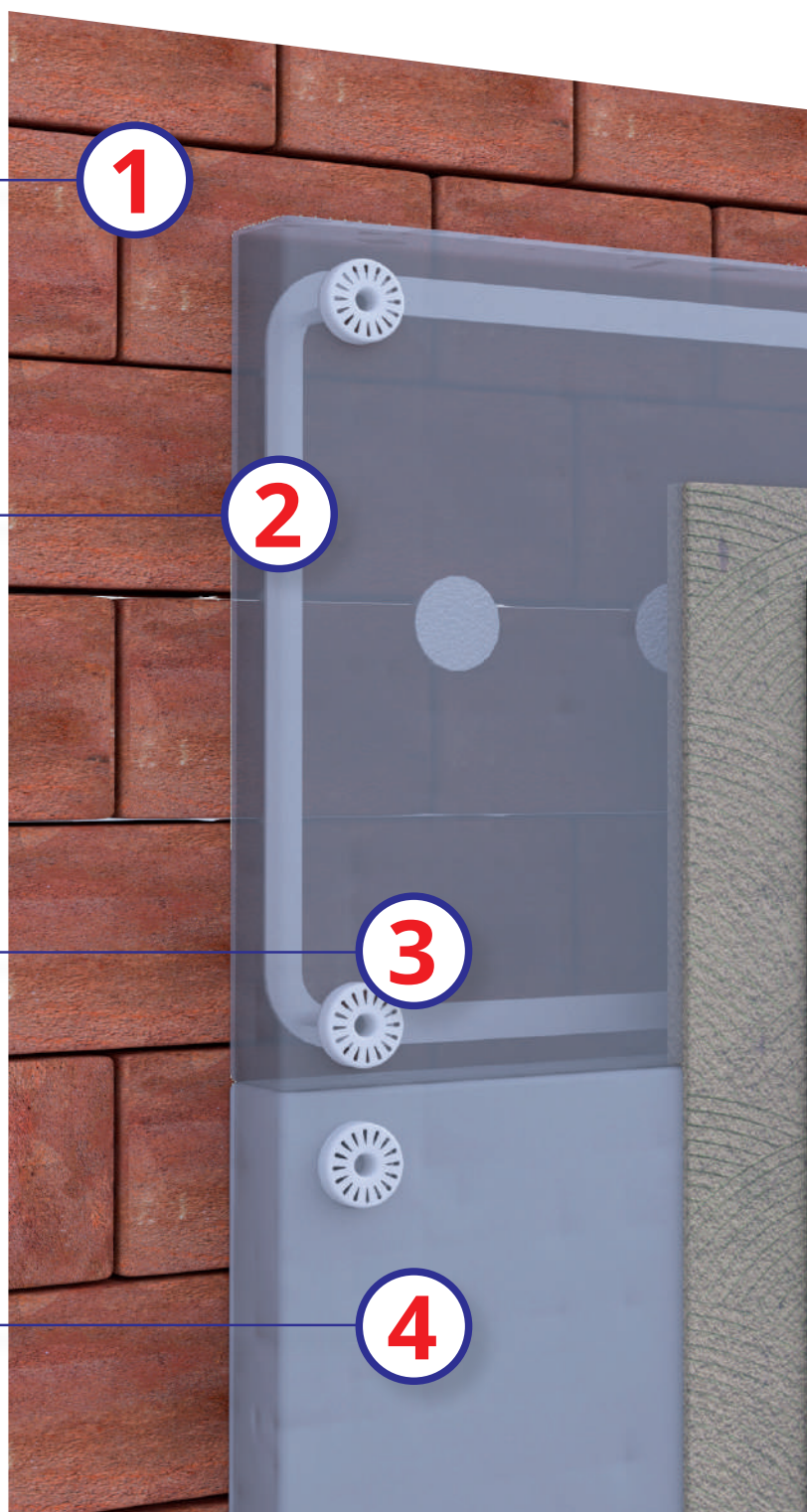
ADHESIVES

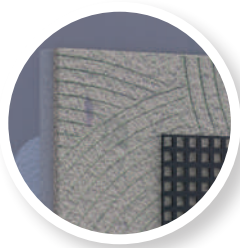


FIXING ANCHORS

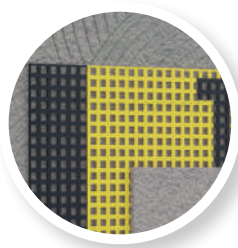


**THERMAL
INSULATING
MATERIAL**

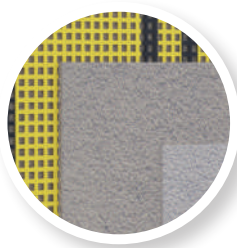




**BASE
PLASTER**



REINFORCEMENT



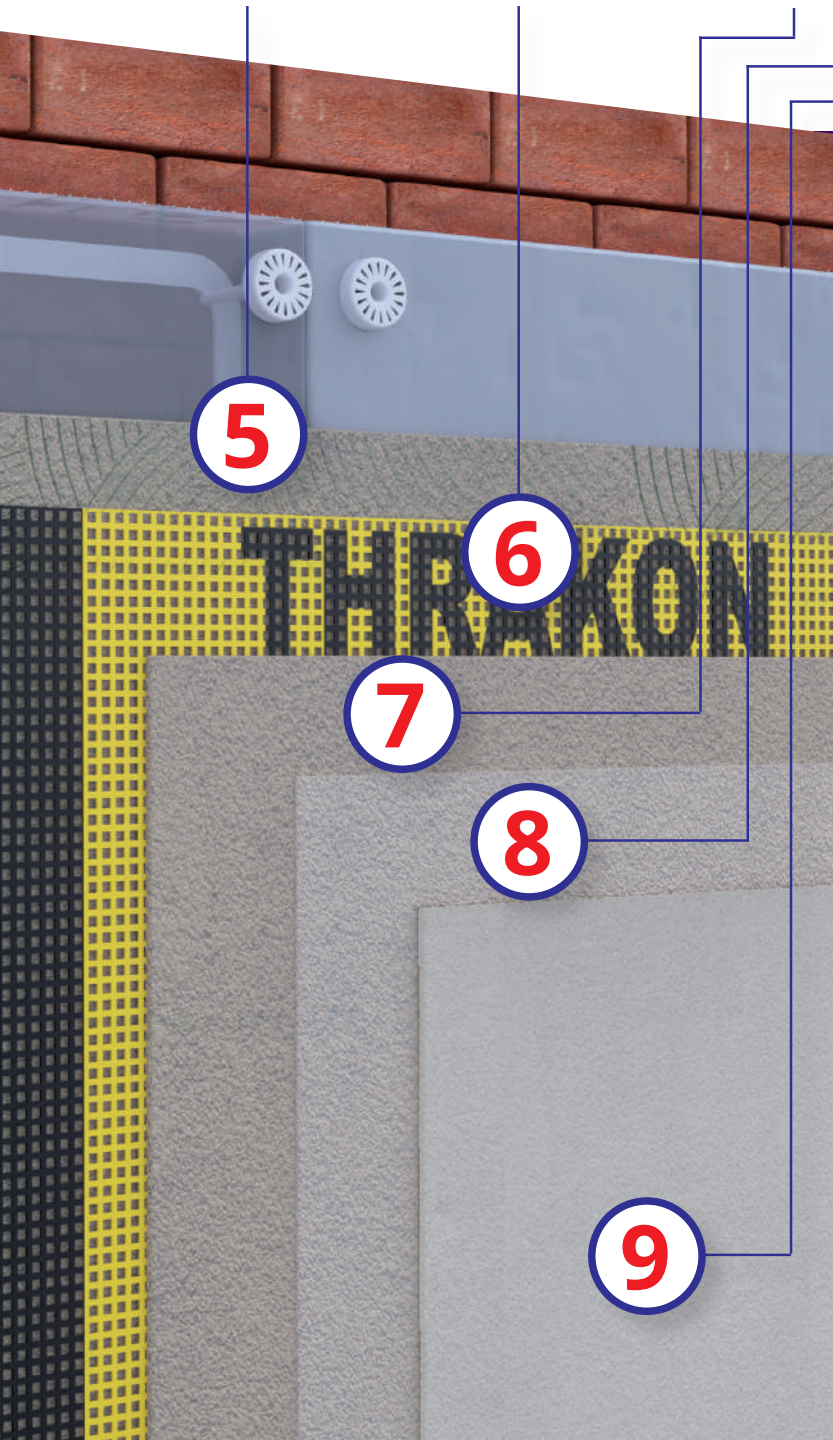
BASE PLASTER



PRIMER



**FINAL
PLASTER**



**REDUCING ENERGY
REQUIREMENTS FOR
HEATING AND COOLING**



**MINIMIZING HEAT
BRIDGES AND AVOIDING
THE GROWTH OF
MICROORGANISMS**



**POSSIBILITY FOR
IMPROVING SOUND
INSULATION AND FIRE
PROTECTION**



**MAXIMUM PROTECTION
OF BUILDING FACADES
FROM CLIMATIC STRESSES**



**FLEXIBILITY OF FINAL
APPEARANCE (TEXTURE,
COLOR)**



BUILDING THERMOGRAPHY – FAULT IMAGING



Facades of buildings made in the past as well as facades of those recently built are designed and constructed in different ways, e.g. single, double or triple coated walls with insulation. Each and every possible version is effective when there are no heat bridges.

Heat bridges are the points or surfaces of the building element where U-coefficient is significantly lower than the mean value of the overall element. Heat bridges reduce the thermal resistance of the element in relation to the other surfaces, resulting in increased heat flow through them and, therefore, heat losses.

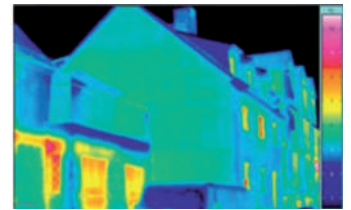
Due to the increased point heat flow, the internal sides of the wall have different surface temperatures, resulting in the frequent appearance of local moisture and mold, while they significantly contribute to reducing the thermal convenience of the space.



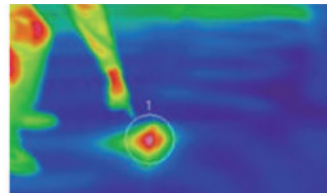
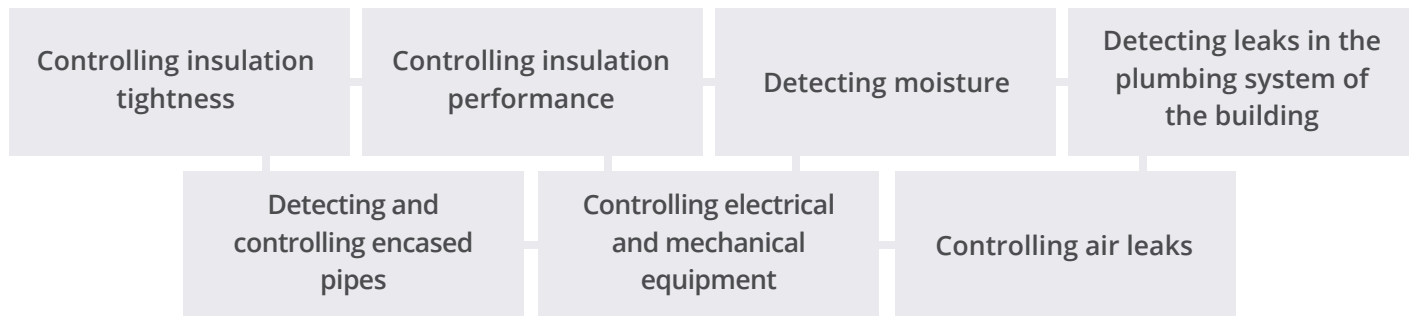
Infrared building thermography is the safest way to detect the points of the building shell where energy losses occur, using a special apparatus called thermographic camera, which records the thermal radiation of objects. According to the images, the following can be inspected:



Before insulation



After insulation



Ingress of water into an insulated penthouse

Condensation

Condensation is a process noted in both old and new buildings due to poor thermal insulation and moisture proofing. It appears in winter months, when large fluctuations and changes of temperature within the same day or day after day are frequent.

At first, condensation appears as condensed water on the surfaces. Then mold is formed, at first as green and then black stains, which indicate the growth of fungi that are harmful for human health.

Old buildings and existing infrastructures

In this case, the inspection of the substrate on which ETICS is to be applied, as well as the preparation of the substrate, is of high importance. The possibly necessary preparation works that are to be carried out on the substrate are described below.

Wooden substrates and light building boards

In case of these substrates, all ETICS types should be connected and also fixed mechanically because they include a large variety of different products. Correct preparation is very important because they should be protected against moisture as:

Moisture could make such substrates swell

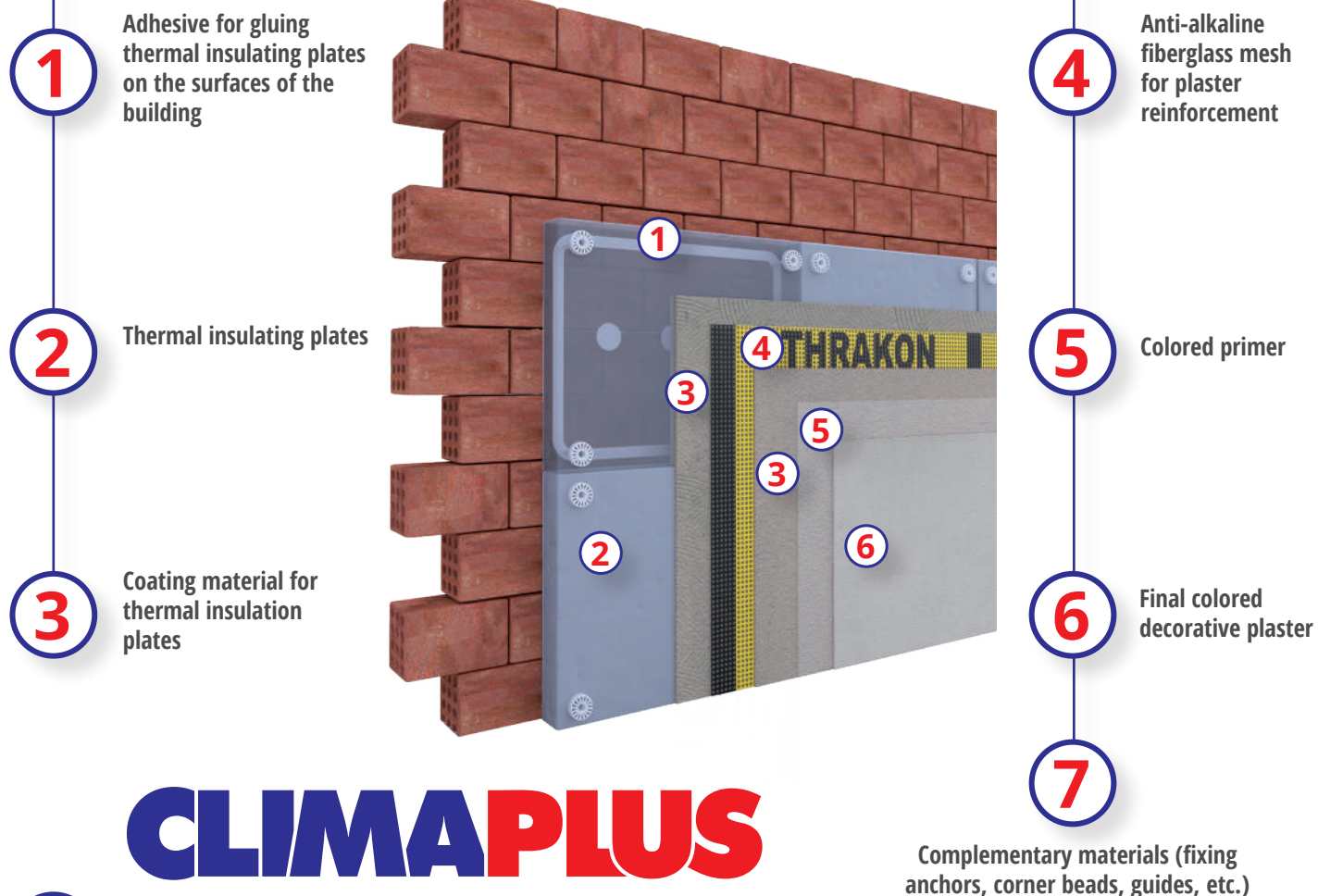
The intrinsic durability of such substrates could be reduced

Possible oscillations of substrates could cause damage

OVERVIEW OF CLIMAPLUS CERTIFIED SYSTEMS

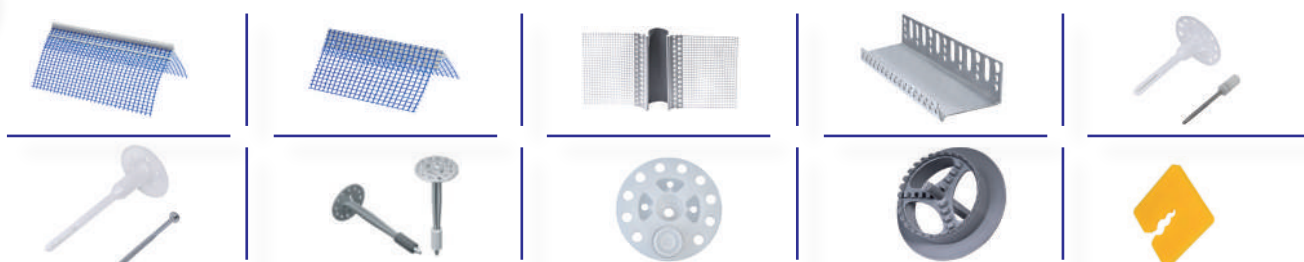
CLIMAPLUS is a thermal insulation system for buildings with multiple applications, as it can be used in either new or already existing constructions. The result is an excellent insulation and an added value for your property.

