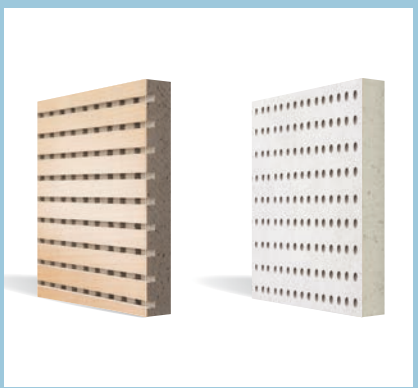
Drywall Systems

Tro171.de

Technical Brochure 03/2017



Room acoustics with Knauf Design

Content

Sound absorption – requirements on the insulating layer

System/product	Mineral wool DIN EN 13162 Thickness in mm	Length-related flow resistance in kPa-s/m²	Insulating layer Examples Knauf Insulation
Tro171.de Room acoustics with Knauf Design	40	≥ 5	e.g. partition wall insulating panel TP 115

Note	If requirements are placed on the fire behaviour of acoustic ceilings (e.g. non-flammable), this must be validated for all materials used, including any mineral wool inserted (bonded-in) as an acoustic layer.

Tested material

Board
Knauf DESIGNBOARD 230, 18 mm thick with acoustic nonwoven lining applied to the rear at the factory.

Insulating layer
Mineral wool acc. to DIN EN 13162, 40 mm thick, e.g. Knauf Insulation partition wall insulating board TP 115, length-related flow resistance acc. to DIN EN 29053 ≥ 5 kPa s/m².

Room acoustics with Knauf Design – application area

Whether a concert hall, classroom or sports hall – every room is different and imposes special requirements on its acoustic properties. It is good to have an experienced partner at your side who can support you with expertise and reliable products. A specialist like Knauf Design.

As part of the Knauf Group, we combine many years of expertise in producing highly compacted and non-flammable gypsum fibreboards with innovative surface finishing. The result: coated wall and ceiling boards which open up all kinds of design freedom, at the same time as ensuring first-class acoustic properties. Irrespective of whether the sound should be carried into the furthest corners or absorbed to the greatest possible extent.

Voilà: **DESIGNBOARD 230**. The coated gypsum fibreboards can be acoustically processed according to your needs. Starting with perforating or slotting, through to individual processing by means of a CNC program. For an exciting design with perfect results on the ear.

Room acoustics with Knauf Design – in harmony with the acoustics

Room acoustic measures are taken to ensure good auditory conditions for different uses (speech, music, theatrical performances, etc.) in various rooms.

Note	■ **Room geometry** Sound waves are reflected or absorbed on the boundary surfaces of a room. Room acoustic planning takes this into account: a skilful arrangement of absorbent and reflective surfaces in the room achieves the required acoustic properties and positively influences voice comprehension. ■ **Use** Knowing the planned use of the room is of elementary importance for precise acoustic planning. Whereas good voice comprehension is of primary importance in a lecture hall or classroom, the key feature in a music rehearsal room, on the other hand, is good audibility of the playing technique and the instruments. It is important to clarify the required use in advance. ■ **Sound absorption coefficient** Building materials, the interior and people possess a certain sound absorption. This is defined by the sound absorption coefficient α or the effective sound absorption surface. The characteristic values range between 0 (complete reflection) and 1 (complete sound absorption). By means of a targeted arrangement of absorbent and reflective materials, the required room acoustics

DESINGBOARD 230

Our coated gypsum fibreboards are, in terms of room acoustics, referred to as Helmholtz resonators. A pure Helmholtz resonator only absorbs effectively within a very narrow frequency band, as a result of which the sound absorption is significantly improved by applying a porous insulating material (acoustic nonwoven material and/or mineral fibre insulation) to the rear. **DESIGNBOARD 230** are thus very good wide-band absorbers and are outstandingly suitable to all applications areas.

Room acoustics with Knauf Design – planning data

This brochure lists the frequency-dependent absorption values of all acoustic systems from Knauf Design which are required for room acoustic forecasts, as a function of the hole pattern, design depth and insulating material lining.

As well as the values in tables, the graph curves are shown in a diagram to provide a rapid overview of the frequency-dependent absorption profile.

The characteristic value for planar objects is the practical sound absorbency between the octave frequencies from 125 Hz to 4000 Hz. In addition, the weighted sound absorption coefficient αw is specified as a single-digit value for the products, as well as the NRC (noise reduction coefficient). The process for calculating the weighted sound absorption coefficient is explained over the following pages. The American parameter NRC is obtained from the αs values as an arithmetic mean of the tertiary frequencies 250 Hz, 500 Hz, 1000 Hz and 2000 Hz, and rounded to 0.05.

The room acoustic quality of non-planar objects, i.e. objects for which it is not possible to determine an acoustically effective surface precisely, is not defined by means of an absorption coefficient, but the equivalent sound absorption surface. Accordingly, when selecting an absorber, it is necessary to consider whether the practical sound absorption coefficient or the equivalent sound absorption surface is specified.

For the majority of objects listed, the acoustic quality was determined according to a standardised test process by measurements in the echo chamber.

The results of the tests are summarised in a validation and can be requested from Knauf Design.

Sound absorption - sound absorption coefficient and verbal weighting acc. to VDI 3755

Sound absorption - sound absorption classes acc. to DIN EN ISO 11654

Weighted sound absorption coefficient α_w	Sound absorption class	Weighting
≥ 0.90	A	Highest absorbency
0.80 and 0.85	B	Highest absorbency
0.60 to 0.75	C	High absorbency
0.30 to 0.55	D	Absorbent
0.15 to 0.25	E	Low absorbency
≤ 0.10	F*	Reflective

**) Referred to in DIN EN ISO 11654 as "not classified"*

Definitions of the sound absorption coefficients based on DIN EN ISO 11654

The building materials and materials used in a room can be reverberant from an acoustic perspective, i.e. without any or with hardly any sound-absorbing properties. In this case, the weighted sound absorption coefficient αw is practically 0. Conversely, a material can be highly sound absorbent. If 100 % of the incident sound energy is absorbed, i.e. the sound energy is completely converted into thermal energy, the weighted sound absorption coefficient αw is practically 1.

Definitions

α_s refers to the values of the frequency-dependent sound absorption coefficient measured in the echo chamber in thirds. This is used for obtaining the practical sound absorption coefficient.

α_p are the values of the frequency-dependent, practical sound absorption coefficient of 3 thirds in each case. They are frequently used for frequency-dependent forecasts.

α_w is the weighted sound absorption coefficient. It is not dependent on frequency, and is specified as a single-digit value. The single-digit weighting is obtained according to the process described below.

Form indicators following the weighted sound absorption coefficient provide information about whether an absorbent material is particularly effective in the low, medium or high frequency range.

