

PERFORMANCE CEILINGS
More scope for innovation



ACOUSTICS
PROGRAMME PART 3



BIG POTENTIAL FOR ROOM ACOUSTICS



Foreword by Theo Scheers of the Peutz Institute of Acoustics in Mook, The Netherlands

Good acoustics are recognized by, among other things, good speech intelligibility and sufficient protection from unwanted or intrusive sounds from the environment. Such a situation also gives rise to a feeling of well-being and peace. Materials and the types of constructions used in building significantly influence the acoustics of our living and working environment. A profound knowledge of the acoustic qualities of materials and constructions is essential for the design of good acoustic surroundings. On the one hand to be able to compare products and systems; on the other hand to be a reliable source for calculating their expected acoustic qualities in a given practical situation.

The Peutz Laboratory for Acoustics has qualified staff, methods and equipment able to ascertain the acoustic performance of products and systems in an objective and precise manner, and produce reports in accordance with international standards.

Concerning suspended ceilings two different acoustic properties are of importance, namely:

- sound absorption
- sound insulation

The sound absorbing quality of any given material is expressed using the Sound Absorption Coefficient α . This varies between 0 for totally reflective up to 1.0 for completely absorbing. Product information on the sound absorbing quality of a suspended ceiling is based on a measured test in a reverberation chamber.

The amount of sound transmitted from one room to another via the ceiling void is controlled by the sound insulation or attenuation. Installing suspended ceilings in two adjacent test rooms allows the sound insulation to be determined. The partitions, concrete floors and solid walls of these test rooms are designed so that sound transmission is only possible via the suspended ceiling.

Both absorption and sound insulation are dependent on the frequency. The determination is performed in octave bands from 100 Hz up to and including 5000 Hz. Based on this frequency-dependent data the following numeric values are calculated:

■ Absorption:

NRC value: This is according to ASTM C 423 the arithmetical average of the absorption coefficients corresponding to the four one-third octave band frequencies of 250 Hz up to and including 2000 Hz, and then rounded to the nearest 0.05.

α_w value: This is calculated according to the BS EN ISO 11654 norm.

■ Sound Insulation:

$D_{n,c,w}$ value: For measurements in the laboratory with parameters as given in BS EN ISO 140-9.

$D_{n,t,w}$ value: For measurements in practice with parameters as given in situ. The “w” index shows that the values at every frequency have been processed using a weighting curve to arrive at a single number, as described in BS EN ISO 717.

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This catalogue contains full details of the AMF range of acoustical ceilings. For information about other AMF products for fire protection, hygiene, integrated high-tech, material and design and the main ceilings programme, complete the fax-back form at the end of the catalogue or download from www.amfceilings.com

HOW NEW TECHNOLOGY IMPROVES ROOM ACOUSTICS



Educational buildings



Offices / call centres



Multiplex cinema / shopping centre

A ceiling can make a significant contribution to room acoustics. The traditional choice for architects of smooth materials with low acoustic absorption or perforated materials with high sound absorption is now in the past.

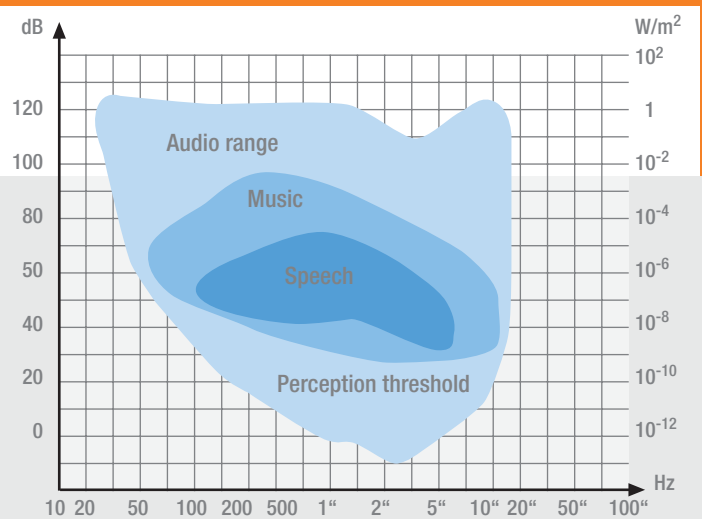
AMF Acoustic ceiling systems combine smooth surfaces with a particular acoustic performance to create the ideal acoustic environment. A choice of different acoustic properties from the AMF THERMATEx Acoustics range of ceiling tiles ensure that specifiers can choose the right option.

An AMF Acoustics suspended ceiling is able to change offices, meeting rooms, corridors, class rooms, auditoria and cinemas into spaces of good speech intelligibility. Concentration and attention spans are increased, enhancing work efficiency and well-being. The new technology of AMF Acoustics ceilings creates a peaceful environment, and offers further benefits of excellent fire protection, high light reflectance and easy installation.

WHEN SOUND BECOMES NOISE



When sound becomes noise



Audio range dependent on frequency and volume

Sound is energy that radiates out from a source as a series of multiple variations through an elastic medium. Movements of air particles create pressure waves. The number of air pressure waves per second is the frequency.

Frequency: 1 oscillation per second = 1 Hz

A person's ability to hear deteriorates progressively with age at the top and bottom frequencies. Noise is primarily defined by level, but often called 'volume'. It is measured in Decibels (dB) and affects the body, the mind and people's activities. If the noise level is too high, it can lead to:

- Irritation, high blood pressure and cardiac activity
- Aggressive behaviour, difficulty in sleeping, moodiness
- Inability to hear, reduced performance, lack of concentration, problems with learning

The noise level at the receiver is dependent upon both the source level and the transmission path. There are two principal ways to combat noise:

- **Attenuating airborne sound** prevents or reduces sound transmission from source to receiver.
- **Airborne sound reduction** specifies by how much sound is reduced and also is dependent on the overall quantity of absorbing surfaces in a room.



Sound levels: examples and effects of noise sources

	SOUND	EFFECTS
< DEGRADATION	<input type="checkbox"/> < 20 dB Threshold of Sound	<input type="checkbox"/> Hearing technically difficult to measure
	<input type="checkbox"/> 20-30 dB Very quiet room	<input type="checkbox"/> Calculation of hearing possible, no effect on concentration
	<input type="checkbox"/> 30-40 dB Usual background noise in the house	<input type="checkbox"/> Possibility of disturbed sleep
	<input type="checkbox"/> 40-50 dB Normal conversation	<input type="checkbox"/> Reduction of third party's ability to concentrate
	<input type="checkbox"/> 50-60 dB Radio and Television	<input type="checkbox"/> Normal conversation requires a raised voice
	<input type="checkbox"/> 60-70 dB Typewriter	<input type="checkbox"/> Noise pollution and reduced performance
	<input type="checkbox"/> 70-80 dB Inside a car travelling at 60mph	<input type="checkbox"/> Greater deterioration with frequent exposure
	<input type="checkbox"/> 80-90 dB Beside a busy motorway	<input type="checkbox"/> Extended exposure undesirable and could lead to hearing damage
	<input type="checkbox"/> 90-100 dB Pneumatic Drill	<input type="checkbox"/> Hearing damage will occur over time unless ear protection is worn
	<input type="checkbox"/> 100-110 dB Pop concert	<input type="checkbox"/> Significant hearing loss even over short periods of exposure
	<input type="checkbox"/> 110-120 dB Airport Runway	<input type="checkbox"/> Painful to the ears
	<input type="checkbox"/> 120-130 dB Jet plane taking off at 20-30 m	<input type="checkbox"/> Physical injury
	<input type="checkbox"/> 130-140 dB Loud Firework	<input type="checkbox"/> Acute, permanent harm even with short-term exposure

SOUND ABSORPTION PARAMETERS



Sound absorption

In a meeting room the acoustics are controlled by sound absorption.

The loudness of the noise source and the room conditions dictate the acoustic performance.

Sound absorbent materials - including people and materials within the room - can damp noise levels and reduce reverberation times.

Put simply, sound absorption ensure that there is a noticeably quieter environment within a space.

The use of a suspended ceiling to control room reverberation times can be very important.

Perforated, porous and open cell materials can all achieve high sound absorption values.

Good audibility in a room describes conditions which give good transmission from an acoustic source to a listener.



Sound attenuation

The ceiling naturally contributes significantly to the transmission of sound between rooms. It is therefore necessary to achieve the highest possible values of sound attenuation for the ceiling. As opposed to sound absorption this is not a problem of optimizing but rather one of maximizing. AMF Sound Insulation Ceilings offer technological leadership by achieving sound attenuation values in excess of 40 dB.

SOUND ABSORPTION

Characteristics of reflection and absorption are measured by the degree of sound absorption in a space. Every element in a room has a sound absorption factor that affects the room acoustics. Sound absorption is measured by calculating the reverberation time in the frequency range 100 to 5000 Hz, in accordance with BS EN ISO 354. The test compares results between an empty reverberation chamber and one containing the test product. The sound absorption in a room is defined by how reverberant a room appears. Speech intelligibility depends on the reverberation time of the room.

The NRC (Noise Reduction Coefficient) is a single value based on the arithmetic average of the four values of α_s at 250, 500, 1,000 and 2,000 Hz and then rounded to the nearest 0.05 (ASTM C 423).

The weighted sound absorption coefficient α_w is determined according to BS EN ISO 11654. The individual third octave band sound absorption coefficients (α_s) - measured in accordance with BS EN ISO 354 - are converted to practical sound absorption coefficient α_p for octave bands 250, 500, 1000, 2000 and 4000 Hz.

$$\alpha_{p(F)} = \frac{\alpha_{F1} + \alpha_{F2} + \alpha_{F3}}{3}$$

A standard reference curve is shifted against this α_p curve until the two graphs match with a deviation of 0.10 or less. The weighted sound absorption coefficient α_w is the single figure rating then obtained at 500 Hz. Shape indicators L, M and H are applied to the weighted sound absorption coefficients where the measured coefficient exceeds the reference curve by at least 0.25.

L - excess of absorption at 250 Hz

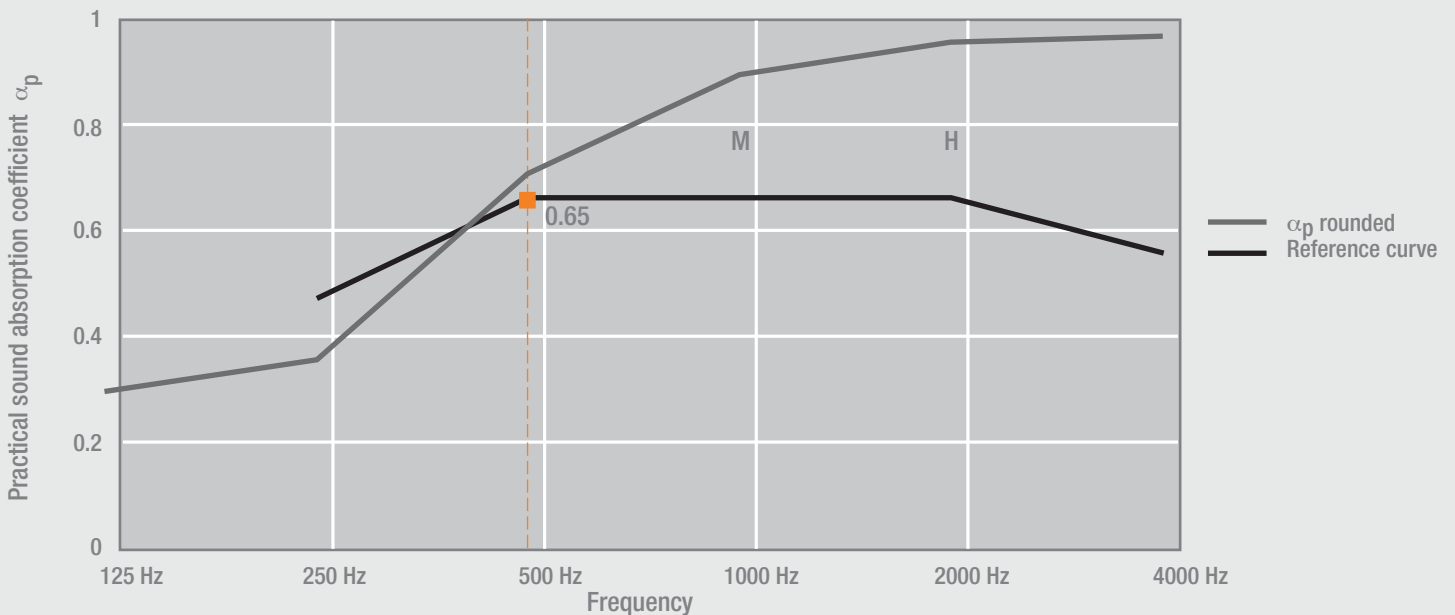
M - excess of absorption at 500 or 1000 Hz