CLIMAPLUS is an integrated external thermal insulation system for buildings based on ETICS and consisting of:



CLIMAPLUS

7



CLIMAPLUS PREMIUM

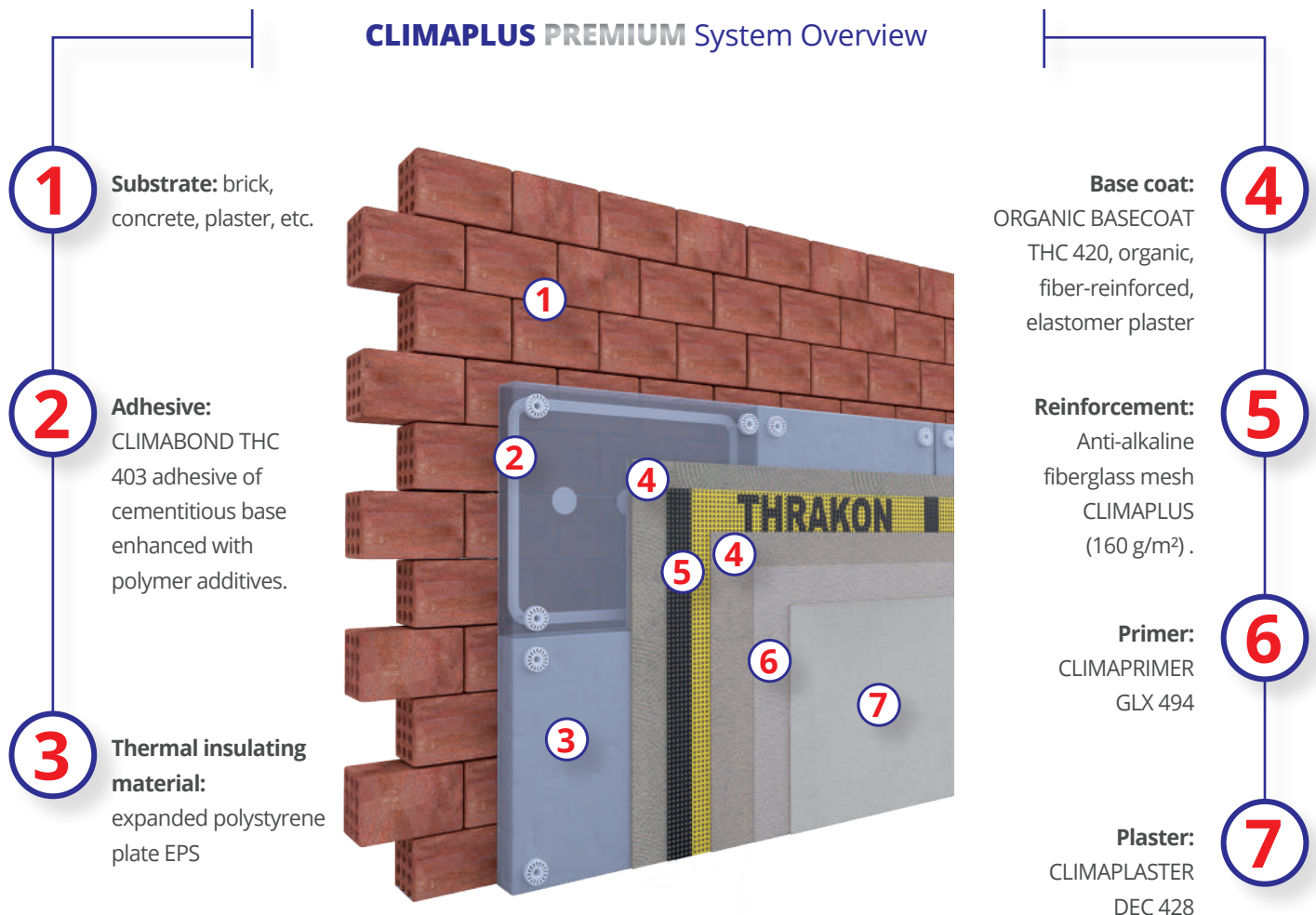

FIRE
PROTECTION*



The best & most complete organic certified external thermal insulation system

The most complete external thermal insulation system combining energy saving and the best possible thermal insulating and sound insulating properties. Its elasticity and anti-cracking action, in combination with the final organic plaster, ensure a pleasant environment and economic benefits.

CLIMAPLUS PREMIUM System Overview



* Included in non-combustible plasters of THRAKON

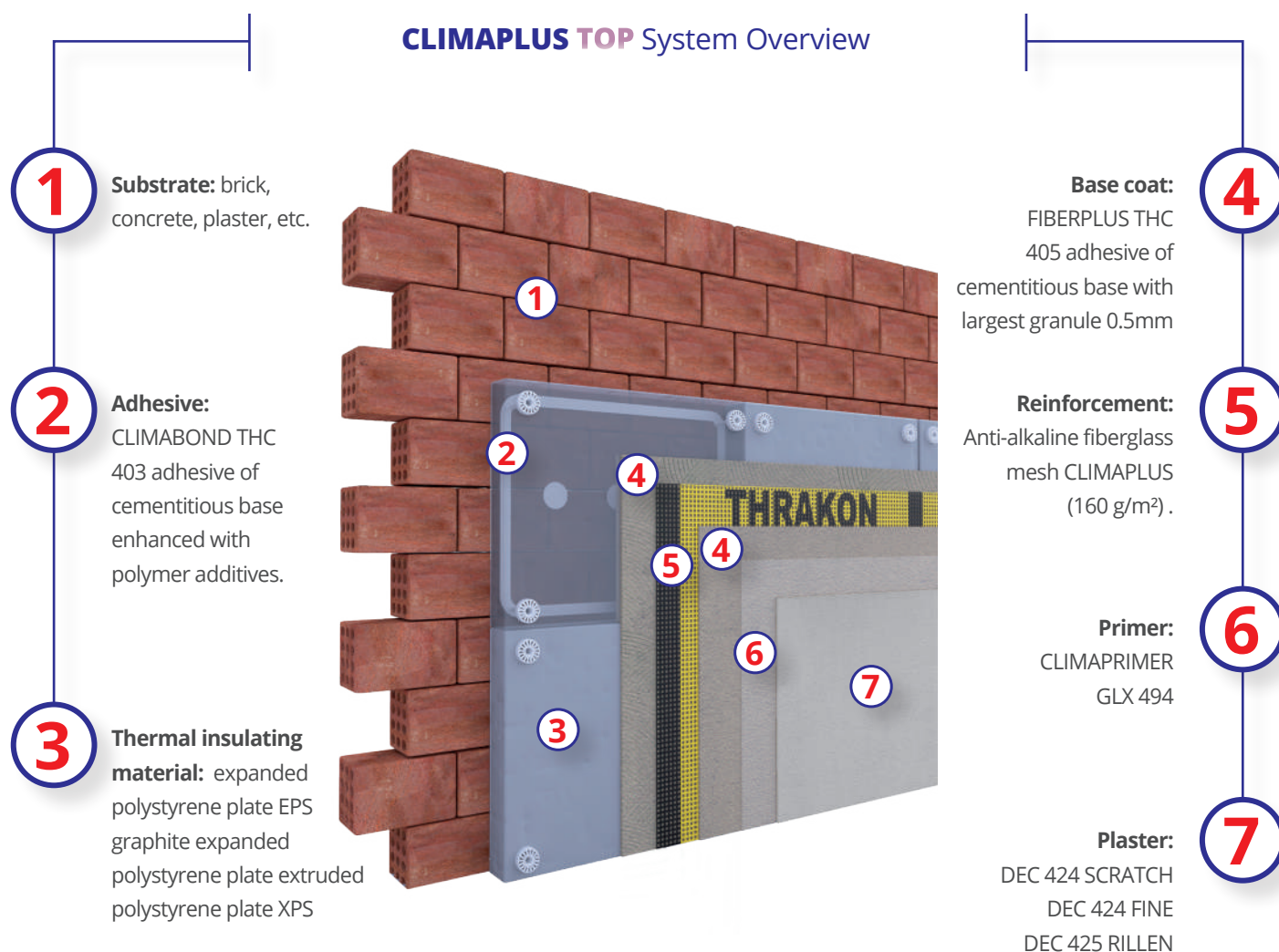
CLIMAPLUS TOP

System with expanded, graphite or extruded, polystyrene in combination with cementitious organic plasters

CLIMAPLUS TOP is the best solution for attaining an excellent thermal insulation in either new or existing buildings, as it combines competitive cost, elasticity and construction speed. THRAKON provides top-quality materials, thus ensuring perfect aesthetics and protection against weather conditions.



CLIMAPLUS TOP System Overview



* Included in non-combustible plasters of THRAKON

CLIMAPLUS GOLD

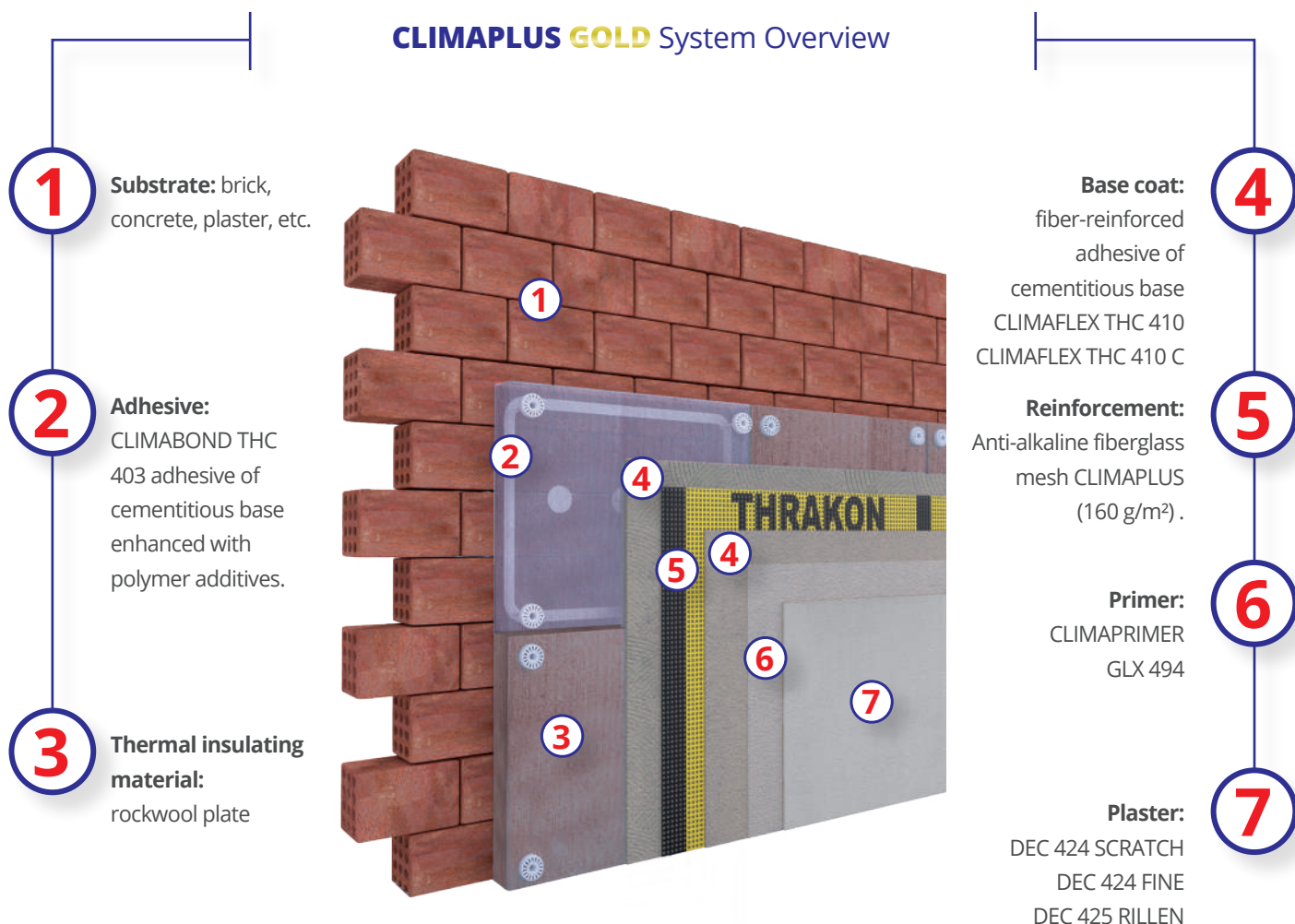

FIRE
PROTECTION*



System with rockwool plates for perfect resistance to fire, increased breathing and resistance to impact

CLIMAPLUS GOLD is an absolutely reliable external thermal insulation system combining non-combustible rockwool plates. The system provides safety, security, long life, with main characteristics being perfect thermal insulation, breathing as well as high resistance to fire.