The following indicators are used in this case:

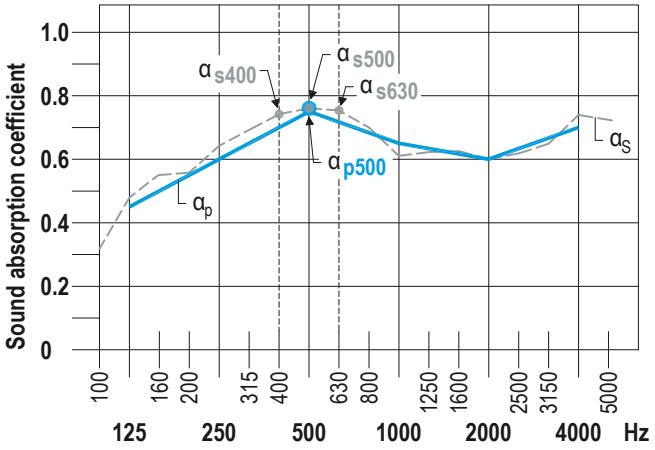
- L if the product is particularly effective in the low-frequency range, e.g. α_w = 0.60 (L)
- M if the product is particularly effective in the medium-frequency range, e.g. α_w = 0.70 (M)
- H if the product is particularly effective in the high-frequency range, e.g. α_w = 0.85 (H)
- Combinations are possible, e.g. α_w = 0.70 (MH)

1. Sound absorption coefficient α_p

α_S = **Sound absorption coefficient for tertiary bandwidth**
Frequency-dependent value of the sound absorption coefficient acc. to DIN EN ISO 354, measured in tertiary bands

α_p = **Practical sound absorption coefficient**
from α_S converted to octave bands
acc. to DIN EN ISO 11654

Example for 500 Hz: $\alpha_{p\,500} = \frac{\alpha_S 400 + \alpha_S 500 + \alpha_S 630}{3}$

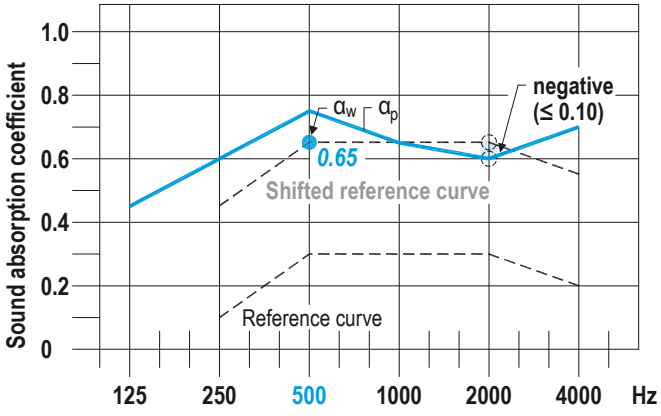


2. Weighted sound absorption coefficient α_w

α_w = **Weighted sound absorption coefficient**
acc. to DIN EN ISO 11654

= **Single-digit specification of the sound absorption coefficient**
obtained from a shifted reference curve (negative deviations ≤ 0.10) and intersection at 500 Hz acc. to DIN EN ISO 11654

Example:

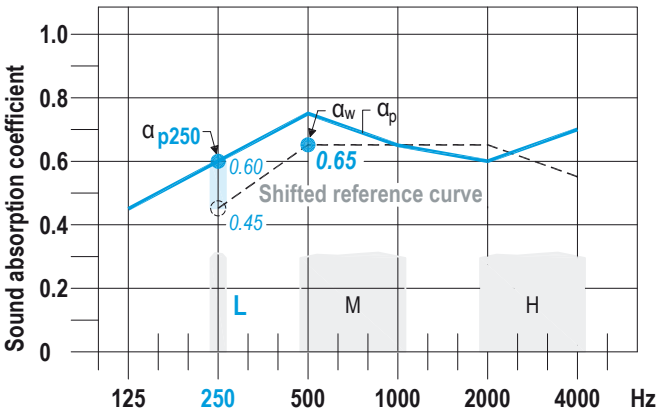


3. Shape indicators

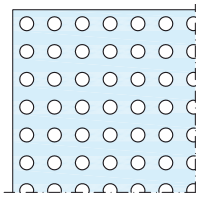
α_w with shape indicators = α_w (...)

if α_p for individual octave frequencies exceeds the reference curve by **≥ 0.25** then supplement:

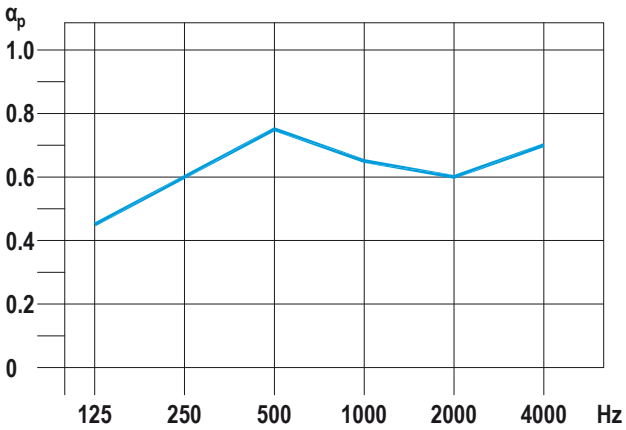
(L) at 250 Hz
(M) at 500 or 1000 Hz
(H) at 2000 or 4000 Hz



Example



Gerade Rundlochung 8/16
With acoustic nonwoven material
perforation proportion



Design depth 200 mm

α_p	0.45	0.60	0.75	0.65	0.60	0.70

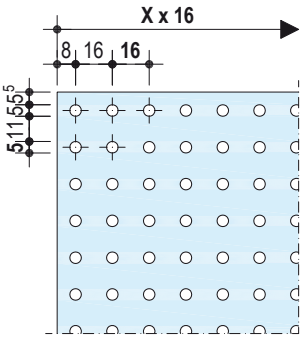
α_w **= 0.65** Highly absorbent

Design overview

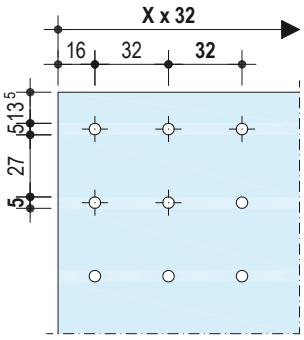
Continuous perforation

Design	Configuration	Perforation proportion (board) in %	Approx. board weight in kg/m²	
			With density 1100 kg/m³	With density 1500 kg/m³
Microperforation	1.5 / 8-4 M	5.4	18.7	25.5
Straight round perforation	5-16 R	7.5	18.3	25.0
	5-32 R	1.9	19.4	26.5
	6.5-16 R	12.7	17.3	23.6
	6.5-64 R	0.9	19.6	26.8
	8-16 R	19.2	16.0	21.8
	8-32 R	5.0	18.8	25.7
	8-64 R	1.3	19.5	26.6
	10-16 R	30.7	13.7	18.7
	10-32 R	7.8	18.3	24.9
	10-64 R	2.1	19.4	26.4
	12-32 R	11.2	17.6	24.0
	12-64 R	3.0	19.2	26.2
Slot	12-97 / 27.5 L	36.8	12.5	17.1
Straight slots	2-16 S	12.5	17.3	23.6
	3-16 S	18.8	16.1	21.9
	4-16 S	25.0	14.9	20.3
Front slots	2-16 F	12.5	17.3	23.6
	3-16 F	18.8	16.1	21.9
	4-16 F	25.0	14.9	20.3

