



VACUPOR®

Vacuum insulation for
building & construction

Morgan Advanced Materials

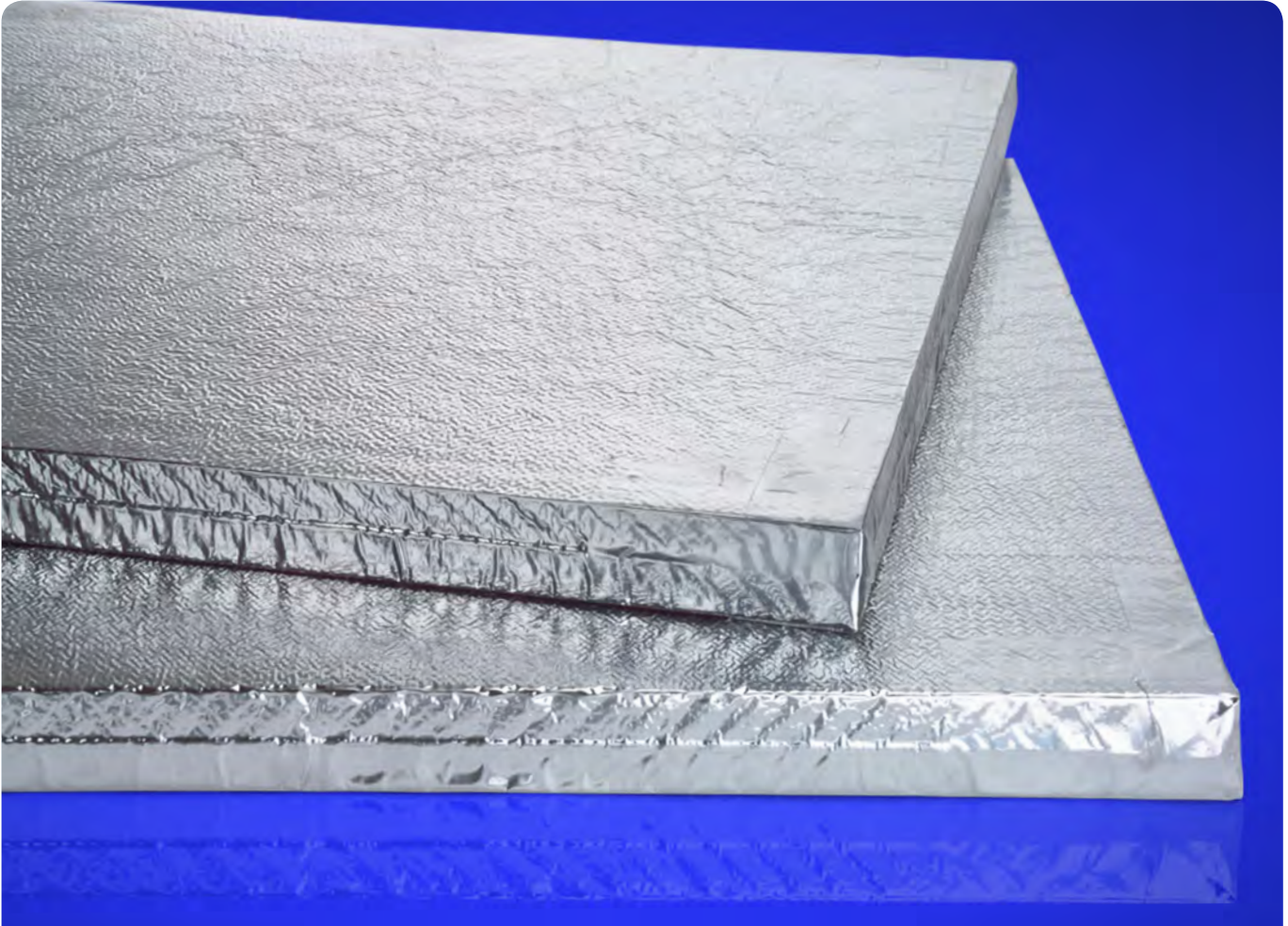
Morgan Advanced Materials is a world leader in advanced materials and is committed to building a sustainable competitive advantage in attractive markets with truly differentiated products and services underpinned by world-leading technology. We supply innovative products which enable our customers' products and processes to perform more efficiently, more reliably and for longer.

About Porextherm

Porextherm is a part of Morgan Advanced Materials – Thermal Ceramics. Porextherm is a provider for innovative thermal insulation solutions. Since 1989 we have continuously expanded our core expertise in microporous insulation systems and build a broad portfolio of partly patented products and processes. Based on our own research and engineering we have developed an impressive variety of insulation products, which are manufactured in our modern state of the art facilities in Kempten, German.

Advantages of VACUPOR® in building & construction

- ▶ very good insulation value of $0,007 \text{ W}/(\text{m}\cdot\text{K})^*$ – markedly reduced energy consumption
- ▶ markedly reduced energy consumption
- ▶ considerably increased gain in area
- ▶ a preferred choice in case of space problems
- ▶ aesthetically, functionally and architecturally appealing solutions for new buildings and renovations
- ▶ saving in costs for special constructions/applications
- ▶ various protective coatings available for different trades
- ▶ wide variety of sizes
- ▶ easy to recycle



VACUPOR®

Vacuum insulation panels –
innovative thermal insulation
in building & construction

Create Space – Save Energy, preferably plan with VACUPOR® straight away



Climate change is a reality

The facts indicate that the measurements of the three major climatic indicators – global warming, increase in the sea level and shrinking snow cover – have markedly changed. The European States are still calling for a 50% reduction in international CO₂ emission by the year 2050 in order to stem global warming. At the last climate summit in Copenhagen, the United Nations were unfortunately only able to agree on the very lowest political denominator – only the “two degrees target” was acknowledged and agreed. The current situation all the more urgently requires everyone to act in order to reduce CO₂ emission.

