

Concepts

Products

Service



Understanding sound.
With acoustic floors by Lindner.



Lindner

Building New Solutions

Building new solutions.

Lindner undertakes major projects worldwide in all areas of interior fit-out, insulation technology, industrial services and building facades. From pre-planning through to project completion Lindner is your partner of choice.

The Company's extensive manufacturing capability enables quality to be strictly maintained whilst allowing maximum flexibility to meet individual project requirements.

Environmental considerations are fundamental to all Lindner's business principles.

Through partnerships with clients Lindner turns concepts into reality.

Choosing Lindner you have:

Lindner Concepts:
Tailored solutions specifically geared to satisfy individual project requirements

Lindner Products:
Quality materials and systems to the very highest industry standards

Lindner Service:
Comprehensive project management services

Audible floor quality.

Lindner acoustic –
The new acoustic floor.

A sustainable acoustic solution you can build on:

- Impressive degree of absorption α_w of up to 0.75
- Carrier panel from “non-combustible” calcium sulphate
- Classified as emission-free and ecologically harmless
- Choice of suitable carpet
- Different types of the acoustic panels are compatible with each other and with other floor systems

Room acoustics are more than the regulation of sound. They define the quality of the building.

Seemingly low volumes of noise directly affect the human body and mind long before the ear is damaged. Permanent stress by high volume ambient noise causes strain to sensory perception. This can have impacts on health, including sleeplessness, high blood pressure and nervousness.

The acoustic design of offices can strongly influence personal wellbeing as well as motivation and productivity of all occupants. However, the interiors of many contemporary buildings are dominated by elegant but hard surfaces such as glass partitions and temperature-activated structural ceilings. In many cases, visible acoustic measures do not meet architectural demands. New solutions for the regulation of sound reflection have to be found. It makes sense that the available area of the raised floor is used for this purpose.

The new Lindner acoustic systems FLOOR and more® acoustic and NORTEC acoustic are the first ones to have been designed to suit these requirements. Thanks to their outstanding sound-absorption characteristics, they can be an integral part of the acoustic concept of a building.



Terms and basics for sound protection with Lindner acoustic floor systems.

Sound absorption – applications

Sound absorption is the most important element in the acoustic design of rooms. Absorbing and reflective surfaces determine the acoustic performance.

The requirements depend on the planned usage of the building and the conditions.

- room acoustic design (concert hall, theatre or auditorium)
- noise reduction (open office space, factory)
- regulation of the reverberation time (office, classroom, library)

Sound absorption

Sound absorption is the loss of sound energy within a given boundary. Objects such as walls of a room, people or items within it will absorb sound energy. The loss of sound energy is created when sound energy hits an object and the energy is converted into heat through friction (dissipation). Sound energy can also escape, such as through an open window (transmission).

Sound absorption α

The degree of sound absorbed by an object is shown as α . If an object or surface does not absorb sound a value of $\alpha = 0$ is shown. So $\alpha = 0$ means that there has been no absorption and 100 % of the original sound source was reflected back. With a value of $\alpha = 0.5$, 50 % of the original sound energy was absorbed and 50 % was reflected back. With a value of $\alpha = 1$, 100 % of the original sound source was absorbed without any reflections of sound back. Typical values are between $\alpha = 0.2$ and $\alpha = 0.8$ depending on the absorber. The measured value of sound absorption α also depends on the surface material and the frequency of the sound energy. The ratio between absorbed and reflected sound plays a key role in the perception of sound in a room to the human ear.

Rated degree of sound absorption α_w

The rated degree of sound absorption α_w according to DIN EN ISO 11654 is determined in reference to the measured values according to DIN EN ISO 354 for the five octaves and medium frequencies from 250 Hz

through to 4,000 Hz. A given reference curve is used and is shifted down in scale by 0.05 increments. The reference curve is gradually moved down by 0.05 to the point where the sum of the negative deviations from the measured values ≤ 0.10 . At this point the value which is reached at a frequency of 500 Hz corresponds to the value of α_w .