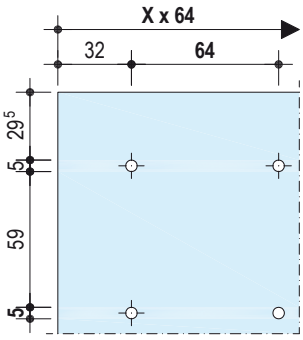
Straight round perforation R



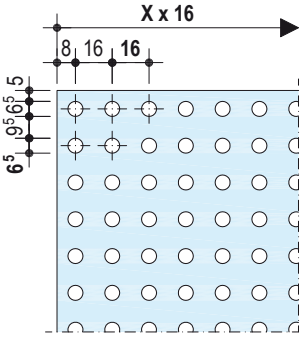
5/16 R



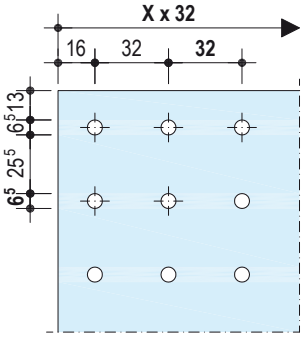
5/32 R



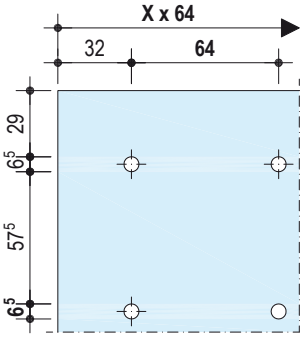
5/64 R*



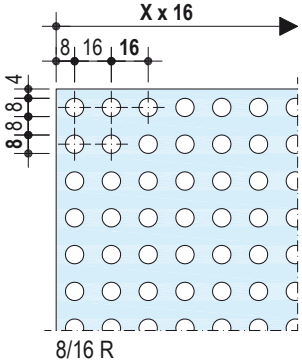
6.5/16 R



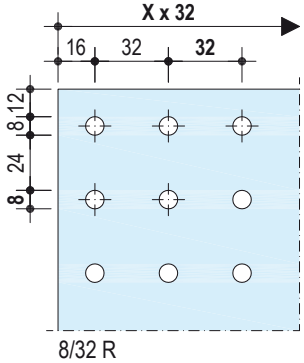
6.5/32 R*



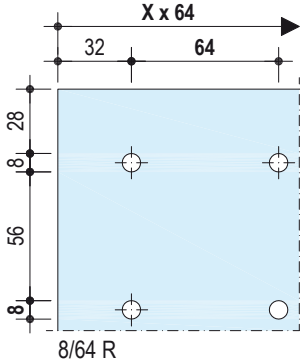
6.5/64 R



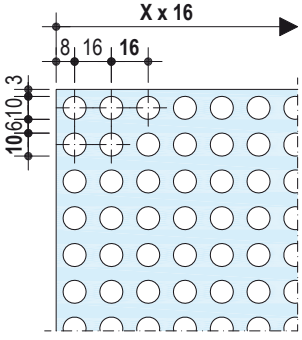
8/16 R



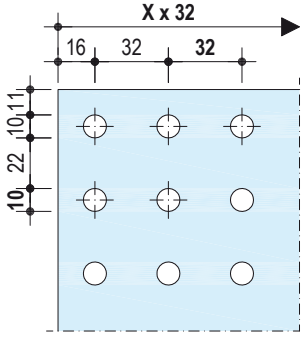
8/32 R



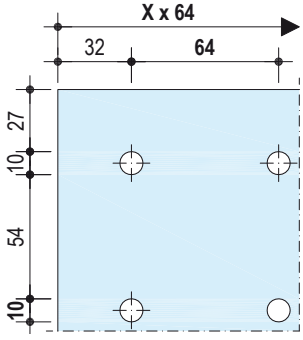
8/64 R



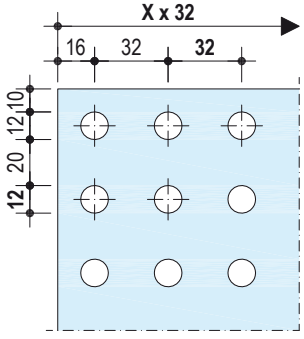
10/16 R



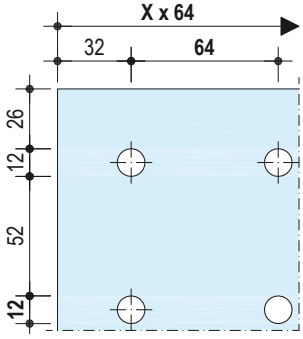
10/32 R



10/64 R



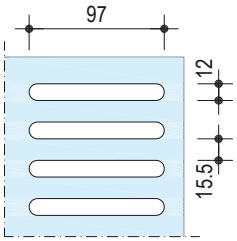
12/32 R



12/64 R

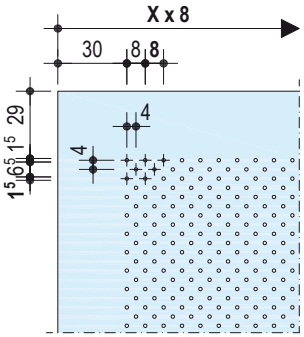
** Acoustic values on request*

Slot L



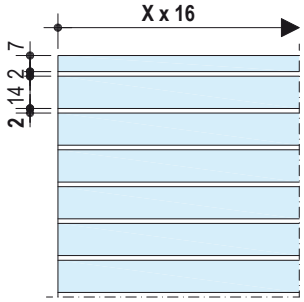
12-97 / 27.5 L

Microperforation M

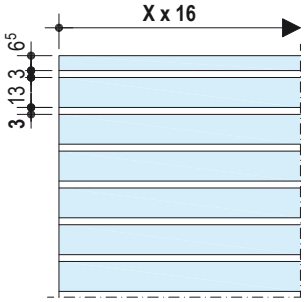


1.5 / 8-4 M

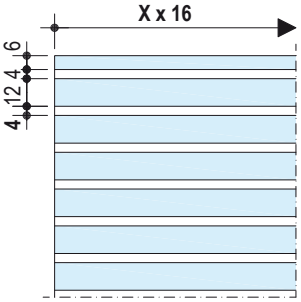
Front slots F or straight slots S



2-16 F / S

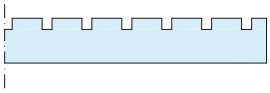


3-16 F / S

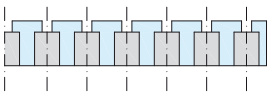


4-16 F / S

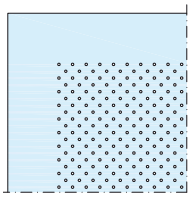
F - cross section without acoustic processing on the rear:

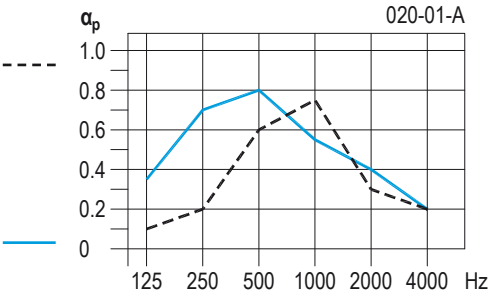


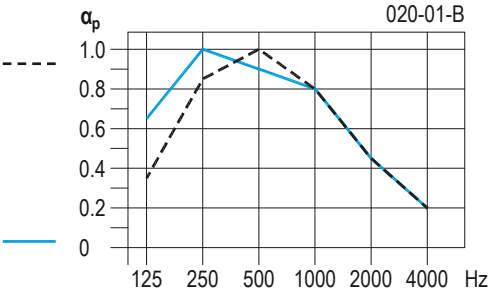
S - cross section with acoustic processing on the rear:



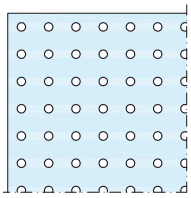
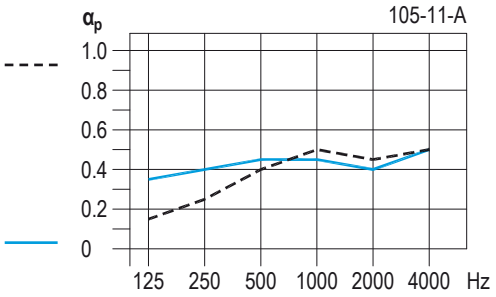
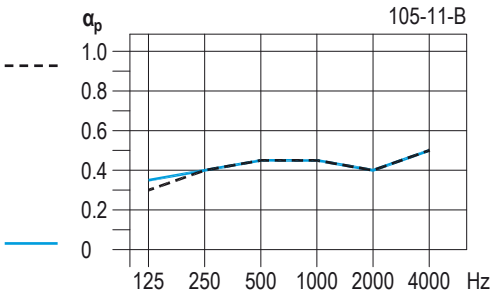
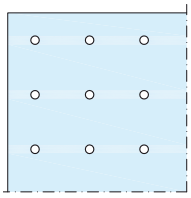
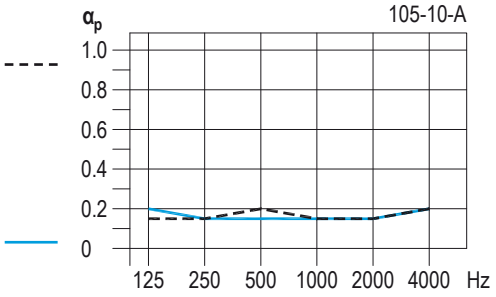
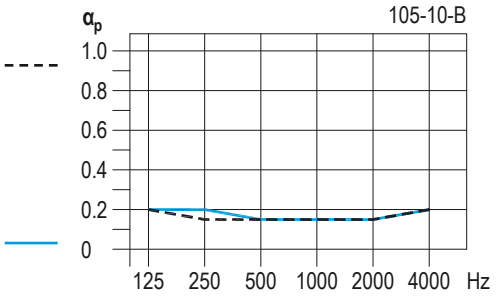
Microperforation M

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material									
	Without insulating layer								
Microperforation 1.5 / 8-4 M  Perforation proportion: 5.4 %	**65**	**0.45**	**0.35 (M)**	0.10	0.20	0.60	0.75	0.30	0.20
	200	**0.60**	**0.40 (LM)**	0.35	0.70	0.80	0.55	0.40	0.20
	With insulating layer (requirement on the insulating layer see page 3)								
	65	**0.80**	**0.40 (LM)**	0.35	0.85	1.00	0.80	0.45	0.20
	200	**0.80**	**0.40 (LM)**	0.65	1.00	0.90	0.80	0.45	0.20

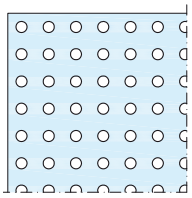
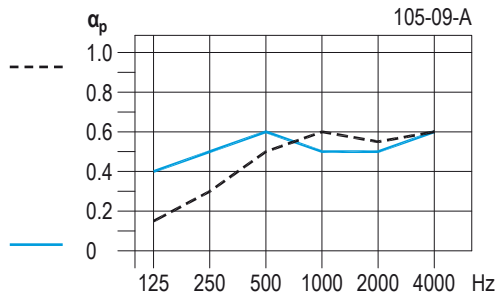
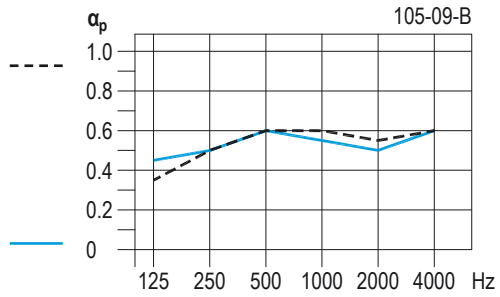
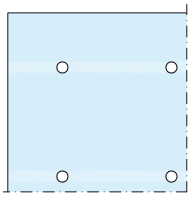
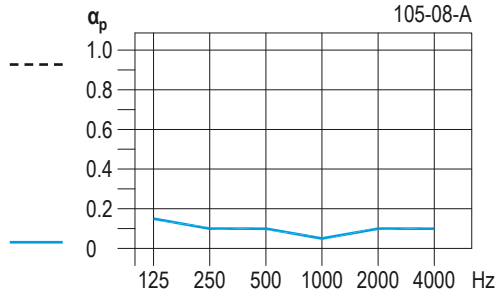
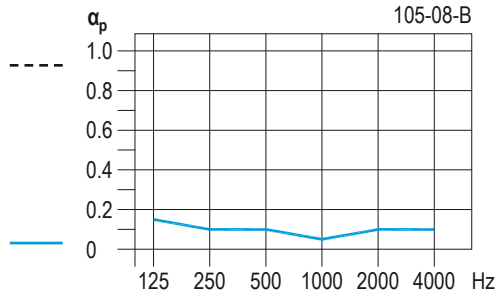




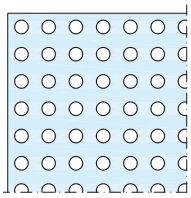
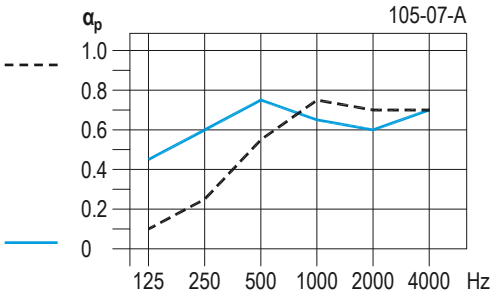
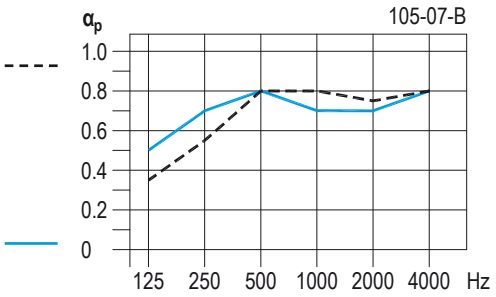
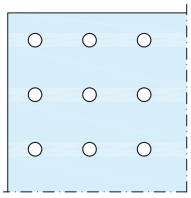
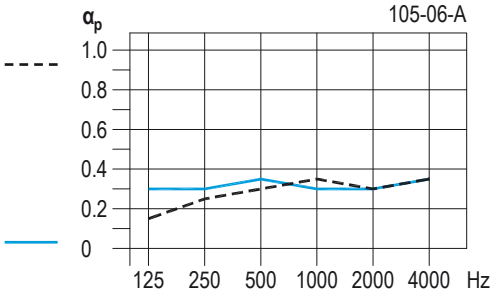
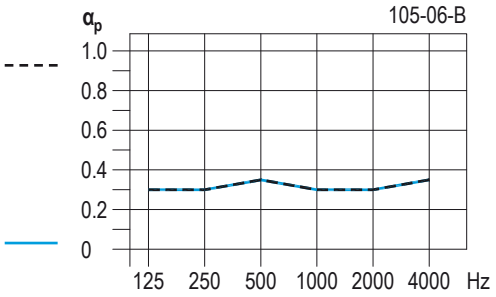
Straight round perforation R

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material										
	Without insulating layer									
Straight round perforation 5-16 R  Perforation proportion: 7.5 %	**65**	**0.40**	**0.45**	0.15	0.25	0.40	0.50	0.45	0.50	
	200	**0.40**	**0.45**	0.35	0.40	0.45	0.45	0.40	0.50	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.45**	**0.45**	0.30	0.40	0.45	0.45	0.40	0.50	
	200	**0.40**	**0.45**	0.35	0.40	0.45	0.45	0.40	0.50	
	Without insulating layer									
Straight round perforation 5-32 R  Perforation proportion: 1.9 %	**65**	**0.15**	**0.20**	0.15	0.15	0.20	0.15	0.15	0.20	
	200	**0.15**	**0.15**	0.20	0.15	0.15	0.15	0.15	0.20	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.15**	**0.15**	0.20	0.15	0.15	0.15	0.15	0.20	
	200	**0.15**	**0.15 (L)**	0.20	0.20	0.15	0.15	0.15	0.20	

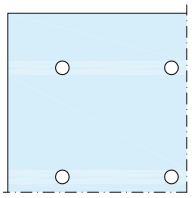
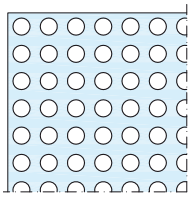
Straight round perforation R