H - excess of absorption at 2000 or 4000 Hz

Void depth of 200 mm as per BS EN ISO 11654

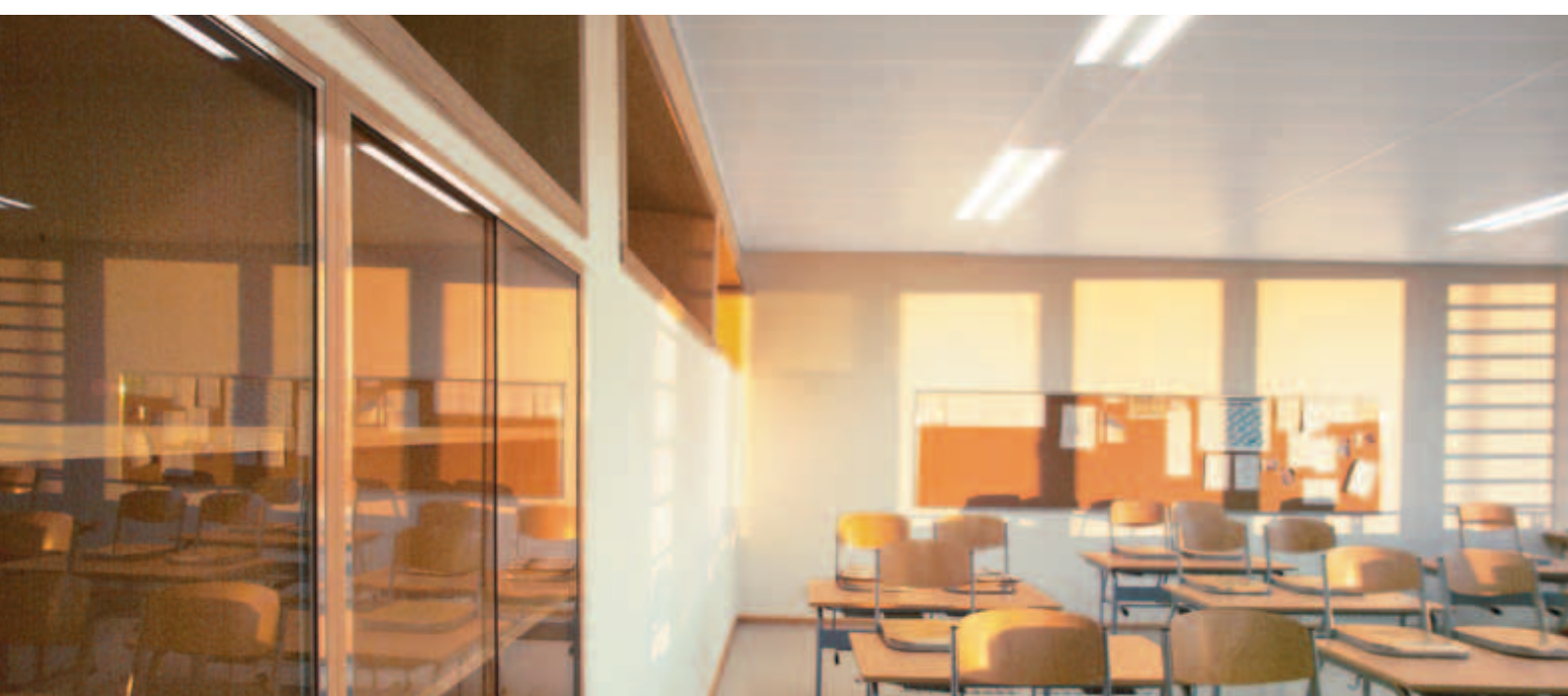


In this illustration the α_w is 0.65 (MH)

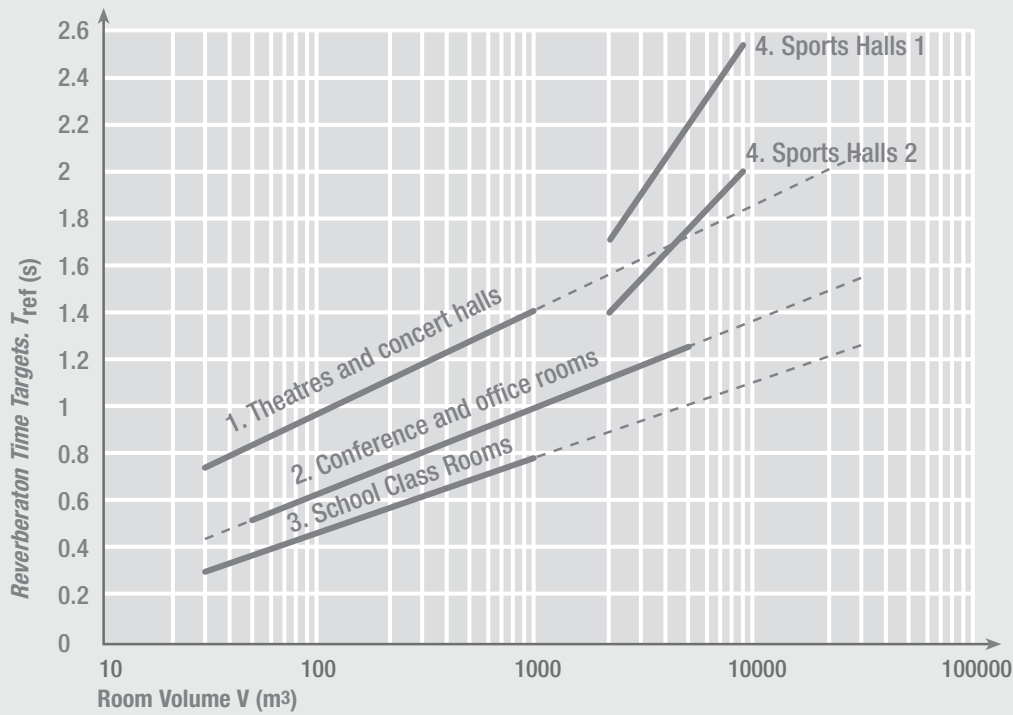


Sound Absorption Class (as per BS EN ISO 11654)	weighted sound absorption coefficient α_w as per EN ISO 11654	Absorption class (as per VDI 3755/2000)	AMF product	
A	0.90; 0.95; 1.00	■ extremely absorbing	THERMATEX Alpha ONE THERMATEX Alpha black THERMATEX Alpha cream, silver THERMATEX Alpha THERMATEX Alpha HD	
B	0.80; 0.85	■ extremely absorbing	THERMATEX Silence THERMATEX Thermofon	
C	0.60; 0.65; 0.70; 0.75	■ highly absorbing	THERMATEX -Acoustic -dB Acoustic -Symetra Rg 4-10 -Symetra Rg 2.5-10	THERMATEX -Kombimetall perf. -Fine Stratos perf. -Star -Mercure
D	0.30; 0.35; 0.40; 0.45; 0.50; 0.55	■ absorbing	THERMATEX Symetra Rg 4-16, Rg 4-16 / 4x4	
E	0.15; 0.20; 0.25	■ hardly absorbing	THERMATEX Kombimetall plain THERMATEX Acoustic RL	
not classified	0.05; 0.10	■ reflecting	THERMATEX Fine Stratos, Laguna, Plain	

Classification of sound absorption as per BS EN ISO 11654



SOUND ABSORPTION



Index values of reverberation time at 500 Hz for:
 1. Theatres and concert halls
 2. Conference and office rooms
 3. School Class Rooms
 4. Sports Halls

Improved audibility with good acoustic design

Sound absorbent materials can damp noise levels and reduce reverberation times. To assess speech intelligibility within a space the STI (Speech Transmission Index) can be used. Taking into account both background and reverberant sound the STI values range from 0 - bad - to 1.0 - perfect.

Echo is caused by reflection. This is where the sound following a different path reaches the listener after the direct sound, and the delay is sufficient to allow the brain to distinguish them as separate sounds. The use of a suspended ceiling to control reverberation times adequate to the use of the room can be very important

Absorption Coefficient = 0. There is a 100% sound reflection,
 Absorption Coefficient = 1. There is 100% sound absorption

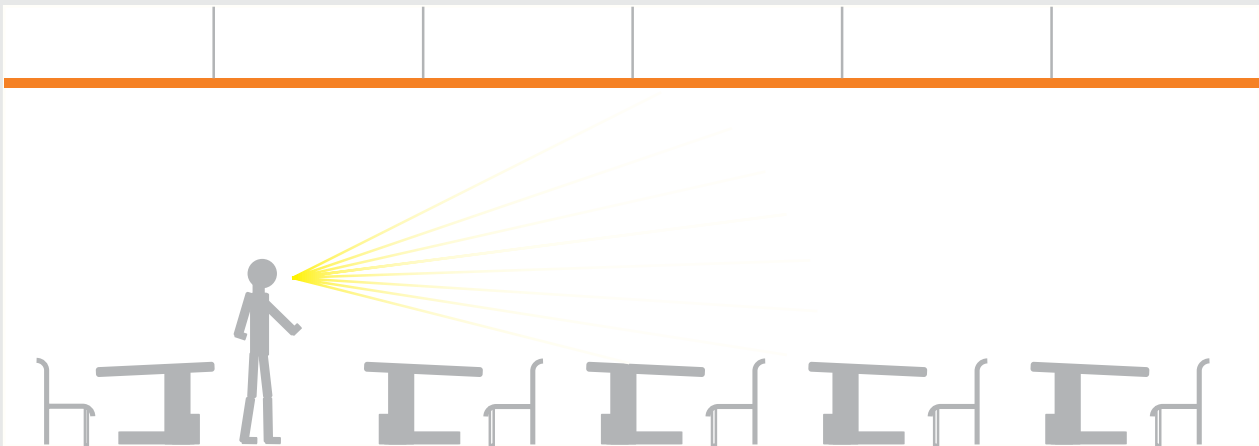
To understand each other communicators need to raise their voices with a resultant increase in undesirable reflected sound and background noise.

Sound volumes are reduced by well-designed acoustic ceilings.

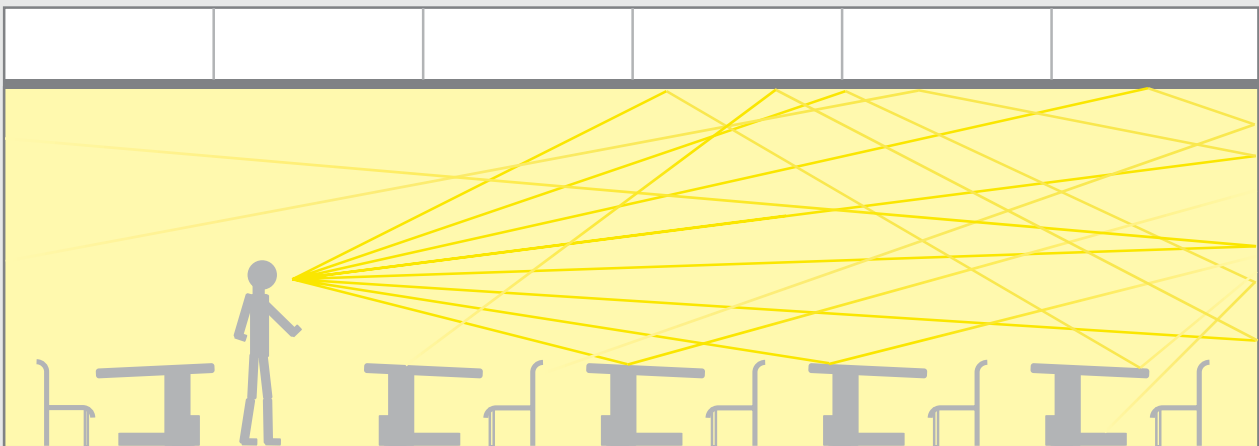
$$L_p = L_w + 10 \lg (4/A) \text{ in dB}$$

L_w is the sound power level of the source.

