Support the film experience

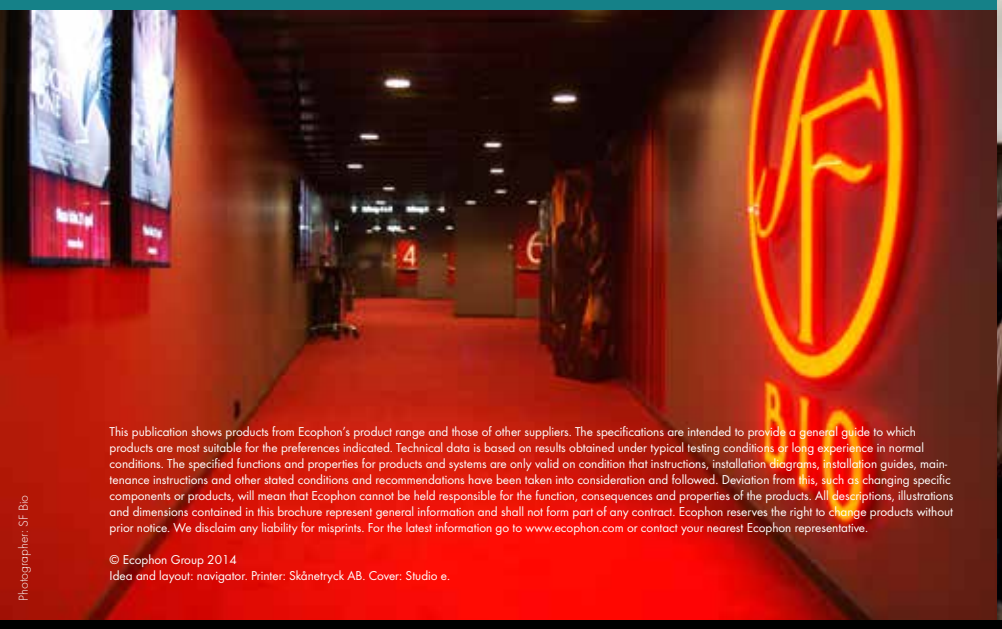
through excellent cinema acoustics

Ecophon®
SAINT-GOBAIN
A SOUND EFFECT ON PEOPLE

Photographer: Studio e

Constantly higher technical standards

The technology that sets the conditions for the film experience is constantly further developed. Today's sound standards were set many years back by Lucas with the THX system – and it really revolutionized the sound experience for filmgoers. How sound is broadcasted has also developed. Speakers along the walls, synchronized with camera angles, really make the viewers feel that they are in the middle of the action. In front, the screen subwoofers create a sound pressure that also affects people physically.



Photographer: SF Bio

Photographer: Gran Maria Gewit

Idea and layout: navigator. Printer: Skånetryck AB. Cover: Studio e.

A central part

of a complete cinema experience

Filmmakers of today know how to use sound to create a complete film experience. Sound carries a lot of information and also adds greatly to different effects, reactions and emotions. Cinemas that offer their visitors the best possible acoustic conditions will get satisfied customers that keep coming back.

The audience is back

After a period of home video and flat screens, it is more popular than ever to watch films in public. Screens often 20 times larger than those achievable at home give a much more impactful experience. The social part, meeting friends and sharing an event, is also important. The possibility to eat and drink in connection with the film makes it a nice occasion.

Adding new dimensions

Globally there is a progress towards adding new and more sophisticated dimensions to the cinema visit. It could be VIP events offering food, extra comfort like adjustable chairs and separate entrance. Other features might be movable chairs, blowing wind, different odours, moving objects and alike.

Extending the visit

Another trend is caring about the people choosing to go to the cinema. Bars, cafeterias and restaurants are often incorporated or close by in order to extend the stay and make it easy and comfortable for people to spend more time. This is a dramatic change from the past where people were guided out via the back door and left alone.

Expanding the scope

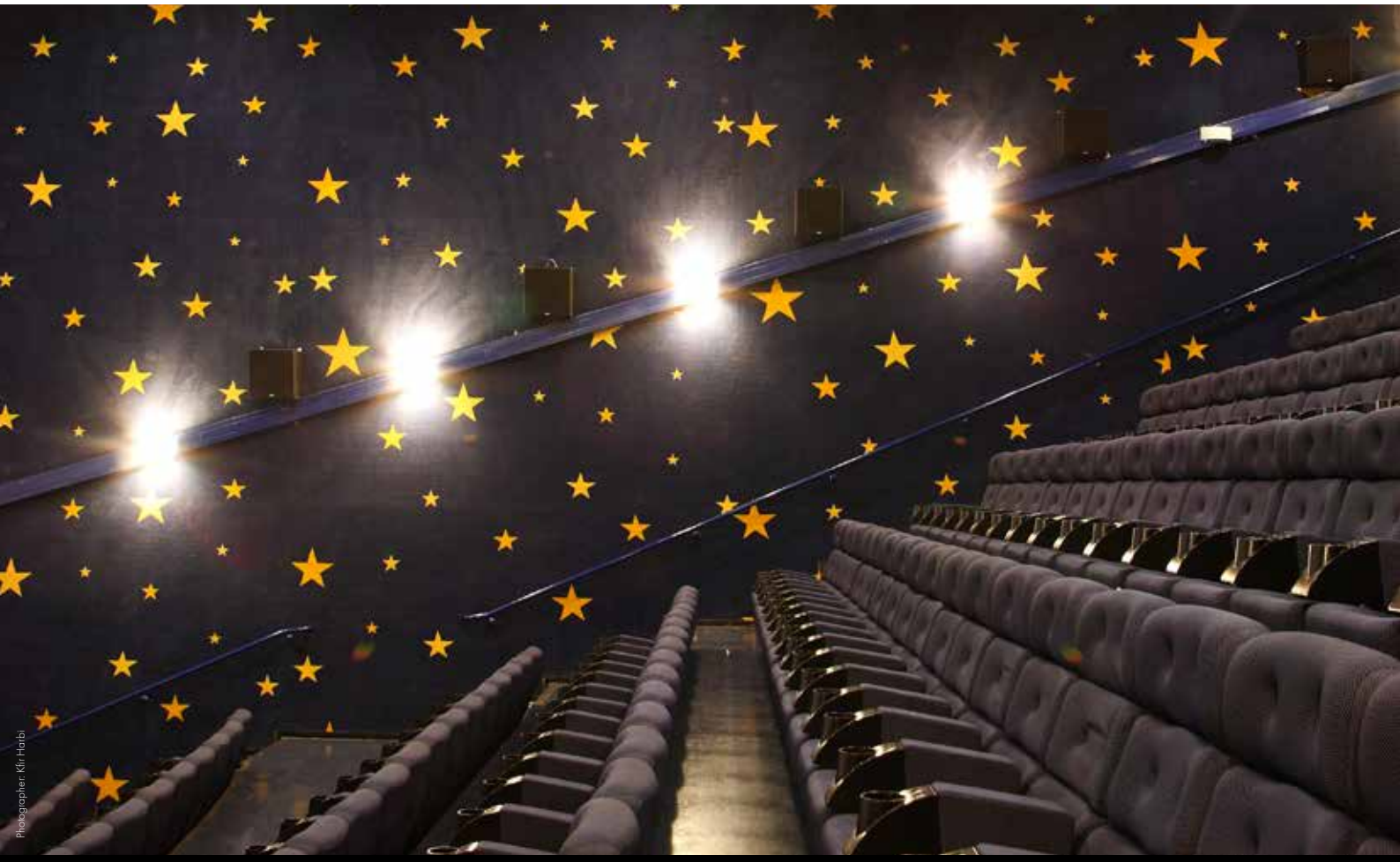
Standard cinemas with overall good comfort are quite common, but there is a great demand for simpler, less luxurious cinemas in developing and urban areas. There is also a trend today that cinemas are used for new purposes, like entertainment, seminars, presentations and launches.

Photographer: Shutterstock

Market leading

cinema systems around the world

Ecophon has developed and provided acoustic solutions for cinemas for many years, and have extensive competence in this field. Many cinemas around the world have chosen acoustic systems from Ecophon, to be able to offer their visitors the best possible sound experience.



Photographer: Kfir Harbi

”As a professional designer and architect, I put a lot of effort into research of finishing materials that I can incorporate in my architectural design. Ecophon offer products that enable a great acoustic and aesthetic solution for our cinema and theatre projects. The key factors for choosing Ecophon products are colour and shape flexibility in combination with great acoustical characteristics. They provide not only the technical properties for great sound and acoustics in the cinema rooms, but also aesthetics and cleanness in the design solution. Also the service is great, and together we are able to get the best out of the Ecophon products.

Shaul Kaner
Achitect, Shaul Kaner Achitects, Herzlia Pituach, Israel

Photographer: Konstantin Antonov

The innovative material poses a qualitatively new level of design to our cinemas, combining aesthetics and acoustics, which also positively affect the experience for our customers. Thanks to the consistent quality of Ecophon products, the design process was facilitated and the final result really met our expectations. The construction period was short, due to system solutions and easy installation. We also assert that the cleaning and maintenance are easily performed.

Stoyan Yordanov
Director "Project Investment and Development"
Alexandra Group, Sofia, Bulgaria

Artec Design is an architectural studio with long experience in cineplex projects in Bulgaria, having designed 9 cineplexes with a total of 75 cinema auditoria operating. Following research for our latest projects, we decided to introduce Ecophon acoustic systems as products meeting all demands for creative sound absorption solutions. At present 9 cinema auditoria with Ecophon acoustic systems are already operating, and 4 more are to open.

Reverberation time and precise estimation of acoustic material arrangement were thoroughly calculated and designed in cooperation with our acoustic engineer. Thus we achieved a perfect acoustic environment. At the same time we managed to introduce unique design elements with custom integrated lighting. Colour schemes provided by Ecophon perfectly matched our interior concept.

Konstantin Antonov
Architect, Artec design Ltd.
Sofia, Bulgaria

Photographer: Konstantin Antonov

Photographer: Studio e

Key principles

for designing a cinema

All cinema design today is computer based, using acoustic simulation programmes in order to optimise the outcome. Advanced speaker systems offering excellent surround effects means a high number of speakers placed on walls. Subwoofers are often located near the screen, using sound waves to create also a physical impact on the audience.

Aiming for minimum reverberation time

When using a surround system, image shifts are a risk that can cause the feeling of sound appearing from the wrong direction. To avoid this it is important to design for minimum reverberation time on all frequencies. Especially the frequency range 100-200 Hz can cause problems and demands very good absorption. The wall constructions are crucial in order to achieve the right reverberation time. Two types of acoustic wall absorbers should be used to create a good balance. The ceiling demands full coverage of absorbing material with a matt surface. Behind the screen, the wall should be covered with thick, soft absorbers, taking care of reflections from the front loudspeakers.