CLIMAPLUS GOLD System Overview



* Included in non-combustible plasters of THRAKON

SELECTING THERMAL INSULATION MATERIALS

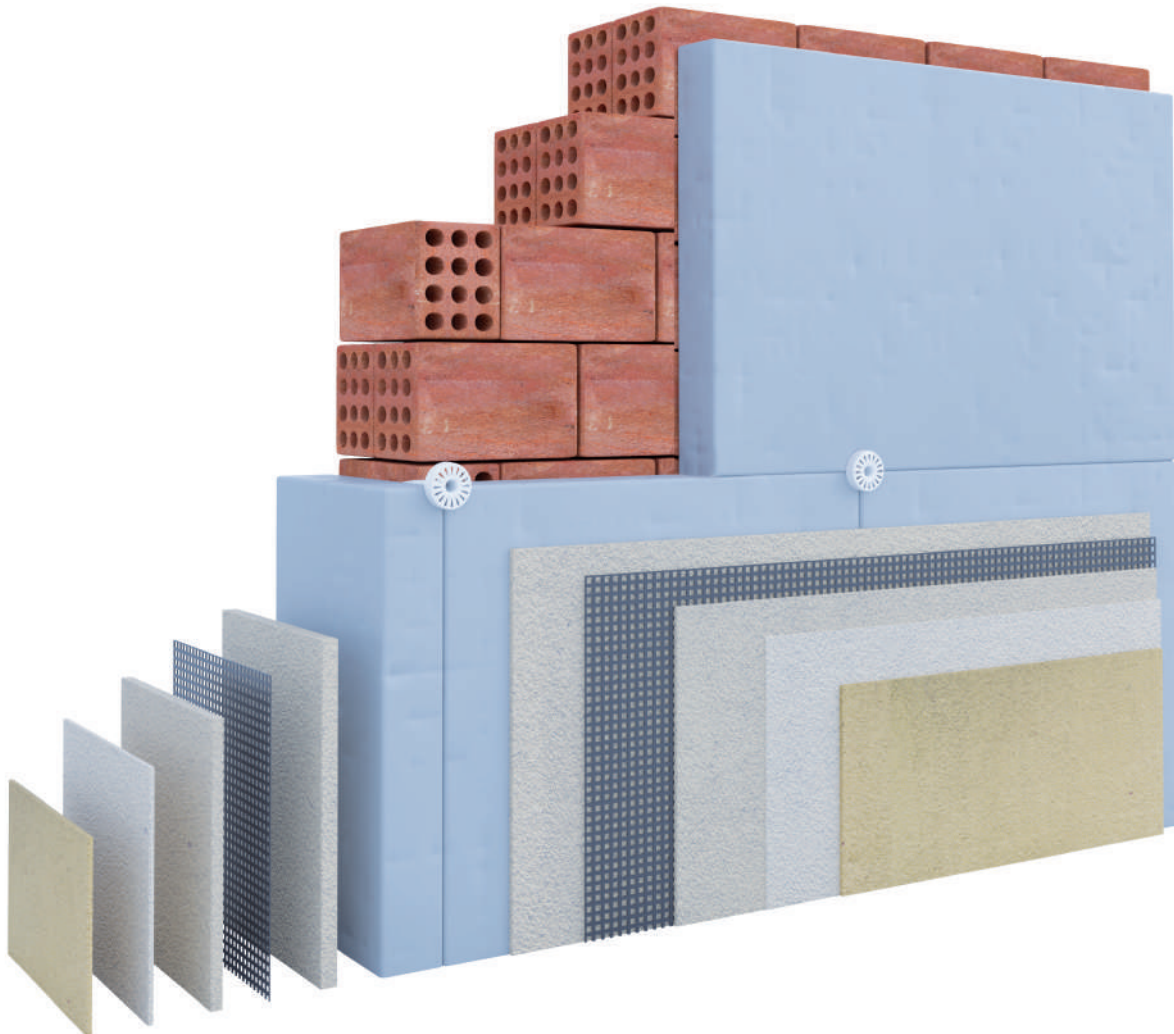


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All insulating materials managing to trap still air inside them are considered thermal insulating materials.

High mechanical strength is considered necessary in several thermal insulation works, but it does not particularly affect the thermal insulation properties of insulating materials.

The following are considered insulating materials: expanded polystyrene plates EPS, graphite plates EPS, extruded polystyrene plates XPS, rockwool plates, THRAKONPOR® and plates from Climaplus Cork.



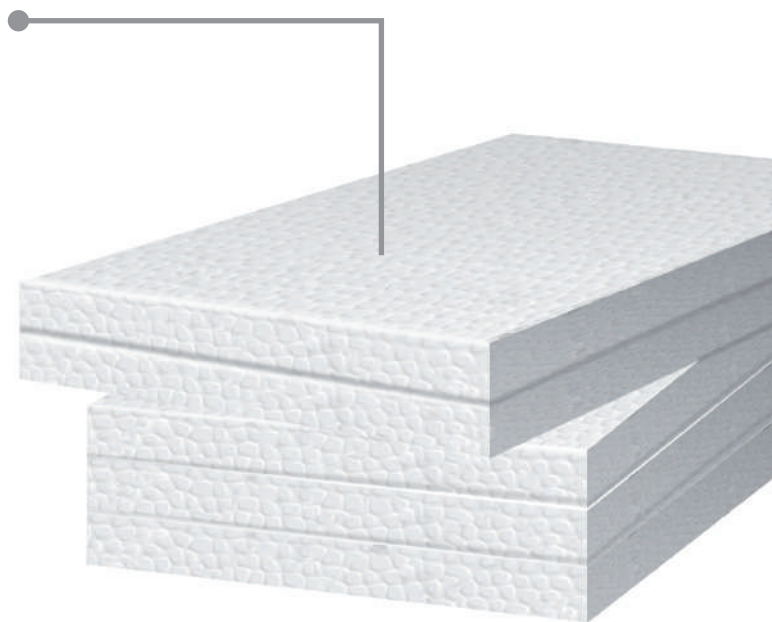
ULTRAPOR® EPS

Expanded polystyrene

THRAKON Group, as a member of the Hellenic Association of Expanded Polystyrene, contributes to promoting and generally managing expanded polystyrene and its by-products.

Expanded polystyrene is a foamy synthetic thermal insulating material widely used across the full range of building industry, such as in insulations, foundations, seismic protection, road construction works as well as in packages due to low cost and good thermal insulation properties.

It is produced in all rates of density (80/100/150/200). Expanded polystyrene has excellent insulating properties and thermally insulates sufficiently every new or existing building.



Perfect thermal insulation

EPS contains 98% air, which makes it a perfect thermal insulating material. U-coefficient (λ) 0.034 W/mk.

Proven sound insulation

Absorbs sound, i.e. both impact sound on floating floors and wall sound that is transferred through the air.

Flexible mechanical properties

Flexible production process makes the mechanical properties of EPS easily adaptable to any particular application.

Fire retardant

There are two kinds, the "typical" and the "self-extinguishing", which contains fire retardants to fight a fire.

Moisture-resistant

EPS resists corrosion that can be caused by water.

For life

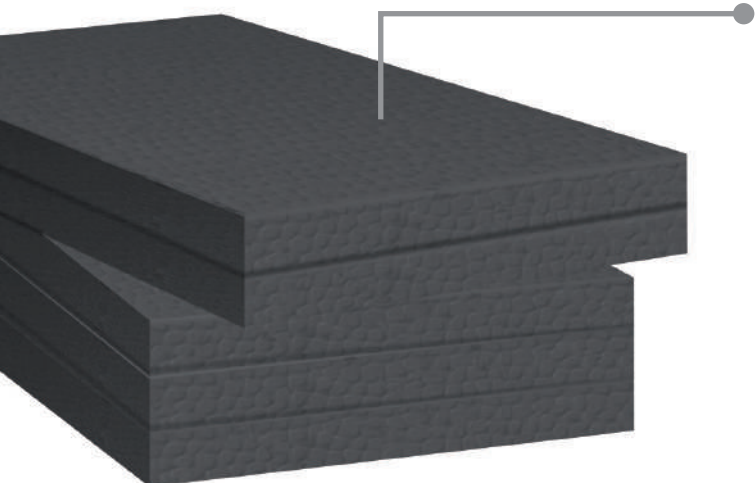
No decomposition. As a result, it can be used for ever.

Economical

The best value for money compared to any other insulating material.

Used in **floor-heating** systems

Used for **seismic protection** of buildings, installed on the perimeter and in the foundations.



ULTRAPOR® GRAPHITE

Graphite expanded polystyrene

Graphite EPS is an insulating material available in grey-silver color because it contains graphite. More specifically, it intervenes in the heat dissipated through radiation and reduces it significantly due to its optimal absorption and reflection properties.

Thanks to its physical characteristics, graphite EPS is a revolutionary insulating material for the thermal insulation of buildings. It provides thermal insulation even at low densities, something nobody had ever imagined before for any kind of expanded polystyrene.



Graphite insulating plates EPS offer one of the **lowest coefficients of thermal conductivity**
($\lambda=0,031$ W/mK)

Vapor permeable

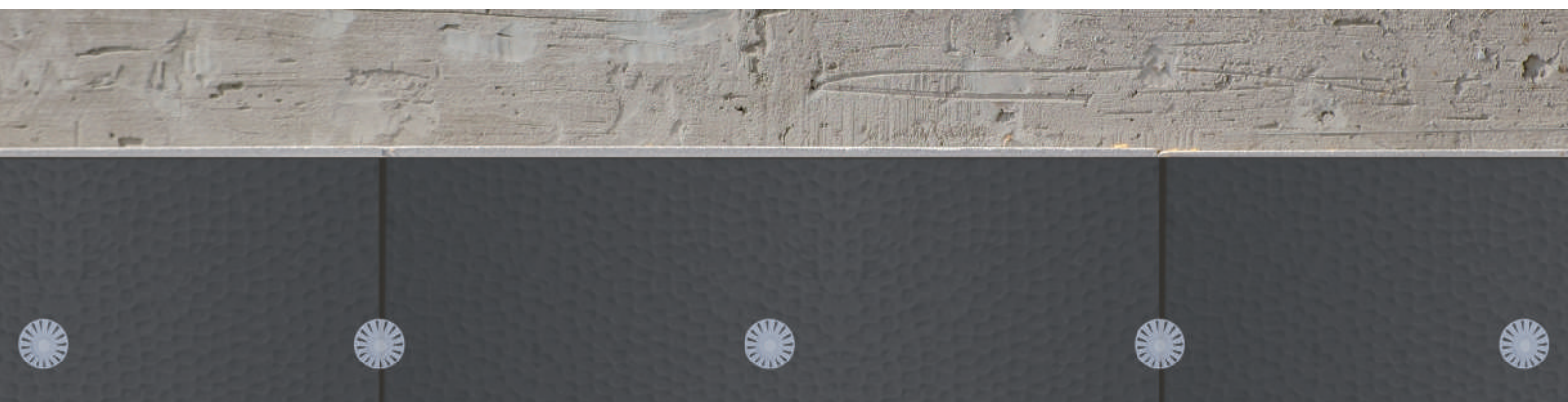
Very safe to use
and easily processed

Resistant to ageing

Zero water absorption

Nonflammable

Produced in different densities depending on the need of researchers for low or high compressive strength

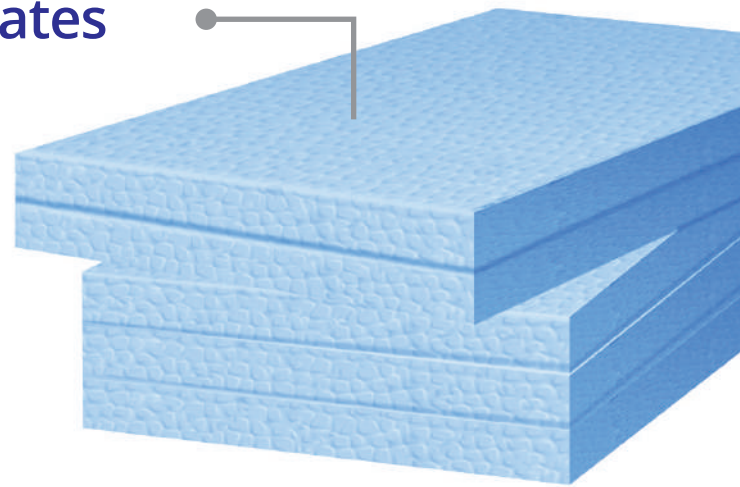


XPS Extruded polystyrene plates

XPS - Extruded polystyrene is a light thermal insulating material based on polystyrene. It is produced in the form of plates using the method of extrusion and has insulating properties because it traps gas/air within a large number of sealed cells. A main characteristic is sealed pores and the lack of water absorption, which makes extruded polystyrene suitable for applications in high humidity.

Despite the fact that 97% of its volume consists of inert gas and the remaining 3% is covered by the walls that look like a cell, the expanded polystyrene XPS is a material with exceptional thermal and mechanical properties.

Due to its homogeneous structure, the extruded polystyrene is a very robust material with very good mechanical properties that make it ideal for use under harsh conditions, i.e. at a construction site.



High tensile strength ($0.3-0.7\text{N/mm}^2$) vertically to the surface of the plate and high resistance to direct tension.

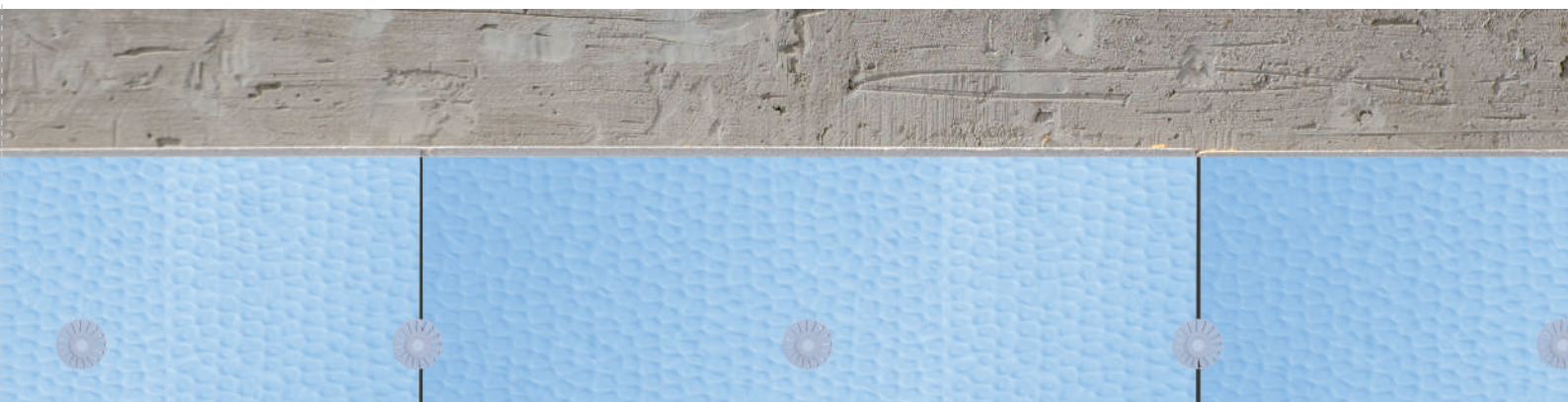


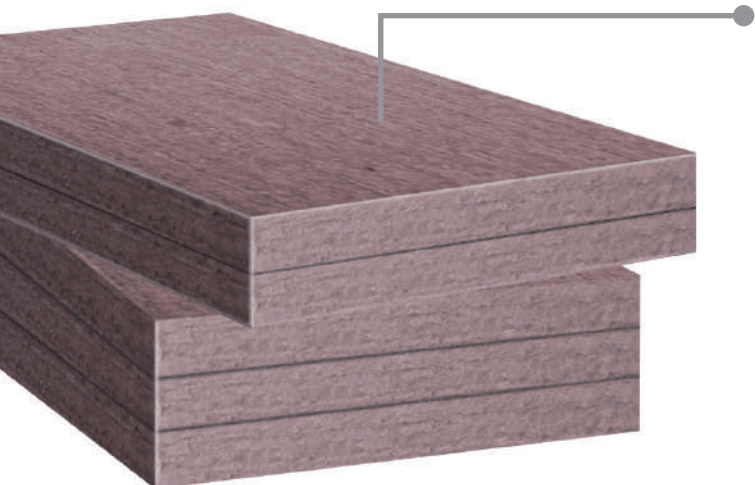
Basic advantage of thermal insulating polystyrene products is that they are **fully recyclable**

Coefficient of thermal conductivity:
 $\lambda=0,031-0,037\text{ W/mK}$

Slightly vulnerable to corrosion,

Therefore, mold or fungi formation is minimized.
Clean, odorless and without irritating powders.





