POLITECNICO DI MILANO





Room Acoustics Fundamentals

acoustic absorption, rating of sound absorption UNI EN ISO 11654

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1 Scope

1.1 This International Standard specifies a method by which the frequency-dependent values of the sound absorption coefficient can be converted into a single number. Before this is done, the one-third-octave band values of the sound absorption coefficient measured in accordance with ISO 354 are converted into octave bands.
In annex B a classification method, based on these single numbers, is given for information.

The single-number rating specified in this International Standard can be used to formulate requirements and to describe acoustical properties of sound-absorbing products to be used for routine applications in normal offices, corridors, class rooms, hospitals, etc. The rating is not appropriate when the products are to be used in qualified environments requiring careful acoustical design by expertise. In such cases, only complete sound absorption data as a function of frequency are satisfactory.

This International Standard is not applicable unless the applications cover the whole frequency range of the reference curve. If only a part of this range is of interest, it may be more appropriate to look for products with a good sound absorption within this range only. The shape indicators described in this International Standard give some guidance in identifying such products which may have a relatively low single number but a much higher potential if a more restricted frequency range is considered. Such products should be judged from the complete sound absorption curve.
As the rating curve in this International Standard has as a lower limit the 250 Hz octave band, the rating is not appropriate below this frequency. If such low frequencies are of interest, reference must be made to the complete sound absorption curve.
This International Standard is, in principle, applicable to all building products for which the sound absorption coefficient has been determined in accordance with ISO 354. It is, however, often not suitable for application to single items, such as chairs, baffles, etc., nor is it applicable to road barriers and road surfaces.

Definitions

practical sound absorption coefficient, α_p

Frequency-dependent value of the sound absorption coefficient which is based on measurements on one-third-octave bands in accordance with ISO 354 and which is calculated in octave bands in accordance with this International Standard.

Note 1 to entry: For the value in the i^{th} octave band, the notation α_{pi} is used.

$$\alpha_{pi} = \frac{(\alpha_{i1} + \alpha_{i2} + \alpha_{i3})}{3}$$

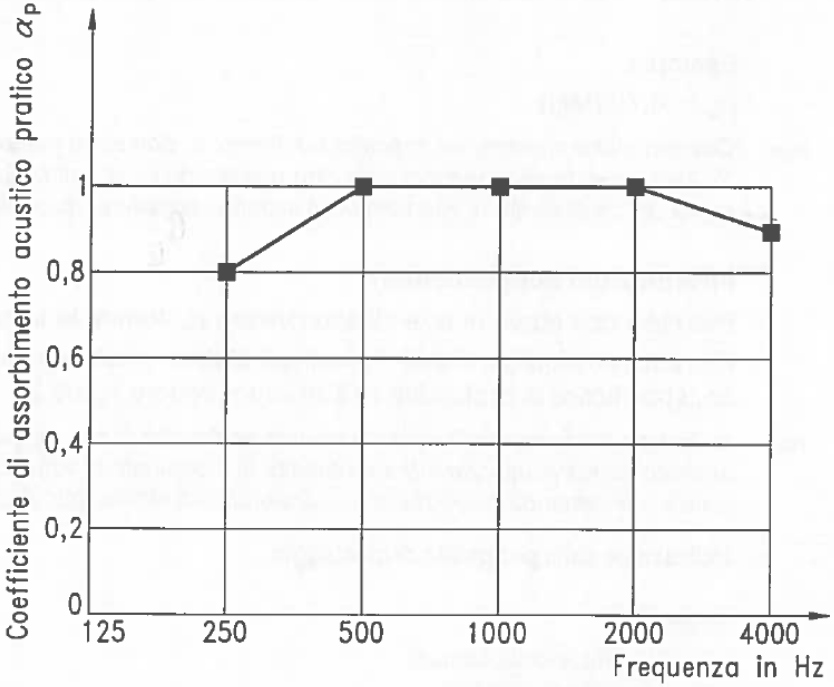
shape indicators, L, M, H

Indication showing practical sound absorption coefficients exceeding those of the shifted reference curve by 0,25 or more in different frequency ranges as specified in this International Standard.

Note 1 to entry: Negative deviations (values under the reference curve) are not considered as they are already maximized to 0,1 in the curve-shifting procedure.