The principle acoustic designing process

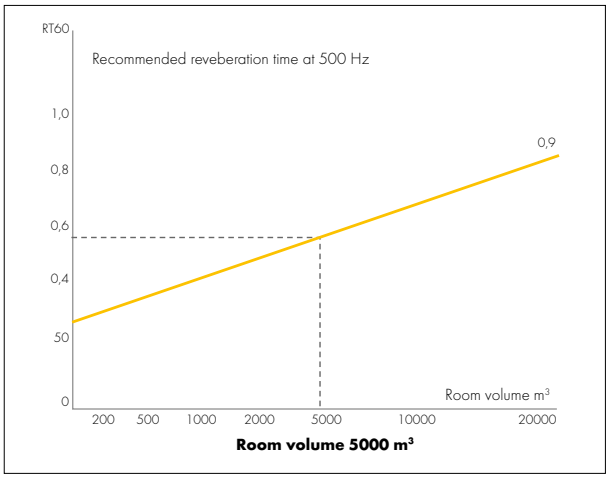


Figure 1*
The total volume of the cinema gives a frequency independent of reverberation time.

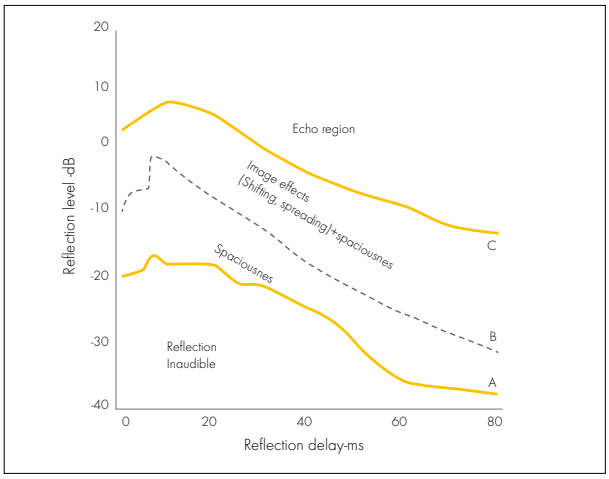


Figure 3
An ecogram is part of the outcome of an acoustic simulation and used for detecting reflections and finding harmful ones needing adjustment. The method is to compare the ecogram with the threshold curves in figure 3.

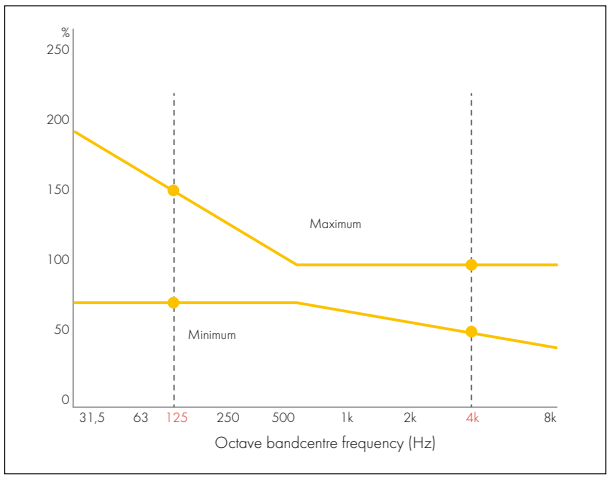


Figure 2*
The reverberation time given by figure 1 corresponds with the level 100%. Maximum allowed deviation from this reverberation time at different frequencies are indicated by the upper and lower bounds in the figure. The increased amount of loudspeakers in today's cinemas has also increased the demand for absorption. As a consequence it is often recommended to reach the target values of the lower bound in figure 2, especially at higher frequencies.

Example: A 5000 m³ indicates 0,6 sec reverberation time (fig 1).
Used in figure 2 this gives allowed deviation at:

125 Hz
150% x 0,6 = 0,9 sec reverberation at maximum level

75% x 0,6 = 0,45 sec reverberation time at minimum level

4 kHz
100% x 0,6 = 0,6 sec reverberation time at maximum level

50% x 0,6 = 0,3 sec reverberation time at minimum level

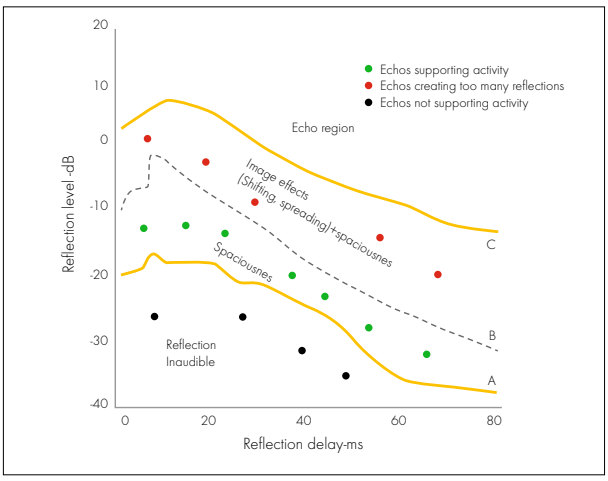


Figure 4
Figure 4 shows the threshold curves for subjective perceptions of reflections in a room. The lower curve (A) shows the threshold for detecting the reflection. Below the curve, reflections are not audible. In the area between threshold curves A and B, reflections contribute positively to the loudness of the sound without causing the negative effects. Above threshold curve B reflections will cause image shifts, which mean that the direction of the original sound source is shifted. This is not wanted in cinemas.

From analysis based on acoustic software single reflections can be traced. If those reflections cause image shifts they could be eliminated by increasing the absorption on the surfaces that are causing the disturbing reflections.

In figure 4 the ecogram example shows separate reflections. The reflections between curve A and B (green) are supporting the activity. The echoes between curve B and C (red) needs to be adjusted. Echoes below curve A are neglectable (black).

A mix of reflecting and absorbing surfaces is often necessary to meet the desired reverberation time according to figure 2 and to avoid harmful reflections based on the threshold curves (figure 3).

*Recommended reverberation times are based on many years of experience. The overall reverberation times for the frequency range 31,5-8000 Hz are estimated according to figure 1 and figure 2.

Components in

Ecophon Cinema systems

Ecophon offer a wide range of sound absorbing systems for different applications. The product pages (starting from page 14) show overall system and product descriptions, installations, acoustics and technical properties. The information includes different surfaces and installation varieties.

Products aimed for Cinema walls

- Ecophon Akusto Wall A and Ecophon Akusto Wall C with a Texona surface
  – Texona is offered in two surface versions: the absorbing “Alpha” and the reflecting “Gamma” (see absorption diagrams)
- Ecophon Akusto Wall A needs to be framed around all edges, and Ecophon Akusto Wall C needs to be framed only on the short edges (see installation diagrams)

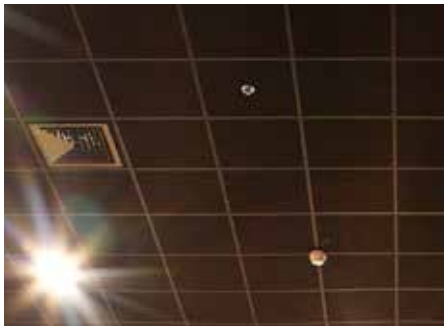
Products aimed for Cinema ceilings

(see absorption diagram page 18 or page 24)

- Ecophon Sombra A
  – Both panels and grid are offered in matt black (colour: Black 997) to avoid reflections
  – The grid system is exposed
- Ecophon Sombra Ds
  – Panels are offered in matt black (colour: Black 997) to avoid reflections
  – The grid system is concealed (not visible)
- Ecophon Extra Bass is a special absorber that can be installed above both Sombra A and Sombra Ds to improve low frequency absorption (see absorption diagram)

Product aimed for Cinema screen

- Ecophon Modus is used on the wall behind the screen to avoid disturbing reflections
  – Thickness: 50mm
  – Colour: Black
- A screw and a perforated washer to minimise sound reflections are used to fix the absorbing panel behind the screen



Grid systems and wall trims aimed for Ecophon Cinema installations

- Ecophon Connect grid: rigid and well-designed visible systems for ceilings including accessories for easy installation and an aesthetically good result
  – The black matt low gloss painted surface eliminates light reflections once the auditorium is in operation
- Ecophon Connect wall trims (WP-profiles) are offered in white, black and natural colours

Photographer: Klir Harbi

Colour options with

Ecophon Akusto™ Wall panels

When designing cinemas, colours can be used to create a certain ambience. Ecophon Akusto Wall panels with a Texona surface offer a wide range of colour options. Each colour has been carefully chosen in collaboration with interior designers, architects and textile designers. Texona has a smooth textured surface, is impact resistant and available in 16 colours that allude to flavours.

Sea Salt S 0500-N	Nutmeg S 7010-Y30R	Chilli S 2070-R
Garlic S 2502-Y	Blueberry S 7020-R80B	Tangerine S 2060-Y50R
Oyster S 4005-Y20R	Menthol S 4040-B30G	Rhubarb S 5030-R20B
Ginger S 2005-Y30R	Mustard S 2050-Y	Mulberry S 7020-R50B
Pepper S 6502-Y	Wasabi S 4020-G70Y	Lavender S 2030-R70B
Liquorice S 9000-N		

Combining wall elements

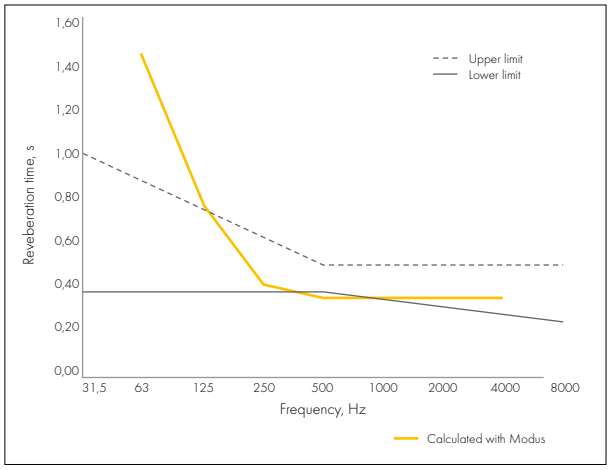
for a perfect result

In order to achieve a balanced absorption, a mix of wall elements is needed (see key principals). The wall elements are built up from combinations of different absorber materials and sometimes also combined with a slotted MDF board. The design of the cinema depends on the volume, dimensions, speaker systems, etc., all customized for the actual situation.

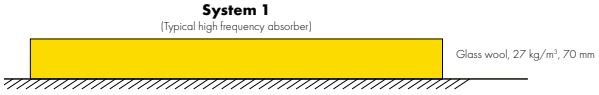
Why not use only Ecophon Modus?