ROCKWOOL

Rockwool is an insulating material coming from mineral raw materials and consisting of fine fibers of natural rocks, which means that it belongs to inorganic fibrous materials.

Rockwool has an environmental impact due to the high fusion temperature required for its manufacture. Rockwool is produced from mineral materials of volcanic origin, which are not harmful for human health. However, particular attention should be paid in the phase of recycling.

The properties of rockwool remain permanent and unchangeable throughout the life cycle as long as the protection of the material from moisture is ensured. Rockwool manages to absorb external sounds, thus meeting the requirements of the Regulation on Noise Insulation. It also ensures the following:



Thermal insulation and sound insulation of tiled roofs

Coefficient of thermal conductivity $\lambda=0.034$

External thermal and sound insulation of walls

Sound insulation

Fire protection

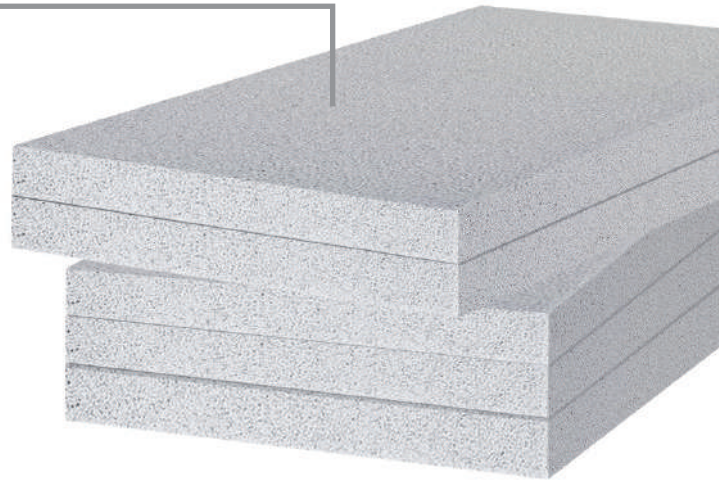
Passive ventilation



THRAKONPOR®

The mineral thermal insulating plates THRAKONPOR® is a thermal insulating material ($\lambda=0.045\text{W/mk}$), which has been used in Europe for more than 15 years thanks to its numerous exceptional properties.

THRAKONPOR®



Natural and environmental-friendly material. Manufactured from cement, lime, sand and water.

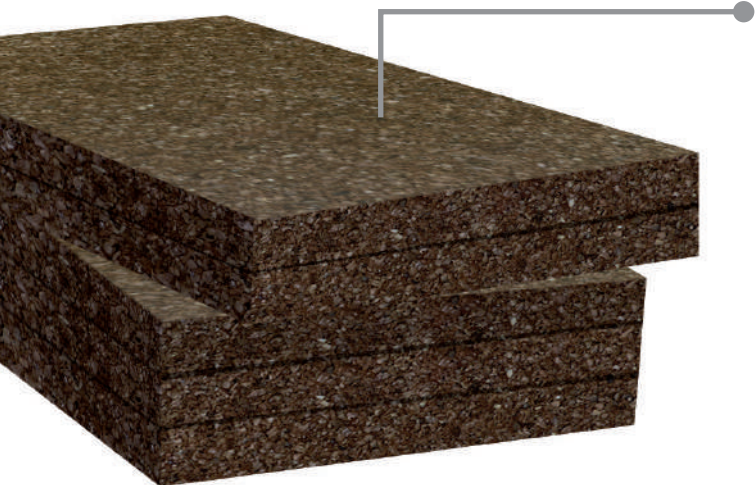
Mold formation is prevented
In combination with their porous structure in internal space

Long life.
Never gets old, no changes noted in their structure in the course of time.

Nonflammable and vapor permeable.
No fibers and pressure-resistant.

Humidity regulators.
Indoor thermal insulation as it absorbs liquid evaporations at their peak and discharges them slowly back when relative humidity is reduced.





CLIMAPLUS CORK

Cork is one of the first materials used in thermal insulation and belongs to organic foamy thermal insulating materials. The exceptional properties of cork are due to the numerous airtight cells it consists of, which serve as closed air chambers, while the gap between them is practically nonexistent. This texture makes cork one of the most effective thermal insulating materials.

Thermal insulating plates of cork are suitable for insulating brickwork, penthouses, floors, refrigeration rooms and pipes.



- | | | | |
|--------------------------------|---|---|--|
| Small weight | • | • | High compression strength |
| Elasticity | • | • | Low water permeability |
| Environmental-friendly product | • | • | Low thermal conductivity
$\lambda=0,039\text{W/mk}$ |



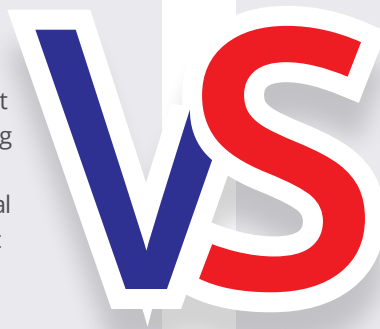
TECHNICAL DIFFERENCES BETWEEN **EXPANDED** AND **EXTRUDED** POLYSTYRENE

Expanded polystyrene (EPS) contains air (O_2, N_2) at a percentage of 98% and is configured with vapor. As a result, tight cells are created, offering exceptional thermal insulating properties.

- **Increased elasticity** of the material
- **Reduced risk of cracking** on the plaster due to contraction-expansion of materials and building elements.
- **Perfect cooperation of thermal insulating material and plasters** so that even in extreme mechanical stress (strong impact, contraction-expansion, etc.), adhesion remains strong and the material behaves excellently and in a highly elastic way, absorbing strong impacts without being detached or cracking.
- **Unchangeable coefficient of thermal conductivity (λ)** in the course of time.
- In general, the technical and physical properties of expandable polystyrene make it **the safest, most effective, most convenient and economical thermal insulating material** in the market for the specific use.

On the other hand, extruded polystyrene (XPS) is a byproduct of oil from polymers and is produced via the extrusion process. It is a closed cell structure that cannot actually be penetrated by moisture and has a life of approximately 100 years.

However, the exceptional behavior mentioned above could not have been possible if extruded polystyrene XPS had been used.



- **Increased rigidity and hardness of the material**, which transfer impacts as well as expansions-contractions more violently to the plasters.
- **Impossible breathing** resulting in unhealthy conditions of living, condensation, etc.
- Extruded polystyrene is usually **inflammable**, unlike expanded polystyrene, which is neither ignited nor spreads fire.
- **Coefficient of thermal conductivity (λ) changes** in the course of time resulting in unreliable thermal insulation throughout the building's life cycle.
- Extruded polystyrene **contains chlorofluorocarbons**, i.e. the well-known freon, which is a greenhouse gas.

Expanded polystyrene should be used as the basic thermal insulating material.

Conclusion

Extruded polystyrene is suggested in basement insulation, inverted insulations, insulations under concrete slabs.

EXPANDED POLYSTYRENE EPS

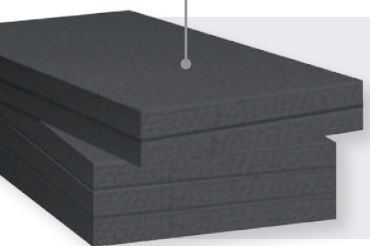


INERT MATERIAL IN THE FORM OF PLATES.

PRESSURE
RESISTANTUNCHANGABLE
OVER TIMEEASY
APPLICATION

RECYCLABLE

GRAPHITE EXPANDED POLYSTYRENE

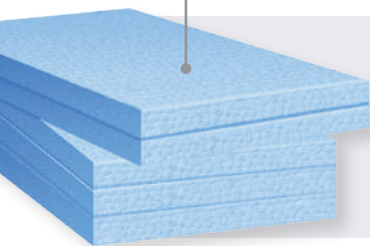


VERY SAFE IN USE AND EASILY PROCESSED

RESISTANT TO
AGEINGVAPOR
PERMEABLEZERO WATER
ABSORPTIONNON-
FLAMMABLE

RECYCLABLE

EXTRUDED POLYSTYRENE PLATES

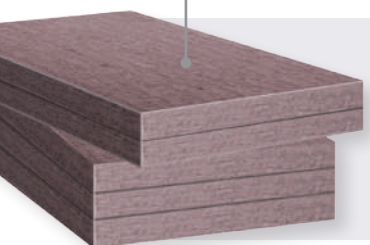


LIMITED SOUND ABSORPTION PROPERTIES

PRESSURE
RESISTANTNO WATER OR DIFFUSED
VAPOR ABSORPTION

RECYCLABLE

ROCKWOOL



INORGANIC MATERIAL PRODUCED FROM VOLCANIC ROCKS

PRACTICALLY NON-
COMBUSTIBLE MATERIALSIGNIFICANT SOUND
ABSORPTION PROPERTIES

THRAKONPOR®

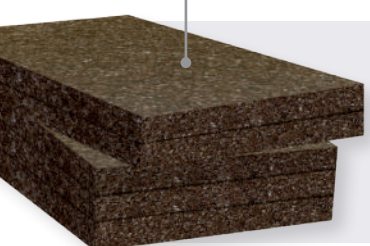
PERFECT THERMAL
INSULATION

NATURAL PRODUCT



RECYCLABLE

CLIMAPLUS CORK (CORK)

PERFECT THERMAL
INSULATION

NATURAL PRODUCT

PERFECT SOUND
INSULATION

RECYCLABLE

THERMAL INSULATION OF PILOTIS AND BASEMENTS



A building with lower or no thermal insulation at all creates a number of problems.

In our everyday life, because our environment does not provide us with thermal convenience, the needs for heating and cooling are big and, as a result, they significantly increase our expenses and affect the environment because we consume larger amounts of energy than those we actually need.

Buildings in our country are responsible for 60-70% of the total energy consumed, a percentage on the rise. A share of 69% of this amount is consumed for space heating and 14% for hot water needs.

The areas that should be thermally insulated are ceilings, perimeter walls as well as pilotis and basements. The advantages of insulating the specific areas is that no heat bridges are created, and these points are protected against moisture.

Pilotis are quite frequent in buildings and are usually used as parking areas. Poor thermal insulation is very widely perceived by first-floor residents, who often feel large amount of heat lost through their floors.

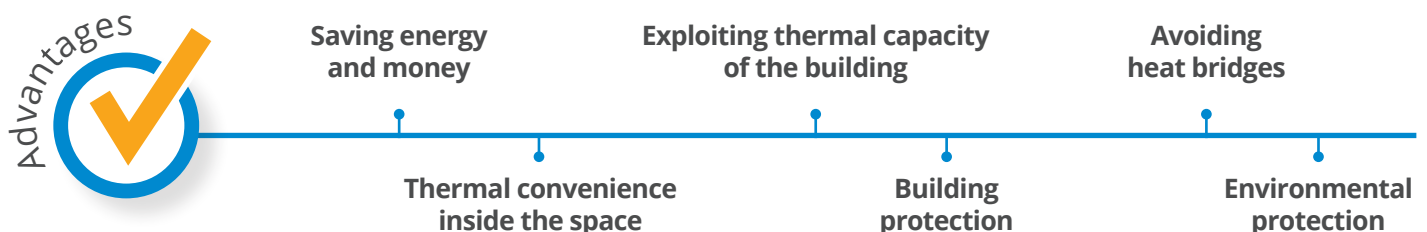
The continuous loss of heat makes the construction quite costly. This shows that thermal insulation of pilotis is necessary for preventing heat escaping from indoors to outdoors.

Furthermore, condensation is formed (in pilotis without thermal insulation), which can become extremely annoying (mainly on the perimeter of the house). It is only natural

that condensation is the precursor of mold, which is expected to occur under such circumstances and deteriorate things further.

If pilotis are not insulated during the construction of the building, insulation can be applied at a subsequent stage, by mechanically fixing insulating plates onto the underside surface and at a rather low cost. This solution can be adopted in both new and older buildings.

Pilotis can be thermally insulated with plates of expanded polystyrene, graphite expanded polystyrene, and THRAKONPOR®, depending on the requirements of the specific building. The thickness of the thermal insulating plate is specified by KENAK/REPB (Regulation for the Energy Performance of Buildings) and depends on local climatic conditions.



Urban heat island



The phenomenon of urban heat island has been recorded and studied in large cities of Greece.

Urban planning, traffic jams, heat from the people and their activities as well as the lack of green areas are main parameters leading to higher temperatures in city centers as compared to the suburbs. The temperature difference noted among such areas in Athens may reach even 18°C on a typical summer day.

The consequences of the phenomenon of urban heat island are serious and can be summarized as follows:



Conditions of thermal discomfort experienced by the people in the summer.



Increased energy consumption for cooling and heating systems.



Increased atmospheric pollution due to increased energy consumption.



On building scale, the highest percentage of the existing buildings have insufficient thermal shell protection due to either uninsulated construction (old buildings made before 1979) or aged window frames. The point is that in this sector consumption is continuously increasing and living conditions are becoming harder.



The new General Building Regulation and the new Master Plan of Attica specify that the reducing energy consumption of buildings will become a reference point and an essential energy revolution in Greece.

This can be attained by designing sustainable buildings and adopting methods involving low energy consumption of buildings, such as thermal insulation, natural ventilation, etc.



PREPARATION

ORGANIZING BUILDING SITES



The correct organization of the building site includes correct storage of all ETICS elements. Throughout the application, drying and hardening processes, the temperature of the environment, the substrate and the material should be at least + 5°C.



In case of hot weather conditions, when temperature rises above +30°C, the appropriate measures should be taken because the wind and direct exposure to sunlight could affect the properties of the application. In this case, shading should be provided with the help of the appropriate scaffolding.



Furthermore, in case of harsh weather conditions (rainfall or fog), application should be avoided as the system could negatively be affected in drying and hardening processes.

DESIGNING THERMAL INSULATION

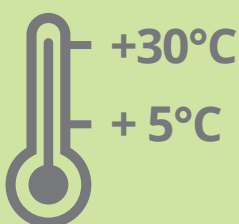
Apart from the thickness of the thermal insulating material, as specified in minimum requirements, the following should also be taken into consideration in the design:

- 1 The use of the building and the climatic zone in which it belongs.
- 2 Possible pressure due to winds expected to blow on the building.
- 3 Preventing the formation of heat bridges (connections, endings, construction openings).
- 4 Moisture prevention (proper waterproofing zone).
- 5 The distance between the scaffolding system and the wall, depending on the thickness of the insulation to be used, so that enough space is ensured for works.
- 6 Climatic conditions by all means.
- 7 Cladding the scaffolding system with a special net, especially when graphite plates are used and the area receives long hours of sunshine.

ENVIRONMENTAL WORKING CONDITIONS

All construction stages should be avoided in case of extreme weather conditions (rainfall, frost, extremely high temperatures, etc.) that could have a negative effect. In particular:

The minimum temperature of the environment, the substrate and the materials should be +5°C and the maximum up to +30°C.



Maximum relative humidity up to 80%



Factors such as frost, temperatures over +30°C, dry winds and direct sunlight could alter the application properties of the materials. Therefore, protection via appropriate covers in the scaffolding system is always necessary, especially in case of graphite thermal insulating plates.



STARTING CLIMAPLUS

CLIMAPLUS

The CLIMAPLUS external thermal insulation system can be installed as long as the following works have been carried out:

1

All installations of the substrate shall have been completed and the resulting openings shall carefully be sealed.

