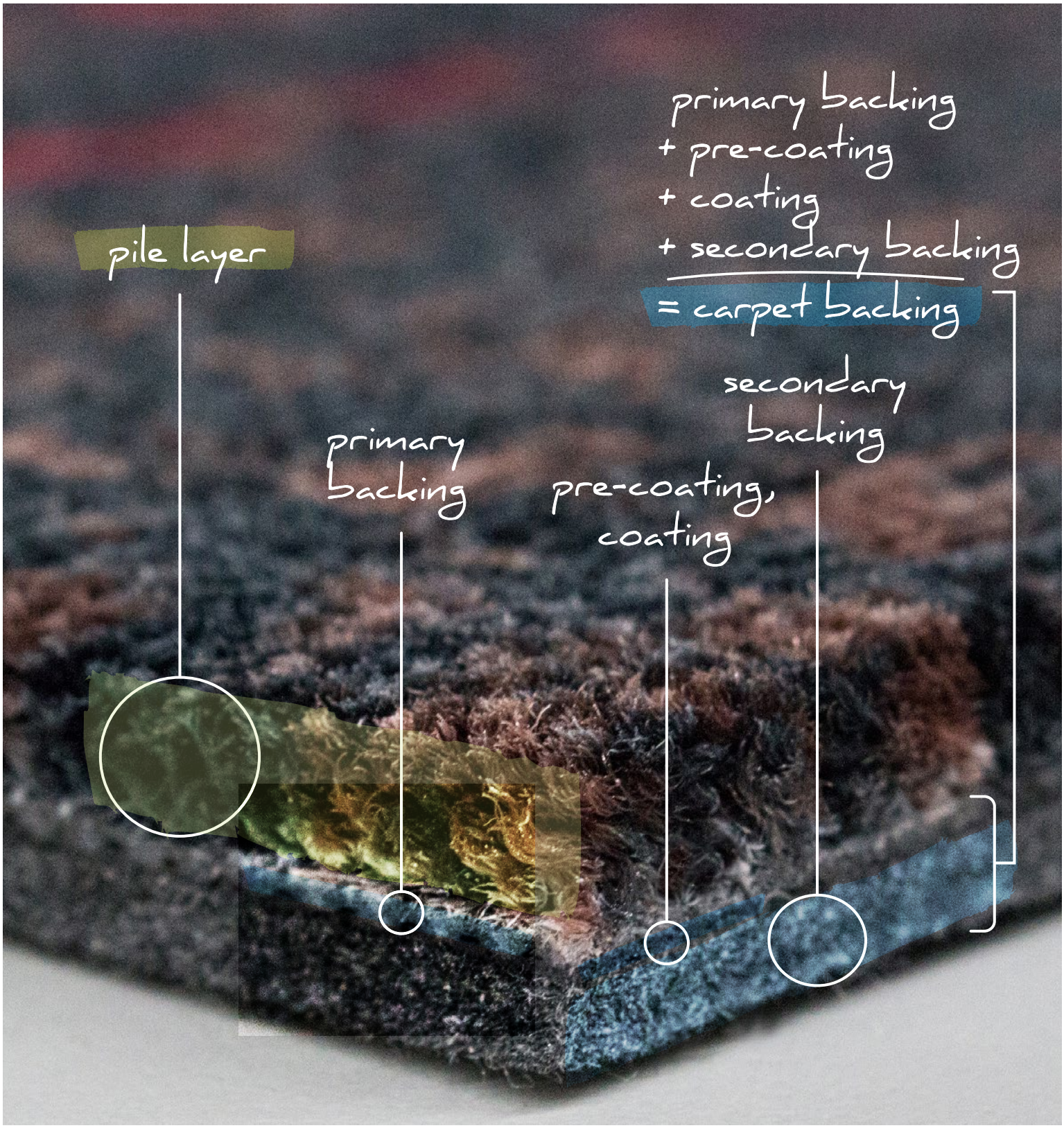
INFO GUIDE | 05

HALBMOND

Backing EXPLANATION



Backing EXPLANATION

en It remains invisible and therefore unnoticed, but it is the most functional part of your floor covering – the backing! What effect does it have on the acoustics, thermal insulation and fire safety of a room? Which tests measure this effect? And how can you interpret and compare these measurements to find your ideal backing structure?
The Infoguide 'Backing EXPLANATION' completes the series, which guides you through the data sheet, the tufting process, our printing methods and the final backing to the finished Halbmond carpet.

de Er bleibt unsichtbar und somit unbeachtet, doch ist der funktionalste Teil Ihres Bodenbelages - der Rücken! Welche Wirkung hat er auf Akkustik, Wärmeisolation und Brandsicherheit eines Raumes? Welche Tests messen diese Wirkung? Und wie können Sie selbst diese Messwerte zur Auswahl Ihres idealen Rückenaufbaus nutzen?
Der Infoguide „Backing VERSTEHEN" vervollständigt die Reihe, welche Sie über das Datenblatt, den Tuftingprozess, unsere Druckverfahren und die finale Rückenbeschichtung bis zum fertigen Halbmond-Tepichboden begleitet.

fr Il reste invisible et donc ignoré, mais c'est la partie la plus fonctionnelle de votre revêtement de sol : le dossier ! Quel est son effet sur l'acoustique, l'isolation thermique et la sécurité incendie d'une pièce ? Quels tests mesurent cet effet ? Et comment pouvez-vous interpréter et comparer ces valeurs mesurées afin de trouver la structure de dossier idéale ?
L'infoguide « COMPRENDRE backing » complète la série qui vous accompagne à travers la fiche technique, le processus de tuftage, nos procédés d'impression et le revêtement final du dossier jusqu'à la moquette finie de Halbmond.

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> Free download of all Infoguides in 3 languages at: **https://halbmond.de/infocenter/**