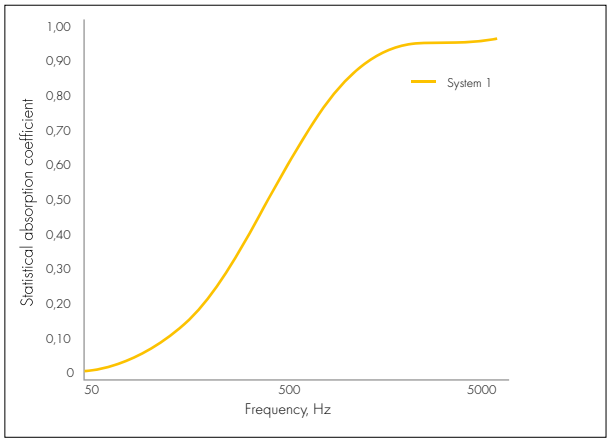
In order to design a low budget cinema, it can be tempting to design with simple wall elements like the Ecophon Modus type (aimed for the wall behind the screen) for the entire room. The absorption addressing 125-200Hz is very influential to achieve a good sound climate in the low frequencies. The absorption chart for Ecophon Modus indicates none or very poor low frequency absorption. On the contrary it offers a very good absorption in the high frequencies, with the risk of too much absorption at the high end. This can be challenging if speakers are concentrated in the front part of the cinema, causing uneven sound distribution.

These charts indicate that when designing with only Ecophon Modus absorbers, it is not possible to meet the THX standards.



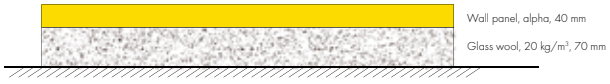
Different types of wall construction (principles)





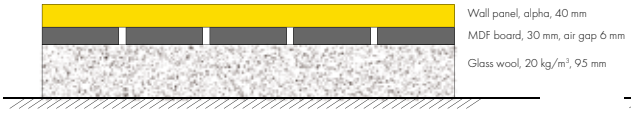
Photographer: Kfir Harbi

System 2
(Broad band absorber)

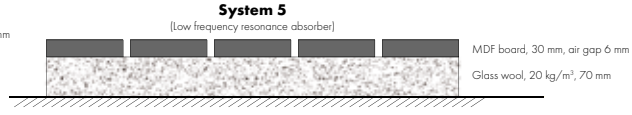


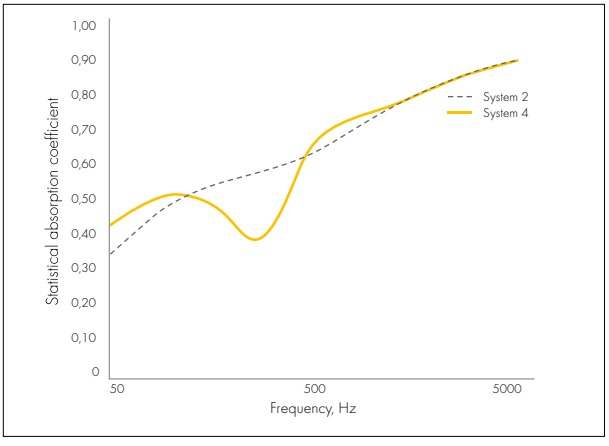
System 3
(Mid frequency range absorber)

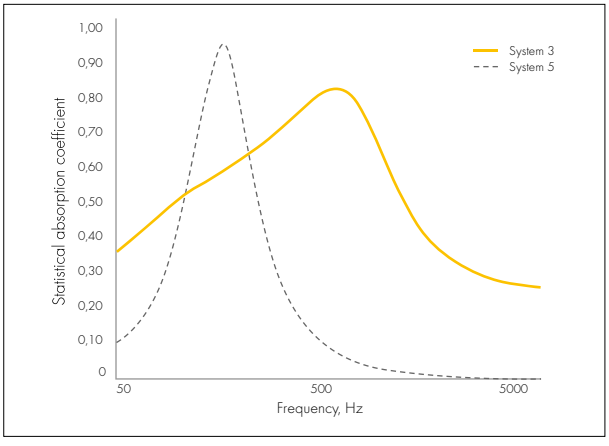
System 4
(Broad band absorber)



System 5
(Low frequency resonance absorber)





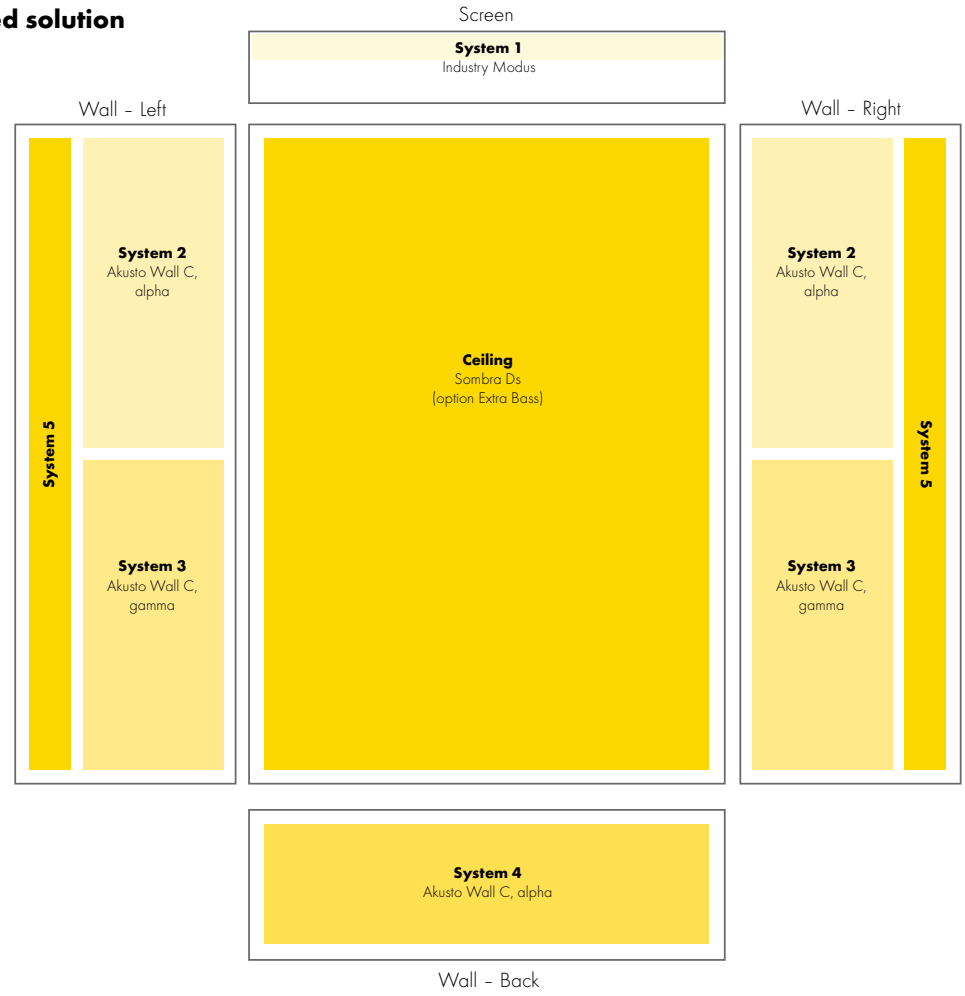


Do you want an optimised

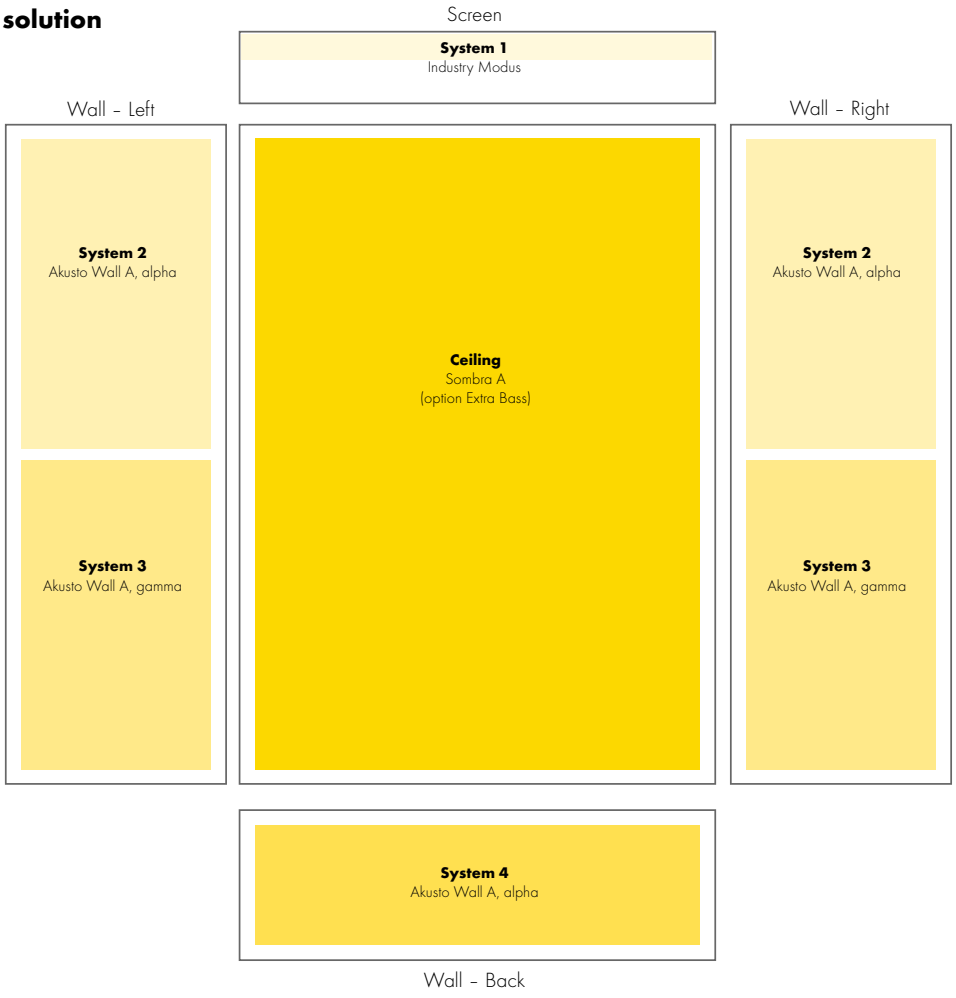
or basic construction?

