SOUNDPROOFING SOLUTIONS

FLANKSOUND PROJECT

SUPPLEMENT

rothoblaas


C

ACOUSTICS AND LIVING

Acoustic comfort in the living environment

SOUND OR NOISE?

Sound propagates in air as a pressure wave. When this pressure wave reaches our ear, the signal and is translated through a complex series of organs into a nervous stimulus and finally becomes the feeling of sound we experience everyday.

Noise is related to a subjective judgment of a listening experience; it is commonly defined as an unwanted sound that disturbs the performance of our standard living activities.

ACOUSTIC DESIGN OF BUILDINGS

Acoustic comfort can be achieved through the control of noise transmission; it is a key factor to guarantee a high quality living experience in our homes and offices.

This is why it is important to care about acoustics from the early stage of the design to the final realisation of the work, so that a good acoustic design can translate into the best living experience.

AIRBORNE AND STRUCTURE BORNE SOUND INSULATION

Sound transmission between a "source room" and a "receiving room" can be related to two kinds of excitation: airborne or structure-borne.

AIRBORNE EXCITATION

In the first case, a sound source generates a sound field inside the source room that induces a vibrational state into the wall that separates the rooms. The wall itself radiates sound energy into the receiving room. Annoying airborne sounds are for instance the television of the neighbours, people talking loud or traffic noise.

STRUCTURE-BORNE EXCITATION

Structure-borne sounds are generated by a mechanical excitation of the partition. The separating wall is excited for instance by an impact; the vibration propagates through the structure and is finally radiated in the receiving environment. A typical structure-borne sound is the noise of heels or furniture dragged on the floor.

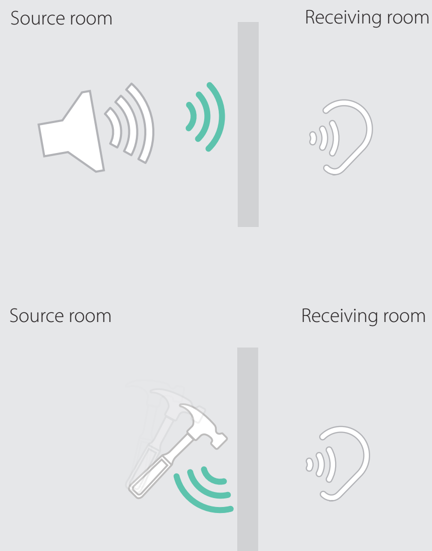


Figure 1.1 Airborne and structure-borne excitation.

In the acoustic design of a building, it is important to consider both kind of excitations as potential annoyance factors.

SOUND INSULATION AND ABSORPTION

ABSORPTION, TRANSMISSION AND REFLECTION

When a sound wave impinges on a partition, part of the sound power is reflected into the source room (W_r); part of it is transmitted into the receiving room (W_t) and a third component is absorbed by the wall (W_a). Thus the incident sound power can be expressed as:

$$W_i = W_r + W_t + W_a$$

The absorption, reflection and transmission coefficients (α, r, τ) are defined as the ratio between the absorbed, reflected and transmitted sound power to the incident sound power.

$$\alpha = W_a / W_i \qquad r = W_r / W_i \qquad \tau = W_t / W_i$$

Therefore the relation holds:

$$\alpha + r + \tau = 1$$

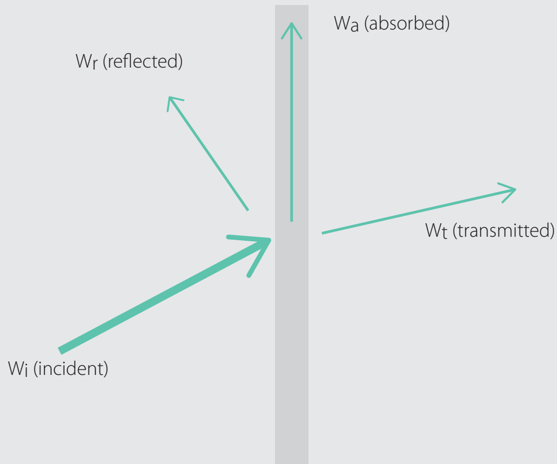


Figure 1.2 Absorption, reflection and transmission.

It is crucial to distinguish between two different concepts and interventions: sound insulation and sound absorption.

SOUND INSULATION

Sound insulation deals with the transmission of sound between adjacent rooms through the minimisation of τ.

SOUND ABSORPTION

Sound absorption aims at controlling the sound field inside a room by maximising α, i.e. decresing the energy content of multiple order reflections inside a room. Sound absorption in an enclosed space is closely related to the reverberation time of that room.

Figure 1.3 Sound insulation and sound absorption.

REVERBERATION TIME T_{60}

It is the time required by a stationary sound field to decay by 60 dB after the sound source has been switched off.
It can be estimated from Sabine's law:

$$T_{60} = 0.161 V/A$$

where V is the volume of the room (m^3) and A is the equivalent absoprion area (m^2), which can be obtained by multiplying each surface of the room S by its absorption coefficient α.