2

In case cables should be encased, everything should be designed from scratch. All electrical-mechanical works should have been installed and then sealed.

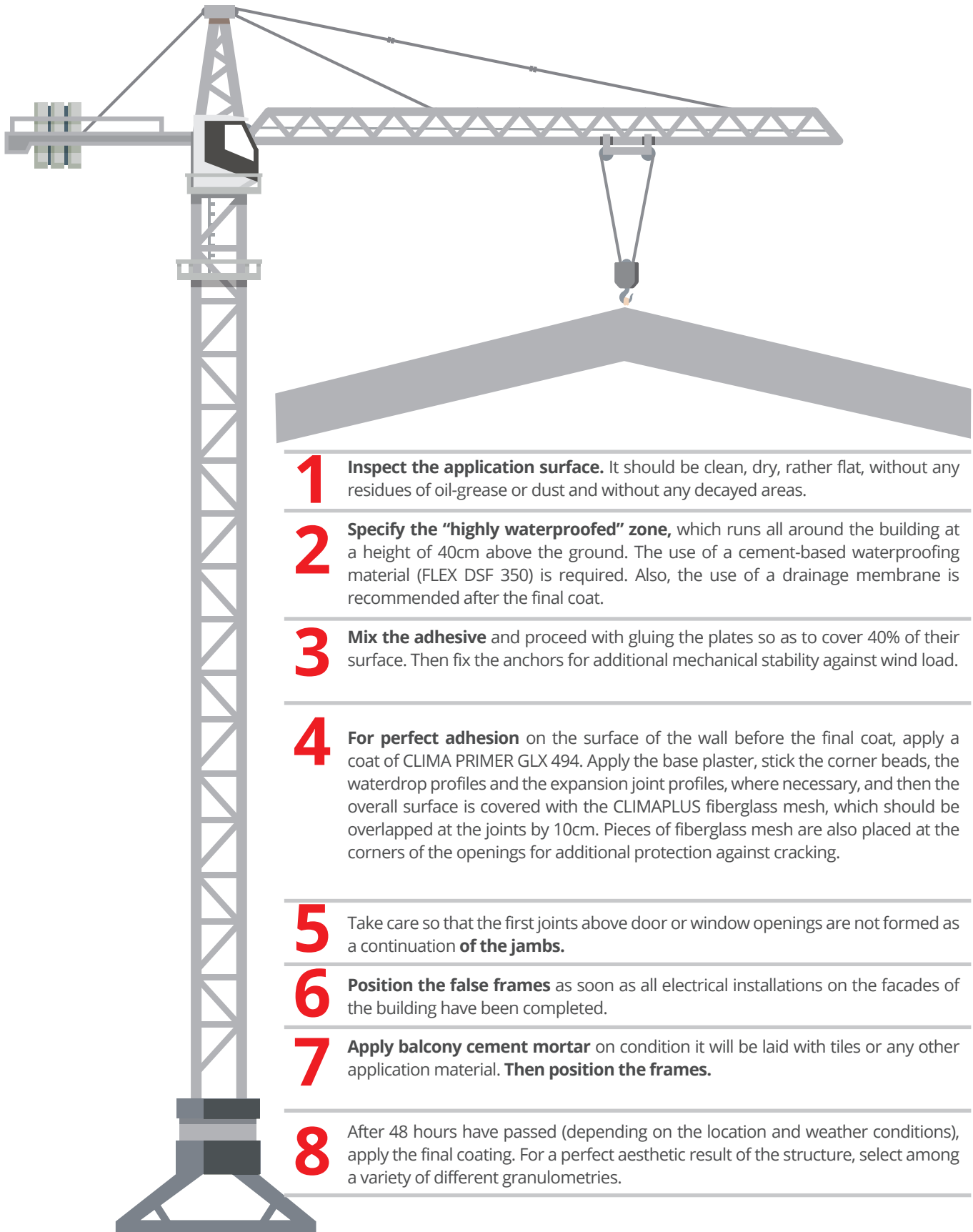
3

The suitability of the substrate should have been verified and the appropriate measures should be taken, if necessary.

4

In case of old buildings, before restoring the causes of increased moisture and the like, the brickwork should have dried out completely.

NEW CONSTRUCTIONS



- 1** **Inspect the application surface.** It should be clean, dry, rather flat, without any residues of oil-grease or dust and without any decayed areas.
- 2** **Specify the “highly waterproofed” zone,** which runs all around the building at a height of 40cm above the ground. The use of a cement-based waterproofing material (FLEX DSF 350) is required. Also, the use of a drainage membrane is recommended after the final coat.
- 3** **Mix the adhesive** and proceed with gluing the plates so as to cover 40% of their surface. Then fix the anchors for additional mechanical stability against wind load.
- 4** **For perfect adhesion** on the surface of the wall before the final coat, apply a coat of CLIMA PRIMER GLX 494. Apply the base plaster, stick the corner beads, the waterdrop profiles and the expansion joint profiles, where necessary, and then the overall surface is covered with the CLIMAPLUS fiberglass mesh, which should be overlapped at the joints by 10cm. Pieces of fiberglass mesh are also placed at the corners of the openings for additional protection against cracking.
- 5** Take care so that the first joints above door or window openings are not formed as a continuation **of the jambs.**
- 6** **Position the false frames** as soon as all electrical installations on the facades of the building have been completed.
- 7** **Apply balcony cement mortar** on condition it will be laid with tiles or any other application material. **Then position the frames.**
- 8** After 48 hours have passed (depending on the location and weather conditions), apply the final coating. For a perfect aesthetic result of the structure, select among a variety of different granulometries.

SUBSTRATE PREPARATION



The substrate on which the system will be applied shall be cleaned with water under pressure, especially when application is carried out on old walls and substrates. It should also be free from dust and oil, as well as flat, stable and solid without cracks on the application surface.

There are several methods for controlling the suitability of the substrate and the construction of the external thermal insulation system.

The following summary table presents some of the most usual situations that may arise and the ways to avoid them.

KIND	CONDITION	PREPARATION
MASONRY	Dusty-Very dirty	Sweeping or washing with technical means
	Painted surfaces	Cleaning brickwork from earlier painting, priming
	Decayed with possible detachment of elements	Restoring reinforcement, using repairing mortar
	Moisture	Applying waterproofing materials
	Algae & fungi	Cleaning brickwork, applying material against mold
	Highly smooth surfaces – low absorption capacity	Scratching – applying the appropriate primer for better adhesion

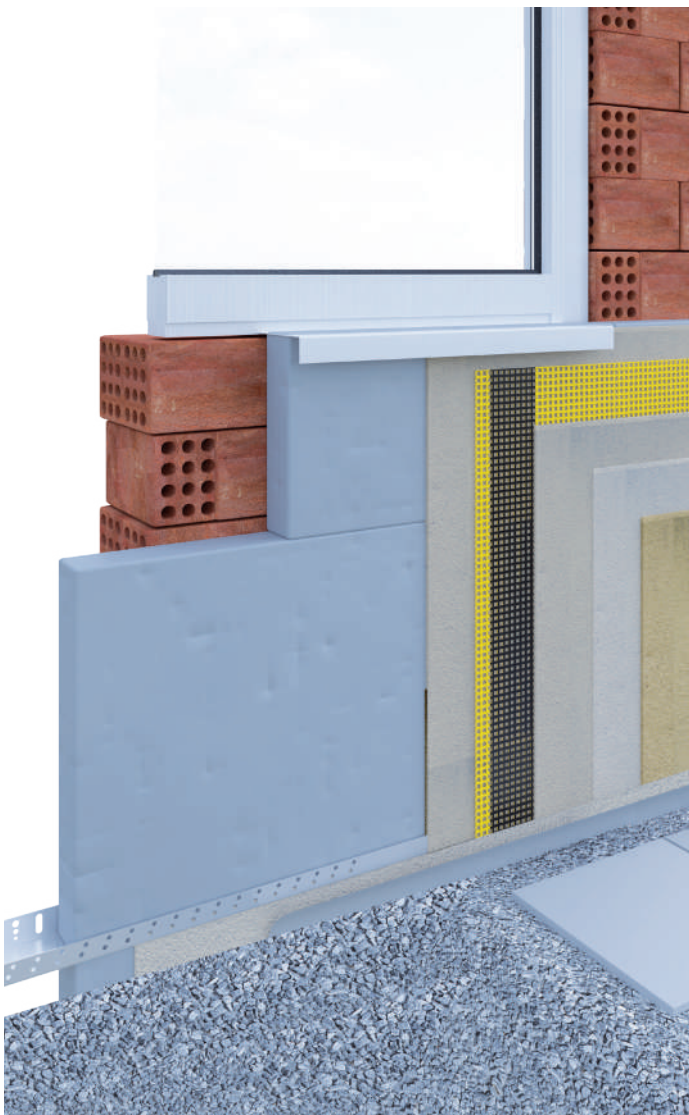
START GUIDE

HIGHLY WATERPROOF ZONE

The metal start guide (rail) is used for applying the first row of thermal insulating plates, parallel to the ground and all around the building. Two adjacent guides are connected through special connection clips.



Due to direct contact with the ground, they should be covered with heavy thermal insulating plates.



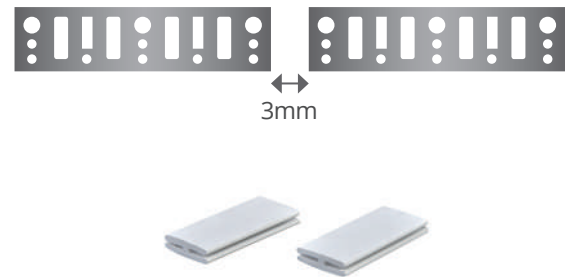
Where appropriate, either a thicker expanded polystyrene EPS 150 or EPS 200 (in case of expanded polystyrene) is applied or it is replaced with XPS extruded polystyrene so that a future occurrence of rising moisture can be avoided. Furthermore, the start guide creates a small heat bridge, which also can be avoided using polystyrene again.

Highly waterproof zone is the perimeter area that should be protected from rising moisture by applying at least two crosswise coats of the two-component brushable sealing slurry FLEX DSF 350. This area should cover the building all around, at least 40cm above the final level of the surroundings (balconies, pavements), while in case of vegetated area, it should continue into the natural terrain.

In case it continues into the natural terrain, before the thermal insulating material is positioned into the ground, it should have been brushed with the sealing elastomer plaster, the plate should be glued, and then the fiberglass mesh should be impregnated. Improve water drainage by also using one or two layers of drainage pebbles.

Highly waterproof zone is used for preventing moisture rising to the system as well as for blocking water flowing to the walls and then inside the building.

The start guide should be carefully leveled so that any impacts on the base can be avoided and the strength of the system can be increased. Aluminum start guides shall be positioned in a row with 3mm-intervals between them. In case of uneven substrate and in case an external corner is formed, use the spacers at different thicknesses and the metal corners ensuring an overlapping of 25mm. The connection of adjacent guides should be absolutely vertical to the vertical edges-corners of the building. Two different pieces of rail may not overlap.



HIGHLY WATERPROOF ZONE OF UNDERGROUND WALLS WITH BRUSHABLE SEALING SLURRY

Another effective insulation method applied externally is insulation with cement-based brushable sealers. This type of insulation protects spaces of the building in contact with moisture or water and, as a result, mold is prevented, sanitary conditions are greatly improved and building elements are protected for long periods.

The process

1. Good cleaning of the substrate with water jetting in order to remove decayed oily points and dust.
2. In case of points in need of repair, the application of repairing mortar is recommended.
3. Brush the surface with impregnating primer and apply crosswise at least three coats of brushable sealing slurry. It is recommended that the sealer be reinforced with sealing fiberglass mesh overlapped by 10cm.
4. Fix the rail and use a backer rod along the joints in order to block moisture.
5. In order to protect the waterproof layer, place a drainage membrane –“egg-box”- that provides effective protection against accidents and mechanical wear during backfilling works (Drainage system), and allows the system to breathe.



CONSTRUCTION

MIXING ADHESIVE MORTAR



THRAKON instructions (highlights, technical brochures, safety data sheets) should be observed while mixing the adhesive mortar. This also applies to ready-made adhesives in the form of paste as well as to the special polyurethane foams.



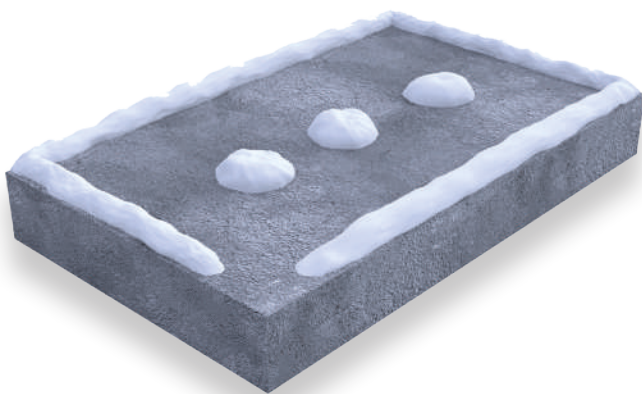
ATTENTION

Ensure the following:

There is no air circulation between the insulation frame and the substrate (otherwise a stack effect could be produced)

Uniform connection of the frame with the substrate (otherwise a cushioning or a mattress effect could be produced)

APPLICATION PATTERNS FOR THERMAL INSULATING PLATES



The way the adhesive is applied and the thickness of its layer depend on the roughness of the substrate.

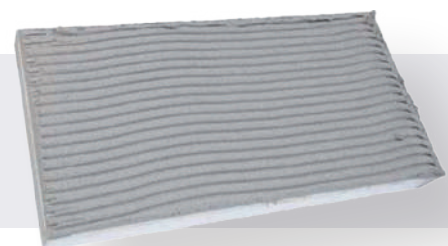
In case of uneven substrates, the adhesive is applied with the method of spot installation, all around the perimeter, forming a strip approximately 3-5 cm wide, and 3 or 4 lumps at the centre of the plate. For better results while applying the adhesive, a gap should be created at one corner of the plate so that any trapped air could escape.

On even substrates, the adhesive is applied on the entire surface of the thermal insulating plate using a notched trowel (10mm all over the plate surface). No material is applied on the sides of insulating plates.



ATTENTION

The adhesive should cover at least 40% of the overall surface of the plate.



APPLICATION OF THERMAL INSULATING PLATES

Thermal insulating plates should be applied from bottom to top, glued side by side, with joints displaced. That is, the plates should be based on the pattern of the brickwork – they should be applied on horizontal rows, in a grid layout, so that continuous vertical joints can be avoided.

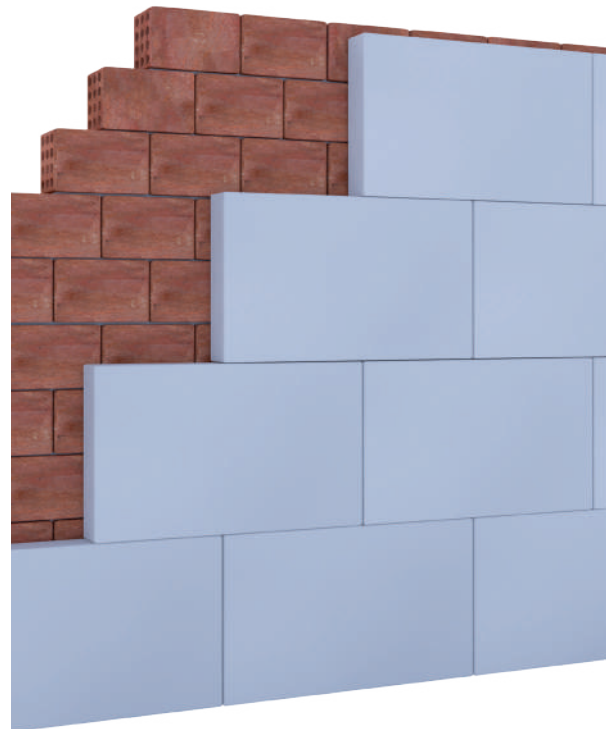
No gaps should be formed between the plates during application. In case of gaps, they should be filled with the same insulating material (thermal insulating plate) or, in case of gaps <4mm, with THRAKON low expansion polyurethane foam, in accordance with system instructions.