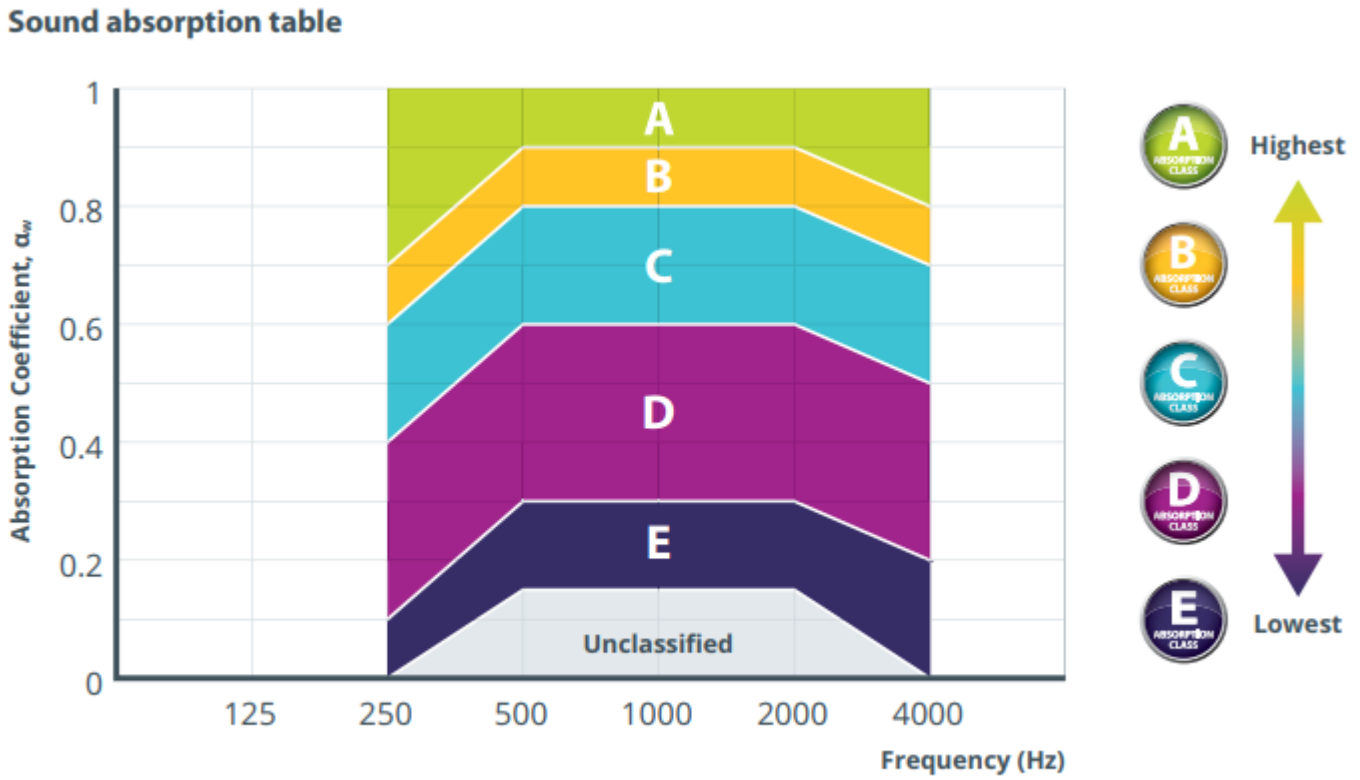
weighted sound absorption coefficient, α_w

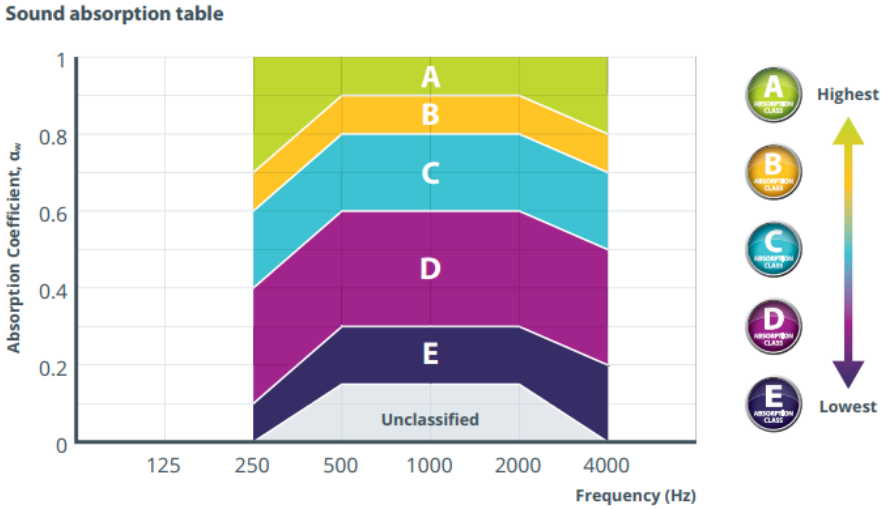
Single-number frequency-independent value which equals the value of the reference curve at 500 Hz after shifting it as specified in this International Standard.