Innovative thermal insulation pay off

Everyone knows that energy resources are becoming increasingly short whereas the requirements are constantly increasing worldwide. Hence, the costs for energy in private households increased by 50% on average between 1990 and 2005. In detail, the price increases are divided up as follows:

Room heating and hot water:	+ 68 %
Process heat (cooking):	+ 42 %
Light/miscellaneous:	+ 48 %

Room heating is by far the biggest “energy guzzler” in a household. This is among other aspects due to the fact that a large percentage of the heat is lost through the roof, walls, windows, floor and chimney of every house. Furthermore, the environment is heavily burdened by an unnecessarily high CO₂ emission. In the case of new buildings, the current energy conservation provisions already stipulates use of thermally insulating building materials.

VACUPOR[®] offers the right solutions for the signs of the times

Effective thermal insulation with markedly reduced insulation thicknesses

Wherever heat is lost in the home, matters can be improved by appropriate insulating measures. Approximately a quarter of the heat energy is wasted by insufficiently insulated external walls alone.

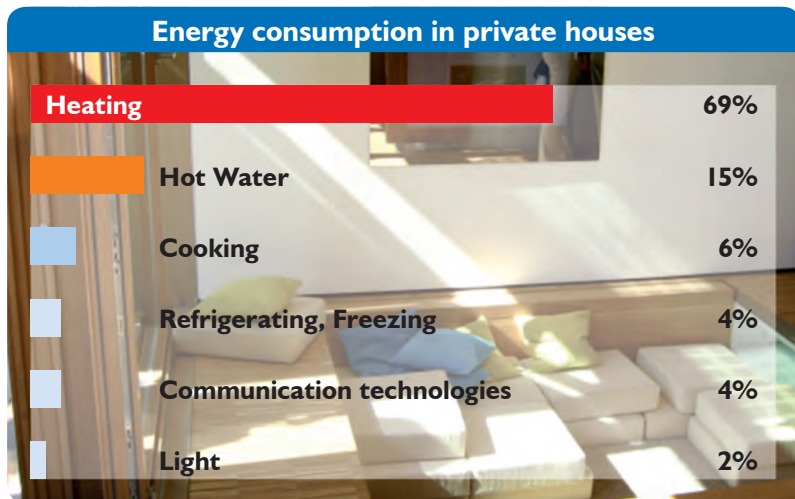
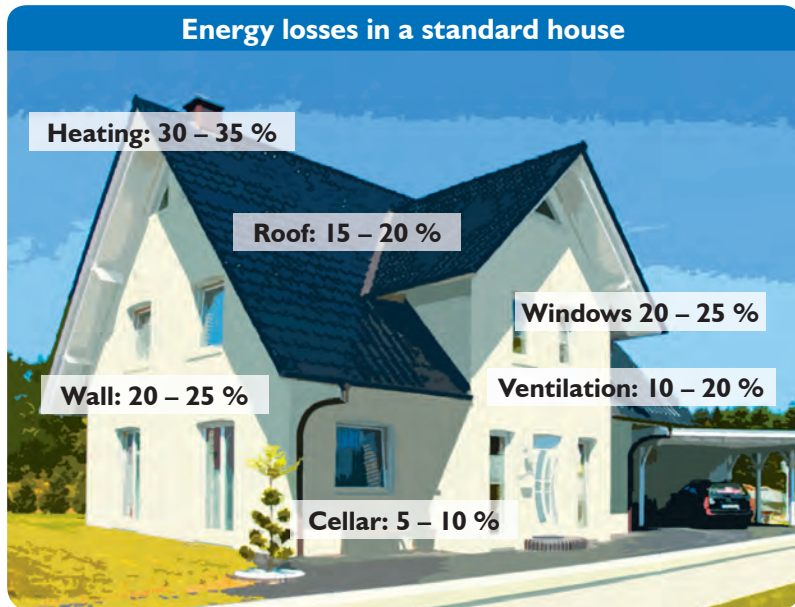
Optimum results can be achieved with VACUPOR[®] VIPs with drastically reduced insulation thicknesses and significantly lower surface consumptions.

Thermal insulation measures with VACUPOR[®] are a sound investment, for they not only reduce the current energy costs, but also demonstrably enhance the value of a property.

House owners who act now will make a double saving

Anyone wanting to relieve the strain on the environment, and on their pocket, should make energy efficiency improvements now. Refurbishment measures are supported with a wide range of subsidies, e.g. through support programs:

- energy-efficient construction
- energy-efficient refurbishment

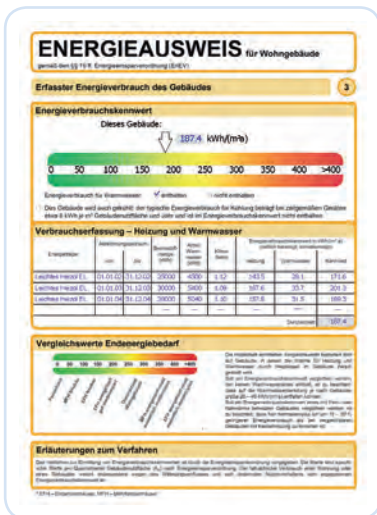


Quelle: Umweltbundesamt

Effectively avoiding energy losses and saving resources

Use the energy certificate as an opportunity

Presentation of an energy certificate has become compulsory on selling or leasing a building owing to the current energy conservation provisions. This provides information about the actual energy requirements of a building.



Each building has a specific energy requirement allocated to it. Consequently, a building can be offered on the market with clear facts and figures and the purchaser or tenant can easily tell the thermal quality of a flat. The quality of the insulation plays a crucial role in the energy requirement of a building. The more efficient it is, the higher the classification of the respective property. If the building certificate indicates a low energy requirement, the property will be markedly more attractive to purchasers and tenants.

Comparison of the effect of thermal insulation on the energy balance of houses:

Basis: uninsulated detached house 100 m² in size, year of construction 1960:

- consumption/year approx. 3700 L of heating oil.

Built according to the Thermal Insulation Ordinance 1982/1984:

- consumption/year approx. 1500 L of heating oil.

Built according to the Thermal Insulation Ordinance 1995:

- consumption/year approx. 1000 L of heating oil.

Low energy house built according to the state of the art:

A consumption/year approx. 500 – 700 L of heating oil.