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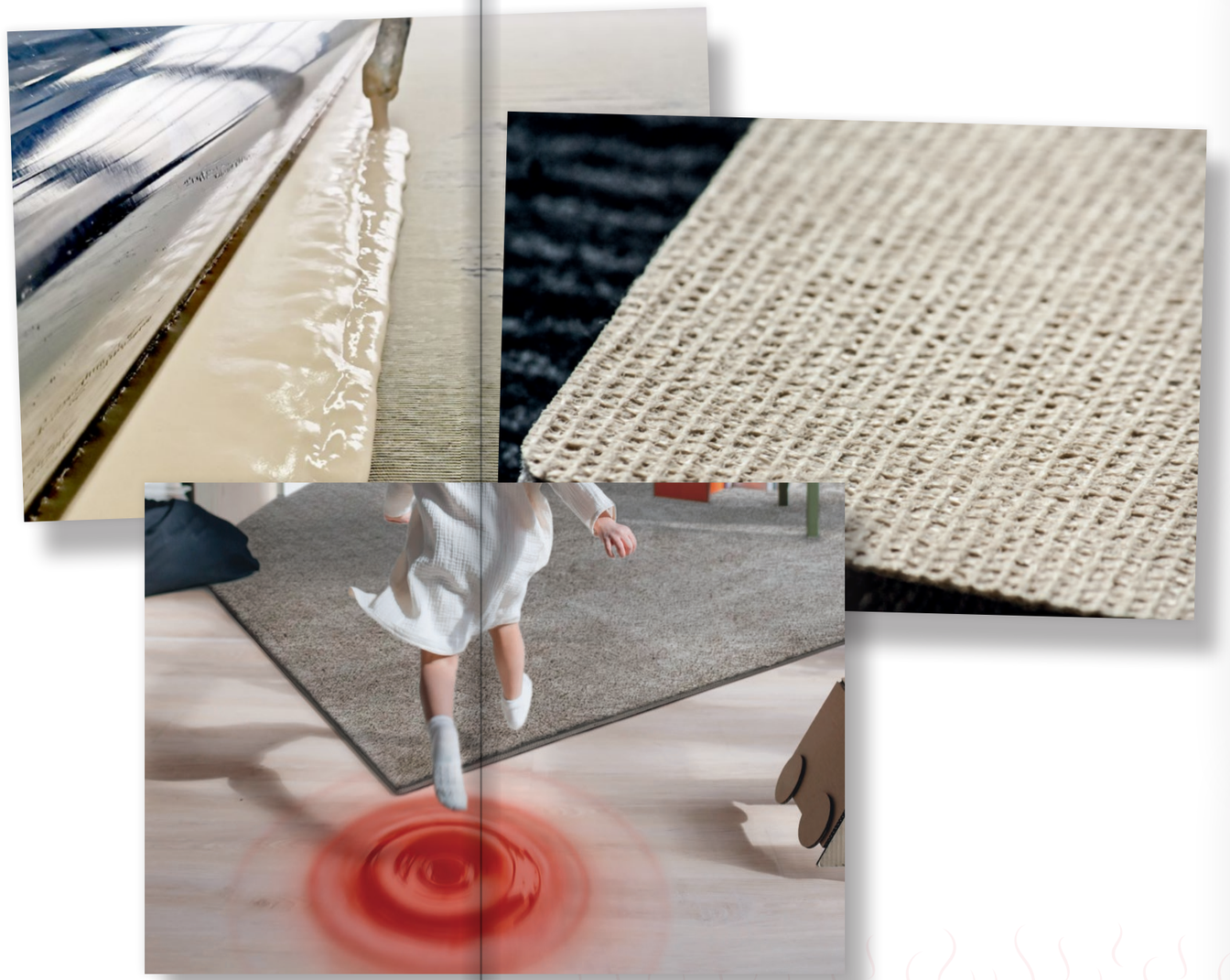

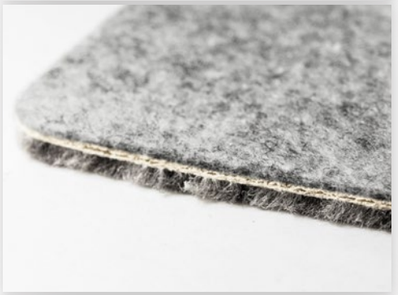

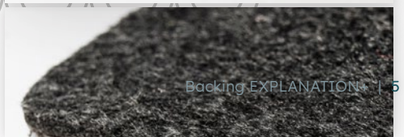

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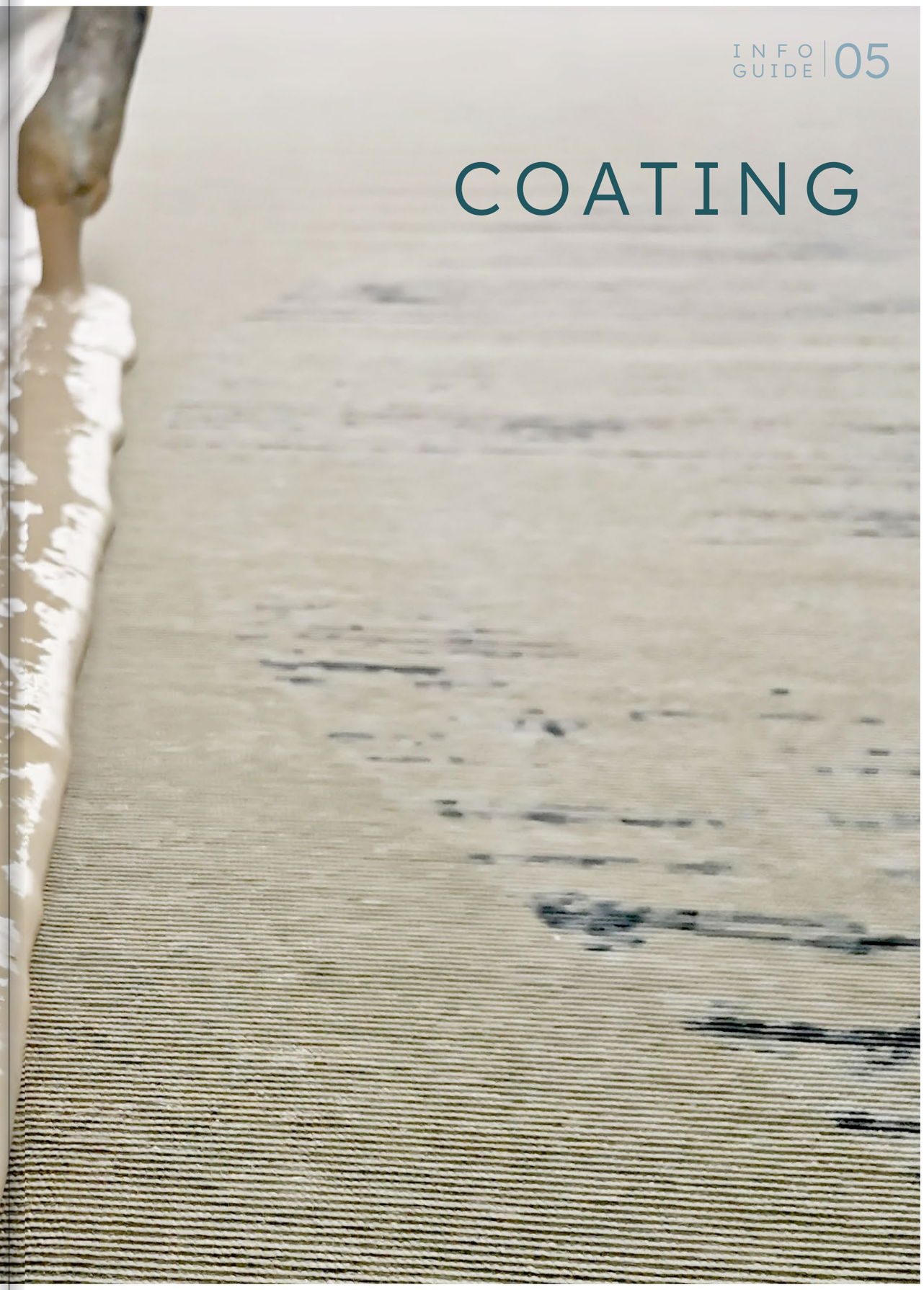
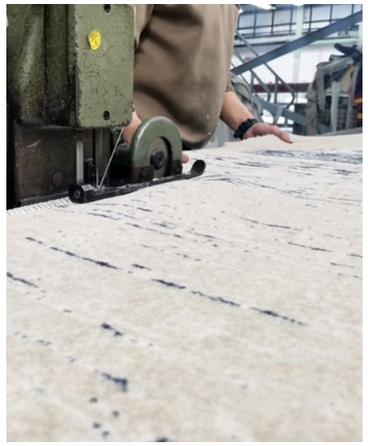
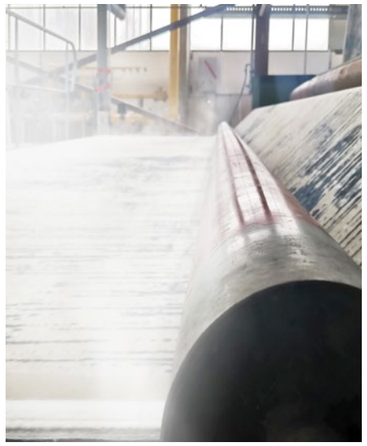
COATING



The coating process





1

Material feed:

The tufted fabric arrives fully printed at the coating hall. Here, it is first sewn onto a fabric strip, the lead-in tape. This allows it to be drawn into the material buffer and stored - laid down in waves - until the actual process begins.