All cinema design aims at creating as good acoustic environments as possible, to support the cinema experience for visitors. But of course there can also be budget limitations, setting the conditions for the level of acoustic performance. Cinema solutions from Ecophon can be tailored to meet different budget scopes. Even if a more basic solution doesn't reach the same acoustic levels as an optimised solution, it should be designed to deliver as good acoustics as possible inside the budget frames. Here we show one example of a basic construction and one example of an optimised construction. These are type examples and used to explain the principles for different levels. Every real design solution must be tailor-made to suit all needs in the actual project.

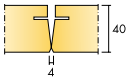
Optimised solution



Standard solution



Ecophon Akusto™ Wall C



For use as wall absorbers together with a sound absorbing ceiling, to achieve excellent acoustic properties in the room. Ecophon Akusto™ Wall C has a concealed grid and the bevelled edges create a narrow groove between each panel. The system provides extensive design possibilities.

The systems consist of Ecophon Akusto™ Wall C panels and Ecophon Connect profile systems with an approximate weight of 5 kg/m². The panels are manufactured from high density glass wool utilizing the 3RD Technology. The visible surface has a glass fibre fabric (Texona in colours or Muralis with printed patterns) or an impact resistant glass fibre fabric (Super G), and is also available with a painted surface (Akutex™ FT). The back of the panel is covered with glass tissue. The edges are painted, and the front surface is partly covering the long edges. Akusto™ Wall C with Texona, Akutex FT and Super G surfaces are available in size 2700x600x40mm. Akusto™ Wall C with Muralis surface in size 2400x600x40mm.
The Texona gamma version offers a reflecting surface, see absorption diagram.

For best performance and system quality, use Ecophon Connect profiles and accessories, which gives a lot of design possibilities. The profiles are manufactured from extruded aluminium.

Akusto Wall C

Section of Akusto Wall C System

Akusto Wall C system with Connect WP profile and external corner

Akusto Wall system with Connect Thinline profiles

SYSTEM RANGE

Size, mm	2400 x 600	2700 x 600
Thinline Profile	•	•
WP Profile	•	•
Thickness	40	40
Inst. Diagr.	M354, M355, M303	M354, M355, M235, M303

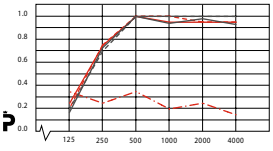
TECHNICAL PROPERTIES

ACOUSTIC

Sound Absorption: Test results according to EN ISO 354.

Classification according to EN ISO 11654, and the single value ratings for NRC and SAA according to ASTM C 423.

α_p Practical sound absorption coefficient



- - - Ecophon Akusto™ Wall C/Texona 40 mm o.d.s
- - - Ecophon Akusto™ Wall C/Super G 40 mm o.d.s
– Ecophon Akusto™ Wall C/Akutex FT 40 mm o.d.s
— Ecophon Akusto™ Wall C/Muralis 50 mm o.d.s.
- · - Ecophon Akusto™ Wall C/Texona gamma 40 mm o.d.s
o.d.s = overall depth of system

Product	Akutex FT	Super G	Texona	Muralis	Texona/ gamma
o.d.s mm	40	40	40	50	40
absorption class	A	A	A	A	E
αw	1,00	1,00	1,00	0,95	0,25

Sound Insulation: Not applicable

Sound Privacy: AC = 240 according to ASTM E 1376 and E 1110

ACCESSIBILITY The tiles are not demountable except in selected installation diagrams. See quantity specification for more information.

CLEANABILITY Daily dusting, vacuum cleaning and weekly wet wiping (Super G and Akutex FT surfaces). Weekly dusting and vacuum cleaning (Texona and Muralis surfaces).

VISUAL APPEARANCE Akusto Wall in white has high light reflectance. Light reflectance and nearest NCS colour sample for all the different

INFLUENCE OF CLIMATE The panels withstand a permanent ambient RH up to 95% at 30°C (Super G and Akutex FT surfaces) and RH up to 75% at 30°C (Texona and Muralis surfaces) without sagging, warping or delaminating (EN 13964). Thermal resistance for the panels, Rp=1,0 m²°C/W. Since a wall absorber mounted on an external wall serves as additional insulation, the need for vapour barrier should be investigated.

INDOOR CLIMATE Certified by the Indoor Climate Labelling, emission class M1 for building materials and recommended by the Swedish Asthma and Allergy Association.

ENVIRONMENTAL INFLUENCE Glass wool core utilizing 3RD Technology. Granted the Nordic Swan eco-label. Fully recyclable.

FIRE SAFETY The glass wool core of the tiles is tested and classified as non-combustible according to EN ISO 1182.

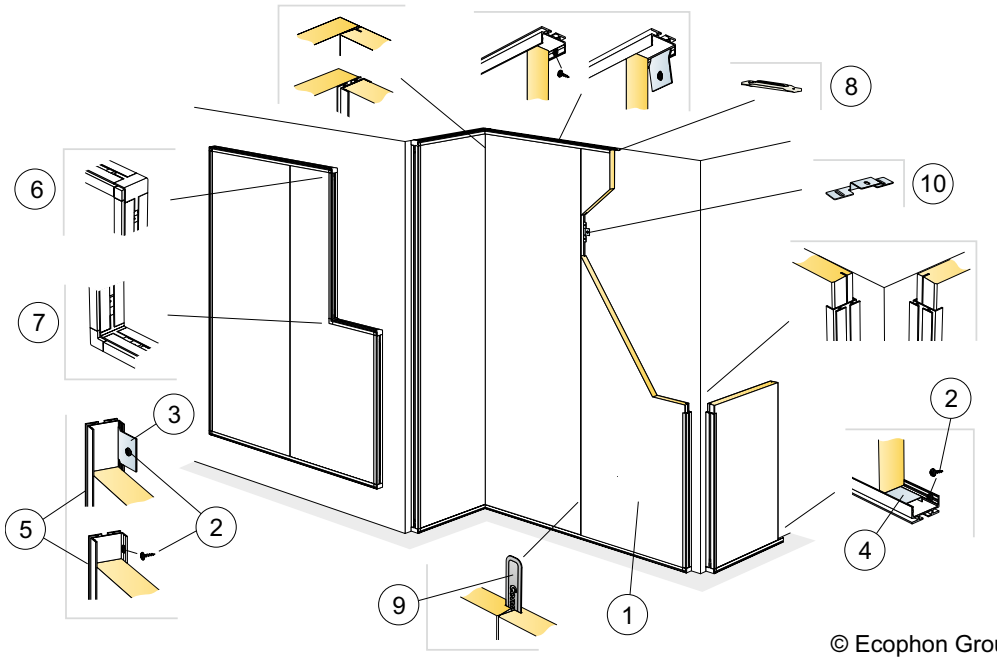
Reaction-to-fire classification

Country	Standard	Class
Europe	EN 13501-1	A2-s1,d0

MECHANICAL PROPERTIES The Texona and Muralis surfaces have moderate impact resistance. M195 and M196 with Super G surface are tested according to EN 13964 annex D and DIN 18032 part 3 and fulfils the demands corresponding to class 1A. Please note: Where the panels are subjected to frequent blows and impacts e.g. behind goal mouths, protection in form of e.g restraining nets or wooden slats is required. No additional live load is allowed.

INSTALLATION Installed according to installation diagrams, installation guides and drawing aid. For information regarding minimum overall depth of system see quantity specification. The systems should not be placed behind goals or similar areas where they frequently will be hit by hard ball shots. In such cases a protective net in front of the system is recommended.

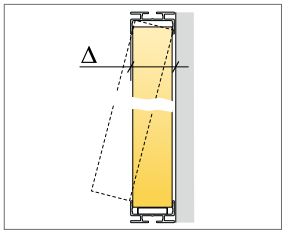
INSTALLATION DIAGRAM (M354) FOR ECOPHON AKUSTO WALL C VERTICAL INSTALLATION



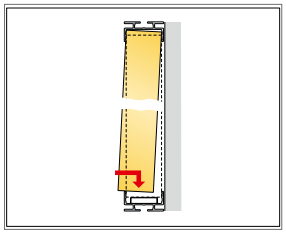
QUANTITY SPECIFICATION (EXCL. WASTAGE)

		Size, mm	
		2400x600	**2700x600**
1	Akusto Wall C	0,69/m²	0,62/m²
2	Connect Installation screw MVL (for use in plasterboard or timber)	as required	as required
3	Alt. Connect Fixing bracket, fixed at 400 mm centres.	as required	as required
4	Connect WP Space bar, L=2400 mm	as required	as required
5	Connect WP Profile, L=2687 mm, fixed at 400 mm centres	as required	as required
6	Connect WP External corner mounted in Connect WP Profile	as required	as required
7	Connect WP Internal corner mounted in Connect WP Profile	as required	as required
8	Connect WP Profile splice. used to extend WP profiles where needed.	as required	as required
9	Connect Spline	as required	as required
10	Connect Fixing plate, installed at 500 mm centres	as required	as required

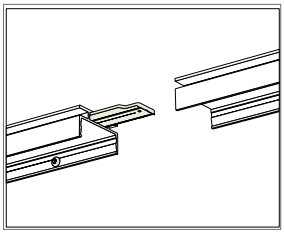
Δ Min. overall depth of system: 44 mm



See Quantity specification



Detail of installation

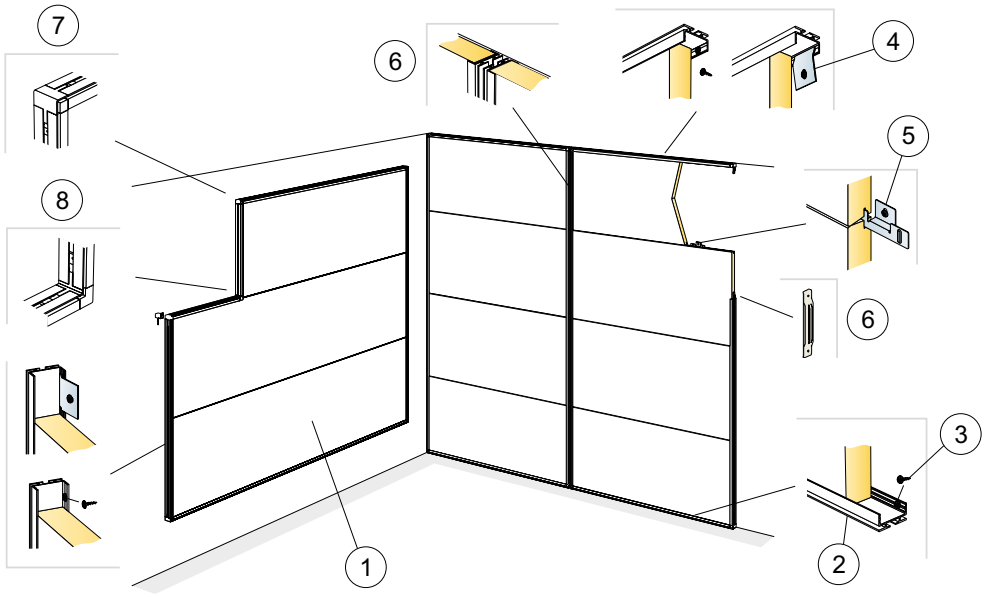


Detail of WP Profile splice

Size, mm	Max live load (N)	Min load bearing capacity (N)
2400x600	0	-
2700x600	0	-