Source: Katalyse environmental database

The VACUPOR® advantages at a glance:

- markedly reduced energy consumption
- considerably increased gain in area
- a preferred choice in case of space problems
- aesthetically, functionally and architecturally appealing solutions for new buildings and renovations
- saving in costs for special constructions/applications
- various protective coatings available for different trades
- wide variety of sizes
- easy to recycle

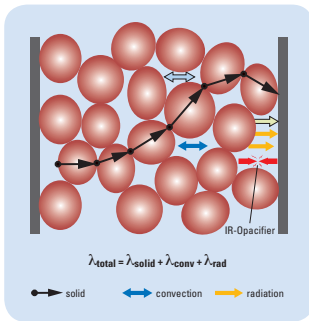
VACUPOR® for various building applications



VACUPOR® – with AbZ and ETA

Very good thermal insulation values at significantly reduced thickness

The highly efficient insulating effect of our products is based on a microporous fumed silica. There is only point contact between the spherical microporous particles. This substantially reduces thermal conduction due to contact between solid particles.

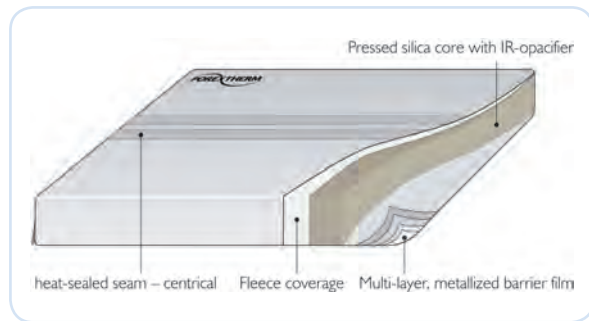


In addition, the micropores minimize thermal transmission by convection. Specially developed infrared opacifiers also reduce heat transport processes by absorption and reflection of radiation. Consequently, it is possible to achieve very

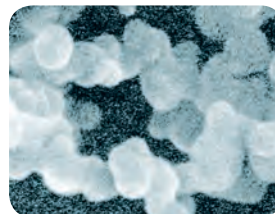
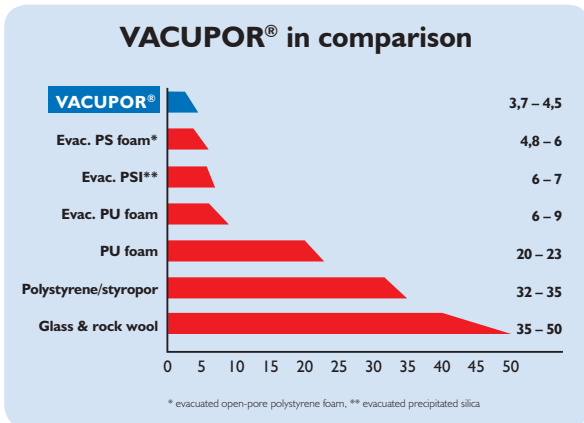
much higher efficiency than with conventional insulation materials. For the same insulating effect, layer thicknesses can be reduced by a factor of 4 – 10 and weight by a factor of 2 – 15 with VACUPOR®

Structure of VACUPOR® vacuum insulation panels

VACUPOR® panels are fused under vacuum in multilayer barrier films during a special process. The evacuation of the material completely prevents any thermal transmission by convection. VACUPOR® ideally combines the properties of the microporous insulating material with the advantages of vacuum insulation technology. Consequently, extremely low thermal conductivity coefficients of $< 5 \text{ mW}/(\text{m}^*\text{K})$ are achieved.



Section drawing of a VIP



Structure of the fumed silica



Filaments for strength



Opacifiers



Pressed VIP core

Reference properties all over the world prove the many advantages of VACUPOR®



VACUPOR® is already in frequent use as a structural and functional solution in various applications in the building industry sector:

Floors

- flooring
- patios/attics
- balcony insulation
- ceilings
- basement ceilings

Walls

- facades
- facade elements
- window reveals
- roller shutter boxes
- radiator recesses
- entrance door panels

Roofs

- roof terraces
- flat roofs
- sloping roofs
- dormers



Consequently, during renovations for example, the limited thickness of the material also caters for aesthetic demands in addition to the functional requirements. Markedly less shading of windows for instance owing to a slimmer wall structure. In the case of patios, VACUPOR® is characterized by a high compressive strength and allows smooth transitions owing to very low structural heights. In the flat roof area, thin energy-saving renovations are made possible in which re-adjusting the balustrade is not required.

Perfect insulation through proper planning

Once preliminary planning has been completed, the VIPs are manufactured to size and can be simply built in at the construction site according to a laying plan.



Environment-friendly and completely recyclable

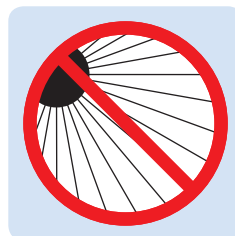
The materials used are environment-friendly and can be simply recycled if necessary.

Special information

Clients, planners and processors are provided further information about structural and technical details through our specific application brochures on the topics of walls, floors and ceilings. Also consult the website: www.bau-vip.de

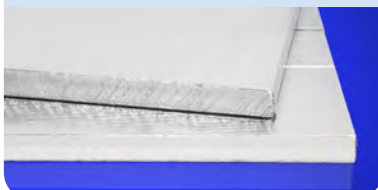
Important processing instructions for VACUPOR® vacuum insulation panels

1. The VIPs should only be installed by professionally trained processors. Ask us for appropriately qualified companies.
2. VACUPOR® VIPs are to be protected against damage and must be stored in a dry place protected from sunlight. The panels must be visually inspected for possible damage before processing.
3. It is advisable on principle to always lay the panels in the same installation direction.
4. The abutting edges should ideally be covered with adhesive tape for fixing the panels.
5. Dimensional tolerances can be filled and compensated if necessary using conventional insulation.
6. VACUPOR® VIPs must be laid in the dry state.
7. The surfaces on which the panels are processed must be even and free from sharp-edged or pointed objects.
8. Care should be taken that the barrier film is not damaged by uncontrolled tensile or pressure stress.
9. The barrier film must not be damaged or removed.
10. Working by sawing, cutting, drilling or the like is not permissible!
11. Loss of the vacuum automatically results in deterioration of the insulating properties.
12. The constant application temperature must not exceed 80° C.
13. Solvent-free adhesives and adhesive tapes are to be used for adhesive fixings.
14. Contact with solvents is to be avoided as a matter of principle.
15. We kindly request that you contact us if in doubt.