2

Steaming:

Brief steaming with saturated steam optimally prepares the tufted carpet for the pre-coating because:
1. Internal stresses are relieved -> the material lies flatter and shows less distortion.
2 Fibres from yarn and primary backing expand, providing a larger surface area for the coating.

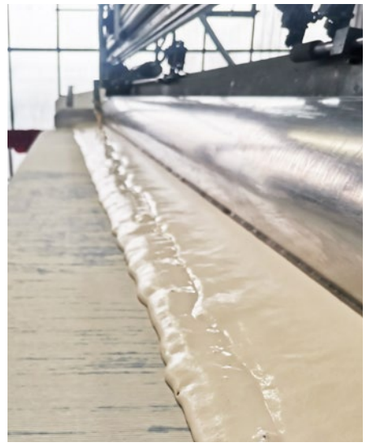
3

Pre-coating:

The pre-coating compound is formulated according to the specific article. It contains antistatic agents and flame retardants. To ensure a more uniform distribution, it is foamed, applied via a moving hose across the full width of the material, and finally...

Why coat at all?

The backing is the part that is not visible but of crucial importance for the carpet. It is essential for achieving key performance characteristics.
Directly after tufting - and even after printing - the pile yarns are not firmly anchored in the primary backing; they could be pulled out with the fingertips. In addition, the carpet is prone to distortion, provides little cushioning underfoot depending on the pile weight, and offers only limited sound and thermal insulation.



4

Spreader roller:

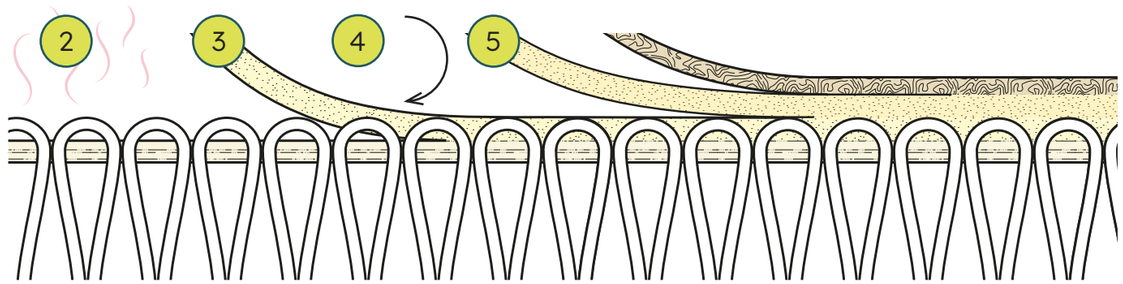
...pressed into the primary backing by a roller. To ensure particularly thorough incorporation, it operates against the production direction.

The pre-coating serves an important function: it bonds the pile tufts, which have so far only been stitched in, to the primary backing.

5

Coating:

The pile is now bonded to the primary backing, but the secondary is still missing. A top coat is applied wet-on-wet in the same way as the pre-coating. It fills the spaces between the tufts to form a level surface and simultaneously acts as the adhesive layer for the secondary backing.



The coating process

6

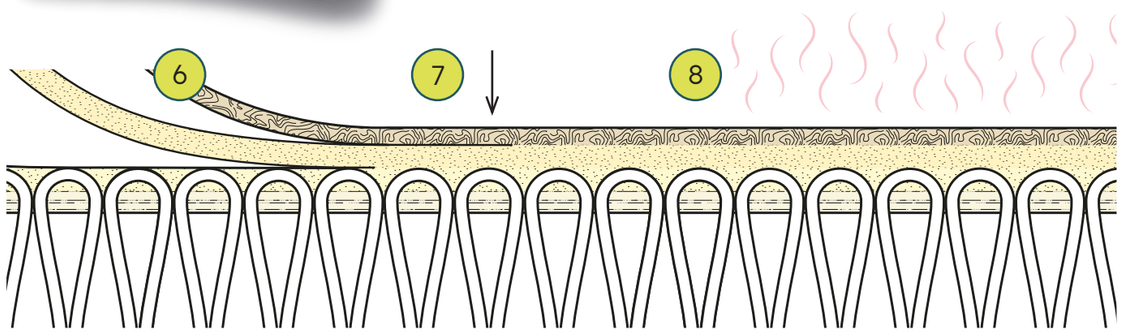
Secondary backing:

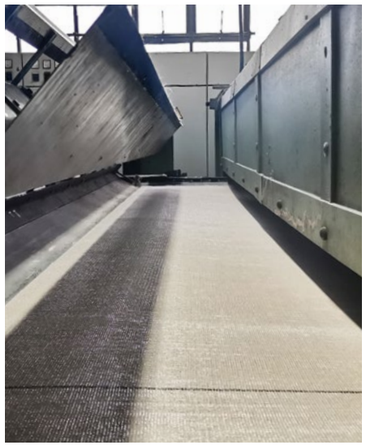
The secondary backing is laid into the high-viscosity coat from above. A wrinkle-free application is ensured by the tenter roller, which smooths the textile from the centre towards the edges beforehand. At the beginning of the coating process, the tufted fabric was pinned to ensure dimensional stability.

7

Pressure plate:

The secondary backing is now impaled onto the same pin bars. A pressure plate presses it deeper into the coat, expels any trapped air, and simultaneously distributes excess coating compound across the reverse side of the carpet to achieve a uniform layer thickness.





8

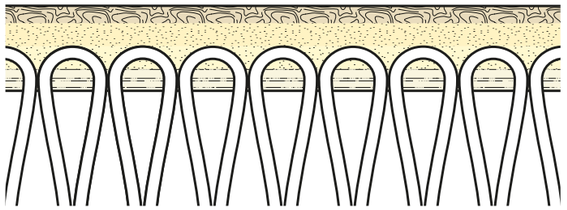
Dryer:

All backing components have now been applied, and the pre-coat and coat must try. To achieve this, they require a specific temperature profile, which has been determined for each product through a series of trials. For finely controlled increases and decreases in temperature, Halbmond has 12 interconnected heating zones at its disposal, each of which can be controlled independently. First, the high water content must evaporate, until finally the pre-coat and coat cross-link into a continuous, elastic, and dimensionally stable structure that permanently anchors the pile and withstands future physical stresses.

9

Post-treatment:

After leaving the dryer, the coating process is complete. This is followed by marking with section identifiers (modules only), the final quality inspection, and, if required, cutting into tiles or modules. Once the product has been packaged, it is ready for delivery to the customer.



That’s why!