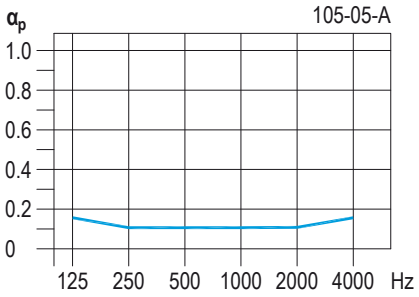
Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material										
	Without insulating layer									
Straight round perforation 6,5-16 R  Perforation proportion: 12.7 %	**65**	**0.50**	**0.55**	0.15	0.30	0.50	0.60	0.55	0.60	
	200	**0.55**	**0.55**	0.40	0.50	0.60	0.50	0.50	0.60	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.55**	**0.60**	0.35	0.50	0.60	0.60	0.55	0.60	
	200	**0.55**	**0.55**	0.45	0.50	0.60	0.55	0.50	0.60	
	Without insulating layer									
Straight round perforation 6,5-64 R  Perforation proportion: 0.9 %	**65**	–	–	–	–	–	–	–	–	
	200	**0.10**	**0.10**	0.15	0.10	0.10	0.05	0.10	0.10	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	–	–	–	–	–	–	–	–	
	200	**0.10**	**0.10**	0.15	0.10	0.10	0.05	0.10	0.10	

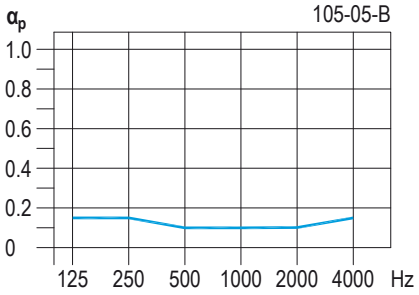
Straight round perforation R

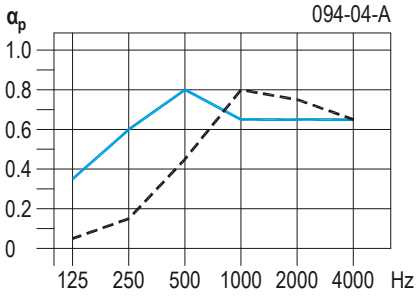
Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material										
	Without insulating layer									
Straight round perforation 8-16 R  Perforation proportion: 19.2 %	**65**	**0.55**	**0.55 (H)**	0.10	0.25	0.55	0.75	0.70	0.70	
	200	**0.65**	**0.65**	0.45	0.60	0.75	0.65	0.60	0.70	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.70**	**0.80**	0.35	0.55	0.80	0.80	0.75	0.80	
	200	**0.70**	**0.75**	0.50	0.70	0.80	0.70	0.70	0.80	
	Without insulating layer									
Straight round perforation 8-32 R  Perforation proportion: 5.0 %	**65**	**0.30**	**0.35**	0.15	0.25	0.30	0.35	0.30	0.35	
	200	**0.30**	**0.35**	0.30	0.30	0.35	0.30	0.30	0.35	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.30**	**0.35**	0.30	0.30	0.35	0.30	0.30	0.35	
	200	**0.30**	**0.35**	0.30	0.30	0.35	0.30	0.30	0.35	

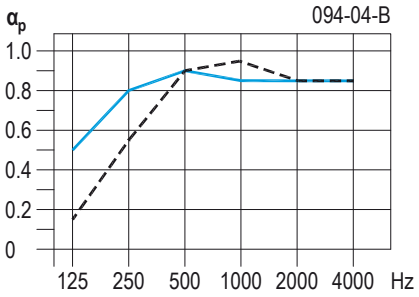
Straight round perforation R

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material										
	Without insulating layer									
Straight round perforation 8-64 R  Perforation proportion: 1.3 %	**65**	–	–	–	–	–	–	–	–	----
	200	**0.10**	**0.10**	0.15	0.10	0.10	0.10	0.10	0.15	——
	With insulating layer (requirement on the insulating layer see page 3)									
	65	–	–	–	–	–	–	–	–	----
	200	**0.10**	**0.10 (L)**	0.15	0.15	0.10	0.10	0.10	0.15	——
	Without insulating layer									
Straight round perforation 10-16 R  Perforation proportion: 30.7 %	**65**	**0.55**	**0.45 (MH)**	0.05	0.15	0.45	0.80	0.75	0.65	----
	200	**0.70**	**0.70**	0.35	0.60	0.80	0.65	0.65	0.65	——
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.80**	**0.85**	0.15	0.55	0.90	0.95	0.85	0.85	----
	200	**0.85**	**0.90**	0.50	0.80	0.90	0.85	0.85	0.85	——

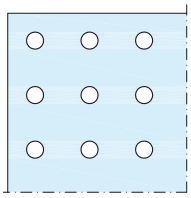
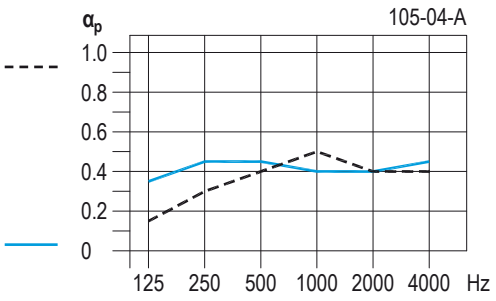
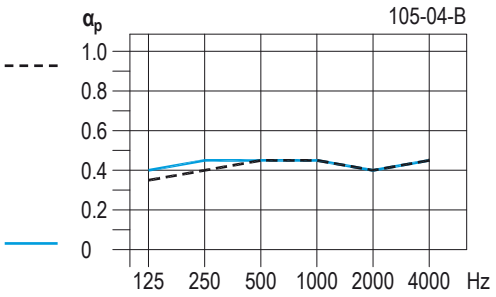
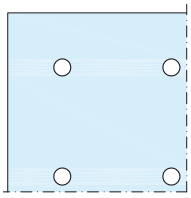
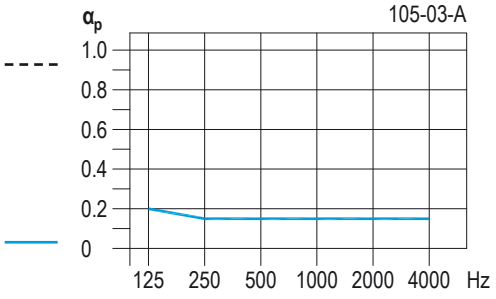
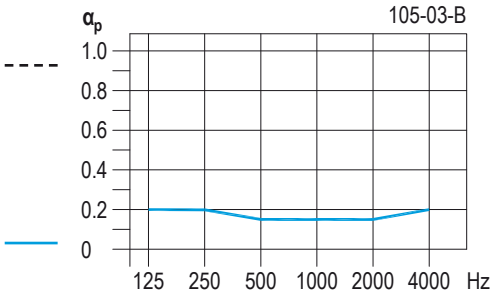