THE METRICS IN BUILDING ACOUSTICS

Building acoustics is a branch of acoustics that deals with the control of noise propagation in buildings. It specifically deals with the verification and optimisation of airborne sound insulation and impact sound insulation.

D. Normalised Level Difference

The normalised level difference D_n is the difference in the space and time average sound pressure level produced in two rooms corresponding to the reference equivalent absorption area in the receiving room.

$$D_n = L_1 - L_2 - 10 \log (A/A_0) \quad \text{(dB)}$$

where L_1 is the sound pressure leve in the source room (dB), L_2 is the sound pressure level in the receiving room (dB), A is the equivalent absorption area in the receiving room (m^2) and A_0 is a reference area of 1 m^2.
The level difference can be alternatively normalised with respect to the reverberation time of the receving room (Standardised Level Difference D_{nT}).

R. Sound Reduction Index

The Sound Reduction Index R (or Tranmsission Loss TL) is defined as minus 10 times the logarithmic ratio of the sound power transmitted into the receiving room to the sound power which is incident on the separating element. It is commonly determined from measurements as:

$$R = L_1 - L_2 + 10 \log (S/A) \quad \text{(dB)}$$

where L_1 is the sound pressure level in the source room (dB), L_2 is the sound pressure level in the receiving room (dB), S is the area of the separating element (m^2) and A is the equivalent absorption area in the receiving room (m^2).

L. Impact Sound Insulation

The normalised impact sound pressure level L_n is the impact sound pressure level measured in the receiving room L_i when a standardised tapping machine is active in the source room, corresponding to the reference equivalent absorption area in the receiving room.

$$L_n = L_i + 10 \log (A/A_0) \quad \text{(dB)}$$

The impact sound pressure level can be alternatively normalised with respect to the reverberation time of the receving room (standardised Impact Sound Insulation L_{nT}).

Each of these parameters is expressed as a frequency dependent quantity. To describe the behaviour of a partition with a single number, a special procedure is used (EN ISO 717 series) that relates the frequency behaviour to a reference curve. The weighted index takes the subscript W.

DIRECT AND FLANKING TRANSMISSION

IN SITU vs LABORATORY MEASUREMENTS

Sound insulation measurements return significantly different results when performed ***in situ*** or in certified laboratories. This is mainly due to two factors: first, when partitions are mounted in the laboratory, it is easier to control the quality of the installation. Second, ***in situ*** measurements are affected by the presence of flanking transmission paths.

LABORATORY MEASUREMENTS

In the laboratory, the test wall is installed in test chambers expressly designed for the purpose which are structurally decoupled one from the other. Therefore the laboratory measurements characterise the transmission through the separating wall only (direct transmission), which is generally referred to as **sound reduction index R.**

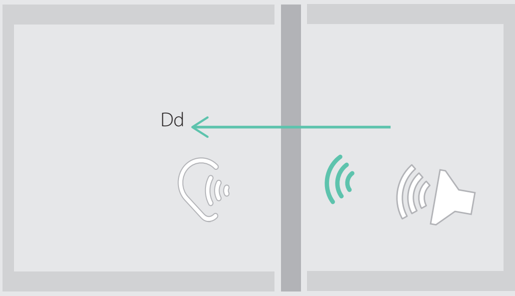


Figure 1.4 Laboratory measurement of the sound reduction index R: direct transmission path.

IN SITU MEASUREMENTS

When this quantity is measured ***in situ***, its value is smaller than the value measured in laboratory for the same wall. This occurs because the sound transmission between the rooms is characterised not only by the direct transmission but also by the flanking transmission, i.e. the contribution of the lateral walls to the propagation of sound into the receiving room.

NOTE: In Figure 1.1 and 1.2 "D" stands for direct while "F" stands for flanking.; capital letters represent the wall excited in the source room while lower case letters represent the wall that radiates sound into the receiving room. Thus the direct transmission path is identified as Dd, while for instance the transmission paths that involve the separating wall as source wall and the side walls as radiating walls in the receiving room are labelled Df.

FLANKING TRANSMISSION PATHS

When a sound source is switched on in the so-called "source room", sound induces a vibrational state into the separating wall. Part of the sound power is radiated directly into the receiving room by the wall itself (direct transmission, path Dd).
The separating wall transmits vibration also to the adjacent walls, which in turn radiate energy into the receiving room (path Df).

The sound source that excites the source room induces a vibrational state also in the side walls. From the side walls, sound energy can be radiated in to the receiving room through two other transmission paths: through the separating wall (Fd) or through the side walls of the receiving room (Ff), completing the first order transmission paths.

All these flanking quantities add up to the direct sound transmission and return to a lower value of sound insulation of the partition. When R is measured in situ, it is generally referred to as **apparent sound reduction index R'**.

The contribution of the flanking paths can be quite significant thus it is crucial for the acoustic designer to estimate properly the entity of the flanking transmission.