The backing provides the carpet with an additional multifunctional layer. It has the following effects:
- stabilising (dimensions, pile fibres)
- cushioning (sound and impact)
- insulating (sound and heat)
- fire-retardant

(see page 20)

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SECONDARY BACKINGS

The secondary backings

1
PET

Secondary backing. The term is often used in a narrower sense to refer to a fabric backing. In fact, however, there are various types of backing.

Woven fabric. A woven fabric is a two-dimensional structure of threads, which are usually arranged at right angles to one another and interlaced, or woven together, according to a specific weave. For a long time, the entire carpet industry used only a polypropylene woven fabric as a backing to give the tufted pile additional strength and dimensional stability. At Halbmond, this backing still accounts for just over half of the secondary backings selected today.

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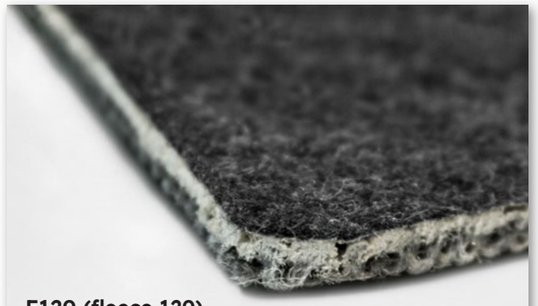
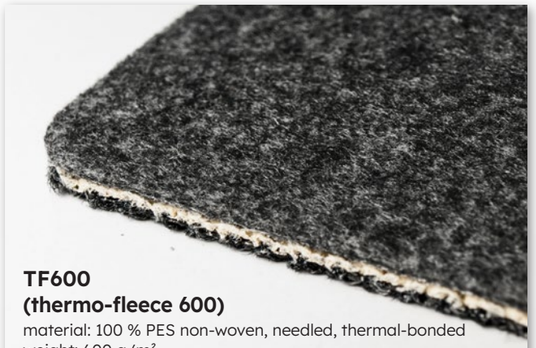
WB (woven backing)
material: 100% PP woven fabric
weight: 64 g/m²



F120 (fleece 120)
material: 100% PES non-woven, needled, thermal-bonded
weight: 120 g/m²

F280 (fleece 280)
material: 100% PES non-woven, needled
weight: 280 g/m²

F550 (fleece 550)
material: 100% PES non-woven, needled
weight: 550 g/m²



TF600
(thermo-fleece 600)
material: 100 % PES non-woven, needled, thermal-bonded
weight: 600 g/m²

TF1000
(thermo-fleece 1000)
material: 100 % PES non-woven, needled, thermal-bonded
weight: 1000 g/m²

Non-woven. Non-woven fabrics are often mistakenly referred to as felts. However, non-woven fabrics and felts differ fundamentally in terms of material and manufacturing process. A non-woven fabric is a flat composite of individual fibres. There are non-woven fabrics in which the fibres are held together purely by mechanical means (e.g. needled non-woven, hydroentangled non-woven), those that are fused together under heat (e.g. thermobonded non-woven) and – less commonly – non-woven fabrics bonded together using adhesives.
For the secondary backing, Halbmond uses polyester non-woven fabrics made from **recycled PET bottles** in weights of 120 g/m², 280 g/m², 550 g/m², 600 g/m² and 1000 g/m². All non-wovens are needled and, with the exception of the 280 g and 550 g grades, are also thermally bonded, resulting in a denser, firmer structure.

Tile backings

EL Easy Lift (EL) is a flexible, dimensionally stable and environmentally friendly heavy-duty backing for floor coverings with a light or heavier non-woven secondary backing. It ensures that the carpet lies flat – particularly when it is made up of individual modules. The 120 g non-woven backing is generally chosen for standard modular formats, whereas the 1000 g version is used for large tile formats (e.g. 1.92 m x 1.92 m) or as an acoustic tile for improved impact sound insulation.

EL/F120
(Easy Lift/fleece 120)
material: 100% PES non-woven, needled, thermal-bonded
weight: 120 g/m²

EL/F1000
(Easy Lift/fleece 1000)
material: 100% PES non-woven, needled, thermal-bonded
weight: 1000 g/m²

Halbmond leads the way:

Easy Lift *for over 20 years!*

the eco-friendly heavy coating

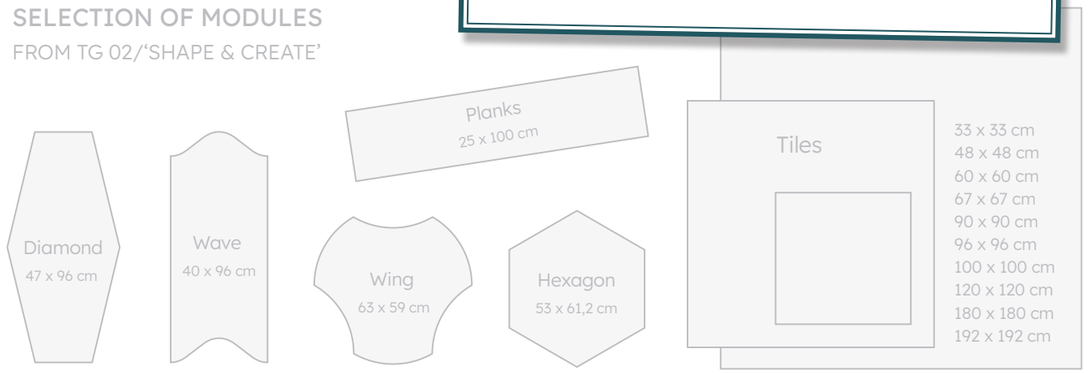
- odourless
- solvent-free
- bitumen-free
- PVC-free
- APEO-free (alkylphenol ethoxylate)
- free from labelable substances
- contains recycled metal
- certified by GUT

can be combined with:

- all module shapes
- planks
- tiles in all sizes
- rolls with a width of 4 m

SELECTION OF MODULES

FROM TG 02/‘SHAPE & CREATE’



TG 01	SET IT UP
TG 02	SHAPE & CREATE
TG 03	MEGA TILES
TG 04	Q STEP TILES
TG 05	QUICK START TILES
TG 06	TILE CREATIONS
TG 07	PLANK CREATIONS
TG 08	FASHION TILES & PLANKS
TG SPEZIAL	NIGHTLIFE TILES
PG 10/2	QUICK SELECTION TILES & PLANKS

> Discover our Tile & Plank Guides featuring hundreds of design ideas!

Special coatings

Bfl All Halbmond backings meet at least fire safety class Cfl-s1, which qualifies the carpet for use in commercial premises. If required or desired, almost every product can also be supplied in Bfl-s1 – the highest fire safety class achievable for textile floor coverings!