Live load/load bearing capacity

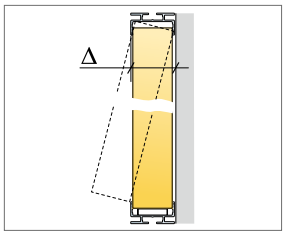
INSTALLATION DIAGRAM (M355) FOR ECOPHON AKUSTO WALL C HORIZONTAL INSTALLATION



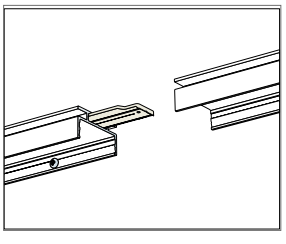
QUANTITY SPECIFICATION (EXCL. WASTAGE)

		Size, mm	
		2400x600	**2700x600**
1	Akusto Wall C	0,69/m²	0,62/m²
2	Connect WP Profile, L=2687 mm, fixed at 400 mm centres	as required	as required
3	Connect Installation screw MVL (for use in plasterboard or timber)	as required	as required
4	Alt. Connect Fixing bracket, fixed at 400 mm centres.	as required	as required
5	Connect Fixing plate, installed at 500 mm centres	as required	as required
6	Connect WP Profile splice. used to extend WP profiles where needed.	as required	as required
7	Connect WP External corner mounted in Connect WP Profile	as required	as required
8	Connect WP Internal corner mounted in Connect WP Profile	as required	as required

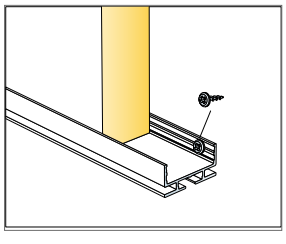
Δ Min. overall depth of system: 44 mm



See Quantity specification



Detail of WP Profile splice

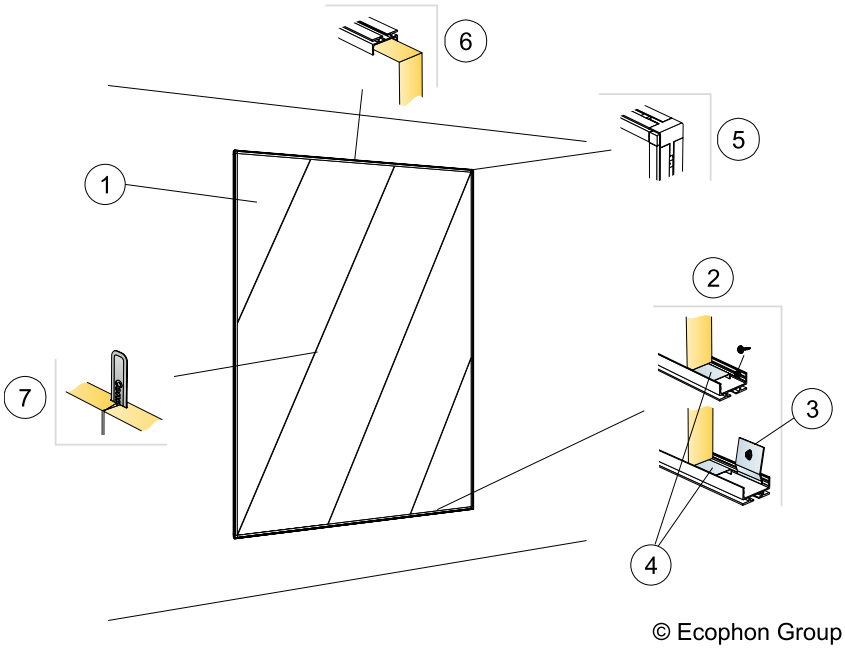


Detail of lower connection

Size, mm	Max live load (N)	Min load bearing capacity (N)
2400x600	0	-
2700x600	0	-

Live load/load bearing capacity

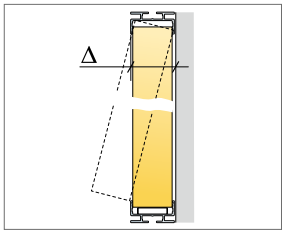
INSTALLATION DIAGRAM (M235) FOR ECOPHON AKUSTO WALL C DIAGONAL INSTALLATION



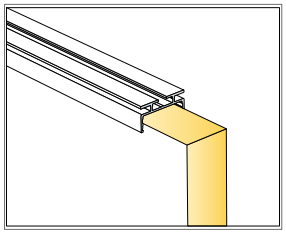
QUANTITY SPECIFICATION (EXCL. WASTAGE)

		Size, mm
		2700x600
1	Akusto Wall C	0,62/m²
2	Connect WP Profile, L=2687 mm, fixed (alt. with Connect Fixing bracket), at 400 mm centres, with Connect WP Space bar, L=2400 mm	as required
3	Alt. 1: Connect Fixing bracket, fixed at 400 mm centres.	as required
4	Connect WP Space bar, L=2400 mm	as required
5	Connect WP External corner mounted in Connect WP Profile	as required
6	Connect WP Profile, L=2687 mm, fixed at 400 mm centres	as required
7	Joint between panels (Connect Spline can be used to secure the panels)	as required

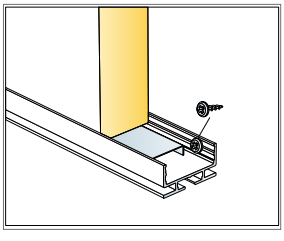
Δ Min. overall depth of system: 44 mm



See Quantity specification



Detail of upper connection

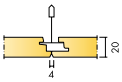


Detail of lower connection

Size, mm	Max live load (N)	Min load bearing capacity (N)
2700x600	0	-

Live load/load bearing capacity

Ecophon Sombra™ Ds

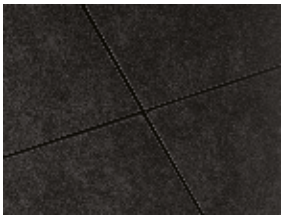


For applications requiring a dark ceiling having low light reflection and a concealed grid, but where individual tiles must be demountable. Ecophon Sombra Ds is installed in a suspended grid system, creating a ceiling with a smooth appearance. The bevelled edges create a narrow groove between each tile. The tiles are easily demountable.

The system consists of Ecophon Sombra Ds tiles and Ecophon Connect grid systems, with an approximate weight of 4 kg/m² (5 kg/m² with Ecophon Extra Bass). The tiles are manufactured from high density glass wool utilizing the 3RD Technology. The visible surface is a matt black batch painted glass tissue and the back of the tile is covered with glass tissue. The edges are painted. To improve absorption in the low frequency range, Ecophon Extra Bass can be installed on top of the suspended ceiling. For best performance and system quality, use Ecophon Connect grid and accessories. The grid is manufactured from galvanized steel.

Sombra Ds tile

Section of Sombra Ds system



Sombra Ds system

SYSTEM RANGE

Size, mm	600 x 600	1200 x 600
T24	•	•
Thickness	20	20
Inst. Diagr.	M227	M227

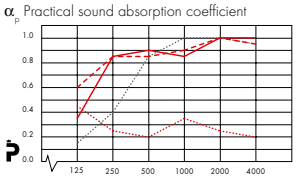
TECHNICAL PROPERTIES

ACOUSTIC

Sound Absorption: Test results according to EN ISO 354.

Classification according to EN ISO 11654, and the single value ratings for NRC and SAA according to ASTM C 423.

α_p Practical sound absorption coefficient



— Ecophon Sombra Ds 200 mm o.d.s.
- - - Ecophon Sombra Ds + Ecophon Extra Bass 200 mm o.d.s.
· · · · Ecophon Sombra Ds/gamma 200 mm o.d.s.
···· Ecophon Sombra Ds 50 mm o.d.s.
o.d.s = overall depth of system

Product	Sombra Ds			Sombra Ds/gamma		Sombra ds+Extra Bass
o.d.s mm	50	200	400	50	200	200
absorption class	C	A		E	E	A
αw	0,70	0,90		0,25	0,25	0,90
NRC	0,85	-	0,85	-	-	-
SAA	0,84	-	0,84	-	-	-

Sound Insulation: Not applicable

Sound Privacy: Not applicable

ACCESSIBILITY The tiles are easily demountable. Minimum demounting depth according to installation diagrams.

CLEANABILITY Weekly dusting and vacuum cleaning.

VISUAL APPEARANCE Black 997, nearest NCS colour sample S 9000-N, 3-4% light reflectance.

INFLUENCE OF CLIMATE The tiles withstand a permanent ambient RH up to 95% at 30°C without sagging, warping or delaminating (ISO 4611).

INDOOR CLIMATE Certified by the Indoor Climate Labelling, emission class M1 for building materials and recommended by the Swedish Asthma and Allergy Association.

ENVIRONMENTAL INFLUENCE Glass wool core utilizing 3RD Technology. Granted the Nordic Swan eco-label. Fully recyclable.

FIRE SAFETY The glass wool core of the tiles is tested and classified as non-combustible according to EN ISO 1182. The systems are classified as fire protective covering according to NT FIRE 003.