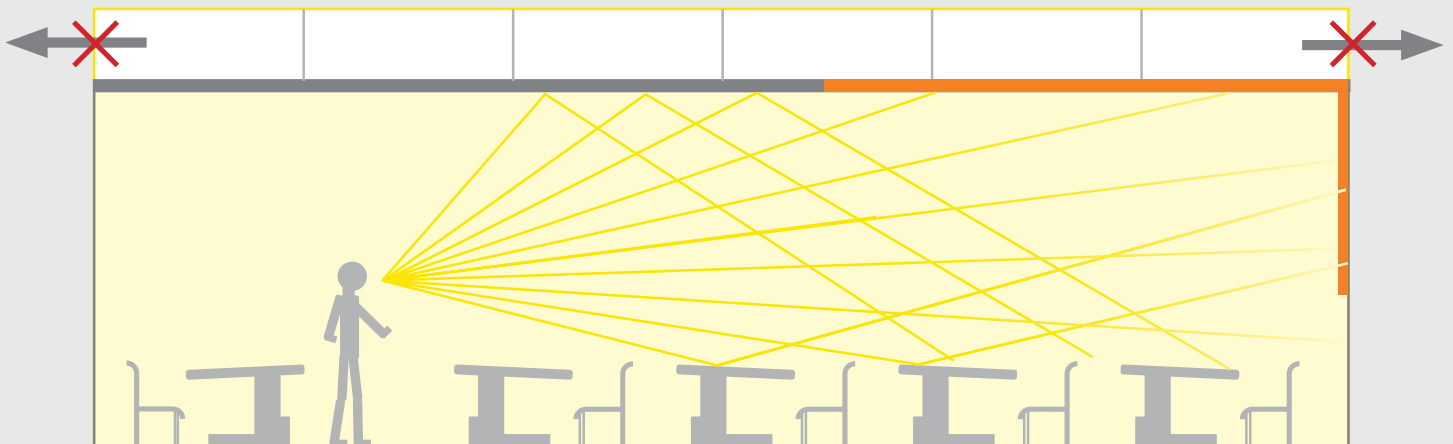
A is the total room absorption.




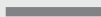

Absorbing materials reduce the sound



Reflecting materials amplify the sound



Using school classrooms as an example, the installation of absorbent materials minimises reflection and reduces noise levels. Reflecting surfaces are also important for reinforcing the voice of the teacher. Materials with high sound attenuation values reduce noise from adjacent rooms.

-  Absorbing materials
-  Reflective materials
-  Suppressed sound transmission between rooms

SOUND INSULATION

In the analysis of room acoustics, it is often just audibility - and thus sound absorption - that is assessed. However all rooms are subject to external noise sources, for example, sounds from adjacent rooms or from the floor above: machinery within the building; and traffic or aircraft noise coming through the building fabric. These sounds are disruptive if not properly controlled.

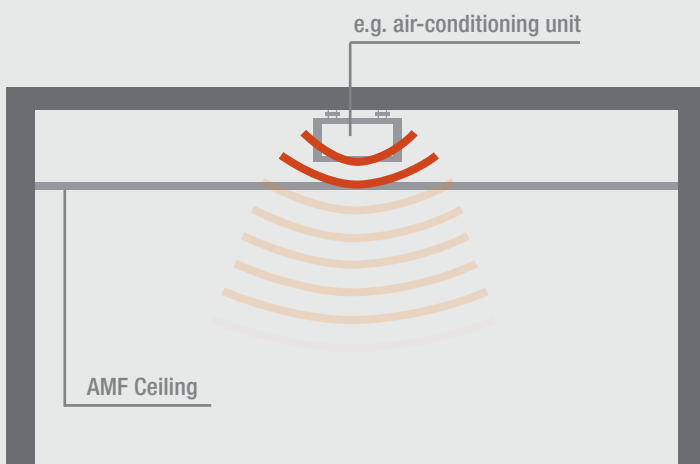
The effective isolation of two zones from disturbing sound influences is called sound insulation. Unlike sound absorption, where material within the room helps speech intelligibility, sound insulation depends on all elements of the room - ceiling, floors and external walls. A single weak point within the structure will affect the sound reduction performance.

To ensure good acoustic design, standards such as Building Bulletin 93 and German Standard DIN 4109 have wider-ranging and more detailed concerns with sound insulation. Performance levels will depend on the sound resistance of the different elements that are installed.

■ Airborne sound insulation

Noise from machinery such as an air-conditioning unit within the ceiling void will pass through the suspended ceiling once before entering the room. In this case the ceiling is the sole sound-protection barrier. For this application AMF ceiling tiles are tested to BS EN ISO 140-3 and rated in accordance with BS EN ISO 717. When combined with the soffit, the suspended ceiling can provide a double barrier against airborne sound, with consequential improved levels of sound insulation.

Airborne sound insulation, direct pass



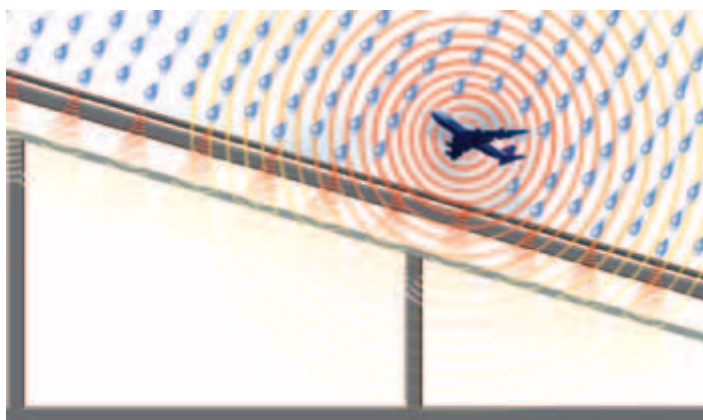
This application is tested under laboratory conditions where ceiling tiles are installed in an opening between two isolated chambers. The test conditions and measurements are defined in BS EN ISO 140-3: this standard measures the sound reduction index (R) of the test specimen. The method of calculating the rating is given in BS EN ISO 717-1 which describes a procedure for fitting a reference curve shape to the measured curve.

External noise

Many modern buildings have suspended ceilings installed directly below the roof, and they can assist in damping down environmental noise.

The impact of rain on metal roofing systems and the resulting internal noise has been acknowledged as a problem for schools (in Building Bulletin 93). It should also be considered for other buildings such as hospitals, offices and leisure complexes.

Within spaces rain noise can reach levels of LA_{eq} as high as 70 to 80 dB and this can have a dramatic effect on speech intelligibility. An insulated roof system combined with AMF THERMATEX Acoustic and THERMATEX dB Acoustic ceiling tiles can lower these levels by 16 dB (depending on outer roof construction), in accordance with ISO / CD 140-18 Laboratory Measurement of sound generated by rainfall on building elements under "heavy" rainfall conditions.

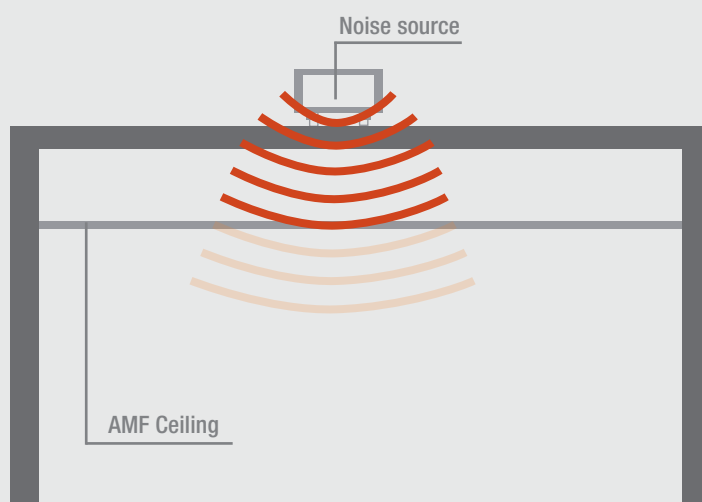


Impact sound insulation

Impact sound insulation

Impact sound insulation occurs when actions such as heavy footsteps or the movement of furniture create noise through the floor to the space below. A suspended ceiling can contribute significantly to the insulation of impact sounds. A tapping machine is used as a standardised impact sound source to rate the impact noise insulation of floors. The transmission into the room below is tested acc. to BS EN ISO 140-7 and rated in accordance with BS EN ISO 717-2.

In this application AMF THERMATEX Silence and THERMATEX dB Acoustic ceiling tiles have achieved good results, and can provide solutions to meet performance levels required by Building Bulletin 93.



SOUND ATTENUATION

■ Sound attenuation between rooms

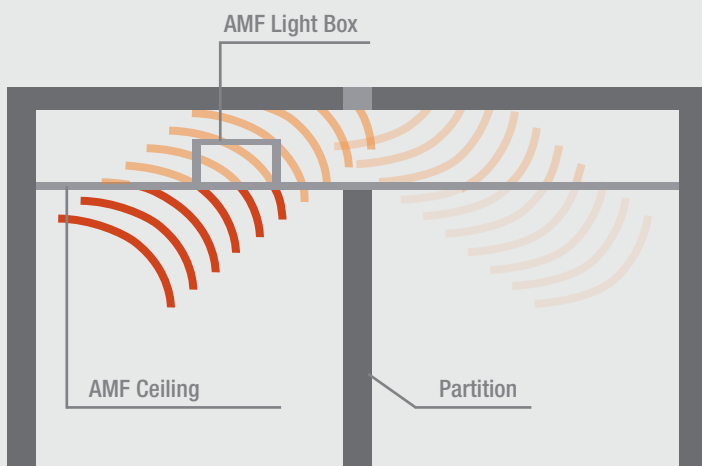
Flexibility is a key concept in today's construction process. Many commercial buildings are built on a shell and core basis with the interior fitted out at a later stage to suit the client's wishes. For fast and flexible room separation lightweight partitions and suspended ceilings are well suited for this application. The transmission of sound from adjacent rooms is primarily controlled by the partitions and ceilings.

This process is called flanking sound attenuation and its testing is defined in BS EN ISO 140-9. With a defined void space of 650 to 760 mm and an open void above the partition between the two rooms, the sound passes up through the ceiling into the void and down again into the receiving room for measurement as noise. To accurately test the performance of the ceiling under laboratory conditions it is necessary that the other elements - the partition, floor and structural ceiling - have significantly higher sound reduction capabilities.

Conditions on site are invariably different from the controlled laboratory environment and it is predictable that lower sound insulation values will be achieved. Sound leakage paths through both ceiling and wall systems and flanking transmission can adversely affect the overall sound insulation performance. Thus to achieve optimum performance the design and construction of the suspended ceiling and other elements is important.

AMF ceiling systems offer exceptional sound attenuation qualities. THERMATEx Silence achieve $D_{n,c,w}$ values of up to 44 dB. Even higher values can be reached with the addition of overlay materials or compartmentalisation with a cavity barrier.