Reaction-to-fire classifications - DIN EN 13501-1

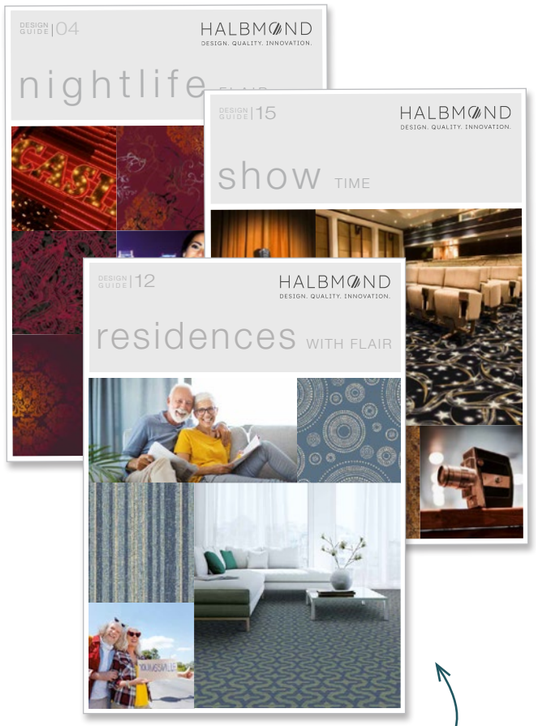
flame-retardant (critical heat flux ≥ 4.5 kW/m²*) low smoke emission	**flame-retardant (critical heat flux ≥ 8.0 kW/m²*) low smoke emission**

-> * critical heat flux according to EN ISO 9239-1

> Weitere Informationen siehe S. 36

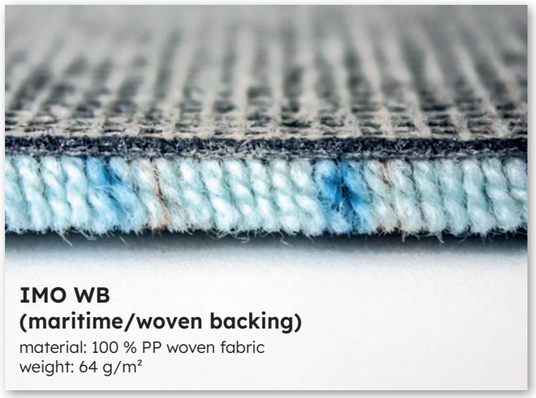
WUB In some situations, accidents are more likely to happen: in bars, restaurants, cinemas and casinos, but also in care facilities, floors are subjected to additional wear and tear, for example from spilled drinks. In such cases, it may be worth treating the carpet with a waterproof WUB coating to make cleaning easier and prevent unpleasant odours.

WUB (water-impermeable coating/fleece 120)
material: 100 % PES non-woven, needled, thermal-bonded
weight: 120 g/m²

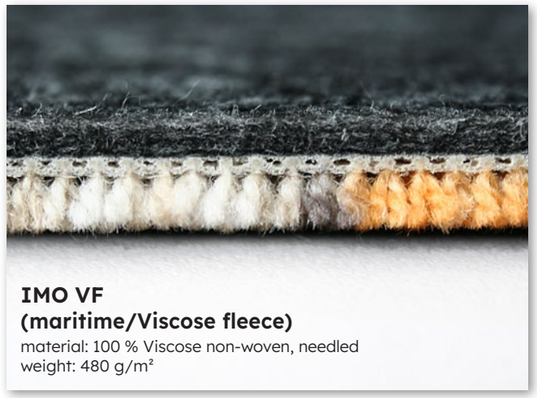


> You can find the perfect design for your water-impermeable flooring here!

IMO Specifically designed to meet maritime requirements (and certified by the Wheelmark) are our combination of the Artemis pile quality and the IMO WB secondary backing (a woven backing made from 100% Polypropylene) or IMO VF backing (a non-woven backing made from 100% Viscose).



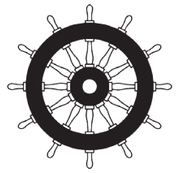
IMO WB (maritime/woven backing)
material: 100 % PP woven fabric
weight: 64 g/m²



IMO VF (maritime/Viscose fleece)
material: 100 % Viscose non-woven, needled
weight: 480 g/m²

Wheelmark

The wheelmark is awarded by the International Maritime Organisation (IMO). It authorises the use of the certified product on board throughout the EU in accordance with the Marine Equipment Directive (MED, Directive 2014/90/EU). The symbol is accompanied by the number of the certification body and the year of certification.



0000/YYYY

> Still looking for maritime design inspiration? Take a look at our Product Guide 06 “Ocean Line”!

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BACKING FUNCTIONS

Dimensional stability

In both the tufting and coating processes, carpets are exposed to significant fluctuations in temperature and humidity, which they must withstand without warping, shrinking or expanding. To ensure their dimensional stability, both a dimensionally stable primary and secondary backing are essential.
In long-term use, heavy foot traffic presents an additional challenge. Particularly in the case of carpet tiles, where the tiles must fit together perfectly at the seams, any change in dimensions could well create a trip hazard. Here, the combination of special heavy coatings such as Easy Lift (see page 16) and a dimensionally stable secondary backing ensures that the tiles lie flat.

Walking comfort

Walking on a hard floor is just as tiring and uncomfortable as walking on tarmac – not to mention crawling or sitting. A floor covering with a thick non-woven secondary backing, on the other hand, cushions every step like a forest floor, reducing the impact when your foot strikes the ground. This is gentle on the foot and hip joints, the knees and the spine. The reduced risk of slipping (e.g. in socks) also lowers the risk of a fall. And should a fall do occur, the impact is significantly softer on carpet...

Durability

But the cushioning effect of a thick carpet backing is not only gentle on your joints, but on the pile too! The pile also suffers less compression and abrasion when the force of each step is gently absorbed and converted into the deformation energy of the foam and/or non-woven. And less wear and tear on the surface means your floor covering will last longer.

Thermal comfort

In fact, the thicker the carpet, the greater its thermal insulation properties (see thermal resistance, p. 30). However, simply having a carpeted floor increases the perceived temperature by 3°C compared to a hard floor, all other room conditions being equal! This means you can heat your home less without compromising on comfort, thereby saving energy...

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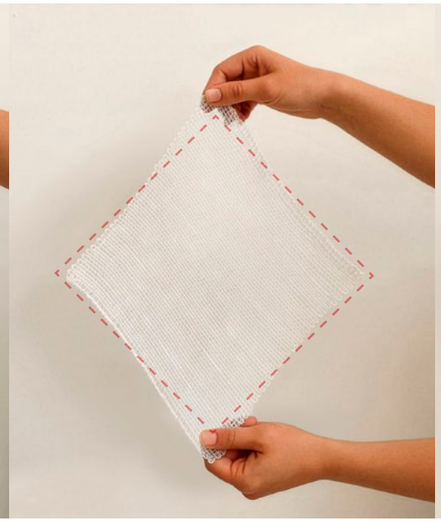
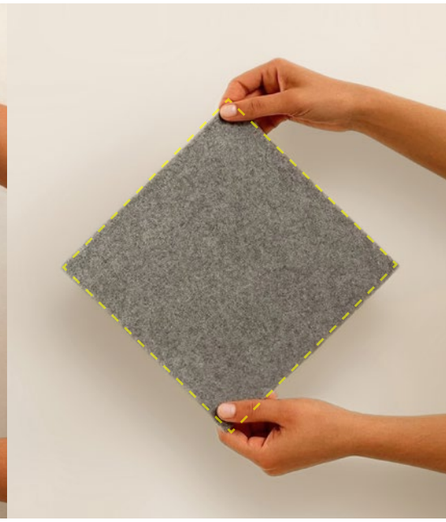




Acoustics

How long does it take for a sound to fade away in your workplace? Offices and meeting rooms benefit from a short reverberation time – meaning the sound level drops as quickly as possible once the sound source has stopped. On the one hand, this improves the clarity of spoken language; on the other, it allows for quicker responses. The reverberation time can be influenced structurally by the shape and volume of the room, as well as by the design of the ceiling, walls and floor. This is where carpet comes into play as a sound absorber.