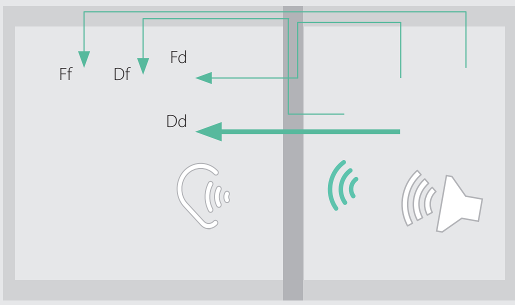


Figure 1.5 In situ measurement of the apparent sound reduction index R': direct and flanking transmission paths.

THE EN 12354 CALCULATION MODEL

The CEN models proposed in the EN 12354 series provide a powerful tool to predict the acoustic performance of a partition from the characteristics of the construction elements. The EN 12354 series is currently under revision and the updated version (2017) has been expanded to provide more exhaustive information relative to timber frame and CLT structures.

EN 12354-1
Airborne sound insulation between rooms

EN 12354-2
Impact sound insulation between rooms

APPARENT SOUND REDUCTION INDEX

The EN 12354 series provide two methods to calculate the acoustic performance of a partition: the detailed method and the simplified method. According to the simplified calculation model and disregarding the presence of small technical elements and airborne transmission paths, the apparent sound reduction index can be calculated as the logarithmic sum of the direct component R_{Dd} and the flanking transmission components R_{ij}.

$$R'_w = -10\log\left[10^{-\frac{R_{Dd,w}}{10}} + \sum_{i,j=1}^{n} 10^{-\frac{R_{ij,w}}{10}} + \frac{A_0}{S_s}\sum_{j=1}^{n} 10^{-\frac{D_{n,j,w}}{10}}\right](dB)$$

(Eq. 1)

where $R_{Dd,w}$ is the sound reduction index due to the direct transmission only and $R_{ij,w}$ is the sound reduction index due to flanking transmission. The flanking paths R_{ij} can be estimated as:

$$R_{ij,w} = \frac{R_{i,w}+R_{j,w}}{2} + \Delta R_{ij,w} + K_{ij} + 10\log\frac{S}{l_0 l_{ij}}\ (dB)$$

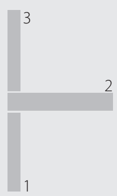
(Eq. 2)

where R_{ij} is the weighted flanking sound reduction index for transmission path i-j; R_i and R_j are the weighted sound reduction indices for the flanking elements i and j respectively; ΔR_i, ΔR_j are the sound reduction index improvements by additional layers for element i in the source room and/or element j in the receiving room; S is the area of the separating element and l_{ij} is the coupling length of the junction between separating elements and the flanking elements i and j, l_0 being the reference coupling length of 1 m.

Among the input parameters required by the model, the sound reduction indices can be easily reached from accredited laboratory measurements; several databases provide freely available certified data, and often the data are provided by the manufacturers of the partitions themselves.
The ΔR_{ij} can be estimated modelling of the system as a mass-spring-mass system (EN12354 annex D).

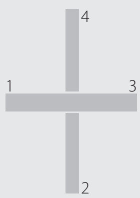
The most critical parameter to estimate is the **vibration reduction index K_{ij}.** This quantity is related to the structural coupling of the elements and represents the vibration energy damped by the junction, thus the highest K_{ij} generates the highest performance of the junction. The standard EN ISO 12354 provides some predictive estimates of two standard T and X junctions, which are reported to the right, but still few measured data are available.

JUNCTIONS FOR CLT ELEMENTS (EN 12354-1:2016)



$K_{13} = 22 + 3.3 \log f/f_k$

$K_{23} = 15 + 3.3 \log f/f_k$



$K_{13} = 10 - 3.3 \log f/f_k + 10\ M$

$K_{24} = 23 + 3.3 \log f/f_k$

$K_{14} = 18 + 3.3 \log f/f_k$

$f_k = 500$ Hz

$M = \log (m'_{perp,i} / m'_i)$

THE FLANKSOUND PROJECT

Determination of the flanking transmission in CLT buildings

EXPERIMENTAL MEASUREMENTS OF THE K_{ij} IN CLT JUNCTIONS

Therefore rothoblaas funded a measurement campaign aimed at measuring the vibration reduction index K_{ij} for a variety of junctions for CLT panels with the twofold aim of providing specific data suitable for the acoustic design of CLT buildings and to contribute to the development of the calculation method.

The vibration reduction index measurements have been conducted according to the EN ISO 10848 standard.

EN ISO 10848

L, T and X junctions were tested. CLT panels were provided by seven different manufacturers and therefore underwent different production processes, showing different characteristics - among all, the number and thickness of the lamellas, the side gluing of the lamellas, the vacuum gluing or the standard gluing. Different kinds of screws and connectors were tested, as well as different resilient interlayers at the wall-floor junction.

The test setup was arranged in the warehouse of the rothoblaas headquarters in Cortaccia (BZ).