VACUPOR® – always the right choice for your building application

VACUPOR® NT

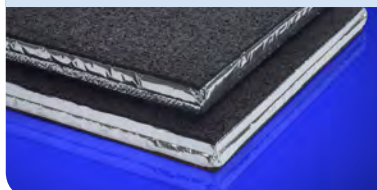


VACUPOR® NT-B2-S: for all applications with excellent λ values.

Rated value: 0,007 W/(m·K)

Application area: DAD, DAA, DZ, DI, DEO, WAB, WAA, WH, WTR, WI and for facade panels

VACUPOR® RP



VACUPOR® RP-B2-S: Suitable for all floor applications.

Rated value: 0,007 W/(m·K)

Application area: DAD, DAA, DZ, DEO and for facade panels

VACUPOR® PS



VACUPOR® PS-B2-S: Polystyrene lamination – ideal for facade insulation.

Rated value: 0,007 W/(m·K)

Application area: DAD, DZ, DI, WAB, WAA, WH, WTR, WI and for facade panels

VACUPOR® XPS

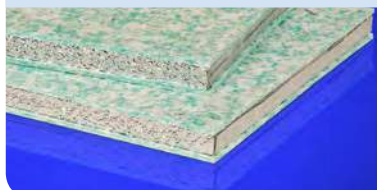


VACUPOR® XPS-B2-S: Thin XPS lamination, e.g. for use in reveals.

Rated value: 0,007 W/(m·K)

Application area: DAD, DAA, DZ, DI, DEO, WAB, WAA, WH, WTR, WI and for facade panels

VACUPOR® TS

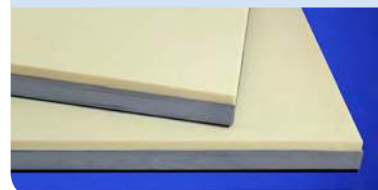


VACUPOR® TS-B2-S: Surface-laminated plastic recycling step sound insulation.

Rated value: 0,007 W/(m·K)

Application area: DAD, DAA, DZ, DI, DEO, WAB, WAA, WH, WTR, WI and for facade panels

VACUPOR® Roof



VACUPOR® Roof: Special covering for flat roof insulation.

***Rated value:** pending*

***Application area:** DAD, DAA, DZ, DI, DEO and for facade panels

VACUSPEED® System



VACUSPEED® – 7 standard sizes for quick use – especially for floor applications.

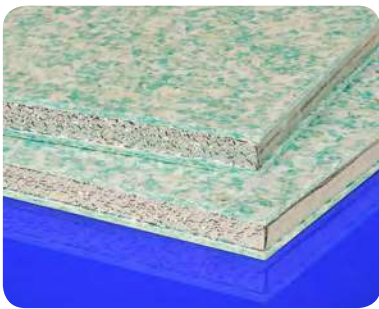
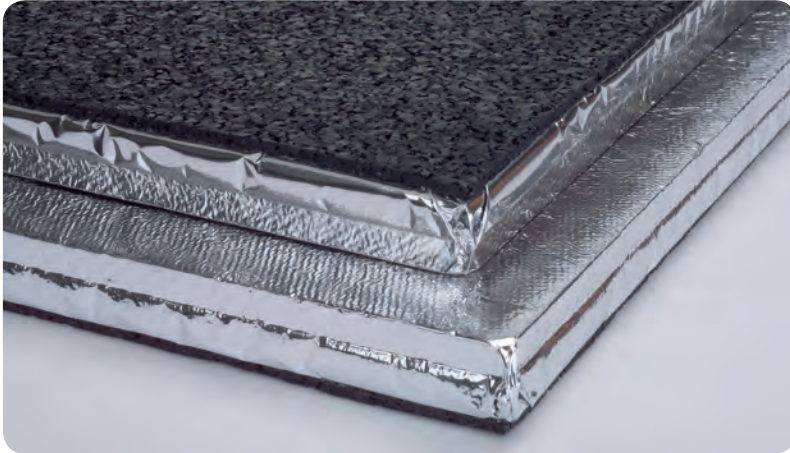
Rated value: 0,008 W/(m·K)

VACUSPEED® – Please ask for our new brochure about VACUSPEED® or obtain information at: www.vacuspeed.com



VACUPOR®
Application examples
in the area of innovative
floor insulation

Floor insulation with VACUPOR®



VACUPOR® TS-B2-S – VIP with laminated step sound insulation.

Constantly increasing importance is being attached to insulation of floors, ceilings, terraces, loggias and balconies in modern house building, but also in renovation of old buildings.

In order to meet the requirements of the current energy conservation provisions or achieve specified standards such as for example the passive house standard, tremendous insulation thicknesses are often required. This frequently results in elaborate structural measures being

indispensable and occasionally even becoming impossible with conventional insulating materials.

In this case, an ideal solution is to be found in VACUPOR® vacuum insulation panels if for example an insulation using conventional insulating materials is impossible or avoidance of steps/shoulders is required due to limited room heights, planning errors, etc.

The major advantage results when it is a matter of providing the desired insulation value without the need to intervene massively in the building structure.

The effort involved in order to achieve the required insulation value can be considerably reduced by using VACUPOR® VIPs. Consequently, there is no need to subsequently re-adjust the balustrade during balcony and terrace renovations for example.

During renovation measures, it is possible to avoid the often inevitable stage and achieve a smooth transition from the living area to the terrace (step-free terrace).

Hence, VACUPOR® VIPs make it possible to fulfill insulating technology, practical and aesthetic demands in a simple manner.

All advantages at a glance:

- Extremely high insulating properties with minimal structural height
- Offset-free realization of terraces, balconies, cold room floors, etc.
- No need for additional structural measures, e.g. balustrade readjustment
- Considerable scope and design for aesthetic demands
- No health or physiological risks during processing
- No creeping problems, even over prolonged periods

Correct use and processing

Successful application examples testify to the efficiency of VACUPOR®

Floor, ceiling, terrace, loggia and balcony insulation is already now being performed with a slim and elegant construction. VIPs have also been successfully used for floor insulation for some years now in refrigeration and deep-freeze rooms.