No other floor covering can improve room acoustics as effectively as carpet. Whilst **hard floors mostly reflect** sound waves (speech echoes within the same room) or **transmit** them through the surrounding building structure (you can hear footsteps in the room below), even a conventional **carpet absorbs** more sound than, for example, a laminate floor with underlay! Carpet therefore has a positive effect on both **sound absorption** (reducing volume and reverberation within the same room) and **sound insulation** (reducing sound transmission to neighbouring rooms). .

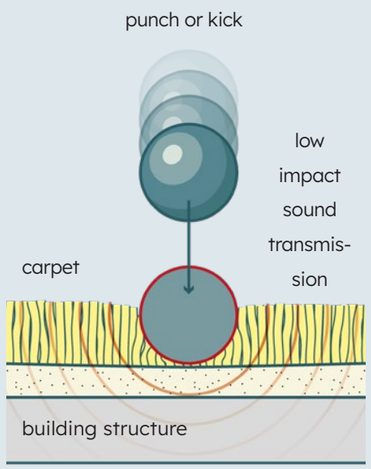
Sound absorption or impact sound reduction?

Sound absorption. Put simply, good sound absorption helps to reduce reverberation – for example, from speech – and benefits both you and your colleagues **in the same office.**

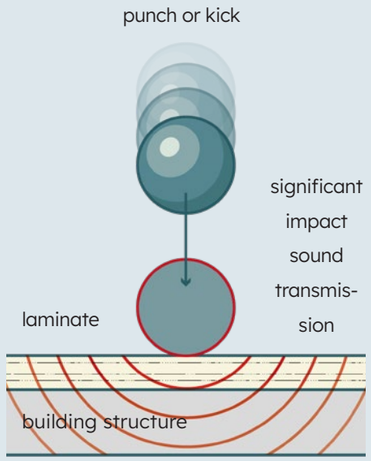
Impact sound reduction. Your **neighbour** and the hotel guest staying **below you** will be grateful for the reduction in impact noise caused by the sound waves transmitted to the building when you walk.

> In our Infoguide 'Acoustics', we'd be happy to introduce you to the subject in more detail.

Impact noise with carpet



Impact noise with laminate flooring



Sound absorption α_w

Speech or music generates airborne sound within a room. When this sound hits hard surfaces such as walls or floors, it is reflected back as an echo. However, when it encounters curtains, upholstered furniture, or **carpet flooring**, these act as **sound absorbers**. Sound waves set the air between the pile yarns in motion, as well as the air within the pores of the foam layer (pre- and coating) and between the fibres of the non-woven backing. The air friction against these materials generates heat. In this way, sound energy is converted into thermal energy, thereby damping the sound and making it quieter.
While the **pile** affects **high** and **partly mid-frequency ranges**, a thick **carpet backing** mainly absorbs **mid** and **partly low frequencies**. The denser and thicker the non-woven backing, the better the overall sound absorption.

THE VALUE IN THE DATA SHEET:

The sound absorption coefficient α_w has a maximum value of 1 (= 100%) and indicates **how much airborne sound is absorbed** by the floor covering. The α_w value summarises 18 measured individual values for various frequency ranges – α_s values – and calculates an average. It is **not** possible to determine from the α_w value alone **which frequencies** are attenuated **and to what extent**.

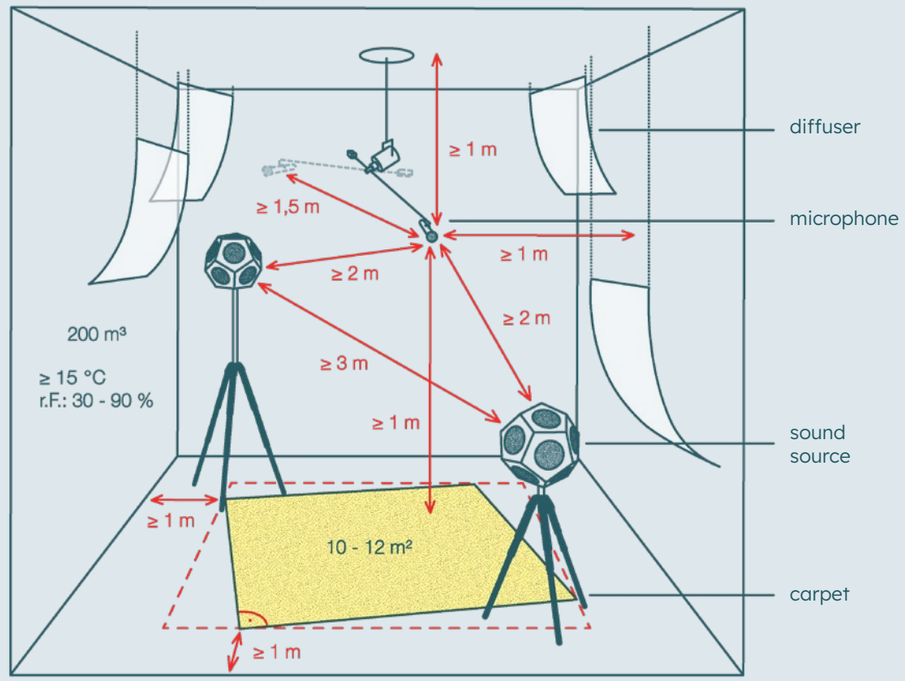
Fig.: TFI reverberation chamber with loudspeakers; Source: TFI Aachen

external

Testing:

> Halbmond commissions an external body to measure the sound absorption coefficient α_w of a textile floor covering in accordance with the DIN EN ISO 354 standard

Measurements are carried out with and without the test specimen under identical environmental conditions (minimum room temperature of 15 °C, relative humidity of 30–90%) and compared with one another in order to determine the acoustic effect of the carpet test specimen. In a room of approximately 200 m³, this must cover a floor area of 10–12 m². It must not be positioned parallel to the room edges or too close to them. Spherical sound sources and directional microphones are used, the distances of which from the walls and the test specimen are also specified. The loudspeaker then generates sound waves, the decay of which after the sound source is switched off (reverberation time) is recorded and plotted as a decay curve. This decaying sound field must be sufficiently diffuse, which can be achieved by means of mounted, suspended or rotating diffusers. A total of at least 12 different decay curves must be measured, each resulting from a different combination of at least 2 different sound source positions and 3 microphone positions. The sound absorption coefficient is then calculated for the third-octave bands from 100 to 5000 Hz (α_s values) and additionally summarised in a weighted single value (α_w value).



Impact sound reduction ΔL_w

The **carpet backing** is the key component for impact sound reduction, as it acts as an elastic **shock absorber** directly between the foot and the building structure. When stepped on, it is compressed, absorbs the impact and **decouples** it from the building. Within the carpet backing itself, the kinetic energy transferred during the compression of the material leads to internal friction and the **generation of heat**. Here, therefore, part of the kinetic energy is converted into heat energy. In addition, part of the **kinetic energy** is stored and **released gradually** as the material later returns to its original shape. Overall, the transfer of force from the footfall to the floor can thus be significantly reduced, resulting in fewer vibrations in the building structure and lower impact sound levels in adjacent rooms.