PRODUCTS TESTED

- HBS partially threaded screws
- VGZ totally threaded screws
- TITAN N angle brackets
- TITAN F angle brackets
- WHT hold down
- XYLOFON resilient interlayer
- ALADIN STRIPE resilient interlayer
- CONSTRUCTION SEALING airtight profile

HIGHLIGHTS

- 7 different CLT manufacturers
- L, T, X vertical and horizontal junctions
- influence of kind and number of screws
- influence of kind and number of angle brackets
- influence of kind and number of hold-downs
- use of resilient interlayers

TEST SETUP

MEASUREMENT SETUP: EQUIPMENT AND DATA PROCESSING

The vibration reduction index K_{ij} is evaluated as:

$$K_{ij} = \frac{D_{v,ij} + D_{v,ji}}{2} + 10\log\frac{l_{ij}}{\sqrt{a_i\, a_j}}\ (dB)$$

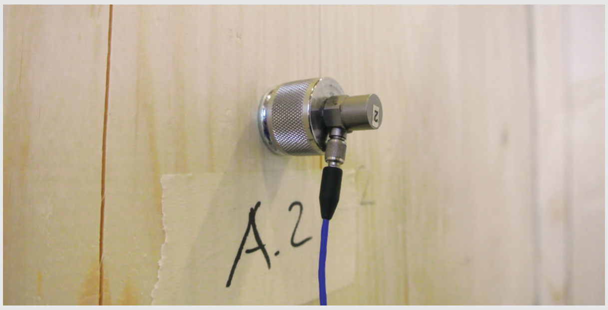
(Eq. 3)

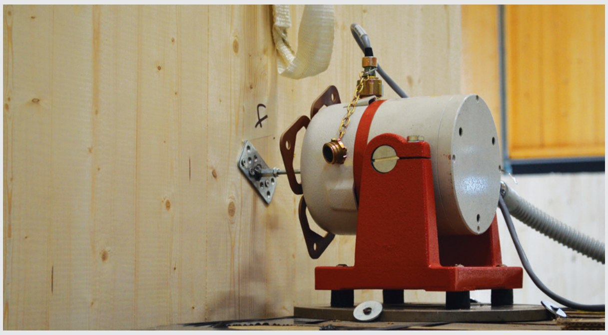
where $D_{v,ij}$ ($D_{v,ji}$) is the velocity level difference between elements i and j (j and i) when element i (j) is excited (dB), l_{ij} is the common element junction between elements i and j and a are the equivalent absorption lengths of elements i and j, expressed as a function of frequency f and of the structural reverberation time T_S:

$$a = \frac{2.2\pi^2\, S}{c_0\, T_s}\sqrt{\frac{f_{ref}}{f}}\ (m)$$

(Eq. 4)

The source consisted of an electrodynamic shaker with sinusoidal peak force of 200 N, which was mounted on a heavy-weight base and screwed to the CLT panels using a plate.





The velocity levels were measured using a pink noise source signal, filtered at 30 Hz in order to get reliable results from 50 Hz on. Structural reverberation times were calculated from impulse responses acquired using ESS test signals. The accelerometers were fixed to the panels using magnets. Eyelets were screwed to the panels with screws whose length was at least half of the thickness of the panels, in order to reach the innermost layer of lamellas. The vibration reduction indices are reported in the one-third of octave bands ranging from 100 to 3150 Hz, together with the value averaged over the one-third octave bands from 200 to 1250 Hz.

THE SIMPLIFIED METHOD

A calculation example using the EN 12354

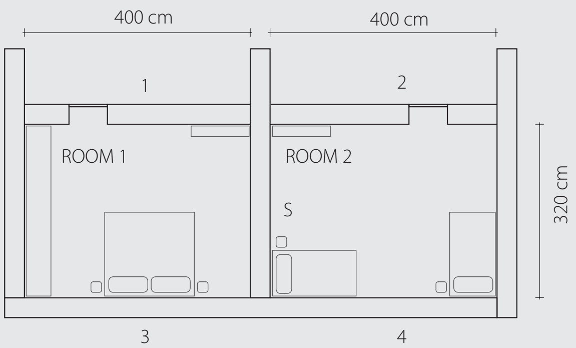
INPUT DATA

As anticipated, the EN 12354 series provide two methods to calculate the acoustic performance of a partition: the detailed method and the simplified method.
The simplified calculation model predicts the weighted apparent sound reduction index on the basis of the weighted sound reduction indices of the elements involved. In the following, a calculation example evaluated the apparend sound reduction index between two adjacent rooms.