Form indicators

One or more form indicators have to be stated in brackets as a suffix to the value of α_w if a degree of sound absorption (absorber curve) exceeds the value of the shifted reference curve by 0.25 or more. Form indicators correspond to the following octave values:

L (low) = 250 Hz

M (medium) = 500 or 1,000 Hz

H (high) = 2,000 or 4,000 Hz

Frequency

The frequency is the number of oscillations per second. The unit is Hertz [Hz]. The frequency characterises the pitch. Octaves are used for the classification of the audible range in frequency intervals. 16 Hz – 20,000 Hz

Application	Frequency, f [Hz]
Hearing / music	20 ... 20,000
Talking / singing	200 ... 2,000
Room acoustics	100 ... 5,000

Excerpt of the DIN EN ISO 11654-B table B.1
Classification of sound absorbers

Sound absorption class acc. to DIN EN ISO	Requirements for the rated degree of sound absorption α_w
A	≥ 0.9
B	0.8 and 0.85
C	0.6 to 0.75
D	0.3 to 0.55
E	0.15 to 0.25
Not classified	≤ 0.1

System overview

Lindner acoustic floors

FLOOR and more[®] acoustic / NORTEC acoustic

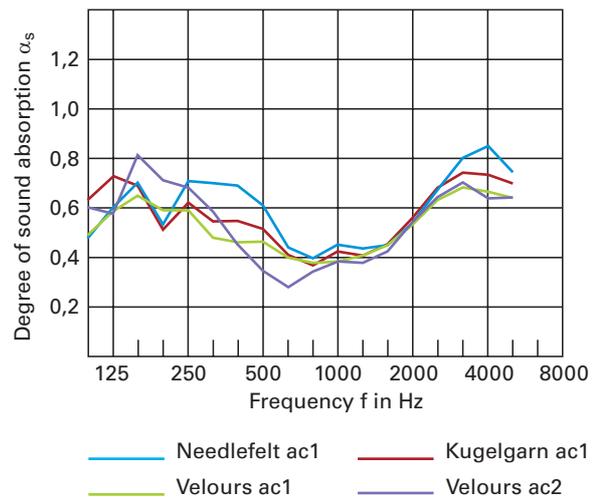
Variant 1

Acoustic-effective floor panel with appropriate floor covering

$\alpha_w = 0.45$ (LH)
Sound absorption class: D

System strengths

- Outstanding absorption performance in the low and high frequency range
- Seepage ventilation possible



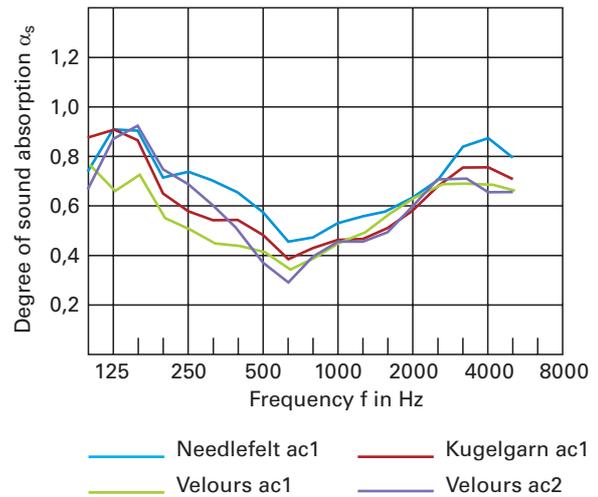
FLOOR and more[®] acoustic / NORTEC acoustic

Variant 2
Acoustic-effective floor panel with appropriate floor covering and cavity matting

$\alpha_w = 0.50$ (LH)
Sound absorption class: D

System strengths

- Outstanding absorption performance in the low and high frequency range
- Improvement on the amount of sound absorption compared to basic variant 1



System overview

Lindner acoustic floors

FLOOR and more[®] acoustic / NORTEC acoustic

Variant 3

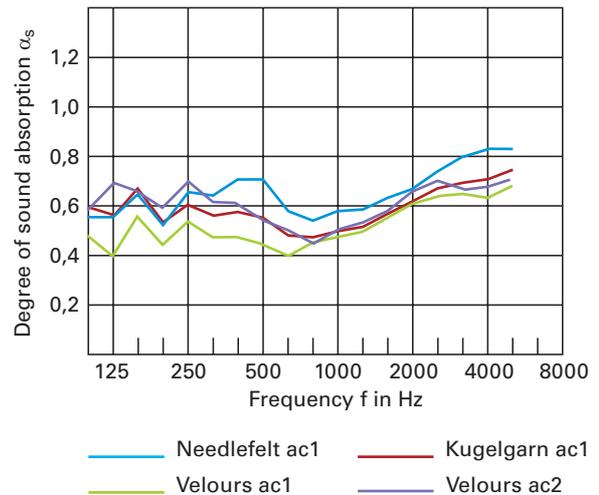
Acoustic-effective floor panel
with appropriate floor covering
and acoustic fleece

$\alpha_w = 0.55$ (LH)

Sound absorption class: D

System strengths

- Outstanding absorption performance in the broadband range
- No impairments with installations in the cavity