Room-to-room sound insulation

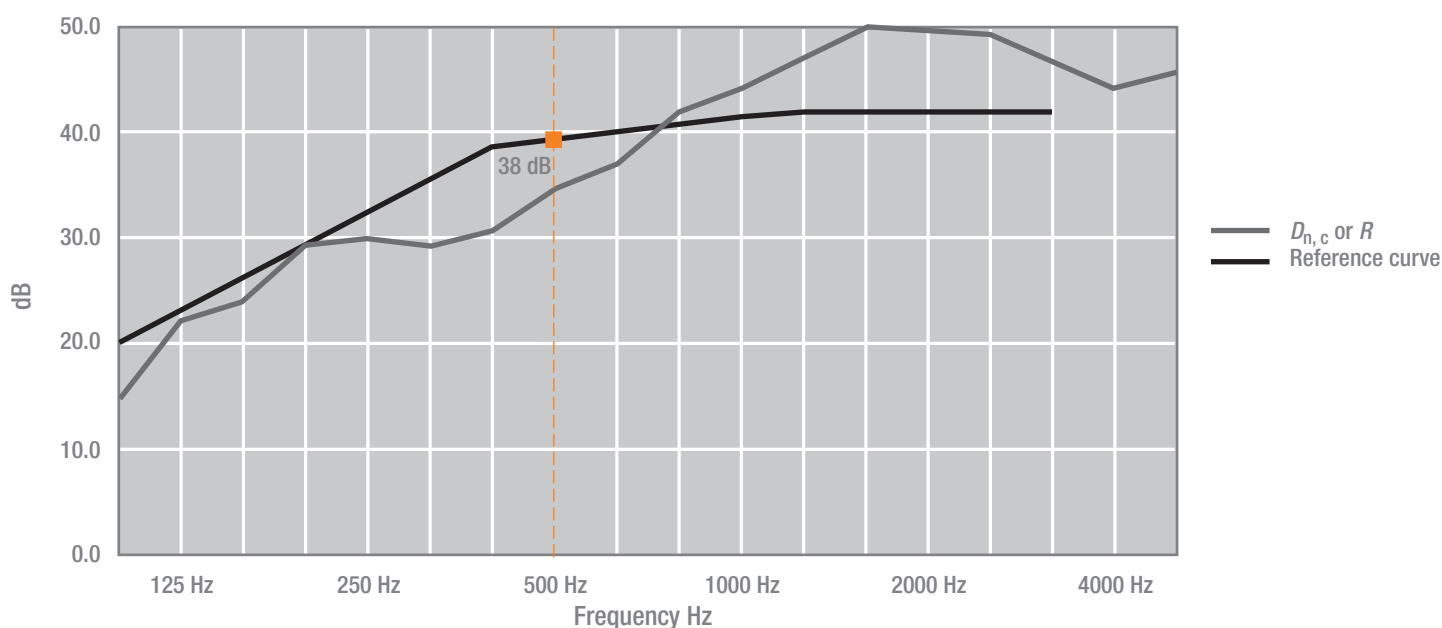


An illustration of the flanking sound attenuation test.

Sound waves of a defined frequency and pressure are produced by the noise source in the activity room. These sound pressure levels are produced when they pass through the ceiling, into the void, and down through the ceiling membrane again into the receiving room. The particular performance characteristics of lateral elements under laboratory test conditions will be higher than the ceiling, to ensure that an accurate value for the ceiling only is obtained.

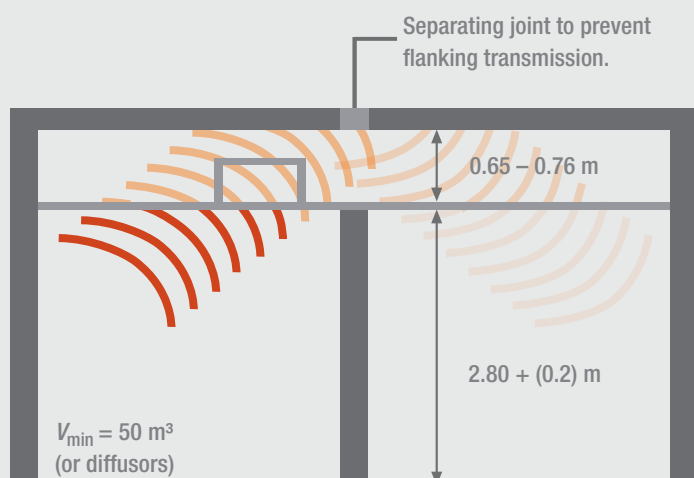
Sound Insulation - Laboratory Requirements

The sound insulation of a single building element is measured in accordance with the appropriate application standard. Sound insulation varies with frequency and measurements are normally made at third octave band intervals in the frequency range 100 - 5000 Hz, a range that encompasses most everyday sounds. The method of measurement is given in BS EN ISO 140-3 (the evaluation is stated in BS EN 717-1), which describes a procedure for fitting a reference curve shape to the measured curve. The 500 Hz value of the shifted reference curve is quoted as a single figure rating and applies to both the weighted sound reduction index (R_w) measured by BS EN ISO 140-3; and the weighted suspended ceiling normalised difference ($D_{n,c,w}$) measured by BS EN ISO 140-9.



Sound insulation - measurement and assessment

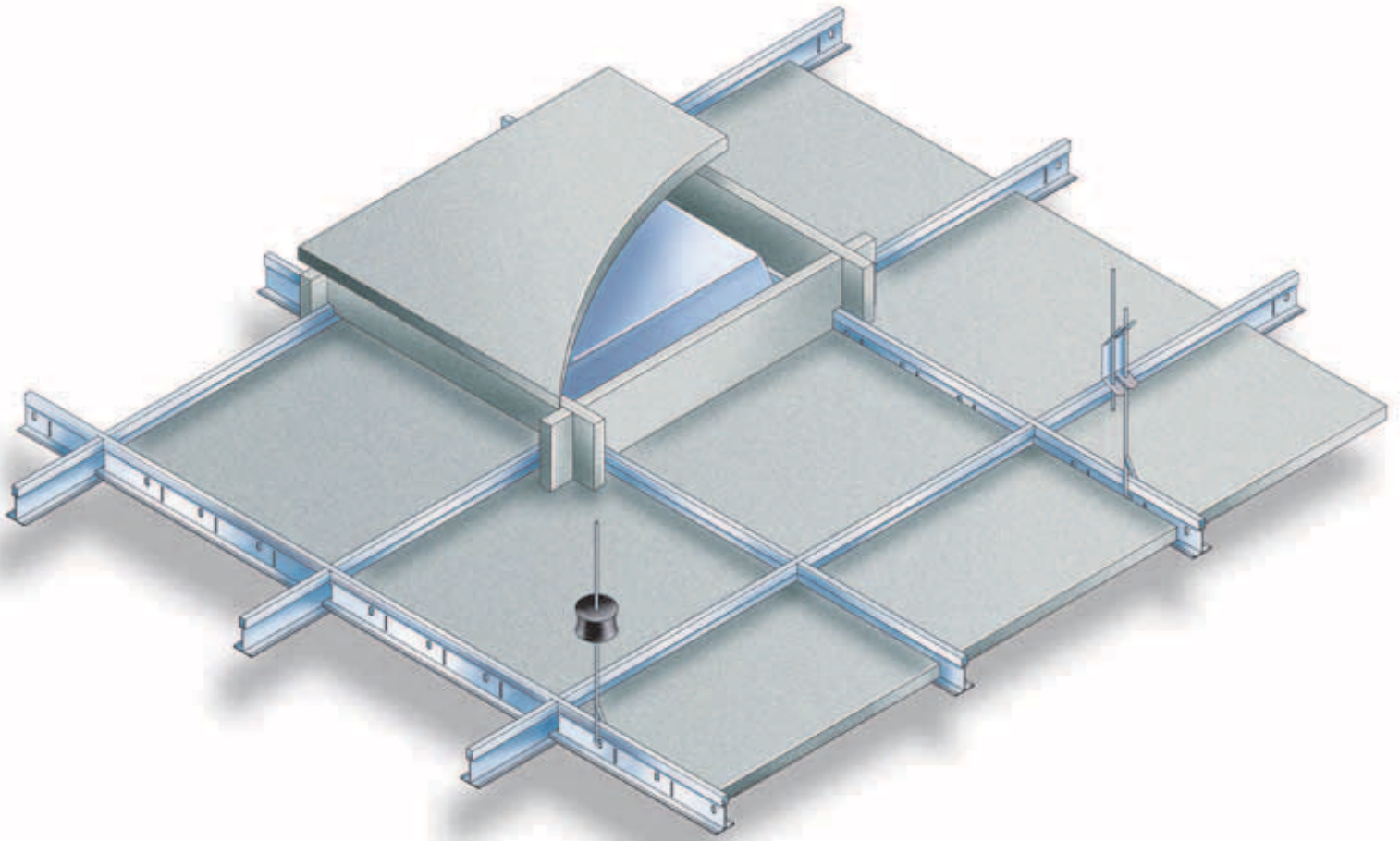
$D_{n,c,w}$ (C , C_{tr}). Annex A of BS EN ISO 717-1 includes two items, C and C_{tr} , that have been developed to take into account different noise sources, that is, C for pink noise and C_{tr} for urban traffic noise. These Spectrum Adaptation Terms C and C_{tr} determine the suitability of building elements with regard to specific noise influences listed in the table of noise sources. The values for C and C_{tr} are usually between 0 and 10.



Laboratory requirements to determine the weighted normalised level difference ($D_{n,c,w}$)

- Suspension height of 650 mm to 760 mm up to the structural ceiling.
- A perimeter seal on three sides in the ceiling void (not exceeding 150 mm)
- The partition wall has to be of the type that its sound insulation index is 10 dB higher than that of the test ceiling at each frequency. At the junction with the ceiling the partition wall has to be ≤ 100 mm. The downwards taper should not exceed 30° looking vertically from above.
- The width of the test construction has to be $4.5 + (0.5)$ m.
- The floor-to-ceiling height has to be $2.8 + (0.2)$ m.
- The volume of each room has to be a minimum of 50 m^3 .

ENHANCED SOUND INSULATION FROM SUSPENDED CEILINGS



Detailed acoustic solutions

1 LIGHT BOX

Fittings such as lights, loudspeakers and return air grilles will reduce the sound insulation performance of a suspended ceiling. By using an AMF Light Box over such installations the sound insulation values of the overall ceiling can be maintained. In addition AMF Light Boxes provide fire protection to the floor above as well as access to the ceiling void.

2 ACOUSTIC HANGER

Transmission of impact sound from the floor above can be substantially reduced by the use of AMF Acoustic Hangers. The two piece suspension assembly limits sound bridging in both directions and provides highly effective sound reduction.

3 OVERLAYS

The sound insulation performance of AMF mineral ceilings can be further improved by the addition of insulation overlaid above the suspended ceiling. Depending on the type of insulation used, sound attenuation values can increase by up to 10 dB.

4 ACOUSTIC BARRIERS
































































The high sound insulation values of AMF ceiling systems can be utilised as acoustic barriers. To prevent sound transmission in the ceiling void above partitions, AMF products can be used as acoustic upstands.



THE OPTIMAL COMBINATION OF SOUND ABSORPTION AND SOUND ATTENUATION



All AMF THERMATEX Acoustic Ceilings demonstrate excellent sound values.
By combining different ceiling tiles the most beneficial acoustics
are achieved in all rooms.

APPLICATIONS	REQUIREMENTS	THERMATEX Alpha ONE	THERMATEX Alpha	THERMATEX Acoustic	THERMATEX dB Acoustic	THERMATEX Thermofon	THERMATEX Alpha HD	THERMATEX Silence	THERMATEX Kombimetall	THERMATEX Comfort	THERMATEX Acoustic RL
 Meeting room	Good sound absorption, high sound attenuation. Dependent on individual room conditions.										
 Open plan office	Different work areas need medium to high levels of sound absorption										
 Airport / Check-in desks	Design of focussed areas of high sound absorption in heavily populated public places. Medium to high sound attenuation for adjacent rooms.										
 Corridor	Circulation areas with various noise sources: good sound absorption and high sound attenuation										
 Foyer	Creation of individual zones with different functions needing acoustic correction through absorption. High sound absorption.										
 Auditorium / class room	Combination of absorbing and reflecting zones to maximise audibility in large rooms.										
 Cinema	Highest requirements regarding sound absorption; e.g. products with additional higher sound attenuation are required for multiplex cinemas										
 Assembly plant	Primarily sound absorption and insulation of noise from adjacent rooms										
 Concert hall	Longer reverberation times require lower sound absorption, sound attenuation as needed										
 Sales Office	Busy areas requiring both reflecting and absorbing zones for good audibility. Sound attenuation is sometimes needed.										
 Technical Rooms	Large areas of high absorption to insulate sound through damping										

AMF ACOUSTIC SOLUTIONS



Individual sound solutions

The creation of good acoustics in a room is an important challenge for the construction industry. A wide range of different requirements are imposed on the ceiling depending on the intended use of the space. To enable specifiers to fulfill these requirements the new acoustic ceiling tiles from AMF offer excellent values of both sound absorption and sound insulation.