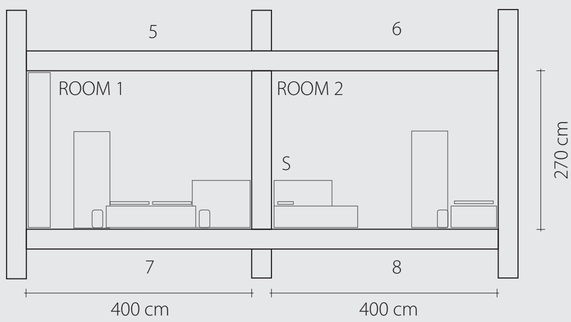
In order to determine the acoustic performance of a partition from the acoustic performance of its components, it is important to determine:

- The geometry of the partition (S)
- The acoustic properties of the partition (R_W)
- The coupling between structural elements (K_{ij})
- The characteristics of each layer composing the partition

PLAN



SECTION



CHARACTERISATION OF THE PARTITIONS

SEPARATING WALL (S)

25 mm	gypsum plasterboard
50 mm	mineral wool
75 mm	CLT
50 mm	mineral wool
25 mm	gypsum plasterboard

EXTERNAL WALLS (3, 4)

6 mm	plaster
60 mm	wood fibre insulation board
160 mm	mineral wool
90 mm	CLT
70 mm	spruce wood battens
50 mm	mineral wool
15 mm	gypsum plasterboard

FLOORS (5, 6, 7, 8)

70 mm	cement screed
0.2 mm	PE membrane
30 mm	soft impact sound insulation
50 mm	backfill (loose)
140 mm	CLT panels
60 mm	mineral wool
15 mm	plasterboard

INTERNAL WALLS (1)

12.5 mm	gypsum fire board
78 mm	CLT
12.5 mm	gypsum fire board

INTERNAL WALLS (2)

75 mm	CLT
50 mm	mineral wool
25 mm	gypsum plasterboard

The data relative to the acoustic characterisation of the partitions were retrieved from the DataHolz database (www.dataholz.com).

ACOUSTIC DESIGN STEP BY STEP

Flanksound catalogue: how to use it

CALCULATION OF THE DIRECT AND FLANKING COMPONENTS

The apparent sound reduction index is given from the contribution of the direct component and the flanking transmission paths (Eq. 1). Since only first order propagation systems are considered, for each i-j combination of walls there are three paths to be considered, for a total of 12 R_{ij} evaluated according to Eq. 2.

1. ACOUSTIC CHARACTERISTICS OF THE PARTITIONS

Transmission path	S (m^2)	R_w (dB)	m' (kg/m^2)
S (separating wall)	8.64	53	69
1	10.8	38	68
2	10.8	49	57
3	10.8	55	94
4	10.8	55	94
5	12.8	63	268
6	12.8	63	268
7	12.8	63	268
8	12.8	63	268

Table 1.1 Geometrical and acoustical characteristics of the partitions.

2. CHARACTERISATION OF THE JUNCTIONS

JUNCTION 1-2-S X junction
detail 11 (page 21)

JUNCTION 3-4-S T junction
detail 5 (page 18)

JUNCTION 5-6-S X junction with soundproofing profile,
detail 42 (page 36)

JUNCTION 7-8-S X junction with soundproofing profile,
detail 42 (page 36)

3. CALCULATION OF THE R_{ij}

Transmission path	R_{ij} (dB)
1-S	**60**
3-S	**68**
5-S	**83**
7-S	**75**
S-2	**66**
S-4	**68**
S-6	**83**
S-8	**75**
1-2	**64**
3-4	**77**
5-6	**75**
7-8	**75**

Table 1.2 Evaluation of the flanking transmission paths.

4. DETERMINATION OF THE APPARENT SOUND REDUCTION INDEX

Though the sound insulation for direct transmission only would provide a R_W of 53 dB, considering the flanking transmission, R'_W goes down to 51 dB.

The simplified model has the unquestioned advantage of providing an easy-to-use tool to predict the sound insulation. On the other side, its application is quite critical for CLT structures because the damping of each structural element is strongly affected by the assembly and should deserve a dedicated modelling. Moreover, CLT panels provide poor insulation at low frequencies, thus the use of frequency weighted indices might return results which lack of representativeness of the real behaviour in the low frequency region. Therefore the use of the detailed method is strongly suggested.

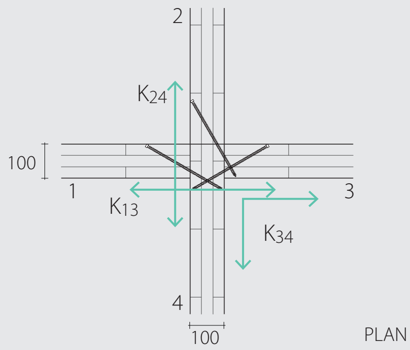
$R_W = 53$ dB $R'_W = 51$ dB

EXPRESSION OF THE RESULTS

Flanksound catalogue: notes

EXPERIMENTAL MEASUREMENTS OF THE K_{ij} IN CLT JUNCTIONS

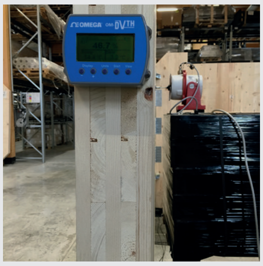
The following pages report the results of the measurement campaign for a selection of junctions. For each junction, the vibration reduction indices relative to the transmission paths involved are reported in1/3 octave bands in the range 100- 3150 Hz. Moreover, the K_{ij} is also averaged in the frequency range 200-1250 Hz; these values can be used as inputs when using the simplified method reported in the EN 12354, being careful and aware of the limitations of the use of such method.