FLOOR and more[®] acoustic / NORTEC acoustic

Variant 4

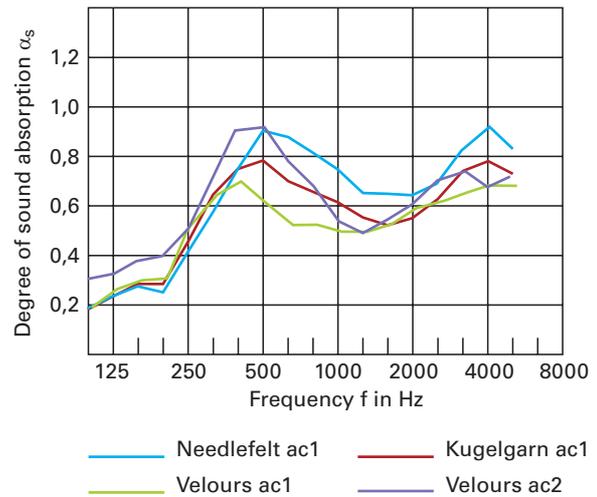
Acoustic-effective floor panel with appropriate floor covering and acoustic element

$$\alpha_w = 0.65$$

Sound absorption class: C

System strengths

- Good flanking level difference
- The use of the cavity as air duct is possible
- Excellent absorption in the frequency range of speech



Lindner floor systems FLOOR and more[®] and NORTEC: the best from the market leader.

We have a long tradition in producing floor systems and we offer the advantage of our years of experience, innovative products and the unique diversity of our product portfolio. This applies more than ever before to Lindner acoustic floors. The new systems for regulation of the room acoustics are designed on the basis of the established calcium sulphate systems, FLOOR and more[®] dry hollow floor and NORTEC raised access floor. Create long-term framework conditions for quiet and concentrated working with Lindner acoustic floors!

The FLOOR and more[®] dry hollow floor system with a smooth surface is perfectly suited for projects with a short construction programme and as a basis for broadloom carpet.

Benefits in construction:

- Quick to install
- Ready to use after 24 hours
- Void space for electric and computer installations
- Smooth surface



NORTEC raised floor panels give superb underfoot comfort. They are manufactured from calcium sulphate (gypsum), a material with superlative structural and physical properties.

High quality for your rooms:

- First class underfoot comfort
- Extreme strength
- Excellent building properties
- Highest quality from the fibre to the finished panel

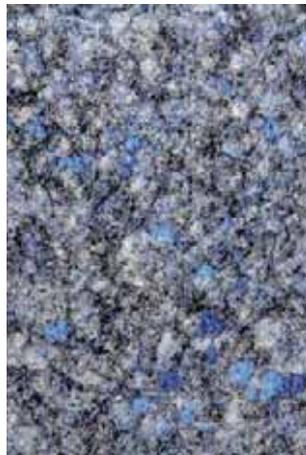


Always on top – coverings for Lindner acoustic floors.

The choice of suitable floor covering has a major impact on the atmosphere of a room and on the whole building. This applies in two ways with FLOOR and more® acoustic and NORTEC acoustic. Not only is the visual appearance determined by the floor covering but also the acoustic performance of the floor system will vary. We have chosen and tested a collection of qualified coverings for use on Lindner acoustic floors.



Needlefelt ac1



Kugelgarn ac1



Velours ac1



Velours ac2



Custom-made solutions from the test laboratory – for planning freedom.

Our strength is “Building new solutions.” For that reason, we have our own certified Lindner test laboratories, which are equipped with innovative simulation and measurement technology. Thanks to these facilities, we are able to test developments and products for a number of requirements very quickly. Our sound laboratory can test infinite options of choice of coverings. With a single test, you will receive reliable evidence of the absorption properties of the particular acoustic floor solution that you have chosen.

We can do it all for you.

Lindner Concepts:

- Insulation Engineering
- Clean Rooms and Laboratories
- Airports and Airlines
- Railways and Tunnels
- Studios and Concert Halls
- Interior Fit-out and Furnishings
- Cruise Liner and Ship Fit-out
- Hotels and Resorts
- General Contracting

Lindner Products:

- Facades
- Steel & Glass
- Roofing Systems
- Ceiling Systems
- Lights and Lighting Systems
- Partition Systems
- Doors
- Floor Systems
- Heating and Cooling Technologies
- Dry Lining Systems

Lindner Service:

- Green Building
- Deconstruction and Gutting
- Clearance of Harmful Substances
- Industrial Scaffolding
- Research and Development
- Delivery
- General Planning
- Installation
- Maintenance and Industrial Service
- Public-Private Partnership (PPP)

Lindner Group

Bahnhofstrasse 29
 94424 Arnstorf
 Germany
 Phone +49 (0)8723/20-36 82
 Fax +49 (0)8723/20-28 30
floorsystems@Lindner-Group.com
www.Lindner-Group.com