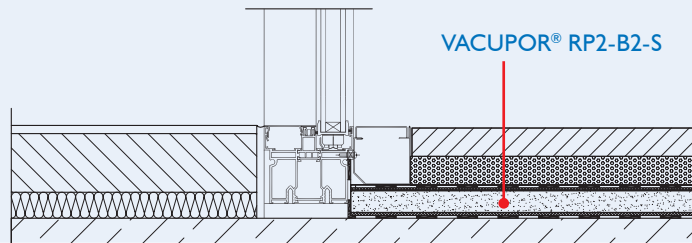
We also deliver the high-efficiency insulation in special finishes ready for construction site processing.

VACUPOR® RPI-B2-S for instance is laminated on one side with a mat and is therefore particularly suitable for double-layer, offset laying, as it is usual for example in the area of deep-freeze room floors.

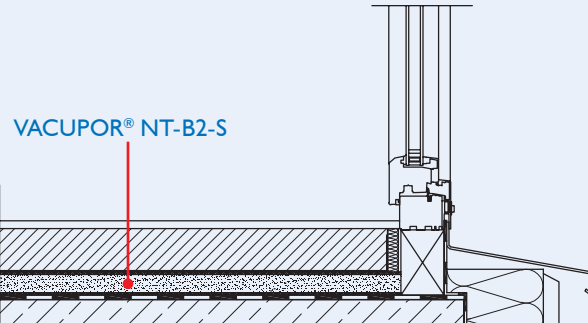
VACUPOR® RP2-B2-S is covered on both sides with rubber granule mat. The protective layer allows the immediate access to the laid insulation and offers further enhanced protection against mechanical damage.

Detailed information concerning applications and processing instructions can be found at: www.bau-vip.com

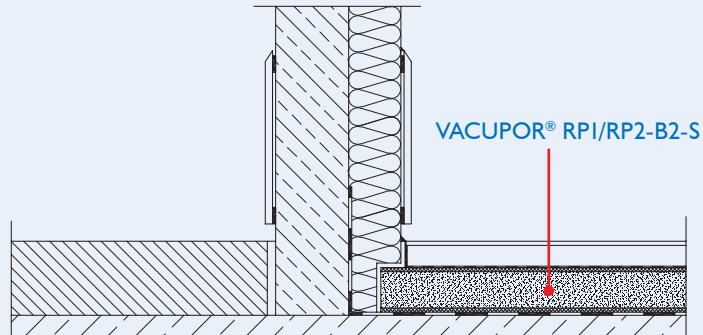
Typical application in the terrace area



Typical application in the indoor floor area



Typical application for refrigeration room floors



VACUPOR® RP-B2-S are available either single or double-sided depending on the application in the floor area.

Delivery forms and service

VACUPOR® VIPs are manufactured precisely customized to our customers' specifications. The laying plans of the properties dictate the sizes and thicknesses.

Our standard sizes are generally used in the floor insulation area, with which the major part of the area can be covered. The remaining areas, as a rule in the periphery, are filled with special sized panels.

When using VACUPOR®, the remaining surfaces are usually filled with customized panels. When using VACUSPEED®, the remaining surfaces are filled with cuttable PU-foam sheets. The VACUSPEED® panels are available from stock.

You will find further information about our VACUSPEED® system at: www.vacuspeed.de

Standard sizes for floor insulation:

VACUPOR® NT-B2-S
VACUPOR® RP-B2-S
VACUPOR® TS-B2-S

1200	x	1000	mm
1200	x	500	mm
1000	x	600	mm
1000	x	300	mm
600	x	500	mm
600	x	250	mm
300	x	250	mm

Our standard sizes are available in 10, 15, 20, 25, 30, 35, 40, 45 and 50 mm.

Special sizes and other thicknesses are available on request.

Quotations made easy – with prepared tender documents



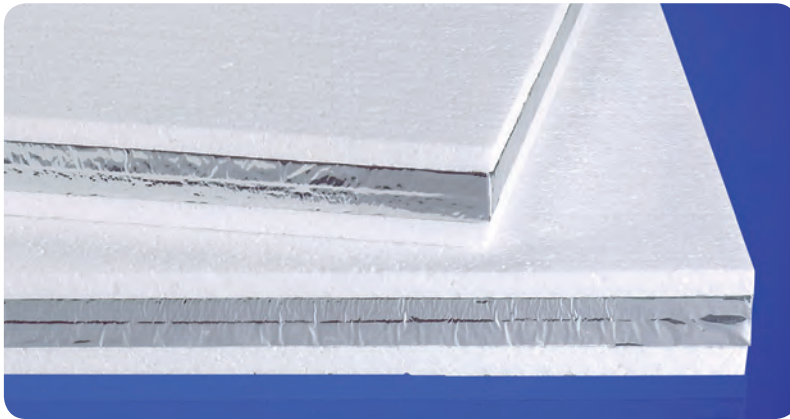
We offer our customers an additional service for the elaboration of quotation. We have placed the most common call to tender texts in the download area of our website: www.bau-vip.com.

These will allow you to react quickly and professionally to your customers' wishes.



VACUPOR®
Application examples
in the area of effective
wall insulation

Wall insulation with VACUPOR®



Owing to the energy conservation provision, greater demands are being placed on the overall energy efficiency of buildings. In order to achieve improved thermal protection of buildings according to the specifications of the energy conservation provision, the building envelope in particular requires excellent insulation. The wall insulation generally takes the largest share in terms of area in this case.

With conventional insulating materials, these specifications are only complied with by means of high insulation thicknesses, as the planning, functional or aesthetic requirements form an obstacle in many cases. Space is usually very limited particu-

larly in the reveal area of windows and doors.

A combination of VACUPOR® and various different face sheets provide the solution in this case.

An additional insulation thickness may therefore result in increased shading for example. Filigree constructions are therefore already impossible in the planning stage. The use of conventional insulation systems substantially reduces the usable surface area, which may represent a disadvantage for clients in marketing their property. Porextherm VACUPOR® vacuum insulation panels (VIPs) easily meet the requirements of the EnEV without drastically increasing the insulation thickness. Quite the contrary,

VACUPOR® VIPs allow an unimaginably slim structure and therefore offer more design leeway.

Wall insulations with VACUPOR® are indicated for the external and internal area, provided that the structural guidelines are observed.