Most of the data were directly measured. The results reported here are not often the result of one measurement only, but the average over sets of measurements performed with the same fixing systems.

One example is given by the vertical X junctions reported to the left. It has been observed that there are slight differences between transmission paths 1-2 and 2-3 due to the fact that the screws that are fixed into panel 2 reach panel 3 too. Anyway, given the uncertainties related to the installation (which can be hardly controlled ***in situ***), an average value between the transmission paths 1-2 (K_{12}) and 2-3 (K_{23}) is given in this catalogue.

Another example can be related to the analysis of different CLT manufacturers. Given the great difference of K_{ij} values measured in configurations with the same nominal fastening system but diffferent CLT manufacturers, in this catalogue the values which are provided represent the average value of each configuration.



This choice has been done in order to return stable data that can take into account mounting tolerances and other variability factors, the aim of the catalogue being the development of a powerful tool for the acoustic design of buildings. For a detailed discussion about the results, please refer to the references reported at the end of the page.

LEGEND

Data calculated starting from the measurements

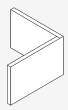
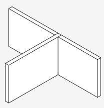
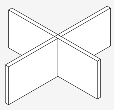
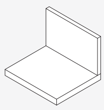
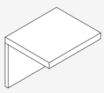
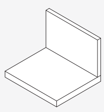
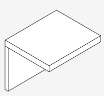
Additional configurations tested for acoustical purposes, with small structural relevance

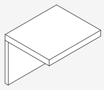
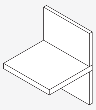
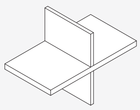
FOR FURTHER INFORMATION

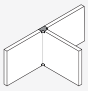
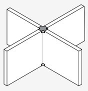
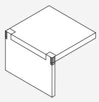
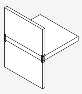
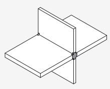
- A. Speranza, L. Barbaresi, F. Morandi, " *Experimental analysis of flanking transmission of different connection systems for CLT panels* " in Proceedings of the World Conference on Timber Engineering 2016, Vienna, August 2016.
- L. Barbaresi, F. Morandi, M. Garai, A. Speranza, " *Experimental measurements of flanking transmission in CLT structures* " in Proceedings of the International Congress on Acoustics 2016, Buenos Aires, September 2016.

SYNOPTIC TABLE

A brief summary of the tested configurations

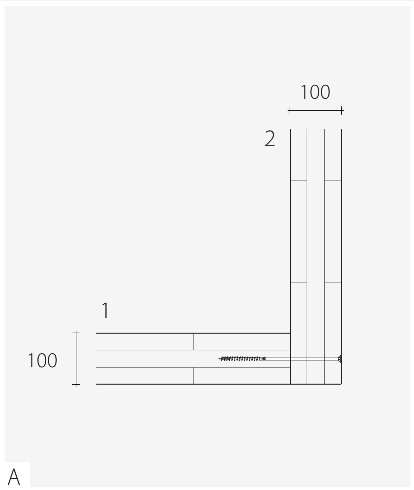
			FIXING SYSTEM					SOUNDPROOFING SOLUTION			
		DETAIL	HBS	VGZ	WHT	TITAN	LVB	CONSTRUCTION SEALING	XYLOFON	ALADIN STRIPE	TITAN SILENT
WALL - WALL JUNCTIONS		1	Ø8 x 240 step 200	-	-	-	-	-	-	-	-
		2	Ø8 x 240 step 400	-	-	-	-	-	-	-	-
		3	-	Ø7 x 260 step 600	-	-	-	-	-	-	-
		4	-	Ø9 x 400 step 300	-	-	-	-	-	-	-
		5	Ø8 x 240 step 400	-	-	-	-	-	-	-	-
		6	Ø8 x 240 step 400	-	-	-	-	●	-	-	-
		7	-	Ø7 x 260 step 400	-	-	-	-	-	-	-
		8	-	Ø7 x 260 step 400	-	-	-	●	-	-	-
		9	Ø8 x 240 step 400	-	-	TTF200 step 600	-	-	-	-	-
		10	-	Ø7 x 260 step 600	-	TTF200 step 600	-	-	-	-	-
		11	Ø8 x 240 step 400	-	-	-	-	-	-	-	-
		12	Ø8 x 240 step 400	-	-	-	-	●	-	-	-
		13	-	Ø7 x 260 step 400	-	-	-	-	-	-	-
		14	-	Ø7 x 260 step 400	-	-	-	●	-	-	-
WALL - FLOOR JUNCTIONS		15	-	-	-	TTN240 step 1000	-	-	-	-	-
		16	-	-	-	TTF200 step 1200	-	-	-	-	-
		17	Ø8 x 240 step 300	-	-	-	-	-	-	-	-
		18	-	Ø9 x 400 step 600	-	-	-	-	-	-	-
		19	Ø8 x 240 step 300	-	-	-	-	-	●	-	-
		20	-	Ø9 x 400 step 600	-	-	-	-	●	-	-
		21	-	-	-	TTN240 + TCW240 step 1400	-	-	-	-	-
		22	-	-	340	-	-	-	-	-	-
		23	-	-	620	-	-	-	-	-	-
		24	-	-	2 x 620	-	-	-	-	-	-
		25	Ø8 x 240 step 300	-	440	-	-	-	-	-	-
		26	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	-	-	-
		27	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	●	-	-
		28	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	●	-	●
		29	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	-	●	-
		30	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	-	●	-