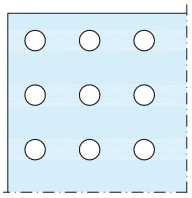
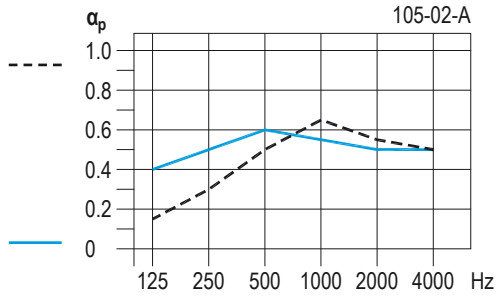
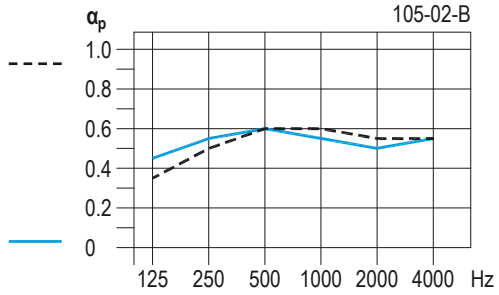
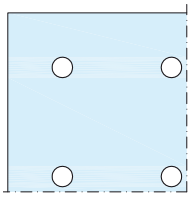
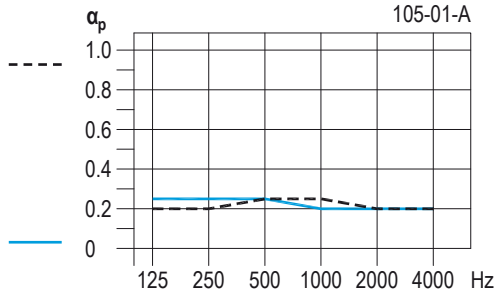
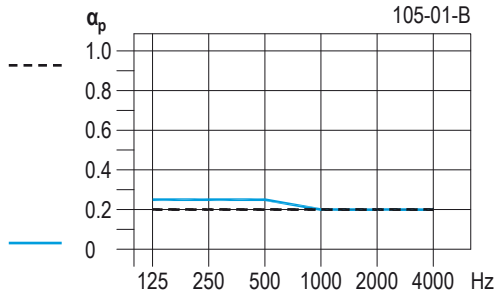




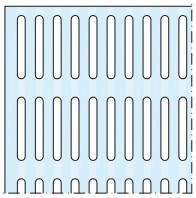
Straight round perforation R

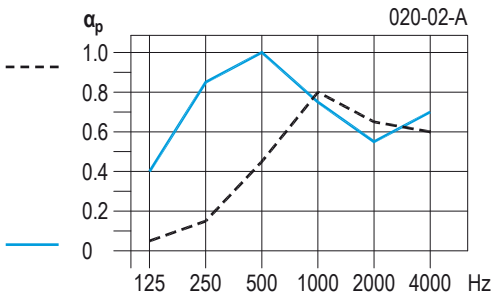
Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material										
	Without insulating layer									
Straight round perforation 10-32 R  Perforation proportion: 7.8 %	**65**	**0.40**	**0.45**	0.15	0.30	0.40	0.50	0.40	0.40	
	200	**0.40**	**0.45**	0.35	0.45	0.45	0.40	0.40	0.45	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.45**	**0.45**	0.35	0.40	0.45	0.45	0.40	0.45	
	200	**0.45**	**0.45**	0.40	0.45	0.45	0.45	0.40	0.45	
	Without insulating layer									
Straight round perforation 10-64 R  Perforation proportion: 2.1 %	**65**	**–**	**–**	–	–	–	–	–	–	
	200	**0.15**	**0.15**	0.20	0.15	0.15	0.15	0.15	0.15	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**–**	**–**	–	–	–	–	–	–	
	200	**0.15**	**0.15 (L)**	0.20	0.20	0.15	0.15	0.15	0.20	

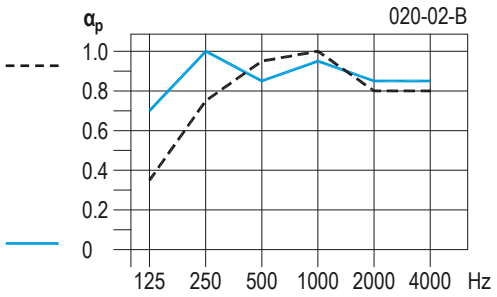
Straight round perforation R

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material										
	Without insulating layer									
Straight round perforation 12-32 R  Perforation proportion: 11.2 %	**65**	**0.50**	**0.55**	0.15	0.30	0.50	0.65	0.55	0.50	
	200	**0.55**	**0.55**	0.40	0.50	0.60	0.55	0.50	0.50	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.55**	**0.60**	0.35	0.50	0.60	0.60	0.55	0.55	
	200	**0.55**	**0.55**	0.45	0.55	0.60	0.55	0.50	0.55	
	Without insulating layer									
Straight round perforation 12-64 R  Perforation proportion: 3.0 %	**65**	**0.20**	**0.25**	0.20	0.20	0.25	0.25	0.20	0.20	
	200	**0.20**	**0.25**	0.25	0.25	0.25	0.20	0.20	0.20	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.20**	**0.20**	0.20	0.20	0.20	0.20	0.20	0.20	
	200	**0.20**	**0.25**	0.25	0.25	0.25	0.20	0.20	0.20	

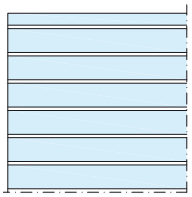
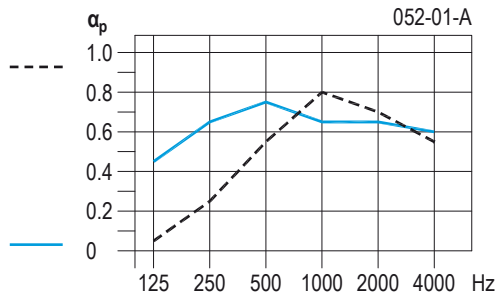
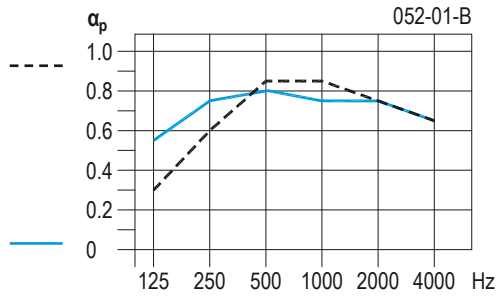
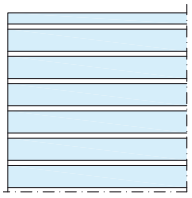
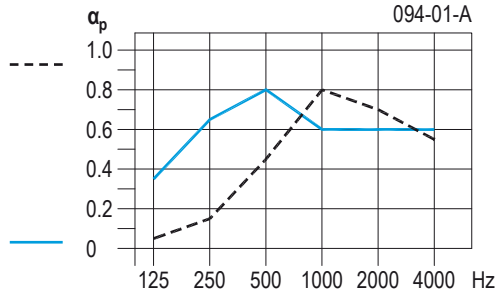
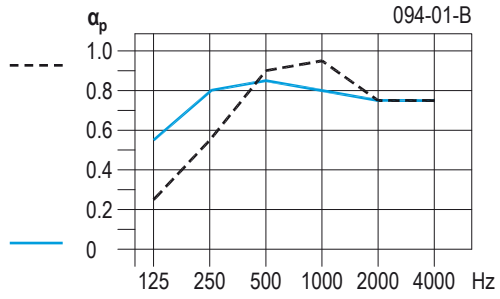
Slot L

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material									
	Without insulating layer								
Slot 12-97 / 27,5 L  Perforation proportion: 36.8 %	**65**	**0.50**	**0.45 (MH)**	0.05	0.15	0.45	0.80	0.65	0.60
	200	**0.80**	**0.65 (LM)**	0.40	0.85	1.00	0.75	0.55	0.70
	With insulating layer (requirement on the insulating layer see page 3)								
	65	**0.90**	**0.90**	0.35	0.75	0.95	1.00	0.80	0.80
	200	**0.90**	**0.90 (L)**	0.70	1.00	0.85	0.95	0.85	0.85