AMF ACOUSTIC CEILINGS

- THERMATEX Alpha ONE
- THERMATEX Alpha
- THERMATEX Alpha coloured
- THERMATEX Alpha HD
- THERMATEX Silence
- THERMATEX Thermofon
- THERMATEX SF Acoustic
- THERMATEX Acoustic
- THERMATEX dB Acoustic
- THERMATEX Acoustic / THERMATEX dB Acoustic planks
- THERMATEX Acoustic RL
- THERMATEX Kombimetall
- THERMATEX Sonic
- THERMATEX Comfort



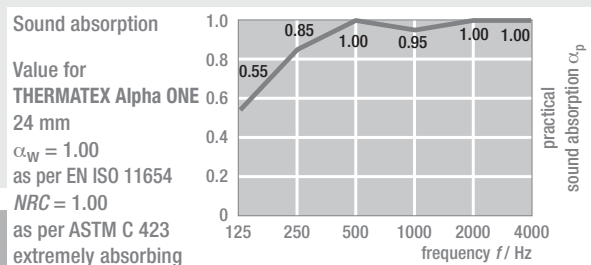
AMF ACOUSTIC SOLUTIONS



THERMATEX Alpha ONE

THERMATEX Alpha ONE is a new wet-felt mineral tile which provides highest sound absorption values. With a strong white acoustic fleece THERMATEX Alpha ONE offers a smooth, elegant surface finish. The combination of bio-soluble mineral wool with clay and starch provides excellent physical characteristics.

SYSTEM	C Exposed system, demountable ceiling ^{*1}
Building material class	A2-s1, d0 as per EN 13501-1
Fire	REI 30 - REI 90 as per EN 13501 part 2 (according to test report)
Sound absorption	as per BS EN ISO 354
Sound attenuation	$D_{n,f,w} = 29$ dB as per EN 10848 (as per test certificate)
Humidity	up to 95% RH
Light reflectance	up to 88%
Thermal conductivity	$\lambda = 0.040$ W/mK as per EN 12667
Dimensions	For sizes as well as supply categories please consult the price list or www.amfceilings.com
Thickness / weight	24 mm (c. 3.8 kg/m ²)
Colours	white similar to RAL 9010



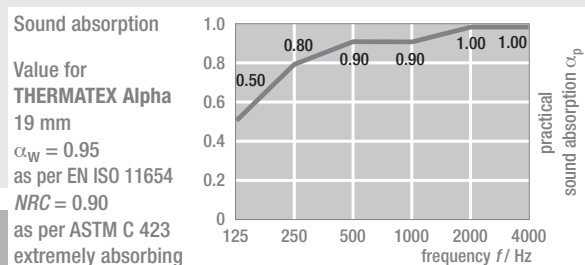
^{*1} For details please see systems solutions. For technical regulations please refer to pages 39



THERMATEX Alpha

THERMATEX Alpha is an extremely absorbing mineral acoustic ceiling tile with a tissue facing. In addition to its Class A sound absorption THERMATEX Alpha also offers both fire protection and the options of hygienic treatment. As a wet-felt mineral tile it has excellent physical properties, assisting handling and installation.

SYSTEM	C Exposed system, demountable ceiling ^{*1}
Building material class	A2-s1, d0 as per EN 13501-1
Fire	REI 30 - REI 90 as per EN 13501 part 2 (according to test report)
Sound absorption	as per BS EN ISO 354
Sound attenuation	$D_{n,f,w} = 28$ dB as per EN 10848 (as per test certificate)
Humidity	up to 95% RH
Light reflectance	up to 88%
Thermal conductivity	$\lambda = 0.040$ W/mK as per EN 12667
Dimensions	For sizes as well as supply categories please consult the price list or www.amfceilings.com
Thickness / weight	19 mm (c. 3.0 kg/m²)
Colours	white similar to RAL 9010



^{*1} For details please see systems solutions.
 For technical regulations please refer to pages 39.

AMF ACOUSTIC SOLUTIONS

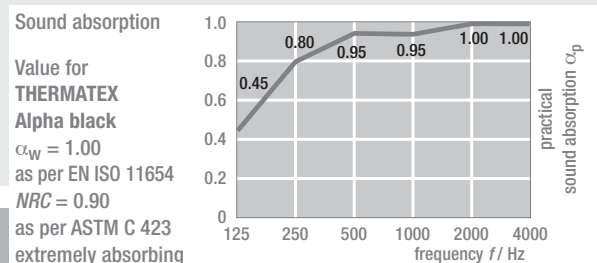


THERMATEX Alpha coloured

THERMATEX Alpha in black, creme and silver is a new ceiling tile providing high sound absorption. With a coloured surface the appearance of THERMATEX Alpha is smooth and elegant. New generation bio-soluble mineral wool, clay and starch contributes to the excellent acoustic performance.

FACE PATTERNS

- 01** black
- 02** creme
- 03** silver



SYSTEM

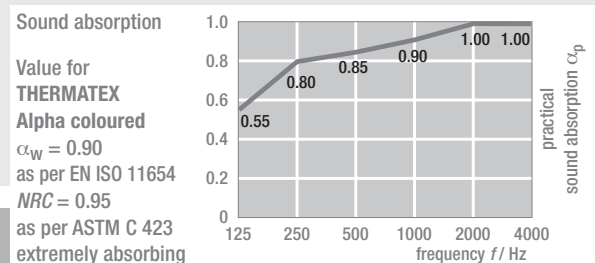
Building material class
Fire

Sound absorption
Sound attenuation

Humidity
Light reflectance
Thermal conductivity
Dimensions

Thickness / weight
Colours

- C** Exposed system, demountable ceiling **
- A2-s1, d0** as per EN 13501-1
- REI 90** as per EN 13501 part 2 (according to test report)
- as per BS EN ISO 354
- $D_{n,f,w} = 28$ dB as per EN 10848 (as per test certificate)
- up to 95% RH
- for black up to 3.8%
- $\lambda = 0.040$ W/mK as per EN 12667
- For sizes as well as supply categories please consult the price list or www.amfceilings.com
- 19 mm (c. 3.0 kg/m²)
- black, creme, silver





THERMATEX Alpha HD

THERMATEX Alpha HD offers the benefits of an extremely absorbing ceiling tile combined with a concealed grid construction.

SYSTEM

- F** Free span system with exposed or concealed suspension ^{*1}
- I** Bandrastrer system, concealed cross sections ^{*1}
- A** Concealed system, panels demountable AW/GN / not demountable GN

Building material class

- A2-s1, d0** as per EN 13501-1

Sound absorption

- as per BS EN ISO 354

Sound attenuation

- $D_{n,f,w} = 30$ dB as per EN 10848 (19 mm thickness, as per test certificate)

Humidity

- up to 95% RH

Light reflectance

- up to 88%

Thermal conductivity

- $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612

Dimensions

- For sizes as well as supply categories please consult the price list or www.amfceilings.com

Thickness / weight

- 19 mm (c. 3.6 kg/m²)

Colours

- white similar to RAL 9010

Sound absorption

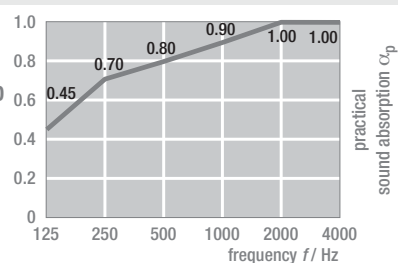
Value for THERMATEX Alpha HD 19 mm

$\alpha_w = 0.90$

as per EN ISO 11654

$NRC = 0.85$

as per ASTM C 423 extremely absorbing



^{*1} For details please see systems solutions.
For technical regulations please refer to pages 39.

AMF ACOUSTIC SOLUTIONS



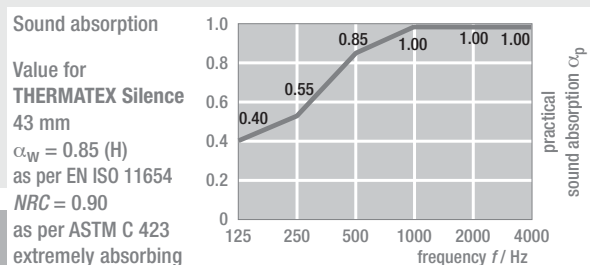
THERMATEX Silence

Good speech intelligibility is reliant on good acoustics and adequate protection from unwanted external noise. Typical office partition walls with a common ceiling void cause a particular problem. The **THERMATEX Silence** provides a combination of high sound absorption to control reverberation and high sound attenuation to reduce unwanted noise. The composite structure of dual density THERMATEX boards serves not only to create good acoustics but also gives a high level of robustness. The acoustic tissue face gives it the same white, uniform appearance as the entire AMF Acoustic Range.

SYSTEM

C Exposed system, demountable ceiling ^{*1}

Building material class	■ A2-s1, d0 as per EN 13501-1
Sound absorption	■ as per BS EN ISO 354
Sound attenuation	■ $D_{n,f,w} = 44$ dB as per EN 10848 (43 mm thickness, as per test certificate)
Humidity	■ up to 95% RH
Light reflectance	■ up to 88%
Thermal conductivity	■ $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612
Dimensions	■ For sizes as well as supply categories please consult the price list or www.amfceilings.com
Thickness / weight	■ 43 mm (c. 10.8 kg/m ²)
Colours	■ white similar to RAL 9010



^{*1} For details please see systems solutions.
For technical regulations please refer to pages 39.



THERMATEX Thermofon

AMF THERMATEX Thermofon is a low density wet-felt mineral tile with a painted acoustic tissue facing. It also offers outstanding sound absorption values.

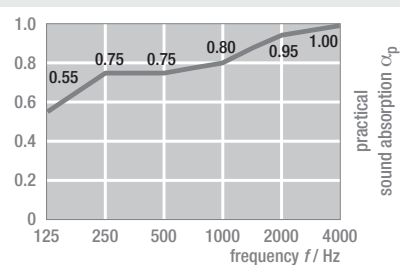
SYSTEM

C Exposed system, demountable ceiling ^{*1}

Building material class	C A2-s1, d0 as per EN 13501-1
Sound absorption	C as per BS EN ISO 354
Sound attenuation	C $D_{n,c,w} = 28$ dB as per EN 20140-9 (as per test certificate)
Humidity	C up to 95% RH
Light reflectance	C up to 88%
Thermal conductivity	C $\lambda = 0.038$ W/mK as per EN 12667
Dimensions	C For sizes as well as supply categories please consult the price list or www.amfceilings.com
Thickness / weight	C 15 mm (c. 2.4 kg/m ²)
Colours	C white similar to RAL 9010

Sound absorption

Value for
**THERMATEX
Thermofon**
 $\alpha_w = 0.80$ (H)
as per EN ISO 11654
 $NRC = 0.85$
as per ASTM C 423
extremely absorbing



^{*1} For details please see systems solutions.
For technical regulations please refer to pages 39.

AMF ACOUSTIC SOLUTIONS

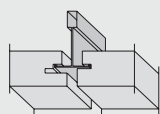


THERMATEX SF Acoustic

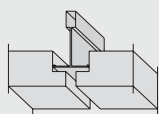
This elegant new AMF performance ceiling with the attractive SF shadow edge requires minimal void as the tile is installed purely from below. Installation and removal of the individual tiles is achieved simply by a small shift of the tile along the tee grid. With its invisible perforation THERMATEX SF Acoustic achieves high values in sound absorption and once installed shows a white, homogeneous surface in a discreet module. For more contrast in ceiling design the tile can be installed on grid in various RAL colours.