Since the extension of the technical approval (DIBt), VACUPOR® VIPs can also be profitably used as an innovative wall insulation system both in new construction and in old building renovations.

Advantages at a glance:

- Significantly slimmer wall structure
- Increased gain in living/usable space
- No shading due to high wall thicknesses
- Enormously increased energy efficiency with equal or reduced insulation thickness
- Additional design leeway for aesthetic requirements
- No health or physiological risks during processing



Source: Flying Spaces Sottrum, Ulrich Herzog

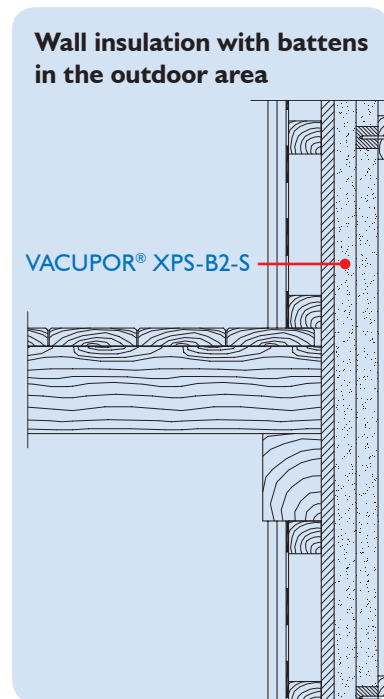
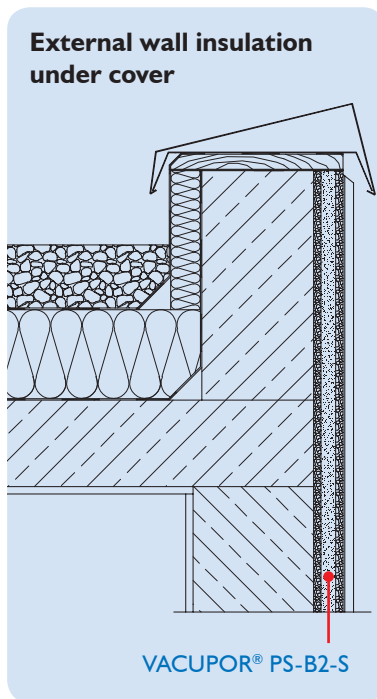
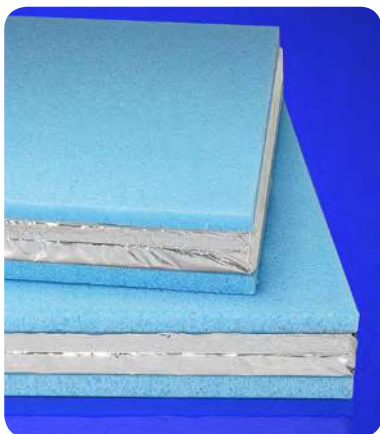


Correct use and processing

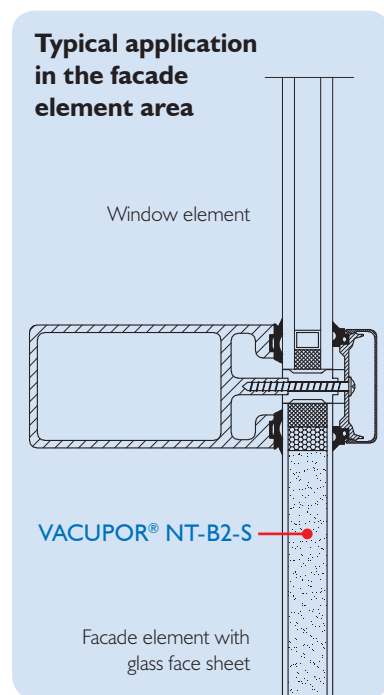
Efficiency of VACUPOR® – successfully tested in modern facade constructions

Modern facade constructions today are widely dominated by so-called sandwich elements. High quality face sheets made of glass and/or aluminium sheeting are used in this case. The Porextherm VACUPOR® VIP in conjunction with this high tech insulation in prefabricated building offers an extremely interesting alternative with many advantages:

- Reduction in the overall height of the façade panel
- Increased gain in space
- Greatly increased energy efficiency
- Saving in transport costs as a result of lower load volumes
- Extensive design leeway for aesthetic requirements



For different applications for wall insulation: VACUPOR® XPS-B2-S and VACUPOR® PS-B2-S.



VACUPOR® XPS-B2-S

Delivery forms and service

VACUPOR® VIPs are manufactured precisely customized to our customers' specifications. The laying plans of the properties dictate the sizes and thicknesses.

Our standard sizes are generally used in the wall insulation area, with which the major part of the area can be covered. The remaining areas, as a rule in the periphery, are filled with special sized panels.

When using VACUPOR®, the remaining surfaces are usually filled with customized panels. When using VACUSPEED®, the remaining surfaces are filled with cuttable PU-foam sheets. The VACUSPEED® panels are available from stock.

You will find further information about our VACUSPEED® system at: www.vacuspeed.de

Standard sizes for wall insulation:

VACUPOR® NT-B2-S
VACUPOR® PS-B2-S
VACUPOR® XPS-B2-S

1200	x	1000	mm
1200	x	500	mm
1000	x	600	mm
1000	x	300	mm
600	x	500	mm
600	x	250	mm
300	x	250	mm

Our standard sizes are available in 10, 15, 20, 25, 30, 35, 40, 45 and 50 mm.

Special sizes and other thicknesses are available on request.