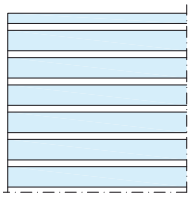


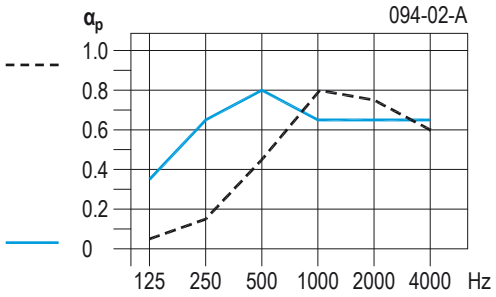


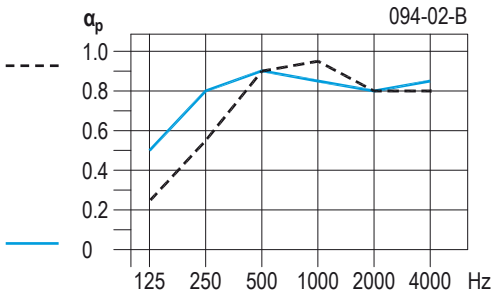
Straight slots S

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material										
	Without insulating layer									
Straight slots 2-16 S  Slot proportion: 12.5 %	**65**	**0.55**	**0.55 (M)**	0.05	0.25	0.55	0.80	0.70	0.55	
	200	**0.70**	**0.70**	0.45	0.65	0.75	0.65	0.65	0.60	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.75**	**0.85**	0.30	0.60	0.85	0.85	0.75	0.65	
	200	**0.75**	**0.75**	0.55	0.75	0.80	0.75	0.75	0.65	
	Without insulating layer									
Straight slots 3-16 S  Slot proportion: 18.8 %	**65**	**0.55**	**0.45 (MH)**	0.05	0.15	0.45	0.80	0.70	0.55	
	200	**0.80**	**0.80**	0.35	0.65	0.80	0.60	0.60	0.60	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.65**	**0.65**	0.25	0.55	0.90	0.95	0.75	0.75	
	200	**0.80**	**0.80**	0.55	0.80	0.85	0.80	0.75	0.75	

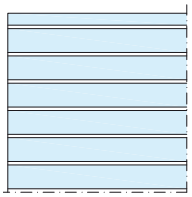
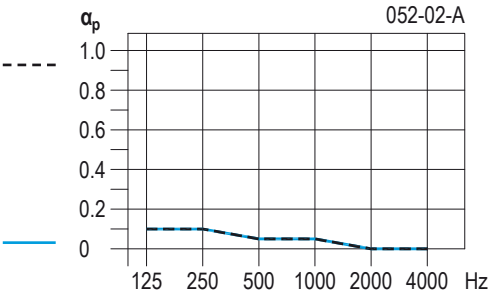
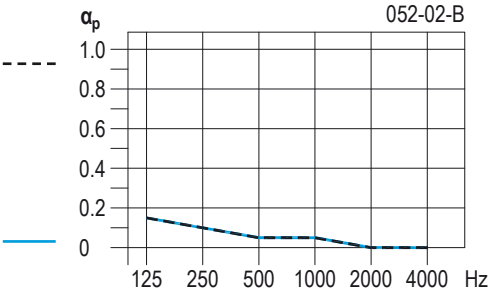
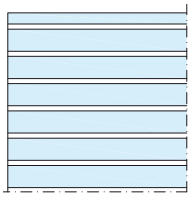
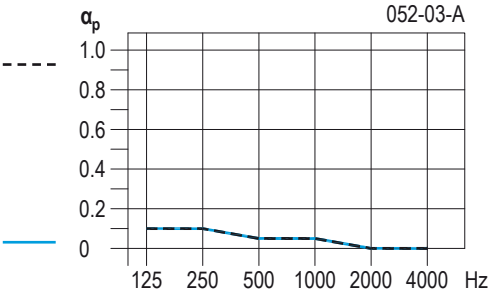
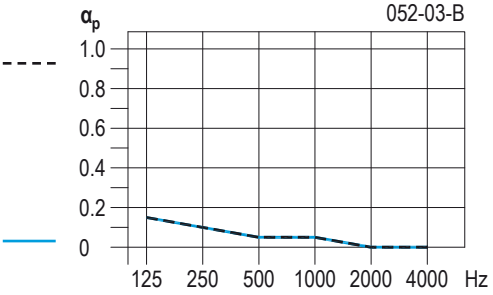
Straight slots S

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material									
	Without insulating layer								
Straight slots 4-16 S  Slot proportion: 25 %	**65**	**0.55**	**0.45 (MH)**	0.05	0.15	0.45	0.80	0.75	0.60
	200	**0.65**	**0.70**	0.35	0.65	0.80	0.65	0.65	0.65
	With insulating layer (requirement on the insulating layer see page 3)								
	65	**0.80**	**0.80**	0.25	0.55	0.90	0.95	0.80	0.80
	200	**0.85**	**0.85**	0.50	0.80	0.90	0.85	0.80	0.85

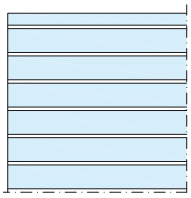


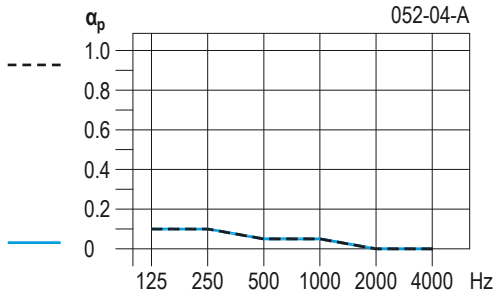


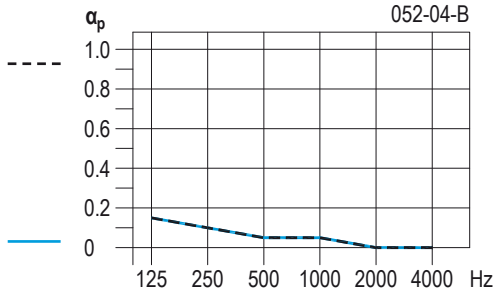
Front slots F

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz	
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material										
	Without insulating layer									
Front slots 2-16 F  Slot proportion: 12.5 %	**65**	**0.10**	**0.05**	0.10	0.10	0.05	0.05	0.00	0.00	
	200	**0.10**	**0.05**	0.10	0.10	0.05	0.05	0.00	0.00	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.10**	**0.05**	0.15	0.10	0.05	0.05	0.00	0.00	
	200	**0.10**	**0.05**	0.15	0.10	0.05	0.05	0.00	0.00	
	Without insulating layer									
Front slots 3-16 F  Slot proportion: 18.8 %	**65**	**0.10**	**0.05**	0.10	0.10	0.05	0.05	0.00	0.00	
	200	**0.10**	**0.05**	0.10	0.10	0.05	0.05	0.00	0.00	
	With insulating layer (requirement on the insulating layer see page 3)									
	65	**0.10**	**0.05**	0.15	0.10	0.05	0.05	0.00	0.00	
	200	**0.10**	**0.05**	0.15	0.10	0.05	0.05	0.00	0.00	

Front slots F

Hole pattern	Design depth in mm	NRC	α_w	Frequency-dependent absorption coefficient α_p 125 Hz	250 Hz	500 Hz	1000 Hz	2000 Hz	4000 Hz
Tro171.de Room acoustics with Knauf Design 18 mm Knauf Designboard with Knauf acoustic nonwoven material									
	Without insulating layer								
Front slots 4-16 F  Slot proportion: 25 %	**65**	**0.10**	**0.05**	0.10	0.10	0.05	0.05	0.00	0.00
	200	**0.10**	**0.05**	0.10	0.10	0.05	0.05	0.00	0.00
	With insulating layer (requirement on the insulating layer see page 3)								
	65	**0.10**	**0.05**	0.15	0.10	0.05	0.05	0.00	0.00
	200	**0.10**	**0.05**	0.15	0.10	0.05	0.05	0.00	0.00