- Elegant appearance
- Minimal void (75 mm or more, depending on hanger)
- Simple access
- Quality ceiling tile

Edge details



SF engaging edge



SF non-engaging edge

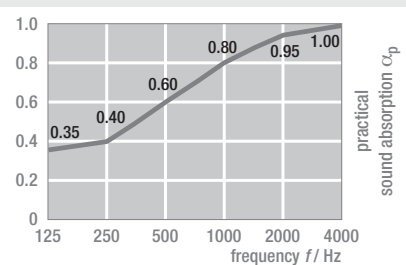
SYSTEM

C Exposed system, demountable ceiling ^{*1}

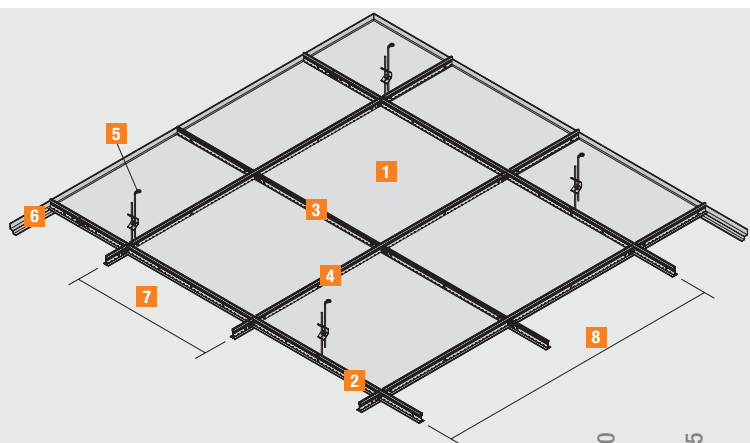
- | | |
|-------------------------|--|
| Building material class | ■ A2-s1, d0 as per EN 13501-1 |
| Sound absorption | ■ as per BS EN ISO 354 |
| Sound attenuation | ■ $D_{n,c,w} = 38$ dB as per EN 20140-9 (as per test certificate) |
| Humidity | ■ up to 95% RH |
| Light reflectance | ■ up to 88% |
| Thermal conductivity | ■ $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612 |
| Dimensions | ■ For sizes as well as supply categories please consult the price list or www.amfceilings.com |
| Thickness / weight | ■ 24 mm (c. 8.4 kg/m ²) |
| Colours | ■ white similar to RAL 9010 |

Sound absorption

Value for
**THERMATEX SF
Acoustic**
 $\alpha_{w} = 0.65$ (H)
as per EN ISO 11654
 $NRC = 0.70$
as per ASTM C 423
highly absorbing



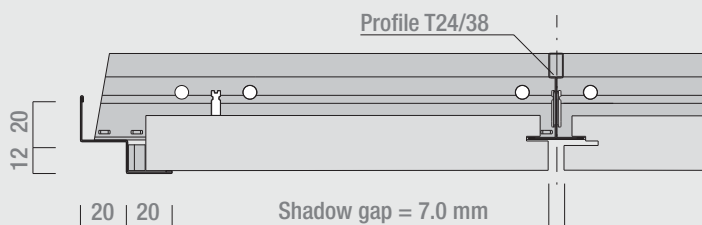
^{*1} For details please see systems solutions.
For technical regulations please refer to pages 39.



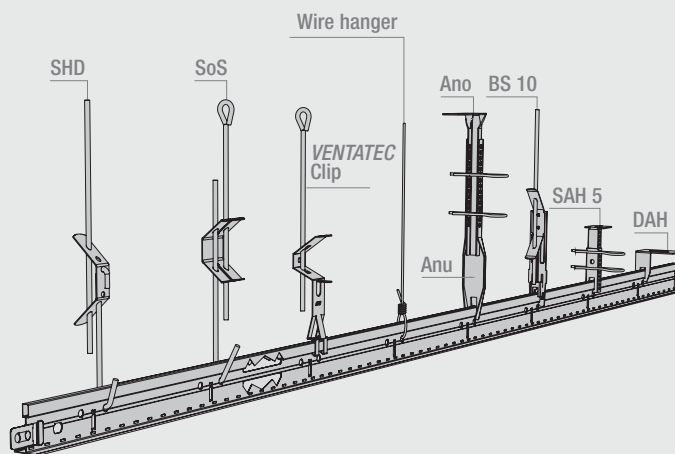
Grid sizes in mm

		600 x 600	625 x 625
THERMATEX ceiling panels	1 pcs.	2.78	2.56
VENTATEC T-Main runner T24/38-3600 or 3750	2 lin. m	0.84	0.80
VENTATEC T-Cross Tee T24/33 - 600 or 625	3 lin. m	0.84	0.80
VENTATEC T-Cross Tee T24/38 - 1200 or 1250	4 lin. m	1.67	1.60
SoS hanger or alternatives	5 pcs.	0.84	0.80
RWL perimeter trim 20/20/12/20	6 lin. m	0.60	0.60
Perimeter wedge (optional)	pcs.	0.60	0.60
Distance between hangers	7 m	1.00	1.00
Distance between main runners	8 m	1.20	1.25
Distance between fixing on wall angles	m	0.40	0.40

Cross-section wall connection and joint width



Hangers



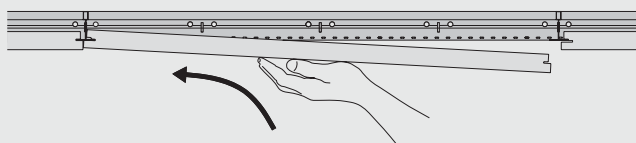
Equivalent, approved hangers can also be used with this system. The choice enables flexibility and ease of installation as particular installations may require butterfly, nonius or direct hangers.

Step-by-step installation and demounting

For further details regarding this product, please take a look at the installation manual, which can be downloaded under www.amfceilings.com

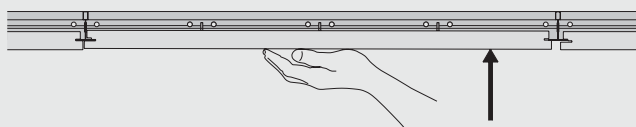
1. Step

Insert the edge with the double notch first.



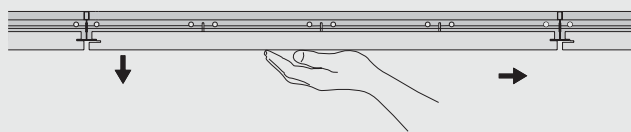
2. Step

Push up gently.



3. Step

Pull the tile across to lock it into place.



AMF ACOUSTIC SOLUTIONS



THERMATEX Acoustic

THERMATEX Acoustic is a 19 mm thick ceiling tile made from a specially perforated mineral board and an acoustic fleece facing. The perforations provide excellent sound absorption while the fleece offers a smooth, elegant surface finish.

The combination of high density, bio-soluble mineral wool with clay and starch provides excellent physical characteristics, particularly for acoustic performance.

SYSTEM

- C** Exposed system, demountable ceiling ^{*1}
- F** Free span system with exposed or concealed suspension ^{*1}
- I** Bandraster system, concealed cross sections ^{*1}
- A** Concealed system,

Building material class
Fire

- panels demountable AW/GN / not demountable GN
- A2-s1, d0 as per EN 13501-1
- REI 30 - REI 120 as per EN 13501 part 2
- up to 60 minutes as per BS 476: parts 20-23 (according to test reports)

Sound absorption
Sound attenuation

- as per BS EN ISO 354
- $D_{n,c,w} = 38$ dB as per EN 20140-9 (as per test certificate)

Humidity
Light reflectance
Thermal conductivity
Dimensions

- up to 95% RH
- up to 88%
- $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612
- For sizes as well as supply categories please consult the price list or www.amfceilings.com

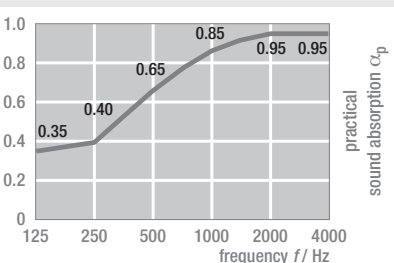
Thickness / weight
Colours

- 19 mm (c. 4.6 kg/m²)
- white similar to RAL 9010

Sound absorption

Value for
THERMATEX Acoustic
19 mm

$\alpha_w = 0.65$ (H)
as per EN ISO 11654
 $NRC = 0.70$
as per ASTM C 423
highly absorbing



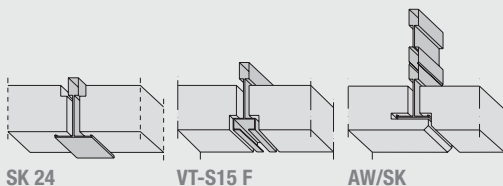
^{*1} For details please see systems solutions.
For technical regulations please refer to pages 39.



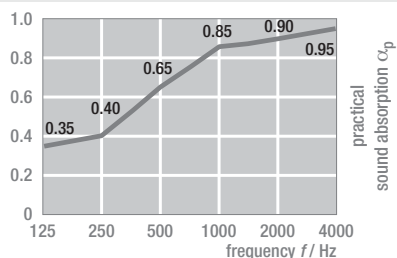
THERMATEX dB Acoustic

THERMATEX dB Acoustic is the ideal solution for high sound attenuation requirements. Additionally good levels of sound absorption are achieved and the white unperforated surface creates an excellent appearance. The combination of high density, bio-soluble mineral wool with clay and starch provides excellent physical characteristics, particularly for acoustic performance.

Edge details SK
THERMATEX
dB Acoustic
30 mm thickness



Sound absorption
Value for
**THERMATEX dB
Acoustic
30 mm**
 $\alpha_w = 0.65$ (H)
as per EN ISO 11654
 $NRC = 0.70$
as per ASTM C 423
highly absorbing



SYSTEM

Building material class
Fire

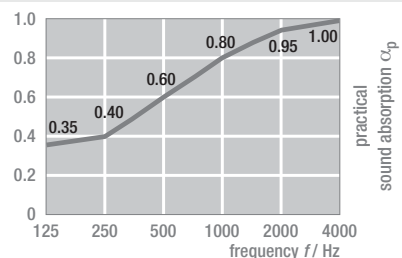
Sound absorption
Sound attenuation

Humidity
Light reflectance
Thermal conductivity
Dimensions

Thickness / weight
Colours

- C** Exposed system, demountable ceiling *1
- F** Free span system with exposed or concealed suspension *1
- I** Bandrastrer system, concealed cross sections *1
- A2-s1, d0 as per EN 13501-1
- REI 30 - REI 90 as per EN 13501 part 2 (according to test report)
- as per BS EN ISO 354
- $D_{n,c,w} = 41$ dB as per EN 20140-9 (24 mm thickness, as per test certificate)
- $D_{n,c,w} = 43$ dB as per EN 20140-9 (30 mm thickness, as per test certificate)
- up to 95% RH
- up to 88%
- $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612
- For sizes as well as supply categories please consult the price list or www.amfceilings.com
- 24 mm (c. 8.4 kg/m²) / 30 mm (c. 10.5 kg/m²)
- white similar to RAL 9010

Sound absorption
Value for
**THERMATEX dB
Acoustic
24 mm**
 $\alpha_w = 0.65$ (H)
as per EN ISO 11654
 $NRC = 0.70$
as per ASTM C 423
highly absorbing