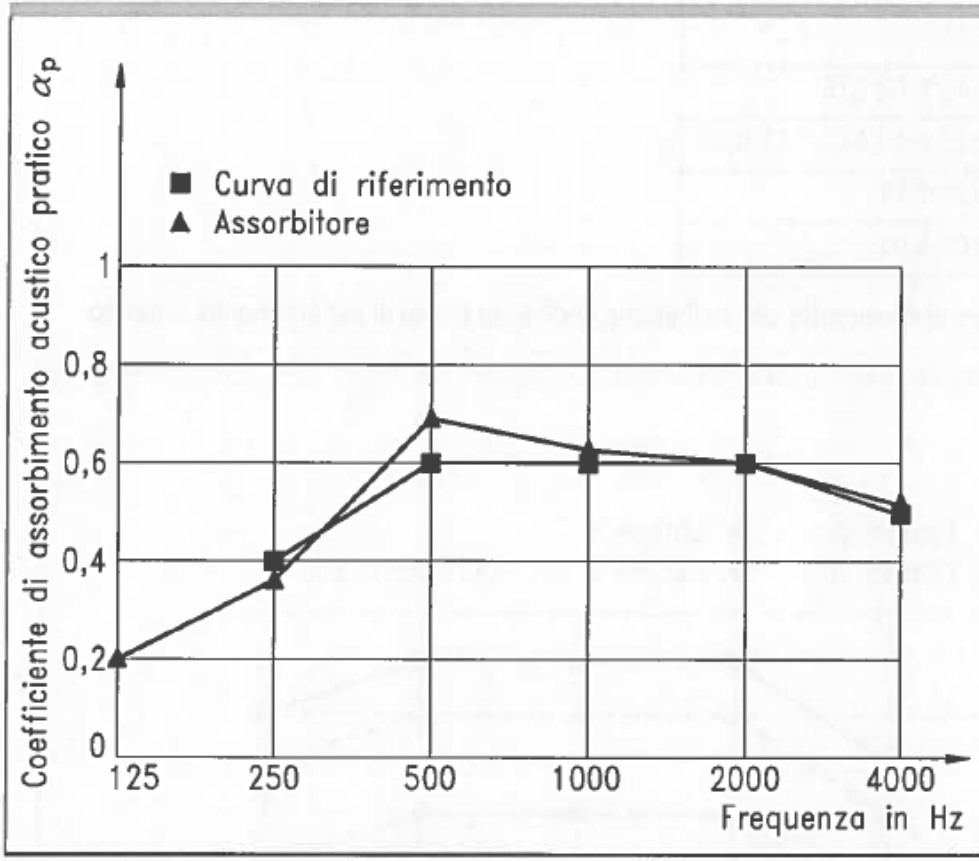
Frequenza	250 Hz	500 Hz	1 000 Hz	2 000 Hz	4 000 Hz
Valore	0,80	1,00	1,00	1,00	0,90

Curve traslation with steps of 0.05,
sum of unfavorable deviations less or equal to 0.10
The deviation is unfavorable when the mesured value is bigger than that of the curve





Absorption class	α_w
A	0,90; 0,95; 1,00
B	0,80; 0,85
C	0.60; 0.65; 0.70; 0.75;
D	0.30; 0.35; 0.40; 0.45; 0.50; 0.55;
E	0.52; 0.20; 0.15;
Non classificato	



Frequenza Hz	Curva di riferimento	Assorbitore
125		0,20
250	0,40	0,35
500	0,60	0,70
1 000	0,60	0,65
2 000	0,60	0,60
4 000	0,50	0,55

α_w=0.6

Exercise

Calcolate the **weighted sound absorption coefficient,** α_w for 4 different panels

The practical sound absorption coefficient, α_p is to be evaluated from the RT measurements on one-third-octave bands as requested by the ISO 354.

Room volume 260 m^3

Panel surface 12 m^2

m1= m2

$C_1=C_2=340$ m/s

Empy room		Panel 1	Panel 2	Panel 3	Panel 4
Frequency	RT	RT	RT	RT	RT
Hz	s	s	s	s	s
100	5,29	2,86	2,43	2,52	2,17
125	5,29	2,86	2,43	2,52	2,17
160	5,29	2,86	2,43	2,52	2,17
200	5,29	2,86	2,43	2,52	2,17
250	5,29	2,86	2,43	2,52	2,17
315	4,41	2,86	2,43	2,52	2,17
400	4,41	2,67	2,27	2,35	2,02
500	4,41	2,67	2,27	2,35	2,02
630	4,41	2,67	2,27	2,35	2,02
800	4,41	2,67	2,27	2,35	2,02
1.000	3,97	2,67	2,27	2,35	2,02
1.250	3,97	2,67	2,27	2,35	2,02
1.600	3,53	2,40	2,04	2,11	1,82
2.000	3,53	2,40	2,04	2,11	1,82
2.500	3,53	2,40	2,04	2,11	1,82
3.150	3,53	2,40	2,04	2,11	1,82
4.000	3,53	2,40	2,04	2,11	1,82
5.000	3,53	2,40	2,04	2,11	1,82