THE VALUE IN THE DATA SHEET:

The floor covering reduces the volume of all sounds transmitted through the building structure to adjacent rooms by the specified number of decibels. The impact sound level is measured in the room below.

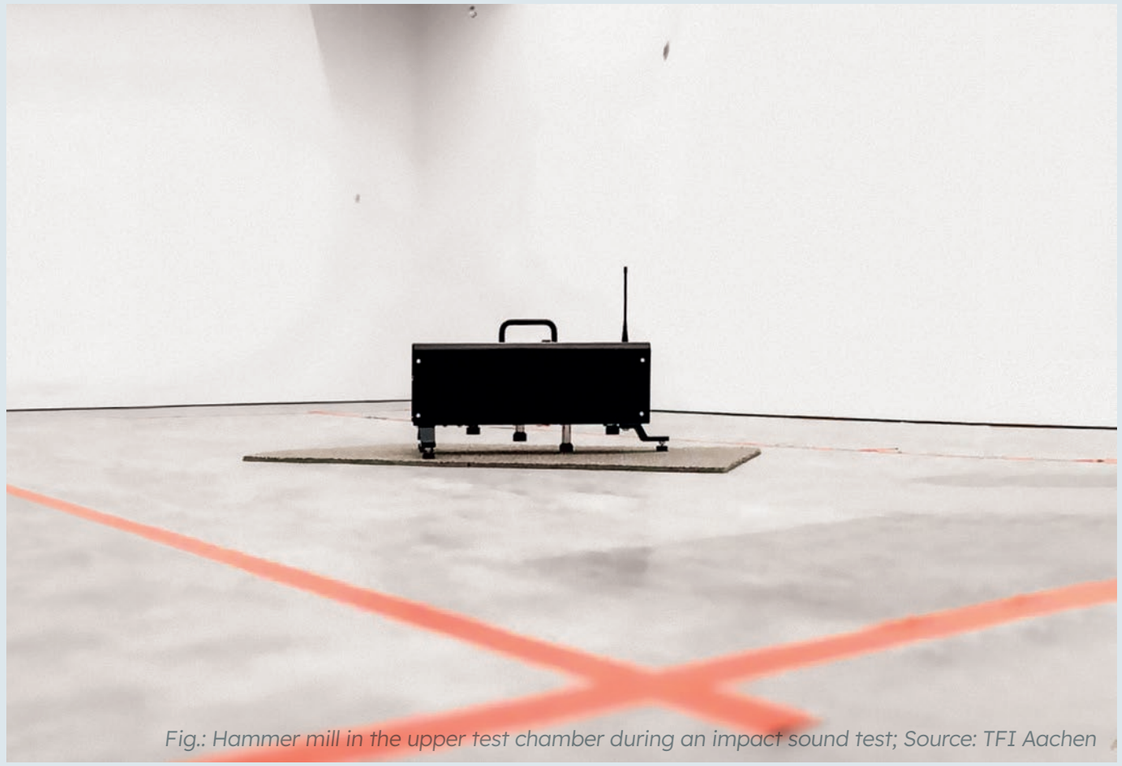
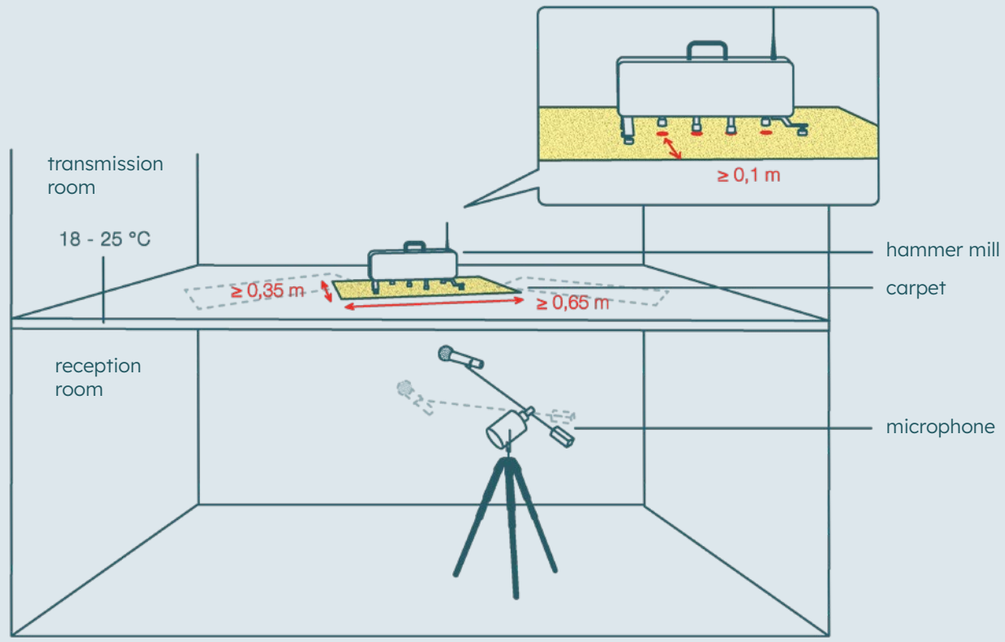


Fig.: Hammer mill in the upper test chamber during an impact sound test; Source: TFI Aachen

external Testing:

> Halbmond commissions an external body to measure the impact sound reduction of a carpet in accordance with the DIN EN ISO 10140-3 standard.

To determine impact sound reduction, two rooms situated one above the other are required. The temperature of the ceiling separating them should be between 18 and 25 °C. The test specimen is laid in the upper source room, and a standard hammer mill is positioned on top of it to generate impact sound. This device has five parallel hammers, each weighing 500 g, which strike the existing subfloor at a rate of 10 blows per second, thereby reproducibly simulating the impact of a person walking in shoes. In the receiving room below, the incoming sound pressure level is measured across a frequency range of approximately 100 to 5000 Hz. A standard impact sound level with ceiling covering (L_n) is measured. The test specimen is then removed from the transmitter room, the hammer mechanism is positioned in the same place as before, and the measurement is repeated. The standard impact sound level without ceiling covering (L_{n0}) is determined. Several measurement runs are carried out on at least 3 test specimens. The difference between the standard impact sound levels L_{n0} and L_n describes the improvement in impact sound insulation, i.e. the reduction in impact sound achieved by the carpet, and is expressed as a weighted single-number value ΔL_w in dB.



Thermal resistance

Thermal resistance is a measure of a carpet's **insulating effect**. The thickness and material of the carpet backing, as well as its density, have a significant influence on the carpet's thermal resistance (the corresponding factors for the pile are pile thickness and density). The thicker the carpet backing layer, the longer the distance the heat has to travel – thermal resistance increases linearly with thickness. Different materials conduct heat to varying degrees. Air is an extremely poor heat conductor and therefore an excellent insulator. As carpet backings often consist of foams and non-woven fabrics, they contain tiny air pockets. The more air is trapped and the 'looser' or more porous the material is, the higher the thermal resistance and the better the insulation.