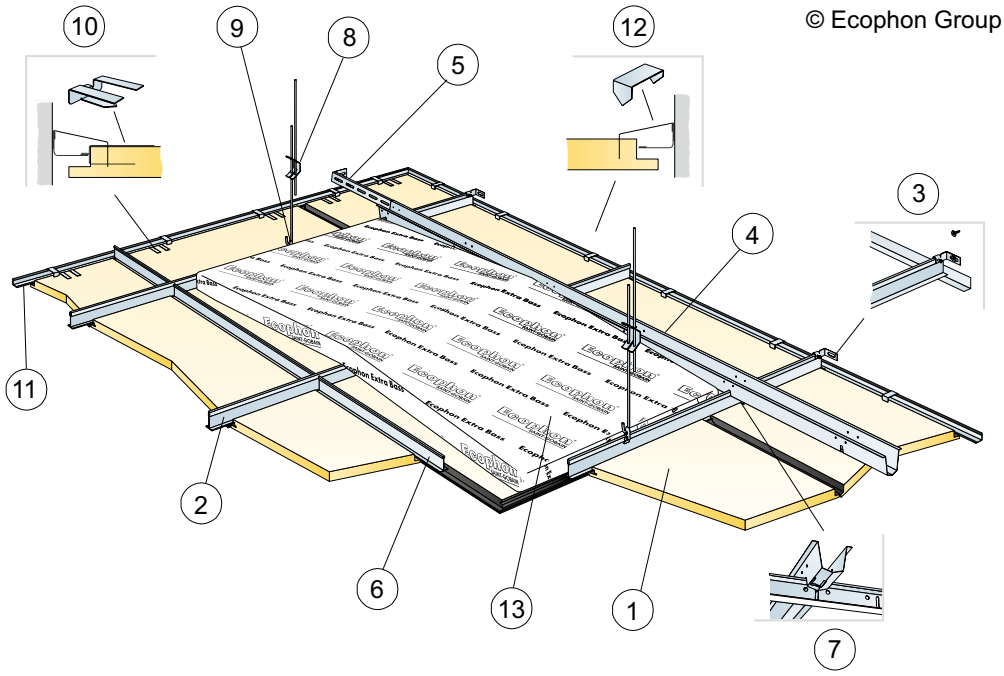
Reaction-to-fire classification

Country	Standard	Class
Europe	EN 13501-1	A2-s1,d0

MECHANICAL PROPERTIES See table about Max live load and Min load bearing capacity and Functional demands, Mechanical properties at www.ecophon.com.

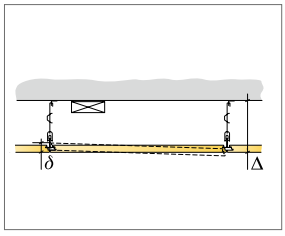
INSTALLATION Installed according to installation diagrams, installation guides and drawing aid. (The tiles have to be installed according to the arrows on the back of the tile.)

INSTALLATION DIAGRAM (M227) FOR ECOPHON SOMBRA DS

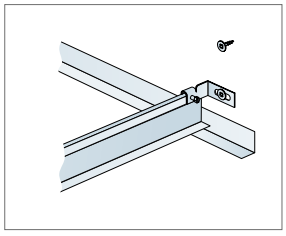


QUANTITY SPECIFICATION (EXCL. WASTAGE)

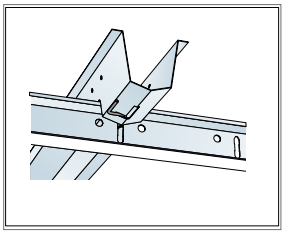
		Size, mm	
		600x600	**1200x600**
1	Sombra Ds	2,8/m²	1,4/m²
2	Connect T24 Main runner HD, installed at 600 mm centres	1,7m/m²	1,7m/m²
3	Connect Wall bracket for T-profiles	1for every row of suspended Main runner HD	
4	Connect Space bar, installed at 1500 mm centres (max. distance from wall 300 mm)	0,7m/m²	0,7m/m²
5	Connect Wall bracket, L=700 mm, for Space bar	1 for every row of Space bar	
6	Connect T24 Cross tee, L=600 mm	2for every row of Main runner HD	
7	Connect Space bar winch, installed one per joint Main runner/Space bar	1,4/m²	1,4/m²
8	Connect Adjustable hanger, installed at 1200 mm centres (max. distance from wall 600 mm)	0,7/m²	0,7/m²
9	Connect Hanger clip	0,7/m²	0,7/m²
10	Connect Support clip Dg20	1 /300-400mm on any cut edge	
11	Connect Angle trim black, (fixed at 300 mm centres)	as required	as required
12	Connect Perimeter tile clip	1 /300-400mm on any cut edge	
13	Extra Bass (1200x600x50 mm)	0,6/m²	0,6/m²
	Δ Min. overall depth of system: 105 mm		
	δ Min. demounting depth: 30 mm		



See Quantity specification



Connection between profiles with split pin

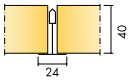


Connection between profiles with space bar winch

Size, mm	Max live load (N)	Min load bearing capacity (N)
600x600	50	160
1200x600	50	160

Live load/load bearing capacity

Ecophon Akusto™ Wall A



For use as wall absorbers together with a sound absorbing ceiling, to achieve excellent acoustic properties in the room. Ecophon Akusto™ Wall A has an exposed profile system.

The systems consist of Ecophon Akusto™ Wall A panels and Ecophon Connect profile systems, with an approximate weight of 4 kg/m². The panels are manufactured from high density glass wool utilizing the 3RD Technology. The visible surface has a glass fibre fabric (Texona) or an impact resistant glass fibre fabric (Super G), and is also available with a painted surface (Akutex™ FT). The back of the panel is covered with glass tissue. The edges are natural.
The Texona gamma version offers a reflecting surface, see absorption diagram.

For best performance and system quality, use Ecophon Connect grid and accessories. The profiles are manufactured from galvanized steel (Connect Channel trim) or aluminum (Connect Thinline).


Akusto Wall A


Akusto Wall A system with Connect Channel trim and Connect T24 Main runner


Akusto Wall A system with Connect Channel trim and Connect Recessed profile


Akusto Wall system with Connect Thinline profiles

SYSTEM RANGE

Size, mm	2700 x 1200
Thinline Profile	•
WP Profile	•
Thickness	40
Inst. Diagr.	M353, M304

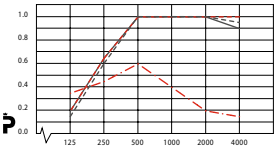
TECHNICAL PROPERTIES

ACOUSTIC

Sound Absorption: Test results according to EN ISO 354.

Classification according to EN ISO 11654, and the single value ratings for NRC and SAA according to ASTM C 423.

α_p Practical sound absorption coefficient



- - - Ecophon Akusto™ Wall A/Texona 40 mm o.d.s
- - - Ecophon Akusto™ Wall A/Super G 40 mm o.d.s
— Ecophon Akusto™ Wall A/Akutex FT 40 mm o.d.s
- - - Ecophon Akusto™ Wall A/Texona gamma 40 mm o.d.s
o.d.s = overall depth of system

Product	Akutex FT	Super G	Texona	Texona/ gamma
o.d.s mm	40	40	40	40
absorption class	A	A	A	E
α_w	0,95	0,90	0,95	0,25

Sound Insulation: Not applicable

Sound Privacy: AC=230 according to ASTM E 1376 and E 1110

ACCESSIBILITY The tiles are not demountable except in selected installation diagrams. See quantity specification for more information.

CLEANABILITY Daily dusting, vacuum cleaning and weekly wet wiping (Super G and Akutex FT surfaces). Weekly dusting and vacuum cleaning (Texona surface).

VISUAL APPEARANCE Akusto Wall in white has high light reflectance. Light reflectance and nearest NCS colour sample for all the different colours: See Ecophon Colours and surfaces.

INFLUENCE OF CLIMATE The panels withstand a permanent ambient RH up to 95% at 30°C (Super G and Akutex FT surfaces) and RH up to 75% at 30°C (Texona surface) without sagging, warping or delaminating (EN 13964). Thermal resistance for the panels, Rp=1,0 m²°C/W. Since a wall absorber mounted on an external wall serves as additional insulation, the need for vapour barrier should be investigated.

INDOOR CLIMATE Certified by the Indoor Climate Labelling, emission class M1 for building materials and recommended by the Swedish Asthma and Allergy Association.

ENVIRONMENTAL INFLUENCE Glass wool core utilizing 3RD Technology. Granted the Nordic Swan eco-label. Fully recyclable.

FIRE SAFETY The glass wool core of the tiles is tested and classified as non-combustible according to EN ISO 1182.

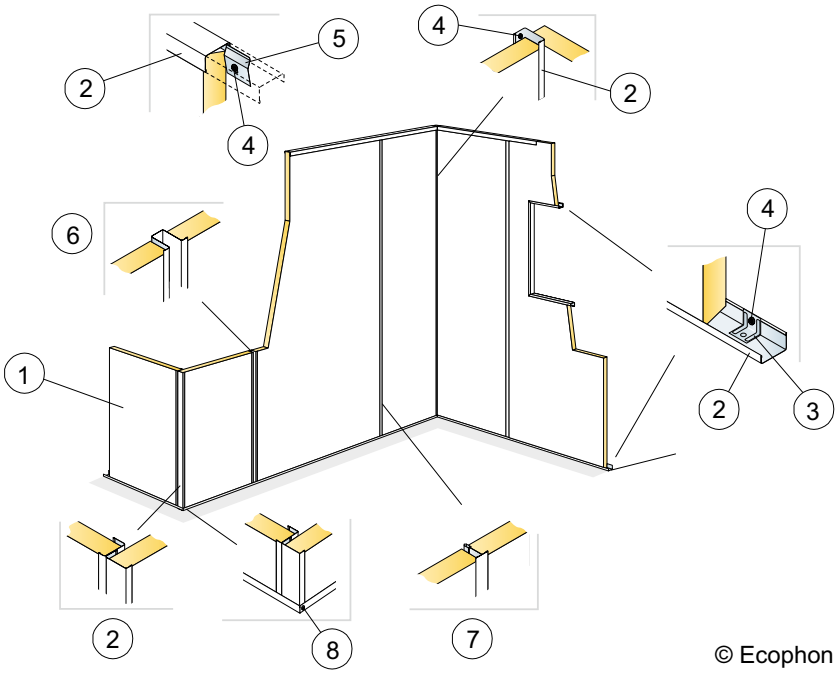
Reaction-to-fire classification

Country	Standard	Class
Europe	EN 13501-1	A2-s1,d0

MECHANICAL PROPERTIES Texona surface has moderate impact resistance. Super G is a stronger glass fibre fabric with high impact resistance. M194 with Super G surface is tested according to EN 13964 annex D and DIN 18032 part 3 and fulfils the demands corresponding to class 1A. Please note: Where the panels are subjected to frequent blows and impacts e.g. behind goal mouths, protection in form of e.g restraining nets or wooden slats is required. No additional live load is allowed.

INSTALLATION Installed according to installation diagrams, installation guides and drawing aid. For information regarding minimum overall depth of system see quantity specification. The systems should not be placed behind goals or similar areas where they frequently will be hit by hard ball shots. In such cases a protective net in front of the system is recommended.