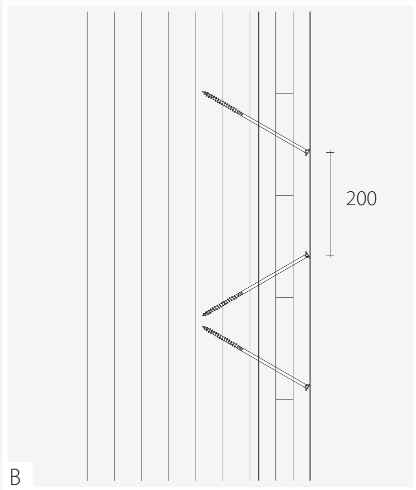
		DETAIL	FIXING SYSTEM					SOUNDPROOFING SOLUTION			
			HBS	VGZ	WHT	TITAN	LVB	CONSTRUCTION SEALING	XYLOFON	ALADIN STRIPE	TITAN SILENT
		31	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	-	●	●
		32	-	Ø9 x 400 step 600	440	-	-	-	-	-	-
		33	-	Ø9 x 400 step 600	440	TTN240 step 800	-	-	-	-	-
		34	-	Ø9 x 400 step 600	440	TTN240 step 800	-	-	●	-	-
		35	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	-	-	-
		36	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	●	-	●
		37	-	-	440	TTN240 step 800	-	-	-	-	-
		38	-	-	440	TTN240 step 800	-	-	●	-	●
		39	Ø8 x 240 step 400	-	-	TTN240 step 800	●	-	-	-	-
		40	Ø8 x 240 step 300	-	-	TTN240 step 800	●	-	●	-	●
		41	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	-	-	-
		42	Ø8 x 240 step 300	-	440	TTN240 step 800	-	-	●	-	●
		43	-	-	440	TTN240 step 800	-	-	-	-	-
		44	-	-	440	TTN240 step 800	-	-	●	-	●

		DETAIL	FIXING SYSTEM						SOUNDPROOFING SOLUTION			
			X-PLATE BASE T	X-PLATE TOP T	X-PLATE BASE X	X-PLATE TOP X	X-PLATE BASE O	X-PLATE MID O	CONSTRUCTION SEALING	XYLOFON	ALADIN STRIPE	TITAN SILENT
X-RAD		45	●	●	-	-	-	-	-	-	-	-
		46	-	-	●	●	-	-	-	-	-	-
		47	-	-	-	-	●	-	-	-	-	-
		48	-	-	-	-	●	-	-	●	●	-
		49	-	-	-	-	●	●	-	-	-	-
		50	-	-	-	-	●	●	-	●	-	-
		51	-	-	-	-	●	●	-	-	-	-
		52	-	-	-	-	●	●	-	●	-	-

L JUNCTIONS

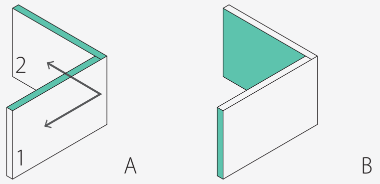
DETAIL 1





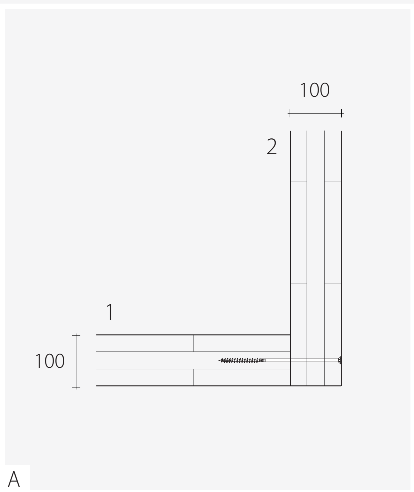
FIXING SYSTEM
HBS screws Ø8 x 240 mm (step 200 mm)

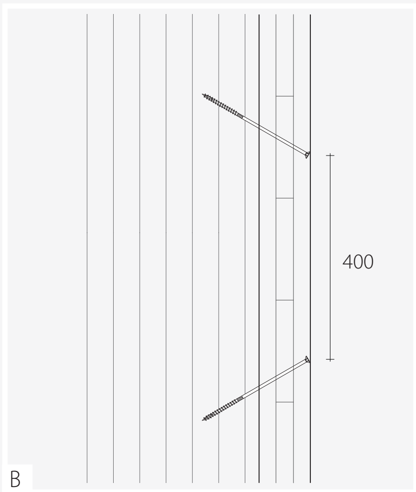
RESILIENT INTERLAYER
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	12.8	9.4	3.9	2.3	2.3	0.2	3.7	4.6	6.6	8.1	9.6	11.7	15.0	15.4	15.9	16.8	**5.5**