AMF ACOUSTIC SOLUTIONS

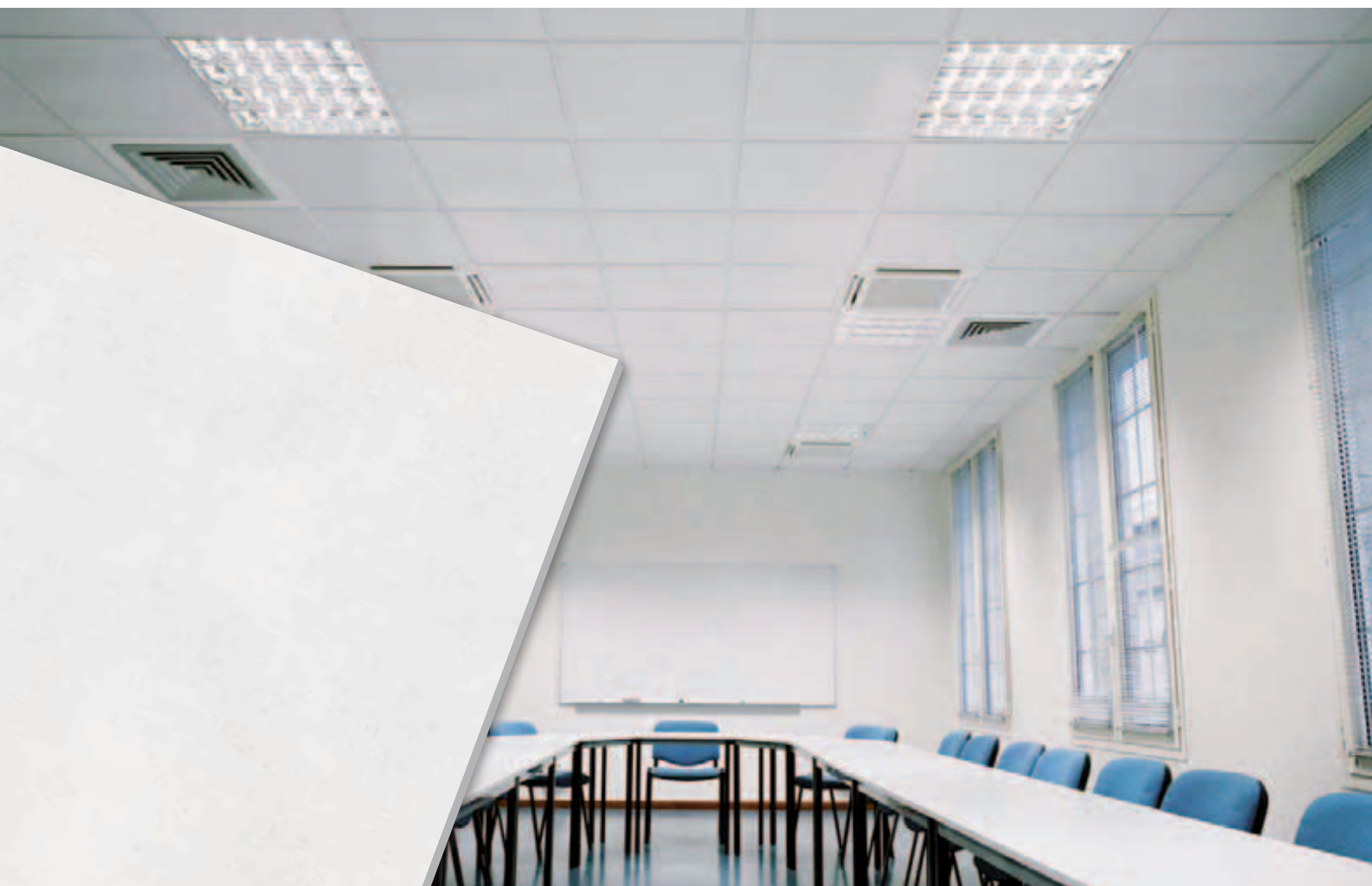


THERMATEX Acoustic / THERMATEX dB Acoustic Planks

THERMATEX Acoustic and THERMATEX dB Acoustic are available in plank sizes. For demanding acoustic requirements, even higher values of sound attenuation are reached in plank formats, while outstanding sound absorption is combined with a smooth, elegant finish. Excellent fire protection and easy demountability make THERMATEX Acoustic and THERMATEX dB Acoustic the ideal choice for schools, conference halls, offices, healthcare facilities and retail premises.

SYSTEM	<ul style="list-style-type: none"> F Free span system with exposed or concealed suspension ^{*1} I Bandrastrer system, concealed cross sections
Building material class	<ul style="list-style-type: none"> A2-s1, d0 as per EN 13501-1
Fire	<ul style="list-style-type: none"> REI 30 - REI 90 as per EN 13501 part 2 (according to test report)
Sound absorption	<ul style="list-style-type: none"> as per BS EN ISO 354
Sound attenuation	<ul style="list-style-type: none"> $D_{n,c,w} = 40$ dB as per EN 20140-9 (19 mm thickness, as per test certificate) $D_{n,c,w} = 43$ dB as per EN 20140-9 (24 mm thickness, as per test certificate)
Humidity	<ul style="list-style-type: none"> up to 95% RH
Light reflectance	<ul style="list-style-type: none"> up to 88%
Thermal conductivity	<ul style="list-style-type: none"> $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612
Dimensions	<ul style="list-style-type: none"> For sizes as well as supply categories please consult the price list or www.amfceilings.com
Thickness / weight	<ul style="list-style-type: none"> 19 mm (c. 4.6 kg/m²) 24 mm (c. 8.4 kg/m²)
Colours	<ul style="list-style-type: none"> white similar to RAL 9010

^{*1} For details please see systems solutions.
For technical regulations please refer to pages 39.



THERMATEX Acoustic RL

THERMATEX Acoustic RL completes the THERMATEX Acoustic Range, the RL provides a high level of sound reflection at the frequencies of human speech. This allows for specific areas of reflective tiles to be included within areas of high absorption while maintaining the same visual appearance.

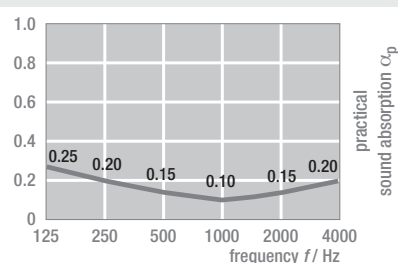
SYSTEM

C Exposed system, demountable ceiling ^{*1}

Building material class	■ A2-s1, d0 as per EN 13501-1
Fire	■ REI 30 - REI 90 as per EN 13501 part 2 up to 60 minutes as per BS 476: parts 20-23 (according to test reports)
Sound absorption	■ as per BS EN ISO 354
Sound attenuation	■ $D_{n,c,w} = 38$ dB as per EN 20140-9 (as per test certificate)
Humidity	■ up to 95% RH
Light reflectance	■ up to 88%
Thermal conductivity	■ $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612
Dimensions	■ For sizes as well as supply categories please consult the price list or www.amfceilings.com
Thickness / weight	■ 19 mm (c. 5.8 kg/m ²)
Colours	■ white similar to RAL 9010

Sound absorption

Value for
THERMATEX
Acoustic RL 19 mm
 $\alpha_w = 0.15$ (L)
as per EN ISO 11654
 $NRC = 0.15$
as per ASTM C 423
reflecting



^{*1} For details please see systems solutions.
For technical regulations please refer to pages 39.

AMF ACOUSTIC SOLUTIONS



THERMATEX Kombimetall

AMF Performance Ceiling THERMATEX Kombimetall, a metal panel with a mineral core, meets the highest requirements of both acoustics and fire protection.

THERMATEX Kombimetall is fixed as a single unit, without the need for additional insulation.

THERMATEX Kombimetall is installed as a free-span corridor system (System F) or as a modular plank in a fixed grid system (System I). Fixings such as downlighters and sprinklers can be easily integrated into the panel.

THERMATEX Kombimetall combines the appearance of a metal ceiling with the fire resistance and easy installation of all AMF Performance Ceilings.

SYSTEM

- C** Exposed system, demountable ceiling ^{*1}
- F** Free span system, with exposed or concealed suspension ^{*1}
- I** Bandraster system, concealed cross tees ^{*1}

Building material class
Fire

- A2-s1, d0** as per EN 13501-1
- REI 30 - REI 90** as per EN 13501 part 2 (according to test report)

Sound absorption
Sound attenuation

- as per BS EN ISO 354**
- $D_{n,c,w} = 42$ dB** as per EN 20140-9 (planks, as per test certificate)

Humidity
Dimensions

- up to 90% RH** (for varying humidity, up to 30°C)

Thickness / weight

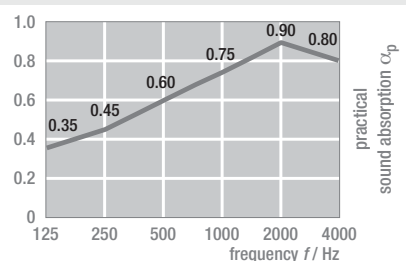
- For sizes as well as supply categories please consult the price list or www.amfceilings.com
- 21 mm** (c. 9.5 kg/m²) Weight is dependent on the type and size of metal facing that is used.

Colours

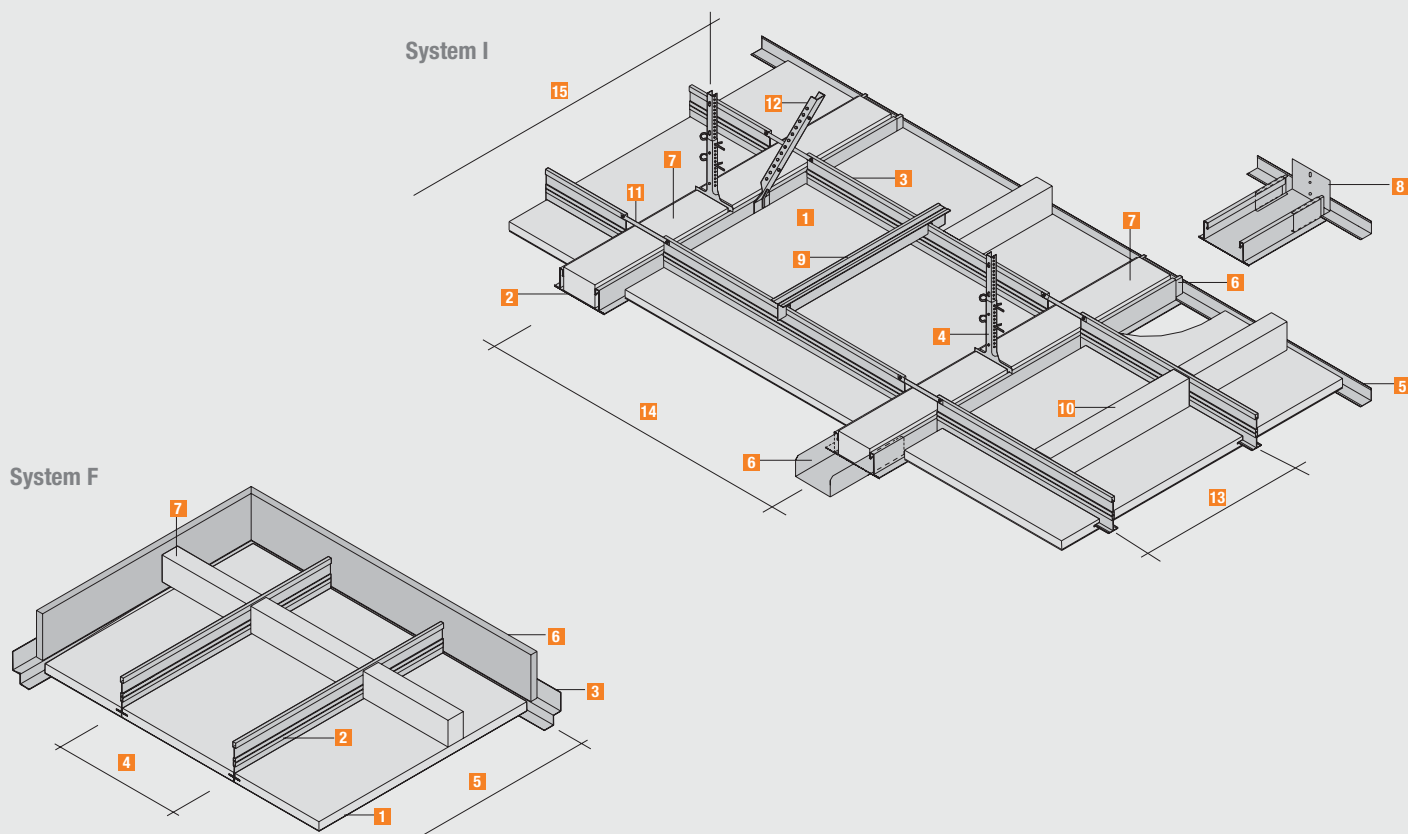
- white similar to RAL 9010**

Sound absorption

Value for
**THERMATEX
Kombimetall 2.0 mm**
 $\alpha_w = 0.65$ (H)
as per EN ISO 11654
NRC = 0.70
as per ASTM C 423
highly absorbing



^{*1} For details please see systems solutions.
For technical regulations please refer to pages 39.