The application slurry may not enter the joints between the insulating plates and, if so, it should be removed. Also, no gaps should be filled with slurry.

Insulating plates should be applied accurately and on a flat position.

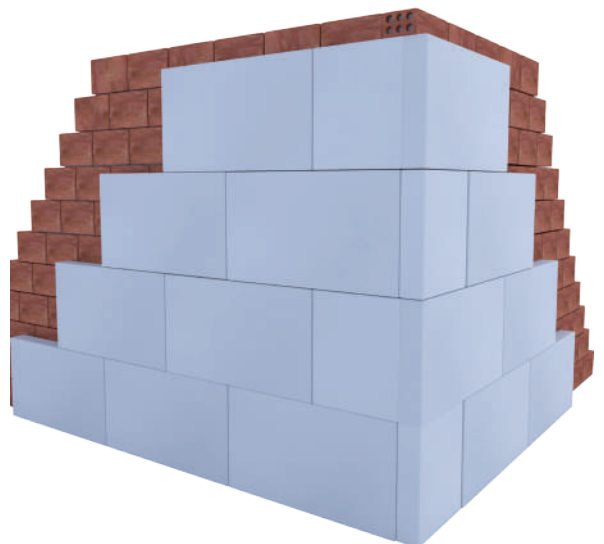
Therefore, the uniformity and the flatness of the surface should be inspected very carefully at regular intervals, especially in the corners, while any displacements on the joints should be avoided. In case of rough surfaces, they should be smoothened with the appropriate planer (12 grit sandpaper).

For better flattening and adhesion, the plates should be pressed steadily, on the corners they should be applied crosswise, while any protruding plate or adhesive should be removed.



CORNER APPLICATION

Only complete or half plates should be applied on the external and internal corners of the surface so that the joints are crossed. They are overlapped by 4-5mm and can be cut and planed after the adhesive has sufficiently dried out (usually after 24 hours).

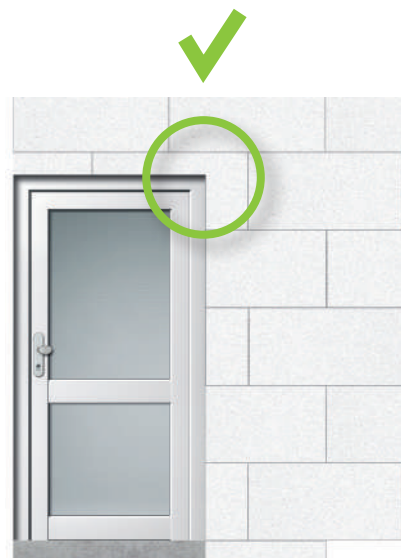
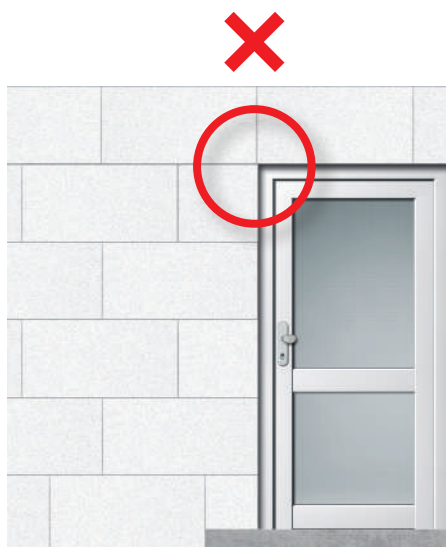


APPLICATION AROUND FRAMES

In wall frames (doors, windows), the edges may not be connected at the extension of their corners so that any cracking can be prevented. In other words, the joints of thermal insulating plates may not form the continuity of the jamb.

Therefore, when applying the plates beside the jambs, an additional length should be taken into consideration so that the plates can be appropriately cut, without creating joints beyond the end of the jambs.

Any protruding elements (drains, blinds, etc.) can be covered by removing the excess thickness of the insulating material from the rear side of the thermal insulating plate, so that the 1/3 of the original thickness is left, while on no occasion can this be less than 3cm. In addition, the plate should provide coverage at least 10cm lengthwise and over the protruding element.



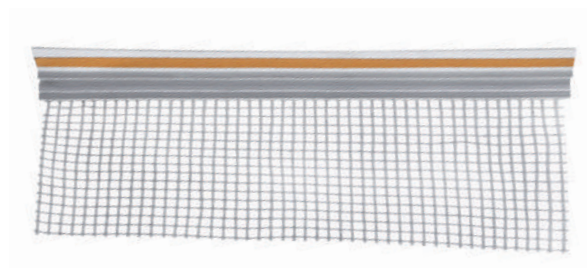
ATTENTION

In order to create murkiness, provision should have been made for in the plates before the base coat is applied, while murkiness may not coincide with the joints of the plates. Then they should be reinforced with CLIMAPLUS fiberglass mesh as a precaution against cracking.

WINDOW JAMBS

In order to seal the connections at the points where the system touches the frame of the window, use the ready-made THRAKON profile with sticker. Apply on the side of the frame with the self-expanding tape after removing the protective tape and strongly pressing onto the frame.

Also, apply a thin piece of thermal insulating plate in the windows, flush with the profile so that the connection is perfect, flat and without any gaps in combination with the special profile with insulating tape for window and door frames.



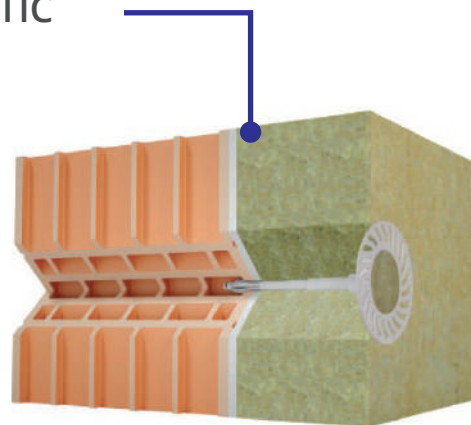
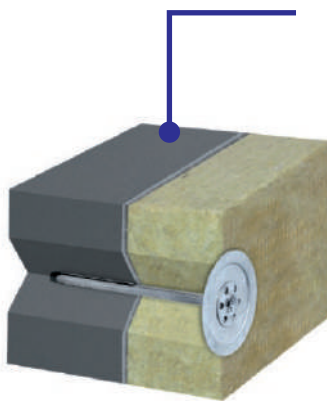
THERMAL INSULATION ACCESSORIES FIXING ANCHORS



The anchors are used for better fixing thermal insulating plates onto the surface. They are always necessary, especially when the building is taller than 8 metres, when its architecture is special, or when the geographical position of the building is exposed to frequent strong winds. In any case, they should by all means be used for securely fixing the materials.

TWO MAIN TYPES OF ANCHORS AVAILABLE:

METAL & PLASTIC



Plastic anchors are used on brick substrates, while metal ones on brickwork of reinforced concrete. Their heads are specially shaped so that they can provide a large area to the thermal insulating plate and no point loads are exerted (which could create heat bridges or cause local deformation and breakage of the material). Also, the anchors should be inserted after the adhesive has completely dried out (24-48 hours).

Holes on the thermal insulating plates should be opened with milling drills.



ADVICE!

Use polystyrene covers for flat surfaces.

Despite the advantages offered to mechanical support, the anchors have also some disadvantages that can be avoided as long as they are properly fixed.

The main disadvantage is the creation of heat bridges, which can be eliminated using special polystyrene plugs. If they are not used at the appropriate depth with regard to the surface they could create problems.

Moreover, the number of anchors should also be investigated during the design process, as the number per square meter of mechanical support is not specified, starting from a minimum of 6 pieces per square meter.



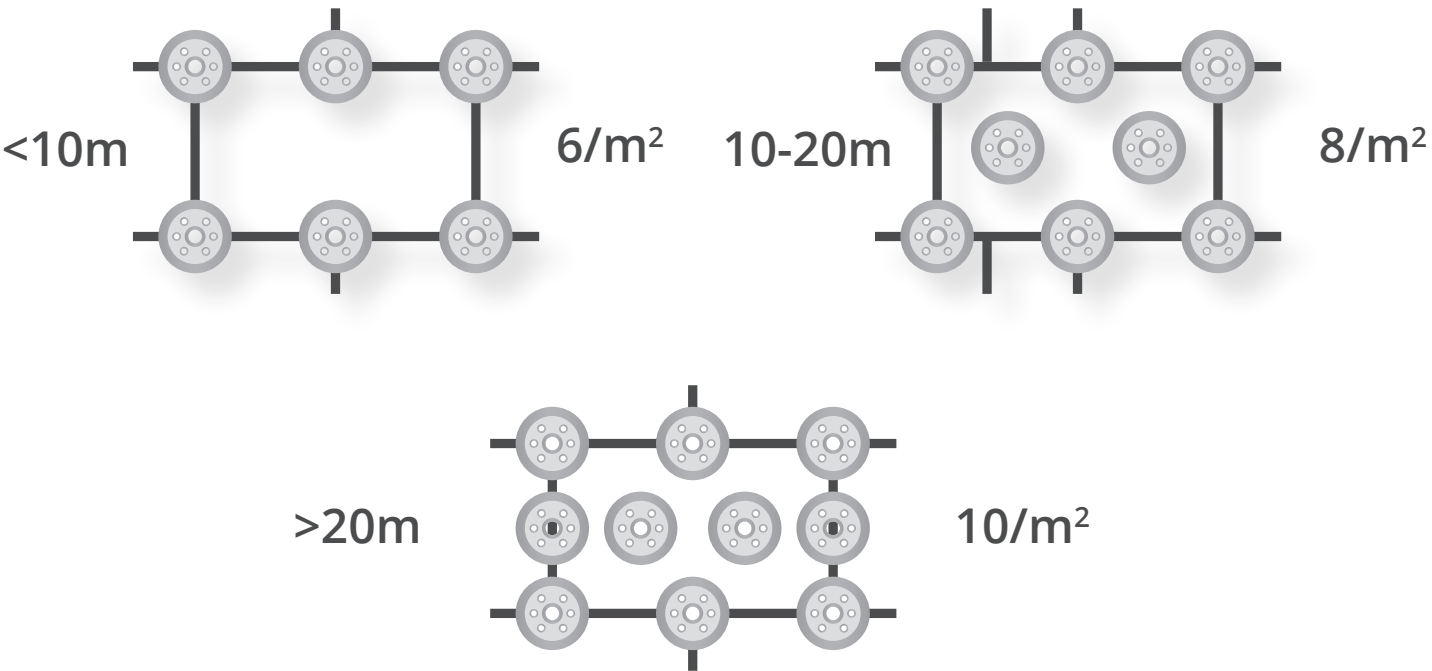
The selection of the correct type and length of anchor is also affected by the thickness of the thermal insulating plate, the thickness of the adhesive and the thickness of the existing plaster.

The number of anchors to be inserted is usually specified based on the pressure on the facade, especially by the wind. The number of anchors should be increased on the upper floors of the buildings, at the corners near the facade and the windows of the rooms.

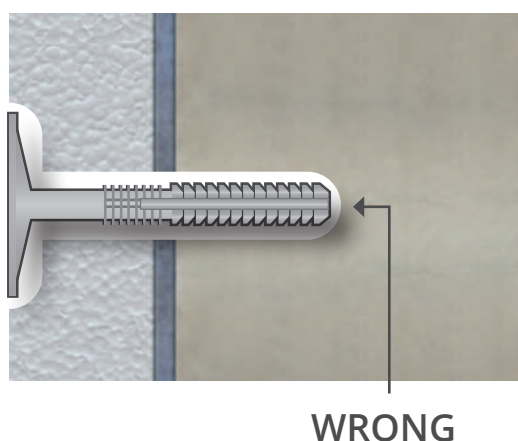
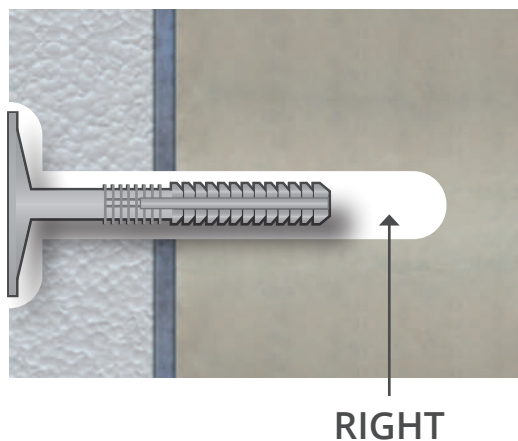
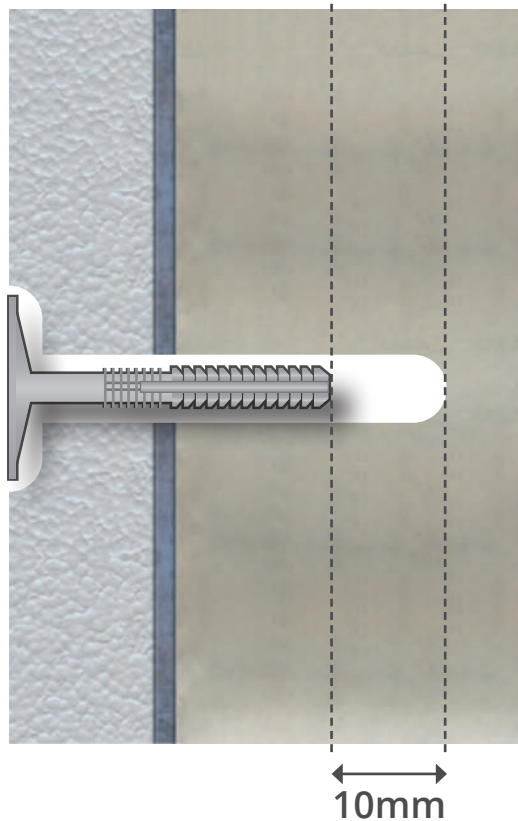
As mentioned above, at least 6 pieces are required per square meter for polystyrenes. In case rockwool has been selected, 8 pieces per square meter are required, while at the corners of the buildings, an additional 20% makes the system safer.

In detail:

CENTRAL WALL		CORNERS		HEIGHT
6	6	6	6	
6	8	8	8	
6	8	8	8	
8	10	10	10	
10	12	12	12	
12	14	14	14	
XPS/EPS		Rockwool		



ANCHOR INSERTION

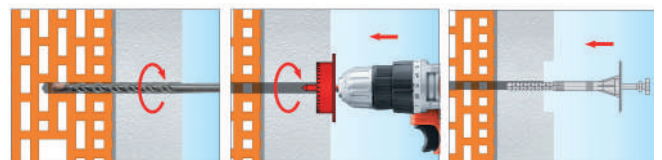
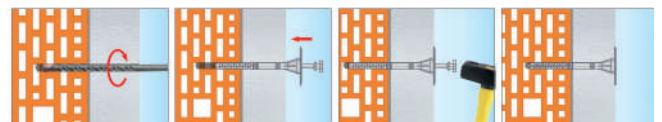


As mentioned above about the insertion of anchors, holes are drilled only at points with adhesive under the thermal insulating plate. These points can be traced by knocking the plate with a small mallet or even with the hand. The holes are drilled with an 8mm drill without impact so as not to affect the adhesive.