THE VALUE IN THE DATA SHEET:

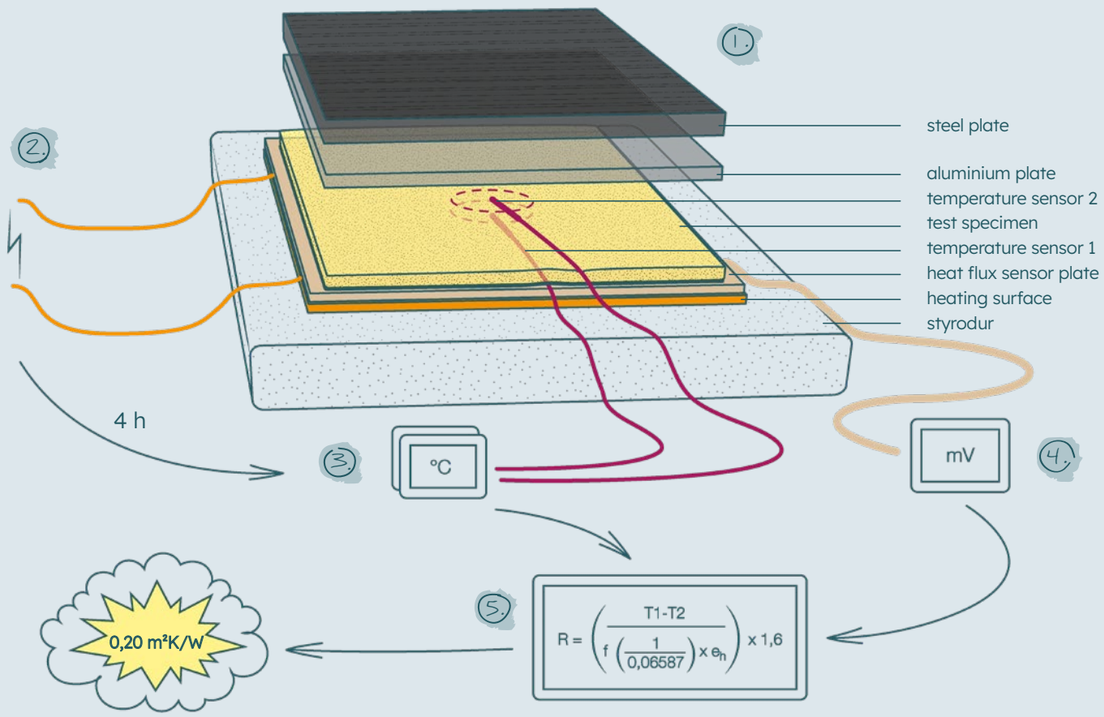
This symbol indicates that the thermal resistance shown opposite was measured at a room temperature of 23 °C. It shows the extent to which a material **impedes the transfer of heat** (low value = low resistance -> rapid heat transfer; high value = high resistance -> slow heat transfer).

Testing:

> To determine the thermal resistance of a carpet, Halbmond can carry out the test procedure using a plate device and a heat flux measurement plate, in accordance with the DIN EN 12667 standard.

To do this, a heating surface, a heat flux measurement plate, a first temperature sensor, the carpet, a further temperature sensor and various weighting layers are first stacked on top of suitable insulation, with the pile side of the carpet facing upwards. This simulates the structure of an underfloor heating system with carpet laid on top. The laboratory power supply is now switched on, set to the target values, and the heating process begins. After 4 hours, the temperatures at the lower and upper temperature sensors can be read in °C, as well as the heat flux in mV.

Using these values and other factors, the thermal resistance can be calculated with the help of a formula; it is expressed in m²K/W. When installing the floor covering over underfloor heating, it should be ≤ 0.17 m²K/W.



Reaction to fire

Floor coverings used in commercial areas are classified as construction products and are therefore subject to the Construction Products Regulation, which defines reaction-to-fire classes. Classes A1fl and A2fl-s1 (non-combustible) apply only to mineral hard floor coverings; **the highest possible classes for textile floor coverings are Bfl-s1 and Cfl-s1** (flame-retardant). Most building regulations, specifications, and building codes require one of these two classifications for floor coverings in commercial applications.

Building requirement	Reaction-to-fire classification according to DIN EN 13501-1	
flame-retardant		Bfl -s1 Cfl -s1
normally flammable		A2fl -s2 Bfl -s2 Cfl -s2 Dfl -s1, -s2, Efl
easily flammable		Ffl

All Halbmond carpets achieve class Bfl-s1 or Cfl-s1.

Fig.: Recording of the fire progression in the 'Radiant Panel' test chamber; Source: TFI Aachen

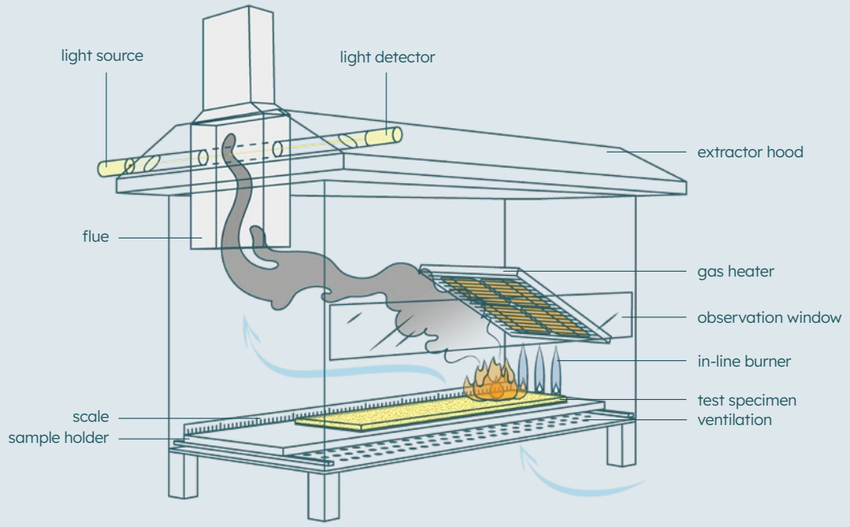
external

Testing:

> To determine the fire behaviour of a carpet, Halbmond has commissioned an external test in accordance with the DIN EN ISO 9239-1 standard.

Before the test begins, the test chamber must first be calibrated to reproduce the required heat flux profile. The specimen is then positioned horizontally beneath the gas-fired radiator, which is inclined at an angle of 30°, and exposed to a defined heat flux, as would typically occur during a room fire on the floor covering in the adjoining corridor. Pilot flames are also brought into contact with the hot end of the specimen for 10 minutes. After ignition, any flame front that forms must be identified and its horizontal spread along the length of the specimen recorded. In addition, smoke development must be recorded via the light attenuation in the flue. The test is carried out on 3 identical specimens.

The results are evaluated in terms of burn distance as a function of time, critical heat flux at flame extinction, and smoke density as a function of time. All specific observations, such as flaring up, melting, blistering, the duration and location of smouldering after the flame has gone out, burning through to the substrate, etc., must also be recorded and are taken into account when classifying the material into one of the reaction-to-fire classes.



Explanation of the reaction-to-fire classes:

A 2 fl - s1

- **A** — Class A1 (non-combustible) to Class F (no performance determined)
- **2** — Additional number only for Class A: A1 = no combustible components; A2 = combustible components
- **fl** = „flooring“
- **s1** — s = „smoke“; s1 = low (Classes A–C for commercial applications); s2 = moderate (for residential applications)

INFO GUIDE 05

CARPET INFO GUIDE

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