Installation for System F

F Free Span THERMATEX Kombimetall - Fire protection model

- 1** THERMATEX Kombimetall 21 mm
- 2** Main runner 24 x 75 mm
- 3** Shadow trim 42 x 20 x 23 x 24 x 1.5 mm
- 4** Module size 300 mm
- 5** Max. length of panel 2500 mm
- 6** Fireboard 15 x 100 mm
- 7** Mineral spacer strip 64 x 40 mm

Installation for System I

I Parallel Bandrastrer construction THERMATEX Kombimetall - Fire protection model

- 1** THERMATEX Kombimetall 21 mm
- 2** 100 mm Bandrastrer
- 3** Main runner 24 x 75 mm
- 4** Nonius suspension hangers
- 5** Perimeter trim 31 x 31 x 1 mm
- 6** Wall connector
- 7** Mineral panel 64 x 40 mm
- 8** Alternative wall fixing
- 9** Spacer bar
- 10** Mineral spacer strip 64 x 40 mm
- 11** Channel connector
- 12** Angled brace hangers
- 13** Module size 300 mm
- 14** Module size 1800 mm
- 15** Distance between hangers 710 mm

AMF ACOUSTIC SOLUTIONS



THERMATEX Sonic sky

The rafts offer flexible and stylish solutions with a wide range of shapes and colours. The Rafts consist of a THERMATEX ceiling panel in a supporting frame. The acoustic panels have a high quality fleece coated face available in a variety of colours. The system is designed to be easy to install with semi concealed hangers providing an elegant floating appearance.

- 1 AMF THERMATEX
- 2 Main Runner
- 3 Perimeter Frame 40 x 30 mm
- 4 Splice Plate (Not Shown)
- 5 Suspension cable
- 6 Perimeter frame length
(Lengths Over 3000 mm use a reinforcement profile)
- 7 Perimeter frame width
(Widths over 2500 mm need an additional cross tee)

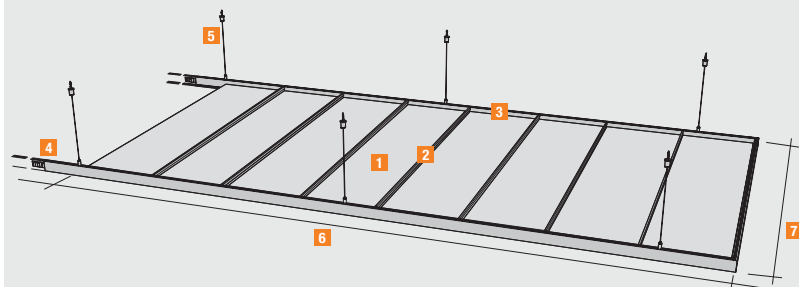
Building material class
Sound absorption
Frame format

Panel format
Whole construction weight

Frame colours

Surfaces

- A2-s1,d0 as per EN 13501-1
- as per BS EN ISO 354
- 2400 x 1800 / 2400 x 1200 / 2000 x 1500 / 1200 x 1200 mm, individual formats are possible
- 600 x 600 / 300 x 1500 / 300 x 1800 mm
- c. 8.0 kg/m² (depending on the raft size and panel type)
- white similar to RAL 9010, anodised Aluminium, further colours on request
- THERMATEX Alpha / THERMATEX Alpha HD with fleece lamination in white, black, silver, cream (Edges VT and AW/SK only in white)

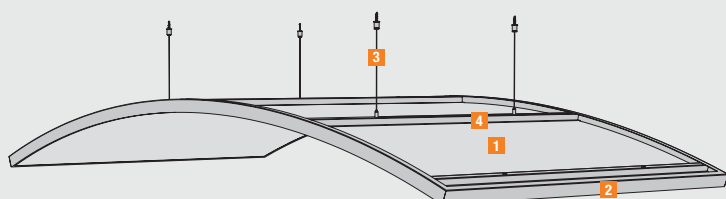




THERMATEX Sonic arc convex / concave

Elegant designs can be created using both **concave** and **convex** rafts together. Different colours are available to offer contrasting options. All rafts are delivered and fitted in one piece to provide a quick and easy installation. The suspension cables are stainless steel and are fully adjustable to allow precise positioning.

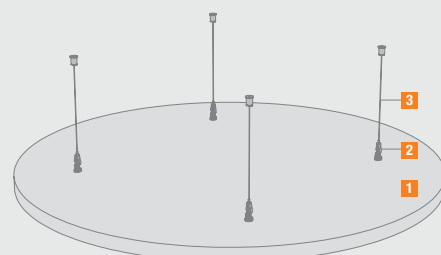
- 1 AMF THERMATEX
- 2 Framing section 15 x 34 x 7 mm
Size 1910 mm x 1180 mm
- 3 Suspension cable incl. hanger
- 4 Cross beam to accept the suspension cable



THERMATEX Sonic element

THERMATEX Sonic **element** is a mineral acoustic ceiling raft which does not require any frame!
The AMF THERMATEX base, together with a special Acoustic Range acoustic fleece surface, ensures the highest sound absorption. It is also an optimal solution for rooms in which the acoustic problems are to be solved in a stylish and creative way.

- 1 AMF THERMATEX
- 2 Tension spring
- 3 Suspending ropes with hooks, steel wire rope and ceiling bindings



AMF ACOUSTIC SOLUTIONS



THERMATEX Comfort

AMF THERMATEX Comfort gives higher levels of acoustic performance and fire protection

THERMATEX

- Fine Stratos
- Fine Stratos micro
- Star
- Mercure

SYSTEM	<ul style="list-style-type: none"> ■ C Exposed system, demountable ceiling *1 ■ I Bandrastrer system, concealed cross tees *1
Building material class Fire	<ul style="list-style-type: none"> ■ A2-s1, d0 as per EN 13501-1 ■ REI 30 - REI 120 as per EN 13501 part 2 up to 60 minutes as per BS 476: parts 20-23 (according to test reports)
Sound absorption Sound attenuation	<ul style="list-style-type: none"> ■ as per BS EN ISO 354 ■ $D_{n,c,w} = 38$ dB as per EN 20140-9 (600 x 600 mm, as per test certificate) ■ $D_{n,c,w} = 40$ dB as per EN 20140-9 (planks, as per test certificate)
Humidity	<ul style="list-style-type: none"> ■ up to 95% RH
Light reflectance	<ul style="list-style-type: none"> ■ up to 88%
Thermal conductivity	<ul style="list-style-type: none"> ■ $\lambda = 0.052 - 0.057$ W/mK as per DIN 52612
Dimensions	<ul style="list-style-type: none"> ■ For sizes as well as supply categories please consult the price list or www.amfceilings.com
Thickness / weight	<ul style="list-style-type: none"> ■ 19 mm (c. 5.7 kg/m²)
Colours	<ul style="list-style-type: none"> ■ white similar to RAL 9010

*1 For details please see systems solutions.
For technical regulations please refer to pages 39.



■ DRAFT SPECIFICATIONS AND TECHNICAL INFORMATION

For copies of draft specifications please contact AMF on:

Telephone: +49 (0) 85 52 / 422 - 0
Fax: +49 (0) 85 52 / 422 - 32
E-mail: info@knaufamf.de

Full technical information, assessments, test reports, samples etc. are available on request.

We recommend you consult AMF representatives for further technical information.

■ IMPORTANT NOTICE

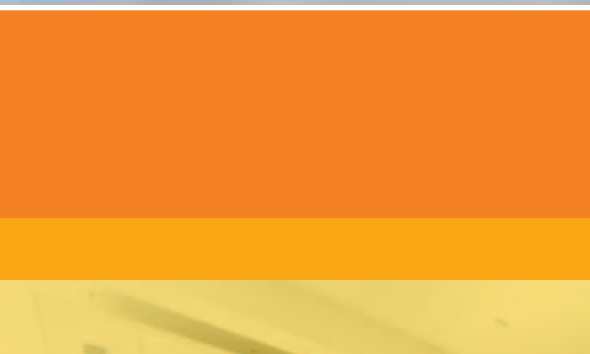
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Errors and omissions excepted. Printing errors excepted.

AMF-PROJECTS

GERMANY



OFFICE BUILDING ASKANISCHER PLATZ, BERLIN

- Product ■ THERMATEX Sonic sky Flat raft
- Construction ■ THERMATEX Alpha white
- Quantity ■ 3,500 m²

UNITED KINGDOM



CINEMA, ODEON GATESHEAD, „NEW IMAX CINEMA“, UNITED KINGDOM

Product	■ THERMATEX Alpha black
Construction	■ System C, edge detail SK 1200 x 600 mm
Quantity	■ THERMATEX Alpha black 2,800 m ²

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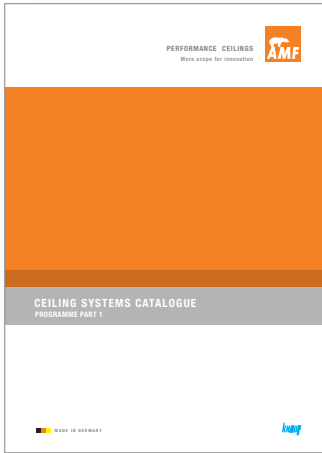
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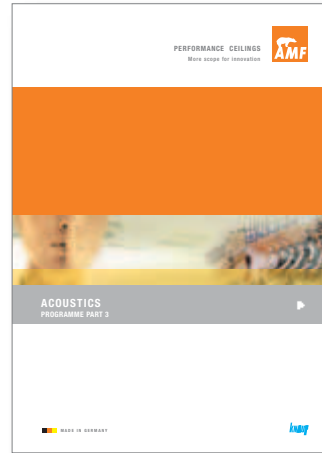
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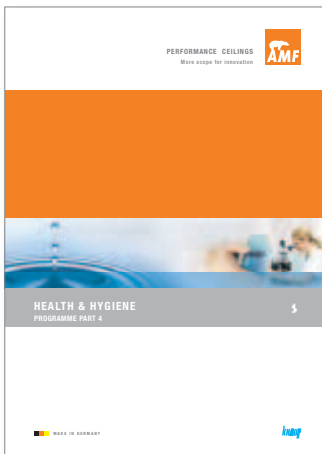
Part 1



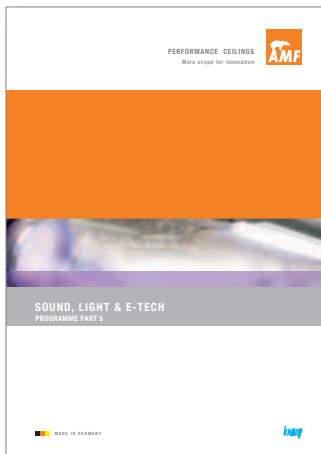
Part 2



Part 3



Part 4

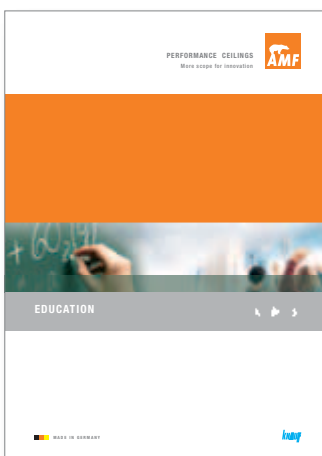


Part 5

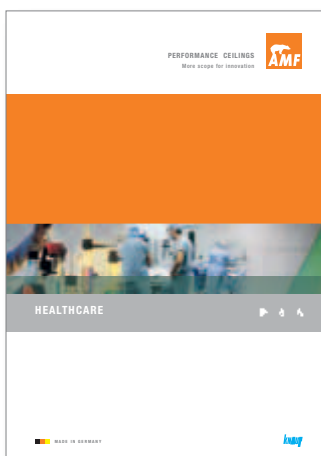


Part 6

AMF APPLICATIONS



Part 1



Part 2

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The Construction Production Directive (Council Directive 89/106/EWG), relevant for Suspended Ceilings, was converted to the European Standard EN 13964. It stipulates essential criteria for the CE labelling of ceiling products and ceilings systems.



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