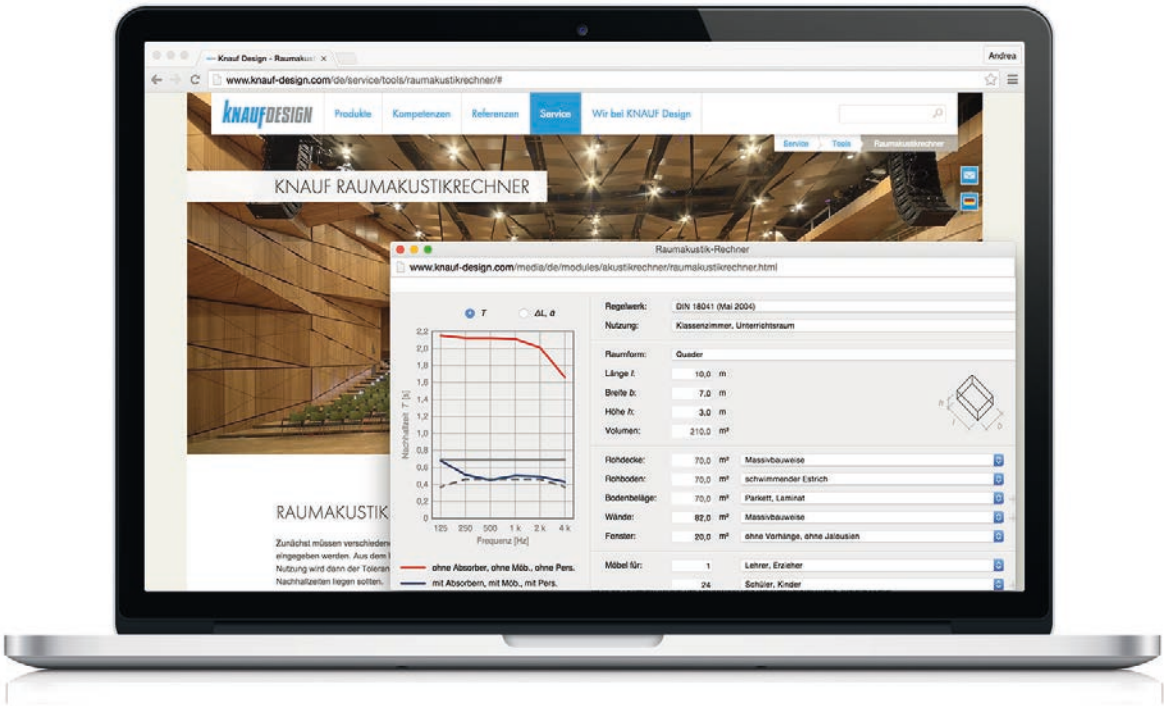
KNAUF ROOM ACOUSTIC CALCULATOR

Right from the beginning, our company philosophy has been to assist our customers as effectively as possible in their everyday work. As a result, not only do we develop our high-quality products, but also special tools which offer practical assistance. Take the room acoustic calculator, for example. This makes it possible to calculate echo times and conduct detailed room acoustic planning in the most straightforward way. A few entries for the room geometry, materials and use are sufficient, and the echo times will already be calculated. In this way, it can be seen at a glance whether the requirements of different standards are met, or if improvements are required in certain areas. Any changes to the input boxes are taken into account immediately, and the results of the calculation are automatically updated. And the best thing is: the data can be printed out as a PDF document at any time. Very handy, don't you think?

Note

You can test it now:

Simply scan the QR code or click the following link:
http://www.knauf-design.com/de/service/tools/raumakustikrechner/.

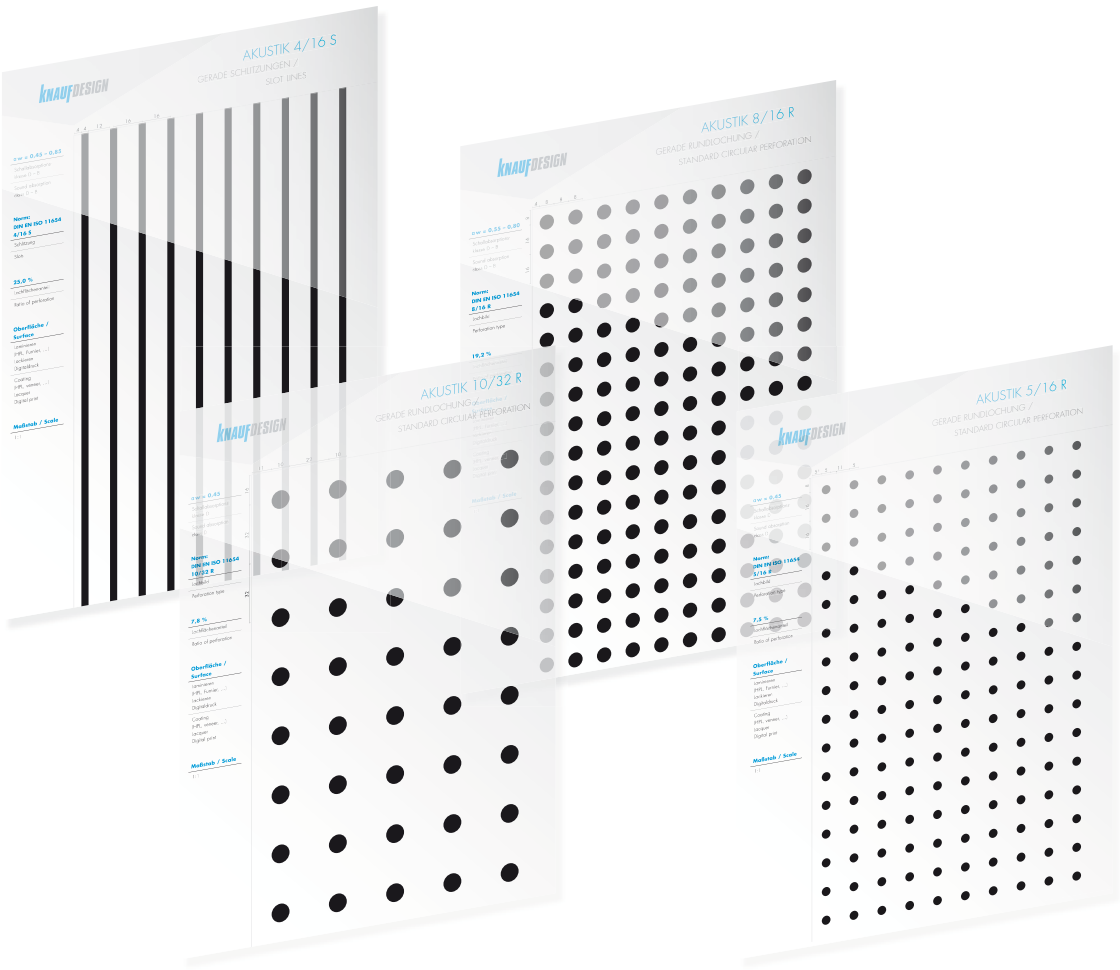


Acoustic template

Whether digitally printed, veneered or painted – coated gypsum fibreboards Knauf Design offer practically unlimited possibilities for surface configuration, and thus significantly determine the look of a room. If the boards are additionally slotted or perforated, not only does this influence the room acoustics, but also the design, it goes without saying.

This is the motivation for the Knauf Design acoustic templates which are now available: Transparent foils simply placed on our DESIGNBOARD 230, thereby simulating the required look. For a perfect first impression and greater certainty in planning.

Ask for them now by phoning +49 7904 9446810 or visiting www.knauf-design.com.



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Technical information

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