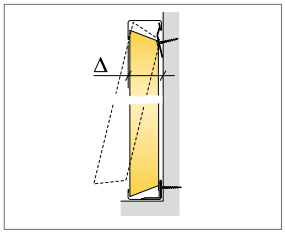
INSTALLATION DIAGRAM (M353) FOR ECOPHON AKUSTO WALL A



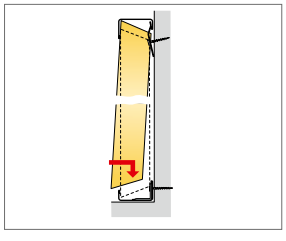
QUANTITY SPECIFICATION (EXCL. WASTAGE)

		Size, mm
		2700x1200
1	Ecophon Akusto Wall A	0,31/m²
2	Connect Channel trim, fixed at 300 mm centres. Connect Direct fixing plate is placed inside at each fixing point if the panel is not supported by the floor.	as required
3	Connect Direct fixing plate	as required
4	Connect Installation screw MVL (for use in plasterboard or timber)	as required
5	Connect Fixing bracket, fixed at 400 mm centres.	as required
6	Alt.1 Connect Recessed profile, (Installation: kept in position with the Channel trims)	as required
7	Alt.2 Connect T24 Main runner, not used in a impact resistant installation, (Installation: kept in position with the Channel trims)	as required
8	Connect Installation screw BR	as required
	Δ Min. overall depth of system: 44 mm	

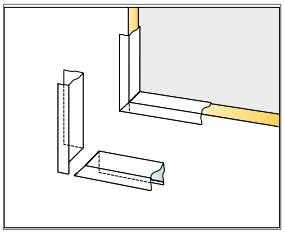
For impact resistant installations: Use HD profiles and secure with additional Connect Installation screw BR where needed.



See Quantity specification



Detail of installation

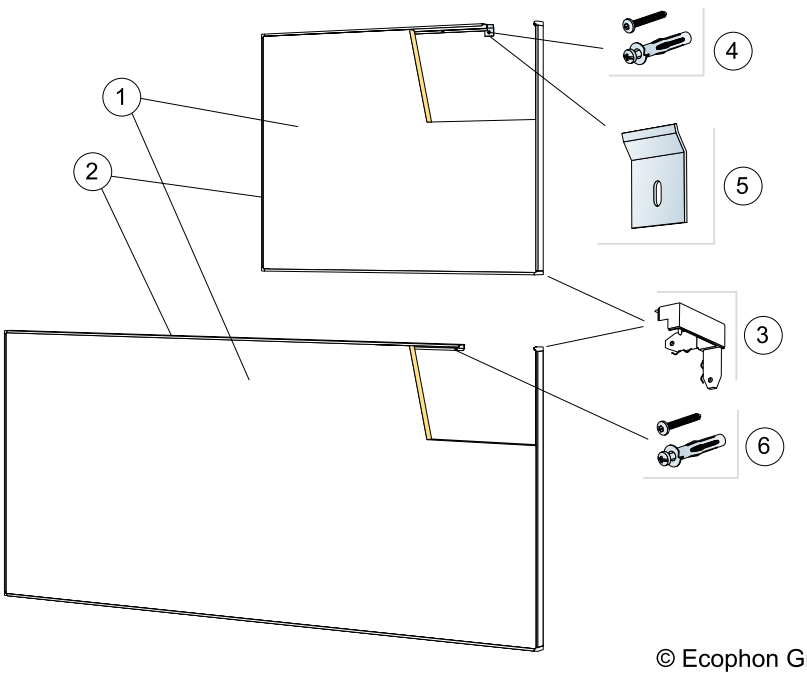


Cutting of channel trim for internal corner

Size, mm	Max live load (N)	Min load bearing capacity (N)
2700x1200	0	-

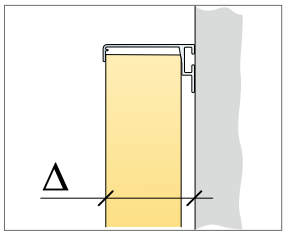
Live load/load bearing capacity

INSTALLATION DIAGRAM (M304) FOR ECOPHON AKUSTO WALL A WITH CONNECT THINLINE PROFILES.

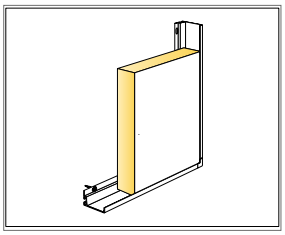


QUANTITY SPECIFICATION (EXCL. WASTAGE)

		Size, mm
		2700x1200
1	Ecophon Akusto Wall A	0,31/m²
2	Connect Thinline profile, L=2678 mm	as required
3	Connect Thinline corner	as required
4	Alt. 1: Installation screw, (select fastener according to wall material)	as required
5	Alt. 1: Connect Fixing bracket, fixed at 400 mm centres.	as required
6	Alt. 2: Installation screw, installed at 200 mm centres (select fastener according to wall material)	as required
	Δ Min. overall depth of system: 49 mm	
	Alt. 1: Max size of panel 1,45 m2.	



See Quantity specification



Detail of panel with Thinline frame

Size, mm	Max live load (N)	Min load bearing capacity (N)
2700x1200	0	-

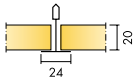
Live load/load bearing capacity

Photographer: Studio e

Photographer: Studio e

Photographer: Konstantin Antonov

Ecophon Sombra™ A

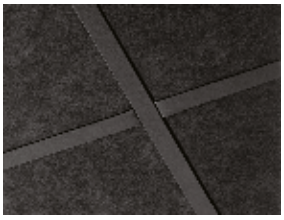


For applications requiring a dark ceiling having low light reflection and good sound absorbing properties. Ecophon Sombra A has an exposed grid system. Each tile is easily demountable.

The system consists of Ecophon Sombra A tiles and Ecophon Connect grid systems, with an approximate weight of 3 kg/m² (4 kg/m² with Ecophon Extra Bass). The tiles are manufactured from high density glass wool utilizing the 3RD Technology. The visible surface is a matt black batch painted glass tissue and the back of the tile is covered with glass tissue. The edges are natural. To improve absorption in the low frequency range, Ecophon Extra Bass can be installed on top of the suspended ceiling. For best performance and system quality, use Ecophon´s matt black Connect grid and accessories. The grid is manufactured from galvanized steel.


Sombra A tile


Section of Sombra A system


Sombra A system


Sombra E with Connect Angle trim black

SYSTEM RANGE

Size, mm	600 x 600	1200 x 600
T24	•	•
Thickness	20	20
Inst. Diagr.	M74	M74

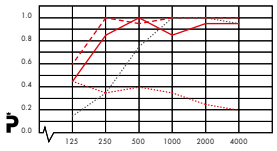
TECHNICAL PROPERTIES

ACOUSTIC

Sound Absorption: Test results according to EN ISO 354.

Classification according to EN ISO 11654, and the single value ratings for NRC and SAA according to ASTM C 423.

α_p Practical sound absorption coefficient



Frequency Hz

— Ecophon Sombra A 200 mm o.d.s.
--- Ecophon Sombra A + Extra Bass 200 mm o.d.s.
· · · · Ecophon Sombra A/gamma 200 mm o.d.s.
···· Ecophon Sombra A 50 mm o.d.s.
o.d.s = overall depth of system

Product	Sombra A			Sombra A/gamma		Sombra A +Extra Bass
o.d.s mm	50	200	400	50	200	200
absorption class	C	A		E	D	A
αw	0,65	0,95		0,25	0,30	1,00
NRC	0,8	-	0,9	-	-	-
SAA	0,81	-	0,89	-	-	-

Sound Insulation: Not applicable

Sound Privacy: Not applicable

ACCESSIBILITY The tiles are easily demountable. Minimum demounting depth according to installation diagrams.

CLEANABILITY Weekly dusting and vacuum cleaning.

VISUAL APPEARANCE Black 997, nearest NCS colour sample S 9000-N, 3-4% light reflectance.

INFLUENCE OF CLIMATE The tiles withstand a permanent ambient RH up to 95% at 30°C without sagging, warping or delaminating (ISO 4611).

INDOOR CLIMATE Certified by the Indoor Climate Labelling, emission class M1 for building materials and recommended by the Swedish Asthma and Allergy Association.

ENVIRONMENTAL INFLUENCE Glass wool core utilizing 3RD Technology. Granted the Nordic Swan eco-label. Fully recyclable.

FIRE SAFETY The glass wool core of the tiles is tested and classified as non-combustible according to EN ISO 1182. The systems are classified as fire protective covering according to NT FIRE 003.

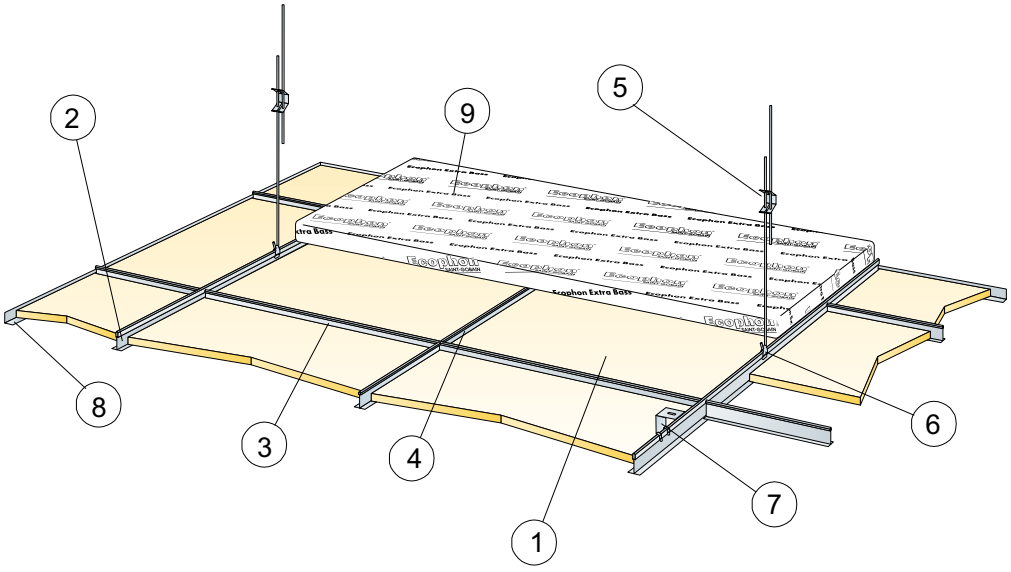
Reaction-to-fire classification

Country	Standard	Class
Europe	EN 13501-1	A2-s1,d0

MECHANICAL PROPERTIES See table about Max live load and Min load bearing capacity and Functional demands, Mechanical properties at www.ecophon.com.

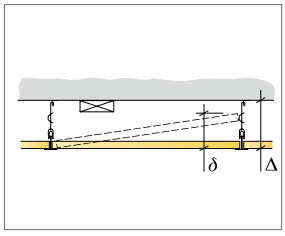
INSTALLATION Installed according to installation diagrams, installation guides and drawing aid. (The tiles have to be installed according to the arrows on the back of the tile.)