Quotations made easy – with prepared tender documents



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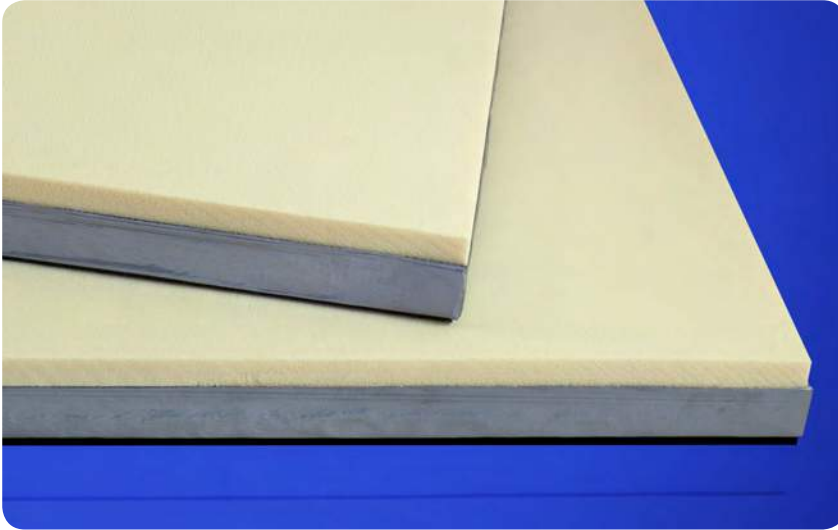
www.bau-vip.com.

These will allow you to react quickly and professionally to your customers' wishes.



VACUPOR®
Application examples
in the area of efficient
roof insulation

Roof insulation with VACUPOR®



Effective and innovative forms of thermal insulation in the roof will constantly increase in importance in the future, not just due to the current energy conservation provision, but also due to ever increasing energy prices. Whether in industrial or residential building, with flat or pitched roofs, VACUPOR® stands out as an excellent high-efficiency insulating material. Particularly during renovations, VACUPOR® will be a preferred choice among the insulating materials.

This is because no conventional insulating material comes even close to offering such fine insulating properties with a drastic reduction in the structural height.

During the use of conventional materials, height offsets may possibly arise. These can be avoided by the low insulation thicknesses of VACUPOR®.

Consequently, structural advantages occur during implementation of architectural specifications and conceptions. These issues arise above all in renovating old buildings and in integration with the existing stock of buildings.

In new construction and industrial construction, lower overall heights can be achieved for, which may have a positive effect on the investment.

In combination with conventional materials, VACUPOR® results in other elegant solution options in subareas. For example in case of implementations which do not allow any scope in the structural height.

Advantages at a glance:

- Extremely high insulating properties with minimal installation height
- Steps are avoided by reduction in the structural height
- Barrier-free construction
- Major gain in space
- No need for subsequent readjustment of terrace doors and balustrades
- Tremendous increase in energy efficiency
- No creeping behavior, even over prolonged periods
- No health or physiological risks during processing



Correct use and processing

Successful application examples testify to the efficiency of VACUPOR®

Floor, ceiling, patio, loggia and balcony insulation is already now being performed with a slim and elegant construction with VACUPOR®.

The roof area is getting more and more important, due to renovation and extension activities. VACUPOR® Roof combines the advantages of VACUPOR® RP-B2-S and PIR-insulation in one product. You achieve best insulation performance at slim structural height. VACUPOR® Roof is covered with a durable and environmentally compatible protection layer. The rubber granule mat offers an improved protection of the VIP on the bottom side. The upper surface is protected by a PIR-foam sheet that is applied in house already. This design provides the basis for further layers of the complete structure. Due to this, VACUPOR® Roof is especially suitable for flat roof insulation.

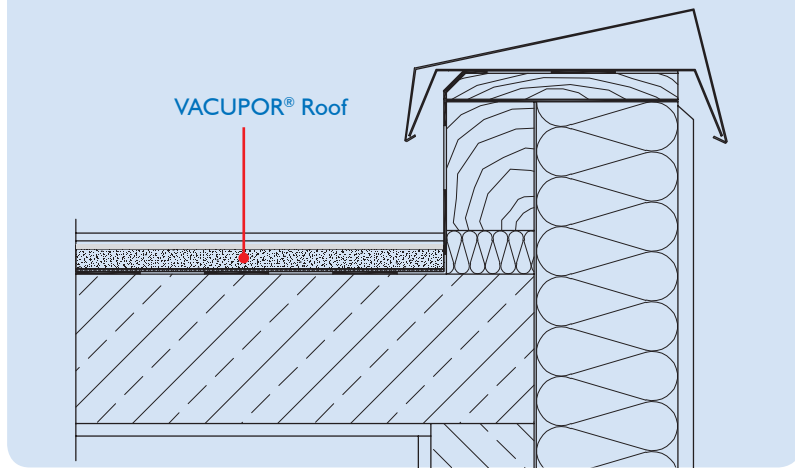
A circumferentially applied textile tape, that offers additional protection on the face sides is available as an option.

Further information and datasheets can be found on our website:

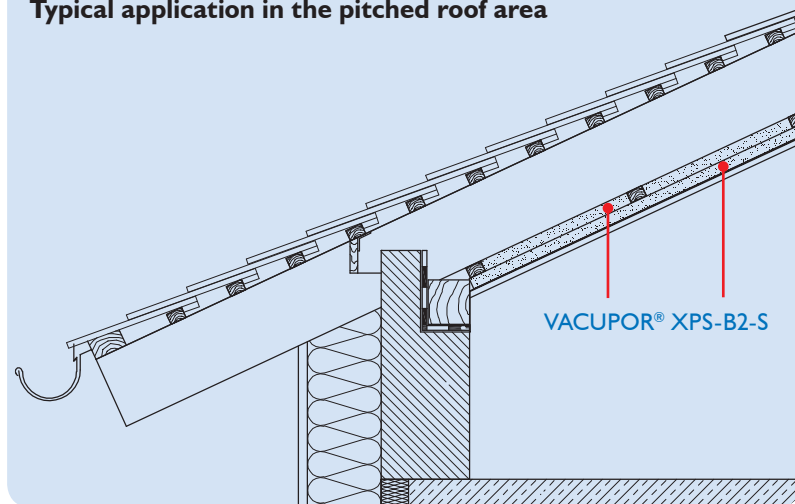
www.bau-vip.com

VACUPOR® RP-B2-S is available either single or double-sided for different applications.

Typical application in the flat roof area



Typical application in the pitched roof area



Delivery forms and service

VACUPOR® VIPs are manufactured precisely customized to our customers' specifications. The laying plans of the properties dictate the sizes and thicknesses.

In the area of flat- and pitched roof insulation, usually VACUPOR® standard sizes or VACUSPEED® Roof are used to cover the major part of the surface.

When using VACUPOR®, the remaining surfaces are usually filled with customized panels. When using VACUSPEED®, the remaining surfaces are filled with cuttable PU-foam sheets. The VACUSPEED® panels are available from stock.