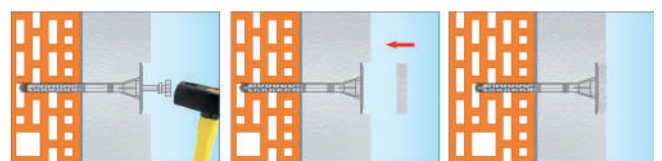
Before the insertion of the anchor, use a special plastic milling tool in order to create a groove so that the head of the anchor can flush with the thermal insulating plate. The depth of the hole should be 10mm bigger than the depth at which the anchor has been fixed.

Then the hole should be carefully cleaned before the anchors are inserted, flush with the insulating plate, with the help of a mallet.

Finally, after the anchors have been inserted, fix the plug so that the surface can remain flat.



Visible anchor



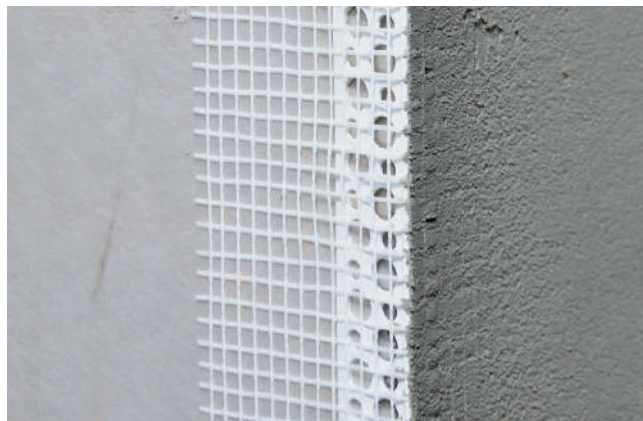
Encased anchor

REINFORCEMENT AT INNER AND OUTER CORNERS

In basic application, the surface of external corners in the windows and the doors, as well as in all corners and openings, should be reinforced with protective corner beads. Connection with the reinforcement of the following surface always provides for an overlapping of at least 10 cm.

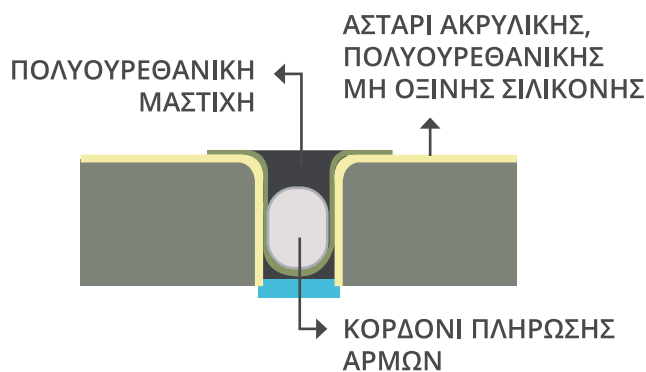
In addition, the waterdrop is installed in the same way as the corner beads, on all horizontal facades exposed to rainfall, such as the lower endings of balconies and window sills, the upper part of frames not protected by a gallery, etc.

When they are installed, the rain is prevented from licking the lintels, while at the same time it prevents pollutants from making the elements of the facade dirty, thus contributing to the functionality of the application. Both special items are positioned during basic application. After it has dried out, the basic coat is applied and the reinforcement is installed over the entire surface.

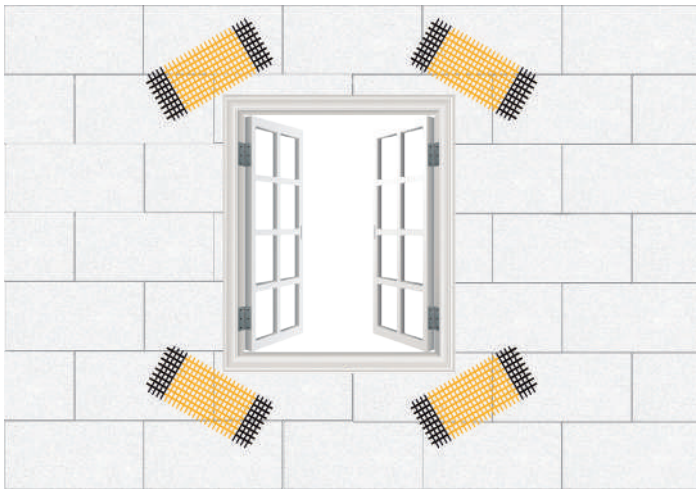


ATTENTION

Joint waterproofing is a process requiring increased attention. At the points where the CLIMAPLUS external thermal insulation system comes into contact with other materials of the building (e.g. frames, casings, marble sills, pipes, etc.) new waterproofing joints should be made. At first, a backer rod is placed in the joints, which are then filled with the appropriate elastomer-waterproofing material (e.g. polyurethane mastic). The elastomer-waterproofing material should be applied on the base plaster.



REINFORCEMENT AT OPENINGS



Additional reinforcement with a mesh 30 x 20 cm is required around the windows and the doors. The installation of additional reinforcement prevents from unwanted cracking, which would otherwise have occurred.

WINDOW SILLS

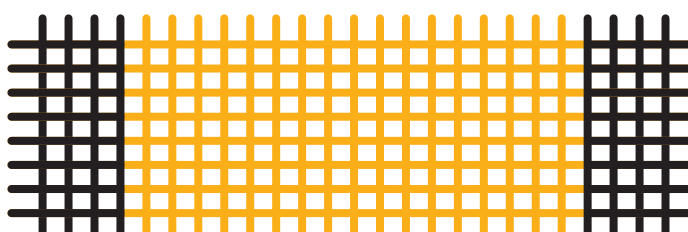


ADVICE!

The selection of the marble sill for the windows is wrong. As a heat-conducting material, marble serves as a thermal bridge, although the thermal bridge of a windowsill is not significant. However, in winter, it is quite often that on the inner side of the sill, which is located in the interior of the apartment, condensation and, more rarely, fungi, are formed.

Window sills from different materials are available on the market and can be used either in new buildings or in old buildings being restored. The dimensions of the sill should correctly be chosen so that the projection of the sill can be at least 3cm, while its sides should precisely contact the internal surface of the system.

REINFORCEMENT



The fiberglass mesh is intended for reinforcing the coat of the base plaster of thermal insulating plates.

The mesh shall weigh 160g/m² while the square open areas shall be between 4x4mm and 4.5x4.5mm. CLIMAPLUS mesh is suitable (flexible) as it can easily be encased within the thin cementitious coats.

Hard fiberglass meshes are unsuitable for external thermal insulation (due to rigidity), although they are only used for following the geometry of the shell. It is very important during application that every new mesh sheet be overlapped by 10cm by the following mesh sheet.

BASE COAT PLASTERS

The same material used for sticking thermal insulating plates together is usually used as base coat. That is, cement-based mortars, modified with polymer additives, or organic fiber-reinforced mortars ready for use, reinforced with polypropylene fibers and improvers, in accordance with European Standard EN 15824.

REINFORCEMENT INTEGRATION

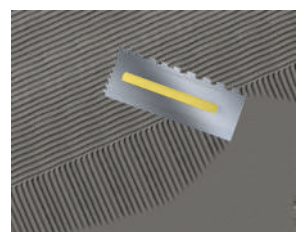
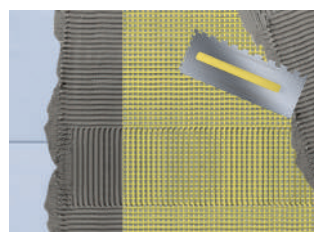
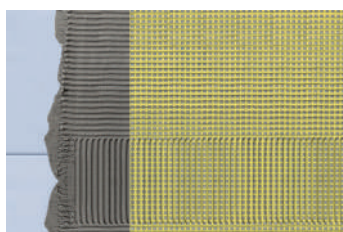
This stage is very important because it “reinforces” the system by restraining the tendencies of the thermal insulating plates to be detached due to expansions/contractions, and offers the system a hardness necessary to withstand impact.

The base coat plaster is spread over the surface with the help of a special notched trowel, at a final thickness of approximately 3mm. While it is still fresh, vertically insert the CLIMAPLUS fiberglass mesh, 1m wide and 160g/m². Then impregnate the fiberglass mesh with the special straight trowel by smoothly spreading the material and by inserting the fiberglass mesh into the material from top to bottom until the surface has become completely smooth again.



ATTENTION

The mesh shall not be visible. Also, every time a piece of fiberglass mesh is applied, it should overlap the previous piece by 10cm so that the system can be shielded. No point should be left in the system without reinforcing fiberglass mesh. Moreover, the fiberglass mesh should also overlap the meshes of corner beads, waterdrops, etc. Two (2) layers of CLIMAPLUS fiberglass mesh could be used for further reinforcing the base of the system.



PRIMING FINAL COAT

Depending on the selected type of plaster intended for the final surface, and the type of plaster for the base coat, the appropriate primer should be used. When using color plasters, the primer should take the color of the final surface.

Before applying the primer and the plaster of the final surface, the plaster of the base coat should have dried out deeply.

Completely dry after at least 24 hours. In cold or humid conditions, at least 72 hours are required. Stir the primer well and apply with a roll.

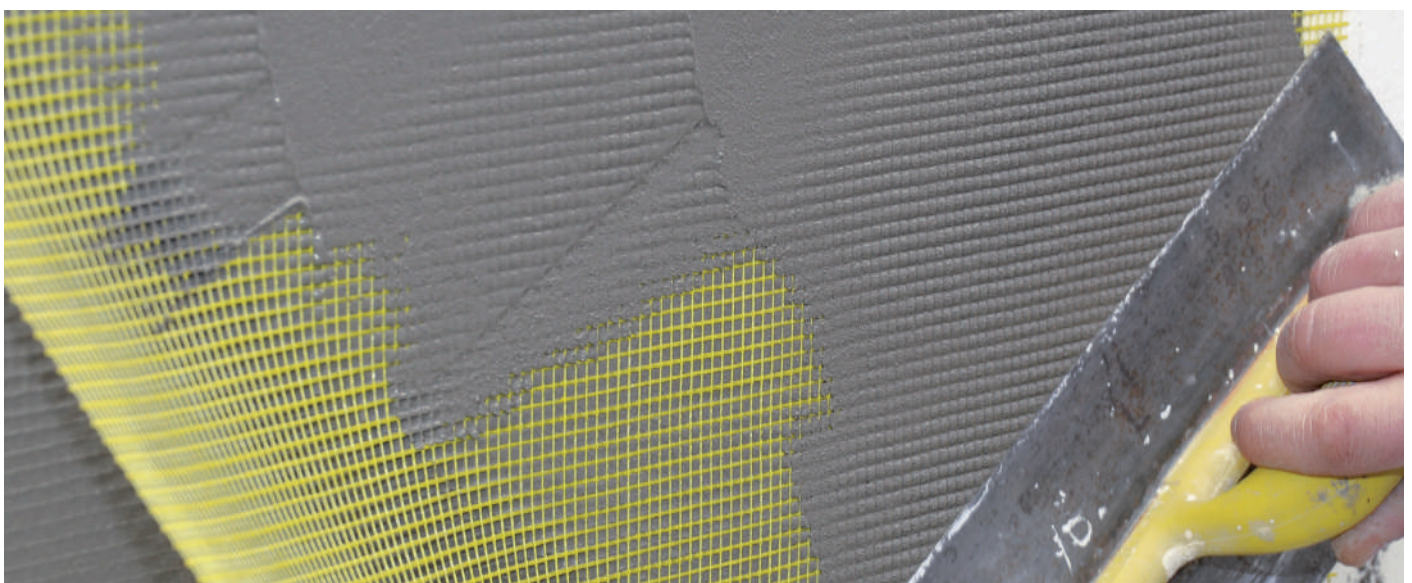
FINAL COAT



The final coat is the final plaster containing appropriate additives so that it can offer an enhanced coefficient of thermal conductivity and can be used in order to meet the thermal insulation needs of the building's shell. It is also used for protecting and finally finishing the surface of brickwork and concrete elements.

Plasters contain a mixture of binding material and fine aggregate mixed with water, with the addition of complementary materials in small amounts for improving performance. The systems offering at the same time thermal insulating and mechanical properties are better than usual systems.

After sufficient drying time for the base coat and the primer, and as long as weather conditions are appropriate, the final coat is applied. The final coat is what we can see on the building throughout its life cycle.



**ATTENTION**

If the final plaster is applied too early, stains of different color might be formed. Different types of final plaster can be applied depending on the system applied.

DEC organic plasters of THRAKON for the final surface are available in various styles and can be colored in a variety of hues through THRAKON's tinting system.

There are thousands of hues available that are included in THRAKON'S fan and each of them has a unique code.

DEC inorganic plasters for final surface by THRAKON are available in a number of styles, are produced in white color, and can be colored in any color of the market. Color can be applied after at least 24 hours.

For the selection of hues, the use of brighter plasters is recommended (luminance > 20). Dark hues absorb solar radiation more intensely, at the risk of cracking due to increased contractions/expansions. The luminance factor appears beside the code of each hue in THRAKON fan.

Grey adhesive is recommended for dark hues and white adhesive for brighter hues.

Before application, the plaster should be stirred well and the hue should be verified that it coincides with the hue of the order. Small fluctuations in grain size and hue is only natural. At first, it is spread over the surface and then the excess material is removed so that the thickness of the layer corresponds to the size of the grains.

A plastic spatula can be used, depending on the style of the plaster. Rillen and Scratch types of plaster should be applied with a plastic spatula so that the desired style can be attained and any discoloration of the final surface can be avoided.



When applying DEC-type plasters, more than one package should ideally be used and mixed into a larger container, which throughout application will continuously be reloaded with new material.

The hardening process of final plasters is a physico-chemical process affected by the prevailing conditions. As long as the latter change (i.e. temperature, relative humidity, etc.) during plaster application, color differences might arise.

This can be avoided as long as the crew work in an absolutely coordinated way and the material is applied with the “wet-on-wet” method and the drying time is not affected by atmospheric conditions

As a result, an adequate number of builders should be ensured so that the application can be completed on entire sides of the masonry at once, without any interruptions. The application crew should work in pairs from left to right and, at the same time, from top to bottom. The first builder shall apply the coating, while the second person of the pair shall work on it, thus finally producing the finally desired result.

CREW WORKING METHOD

External thermal insulation systems have been used abroad for several decades. Any problems related to the technique, the shape and the aesthetic appearance of the facades depend on many factors. They result from mistakes that might have been made at any stage, such as material construction, system completion, or even later, during maintenance sessions.



ADVICE!