INSTALLATION DIAGRAM (M74) FOR ECOPHON SOMBRA A

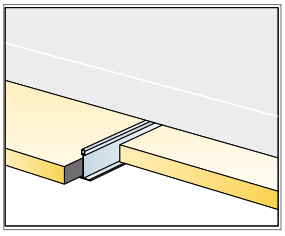


QUANTITY SPECIFICATION (EXCL. WASTAGE)

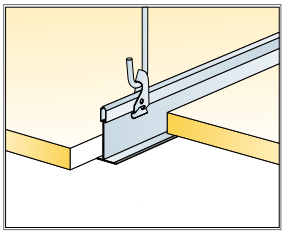
		Size, mm	
		600x600	**1200x600**
1	Sombra A	2,8/m²	1,4/m²
2	Connect T24 Main runner black, installed at 1200 mm centres (max. distance from wall 600 mm, can be extended up to 1200 mm if no live load between Main runner and wall).	0,9m/m²	0,9m/m²
3	Connect T24 Cross tee black, L=1200 mm, installed at 600 mm centres	1,7m/m²	1,7m/m²
4	Connect T24 Cross tee black, L=600 mm	0,9m/m²	-
5	Connect Adjustable hanger, installed at 1200 mm centres (max. distance from wall 600 mm)	0,7/m²	0,7/m²
6	Connect Hanger clip	0,7/m²	0,7/m²
7	For direct installation without Extra Bass: Connect Direct bracket, installed at 1200 mm centres	0,7/m²	0,7/m²
8	Connect Angle trim black, (fixed at 300 mm centres)	as required	as required
9	Extra Bass (1200x600x50 mm)	0,6/m²	0,6/m²
	Δ Min. overall depth of system: Sombra A: 50 mm (Direct bracket). Sombra A/with Extra bass: 100 mm.	-	-
	δ Min. demounting depth: Sombra A: 130 mm, Sombra A/with Extra bass: 170 mm	-	-



See Quantity specification



Installation with Extra Bass

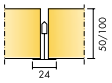


Suspension with adjustable hanger and clip

Size, mm	Max live load (N)	Min load bearing capacity (N)
600x600	50	160
1200x600	50	160

Live load/load bearing capacity

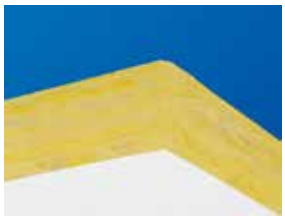
Ecophon Industry™ Modus



Suitable for noise reduction in industry premises, where different sizes and installation methods are required. Ecophon Industry Modus can be installed in exposed grid systems or with screw and washer.

The systems consist of Ecophon Industry Modus tiles and Ecophon Connect grid systems, with an approximate weight of 3-5 kg/m² depending on thickness. The tiles have a glass wool core utilizing the 3RD Technology. The visible surface is a batch painted glass tissue (S) and the back of the tile is covered with glass tissue. The edges are natural.

For best performance and system quality, use Ecophon Connect grid and accessories. The grid is manufactured from galvanized steel.



Industry Modus tile

Section of Industry Modus system

Section of Industry Modus TAL system.

SYSTEM RANGE

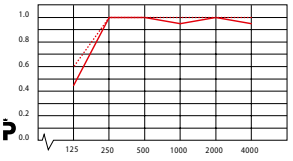
Size, mm	1200 x 600	1200 x 1200	1200 x 1200
Direct	•	•	•
T24	•	•	•
Thickness	50	50	100
Inst. Diagr.	M22, M23, M44	M22, M23, M44	M22, M23, M44

TECHNICAL PROPERTIES

ACOUSTIC

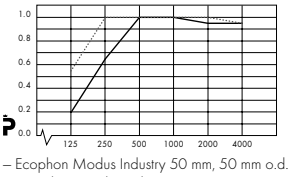
Sound Absorption: Test results according to EN ISO 354. Classification according to EN ISO 11654.

α_p Practical sound absorption coefficient



— Ecophon Modus Industry 50 mm, 200 mm o.d.s.
· · · · Ecophon Modus Industry 100 mm, 200 mm o.d.s.
o.d.s = overall depth of system

α_p Practical sound absorption coefficient



– Ecophon Modus Industry 50 mm, 50 mm o.d.s.
···· Ecophon Modus Industry 100 mm, 100 mm o.d.s.
o.d.s = overall depth of system

Product	Industry Modus, 50 mm		Industry Modus, 100 mm	
o.d.s mm	50	200	100	200
absorption class	A	A	A	A
αw	0,95	1,00	1,00	1,00

Sound Insulation: Not applicable

Sound Privacy: Not applicable

ACCESSIBILITY The tiles are easily demountable. Minimum demounting depth according to installation diagrams.

CLEANABILITY Weekly dusting and vacuum cleaning.

VISUAL APPEARANCE S White 190, nearest NCS colour sample S 0500-N, 80% light reflectance. S Grey 981, nearest NCS colour sample S 2502-Y, 45% light reflectance. S Black 970, nearest NCS colour sample S 8502-Y, 4% light reflectance. S Nature, 60% light reflectance. Slight colour differences can occur.

INFLUENCE OF CLIMATE The tiles withstand a permanent ambient RH up to 95% at 30°C without sagging, warping or delaminating (ISO 4611).

INDOOR CLIMATE Certified by the Indoor Climate Labelling and recommended by the Swedish Asthma and Allergy Association.

ENVIRONMENTAL INFLUENCE Glass wool core utilizing 3RD Technology. Fully recyclable.

FIRE SAFETY The glass wool core of the tiles is tested and classified as non-combustible according to EN ISO 1182. The systems are classified as fire protective covering according to NT FIRE 003.

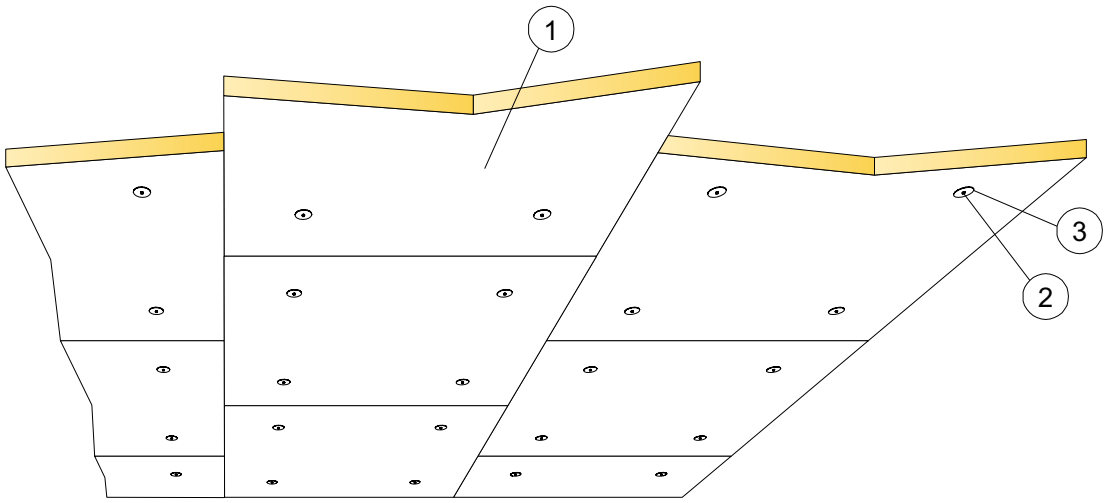
Reaction-to-fire classification

Country	Standard	Class
Europe	EN 13501-1	A2-s1,d0

MECHANICAL PROPERTIES See table about Max live load and Min load bearing capacity and Functional demands, Mechanical properties at www.ecophon.com.

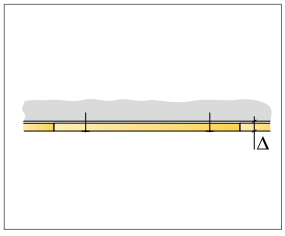
INSTALLATION Installed according to installation diagrams, installation guides and drawing aid. For information regarding minimum overall depth of system see quantity specification.

INSTALLATION DIAGRAM (M23) FOR ECOPHON MODUS WITH SCREW AND WASHER

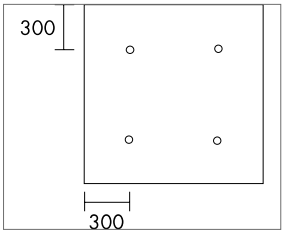


QUANTITY SPECIFICATION (EXCL. WASTAGE)

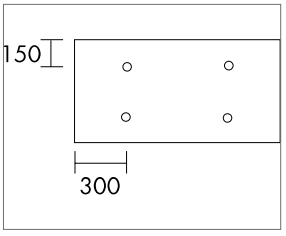
		Size, mm	
		1200x600	**1200x1200**
1	Industry Modus	1,4/m²	0,7/m²
2	Connect Screw (for light weight concrete or metal)	5,6/m²	2,8/m²
3	Connect Washer	5,6/m²	2,8/m²
	Δ Min. overall depth of system: 50 or 100 mm	-	-
	δ Min. demounting depth: The system is non-demountable	-	-



See Quantity specification



Position of screws size 1200x1200



Position of screws size 1200x600

Size, mm	Max live load (N)	Min load bearing capacity (N)
1200x600	-	-
1200x1200	-	-

Live load/load bearing capacity

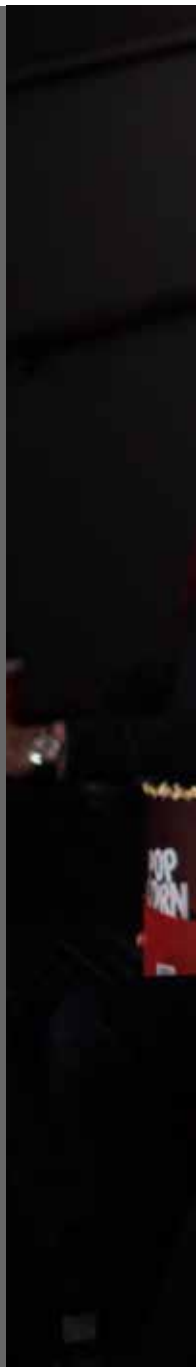
Ecophon®
SAINT-GOBAIN

A SOUND EFFECT ON PEOPLE

Ecophon dates back to 1958, when the first sound absorbers from glass wool were produced in Sweden to improve the acoustic working environment. Today the company is a global supplier of acoustic systems that contribute to good room acoustics and a healthy indoor environment with the focus on offices, education, health care and industrial manufacturing premises. Ecophon is part of the Saint-Gobain Group and has sales units and distributors in many countries.

Ecophon efforts are guided by a vision of earning global leadership in room acoustic comfort through sound-absorbing systems, enhancing end-user performance and wellbeing. Ecophon maintains an ongoing dialogue with government agencies, working environment organisations and research institutes, and is involved in formulating national standards in the field of room acoustics where Ecophon contributes to a better working environment wherever people work and communicate.

www.ecophon.com



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