You will find further information about our VACUSPEED® system at: www.vacuspeed.de

Standard sizes for roof insulation:

VACUPOR® NT-B2-S
VACUPOR® RP-B2-S
VACUPOR® TS-B2-S
VACUPOR® XPS-B2-S
VACUPOR® Roof*

1200	x	1000	mm
1200	x	500	mm
1000	x	600	mm
1000	x	300	mm
600	x	500	mm
600	x	250	mm
300	x	250	mm

Our standard sizes are available in 10, 15, 20, 25, 30, 35, 40, 45 and 50 mm.

Special sizes and other thicknesses are available on request.

Quotations made easy – with prepared tender documents



We offer our customers an additional service for the elaboration of quotation. We have placed the most common call to tender texts in the download area of our website: www.bau-vip.com.

These will allow you to react quickly and professionally to your customers' wishes.

Convincing quality management

Our references are something to be proud of

Porextherm is one of the world wide innovation and market leaders for thermal insulation and vacuum insulation panels. Our products have contributed to innovative projects (among others the Solar Decathlon house) having received awards. In conjunction with our partners, we have already successfully handled properties in the area of floor, ceiling, patio, loggia and balcony insulation. A current list of reference properties can be found on our website.

Approvals and certificates

VACUPOR® is approved by the general technical approval (AbZ) with the No. Z-23.11-1662 and a european technical approval (ETA) with the No. ETA-13/0515. In combination with the declaration of performance (DOP), the ETA allows to sign the products with the CE label.



Quality speaks for itself

Porextherm has been an official member of the Güteschutzgemeinschaft Hartschaum e.V. (GSH) [Rigid Foam Quality Assurance Association] since April 2008.

On the same date, the “Vacuum insulation panel” product group was established within the GSH. Renowned vacuum insulation panel manufacturers joined together in the GSH with the target of assurance quality.

The jointly drafted quality and testing regulations were approved by the RAL, Deutsches Institut für Gütesicherung und Kennzeichnung e.V. and the RAL quality label was awarded.

Porextherm is therefore subject to very stringent quality criteria, specifically in the area of the products which are sold in the construction industry.

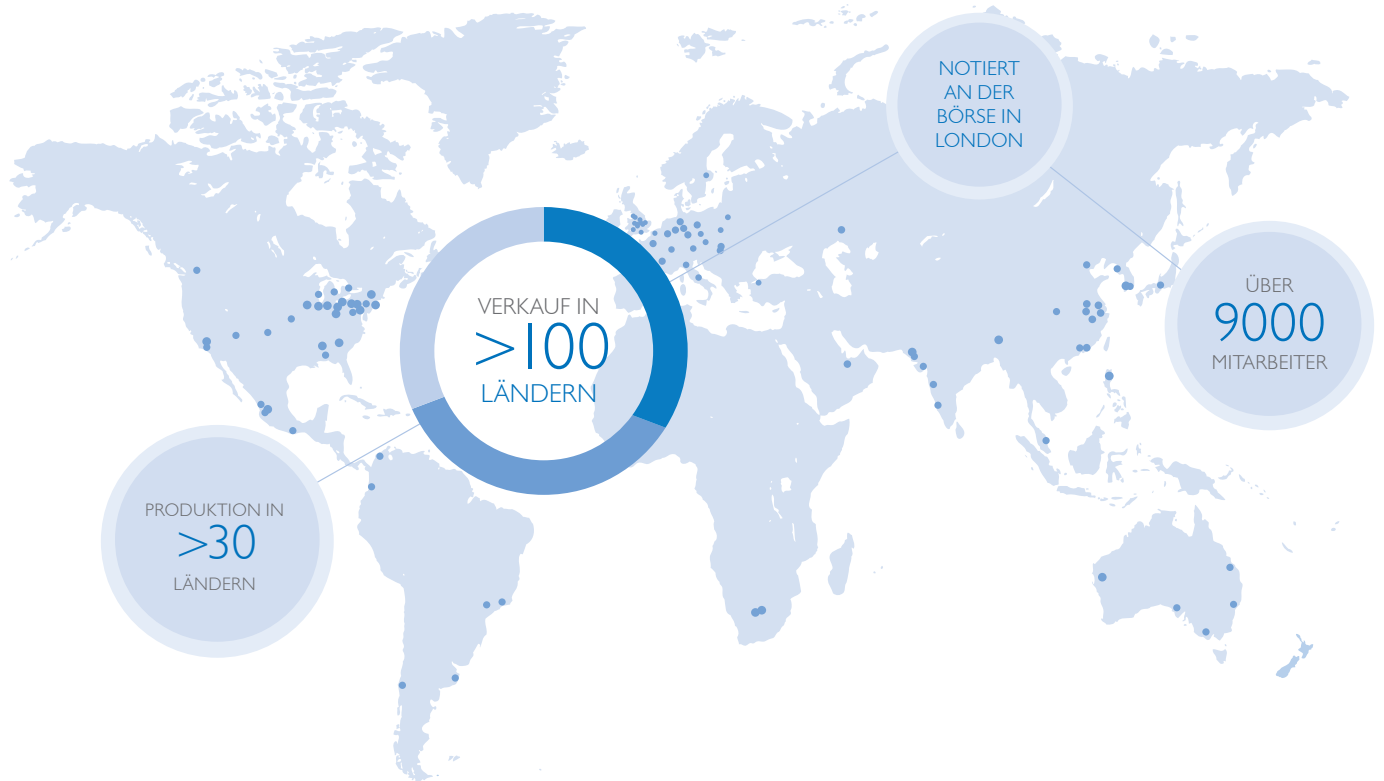
In addition to the technical approval for Vacupor types and likewise the Ü label for external monitoring, the RAL quality mark will also continue to contribute to improve processors' and consumers' confidence in the quality of vacuum insulation panels.

Furthermore, Porextherm is certified according to ISO 9001 (quality management system) and ISO 14001 (environment management system). An environmental product declaration (EPD) according to ISO 14025 is available for VACUPOR® and VACUSPEED®

Further actual and detailed information about quality issues are available on our website: www.bau-vip.de



MORGAN ADVANCED MATERIALS



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