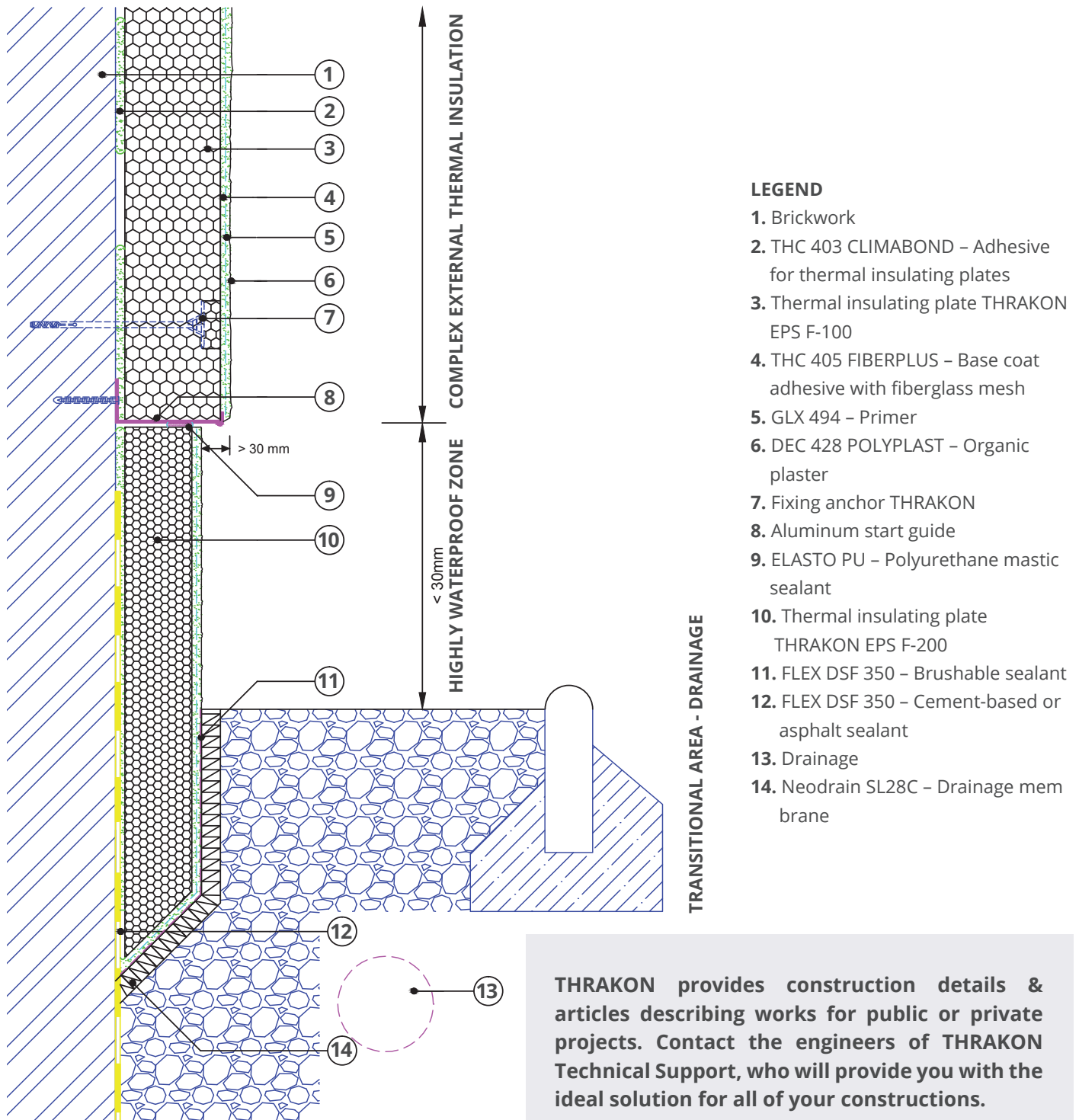
The use of plugs is recommended for firmly fixing the scaffolding so that any repairs can be avoided.



EXTERNAL THERMAL INSULATION SYSTEM

Construction Details

ClimaPLUS System Base with Start Guide

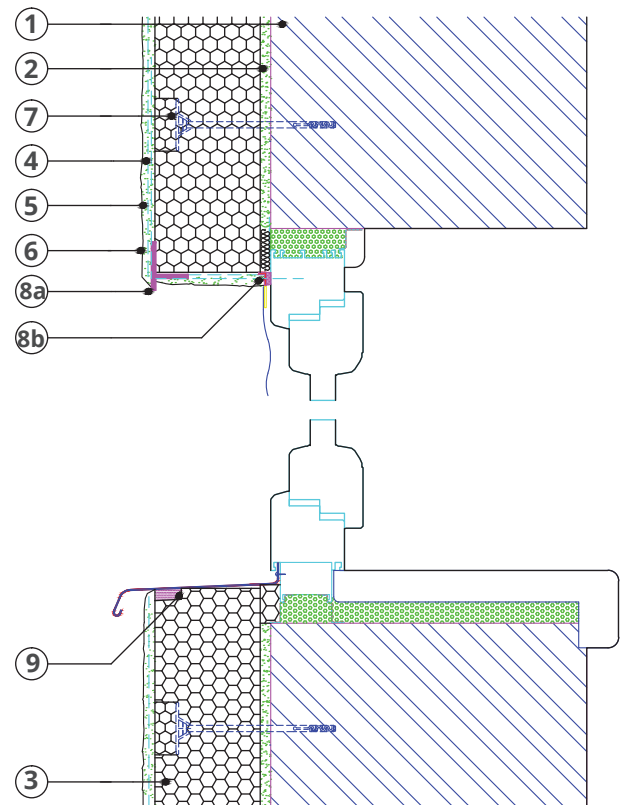


EXTERNAL THERMAL INSULATION SYSTEM Construction Details

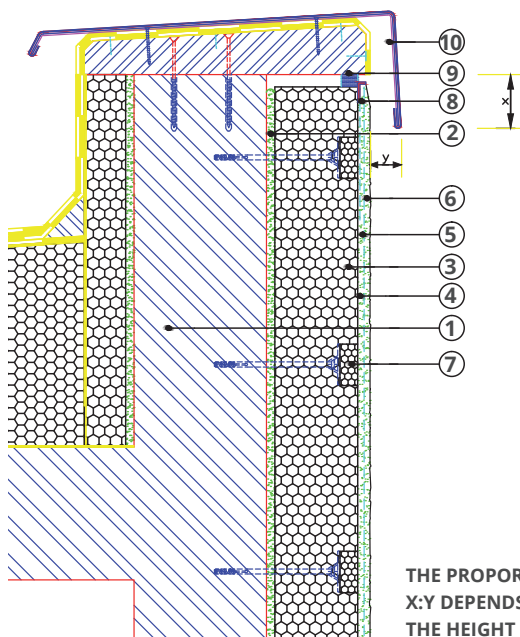
ClimaPLUS System Connection with Window sills

LEGEND

1. Brickwork
2. THC 403 CLIMABOND – Adhesive for thermal insulating plates
3. Thermal insulating plate THRAKON EPS F-100
4. THC 405 FIBERPLUS – Base coat adhesive with fiberglass mesh
5. GLX 494 – Primer
6. DEC 428 POLYPLAST – Organic plaster
7. Fixing anchor THRAKON
- 8a. Waterdrop THRAKON with fiberglass mesh
- 8b. Connection profile
9. ELASTO PU – Polyurethane mastic sealant



ClimaPLUS System Connection- Parapet Application



THE PROPORTION
X:Y DEPENDS ON
THE HEIGHT OF THE
BUILDING

LEGEND

1. Brickwork
2. THC 403 CLIMABOND – Adhesive for thermal insulating plates
3. Thermal insulating plate THRAKON EPS F-100
4. THC 405 FIBERPLUS – Base coat adhesive with fiberglass mesh
5. GLX 494 – Primer
6. DEC 428 POLYPLAST – Organic plaster
7. Fixing anchor THRAKON
8. Corner bead THRAKON with fiberglass mesh
9. ELASTO PU – Polyurethane mastic sealant
10. Protection parapet

A. ADHESIVE – BASIC COAT



CLIMABOND THC 403

Cement-based adhesive suitable for applying thermal insulating plates

Consumption: 3,5 - 4,0 kg/m²

Package: 25kg

Color: Grey



FIBERPLUS THC 405

Fiber-reinforced adhesive-plaster, cement-based, for applying and plastering thermal insulating plates

Consumption: 3,5 - 4,0 kg/m²

Package: 25kg

Color: Grey and White



CLIMAFLEX THC 410

Highly elastic, fiber-reinforced adhesive-plaster, cement-based, for applying and plastering thermal insulating plates

Consumption: 3,5 - 4,0 kg/m² (per coat) 7,0 - 9,0 kg/m² (as plaster on flat brickwork)

Package: 5kg and 25kg

Color: Grey and White



CLIMAFLEX THC 410 C

Thick-grained, fiber-reinforced adhesive-plaster, cement-based, for applying and plastering thermal insulating plates

Consumption: 3,0 - 4,0 kg/m²

Package: 25kg

Color: Grey and White



ORGANIC BASECOAT THC 420

Organic, fiber-reinforced plaster for base coat on thermal insulating plates

Consumption: 3,0 - 3,5 kg/m²

Package: 25kg

Color: Grey



CLIMAPLUS STICK

High-quality welding foam (hand-use)

Consumption: Up to 9m²/bottle

Package: Bottle 800gr



CLIMAPLUS STICK GUN

High-quality welding foam (gun-use)

Consumption: Minimum consumption 14 m²/bottle

Package: Bottle 800gr

B. THERMAL INSULATING MATERIALS



PU FOAM

High-quality self-expanding polyurethane foam hand-use

Package: Bottle 750ml



PU FOAM GUN

High-quality self-expanding polyurethane foam gun-use

Package: Bottle 750ml



ULTRAPOR® EPS

Fixed plates of expanded polystyrene EPS

Thickness:

EPS 60: from 20mm to 100mm
 EPS 80: from 30mm to 100mm
 EPS 100: from 30mm to 100mm
 EPS 150: from 30mm to 100mm
 EPS 200: from 30mm to 100mm

*Available in more thicknesses upon request.

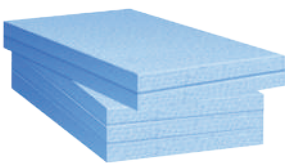


ULTRAPOR® GRAPHITE

Fixed plates of "self-extinguishing" EPS graphite expanded polystyrene

Thickness:

GRAPHITE 60: from 20mm to 100mm
 GRAPHITE 80: from 30mm to 100mm
 GRAPHITE 100: from 30mm to 100mm
 GRAPHITE 150: from 30mm to 100mm
 GRAPHITE 200: from 30mm to 100mm

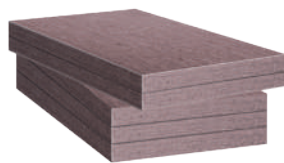


XPS

Fixed plates of XPS extruded polystyrene

Thickness:

from 20mm to 100mm



ROCKWOOL

Nonflammable plates with enhanced thermal and sound insulation properties

Thickness:

from 50mm to 100mm



THRAXONPOR®

Thermal insulating plates from autoclaved aerated concrete (AAC)

Density: 100-115 kg/m³

Thickness:

50mm, 75mm, 100mm, 125mm, 150mm and 200mm

C. IMPREGNATING COAT



CLIMA PRIMER GLX 494

High-quality acrylic adhesion primer

Consumption: ~0.20-0.25 kg/m² depending on the absorption capacity of the surface

Color: White and thousands other hues through the THRAKON ULTRA COLOR SYSTEM

Package: 5kg and 25kg



CLIMASIL PRIMER GLX 498

High-quality silicone primer

Consumption: ~0.20-0.25 kg/m² depending on the absorption capacity of the surface

Color: White and thousands other hues through the THRAKON ULTRA COLOR SYSTEM

Package: 5kg and 25kg

D. FINAL PLASTER ACRYLIC PLASTERS



CLIMA PLASTER DEC 428

Acrylic plaster of high elasticity and perfect adhesion

Color: White and thousands other hues through the THRAKON ULTRA COLOR SYSTEM

Package: 25kg

Consumption: **RILLEN**

1,5 mm: 2,3 kg/m²
2,0 mm: 2,7 kg/m²

SCRATCH

1,0 mm: 1,8 kg/m²
1,2 mm: 2,0 kg/m²
1,5 mm: 2,5 kg/m²
2,0 mm: 3,3 kg/m²

FINE

0,60 mm: 2,0 kg/m²



MOZAIC PLASTER DEC 433

Mosaic plaster with color silicone grains

Consumption: 1,5 mm: 3-3,5 kg/m²

Color: Available in 16 new hues

Package: 25kg



CLIMASIL PLASTER DEC 438

Color silicon plaster of high vapor-permeability and antifungal action

Color: White and thousands other hues through the THRAKON ULTRA COLOR SYSTEM

Package: 25kg

Consumption: **RILLEN**

1,5 mm: 2,3 kg/m²
2,0 mm: 2,7 kg/m²

SCRATCH

1,0 mm: 1,8 kg/m²
1,2 mm: 2,0 kg/m²
1,5 mm: 2,5 kg/m²
2,0 mm: 3,3 kg/m²

SILICONE-BASED PLASTERS

CEMENT-BASED PLASTERS

**DEC 424 SCRATCH**

White inorganic plaster enhanced with special resins

Consumption:

1,5 mm: 2,5 - 3,0 kg/m²

2,5 mm: 3,0 - 3,5 kg/m²

Package: 25kg

**DEC 424 FINE**

White smooth inorganic plaster

Consumption: 1,5 - 2 kg/m² per 2 - 3mm

Package: 25kg

**DEC 425 RILLEN**

White inorganic plaster enhanced with special resins

Consumption: 1,5 - 2 kg/m² per 2 - 3mm

Package: 25kg

E. REINFORCEMENT



CLIMAPLUS
Fiberglass mesh
(160g/m²)

Anti-alkaline fiberglass mesh complying with ETAG 004



CLIMAPLUS PROFES-
SIONAL Fiberglass mesh
(160g/m²)

Anti-alkaline professional mesh complying with ETAG 004

F. ANCHORS & ACCESSORIES



Plastic anchors for fixing thermal insulation for brick

Dimensions:

60mm*10mm* 70-90-120-140-160-180-200 mm



Metal anchors for fixing thermal insulation for brick

Dimensions:

60mm*10mm* 95-115-135-155mm



Thermal insulation anchors for cement boards

Dimensions:

60mm*10mm* 90mm



Metal anchors for fixing thermal insulation for aerated concrete

Dimensions: 60mm* 8mm *

115-135-155-175-195mm



Anchors for mounting loads on the thermal insulation system

Dimensions: 5 & 8 cm



Plug for EPS (White)

Thickness: 12 mm

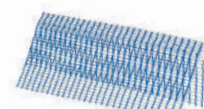
Diameter: 70 mm



Plug for EPS (Graphite)

Thickness: 12 mm

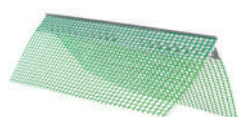
Diameter: 70 mm



Corner bead with anti-alkaline mesh

Dimensions:

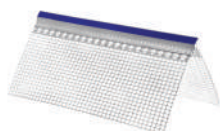
2,5 m x 0,08m x 0,12m



Waterdrop with mesh

Dimensions:

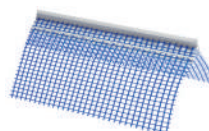
2,0m X 0,10m X 0,10m



Waterdrop profile with sticker

Dimensions:

2,0m X 0,10m X 0,10m



Waterdrop with mesh - secret waterdrop

Dimensions:

2,0m x 0,11m x 0,06m



CLIMAPLUS Start guide

Dimensions:

2,5 m / 33 mm

2,5 m / 53 mm

2,5 m / 73 mm

2,5 m / 83 mm



Clips/ Connectors of thermal insulation guides

Dimensions: 25mm x 53mm



Thermal insulation guide spacers

Dimensions: mm, 5 mm, 8 mm, 10 mm, 15 mm



Fixing anchors for start guides

Dimensions: 3,5 mm, 4 mm, 4,5 mm, 5,5 mm, 6 mm, 8 mm

G. Tools



Plastic spatula CLIMAPLUS

Plastic spatula 280x130mm with ABS handle



Metal spatula CLIMAPLUS

Steel spatula 280x120mm, with plastic handle



Plastic mill

Plastic cutting mill for modulating shoulders on thermal insulating plates for encasing fixing anchors

Diameter: 68 mm



Metal mill

Metal cutting mill for modulating shoulders on thermal insulating plates for encasing fixing anchors

Diameter: 60 mm



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