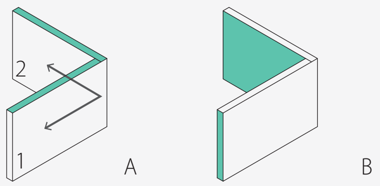
DETAIL 2





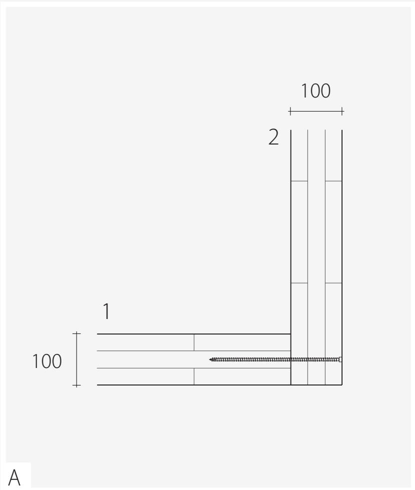
FIXING SYSTEM
HBS screws Ø8 x 240 mm (step 400 mm)

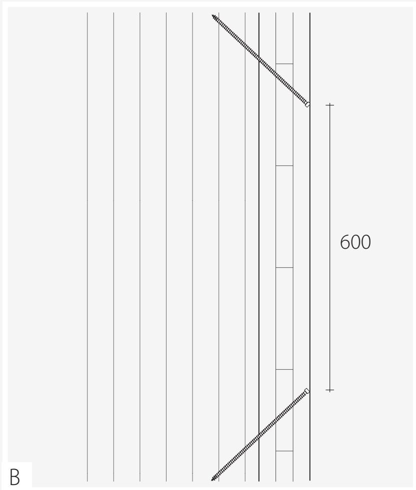
RESILIENT INTERLAYER
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	11.4	9.8	2.9	2.1	2.7	1.8	6.3	8.3	10.1	12.6	12.9	16.1	18.3	16.9	19.6	22.2	**8.1**

DETAIL 3



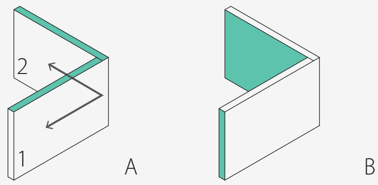


FIXING SYSTEM

VGZ screws Ø7 x 260 mm (step 600 mm)

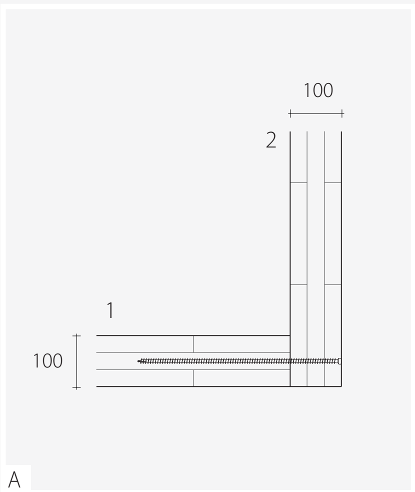
RESILIENT INTERLAYER

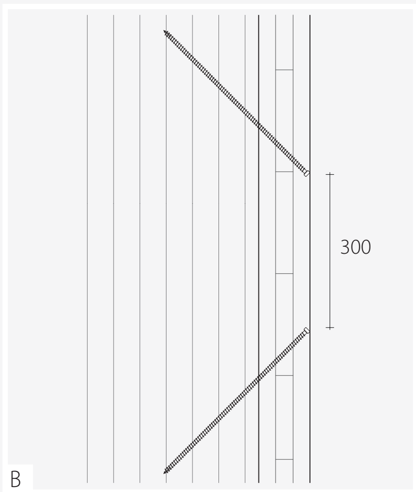
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	16.5	15.1	6.4	11.5	11.3	9.8	11.7	12.8	15.0	15.5	16.0	19.7	18.8	19.8	22.5	23.0	**13.7**

DETAIL 4



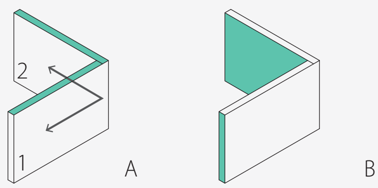


FIXING SYSTEM

VGZ screws Ø9 x 400 mm (step 300 mm)

RESILIENT INTERLAYER

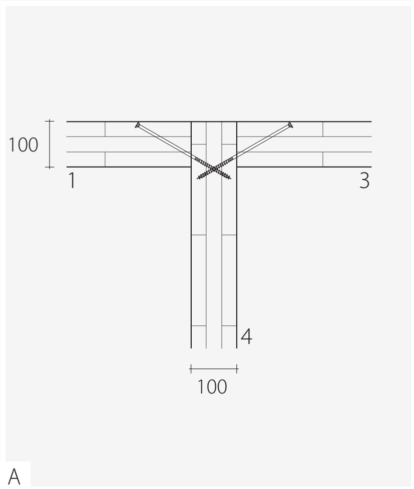
no

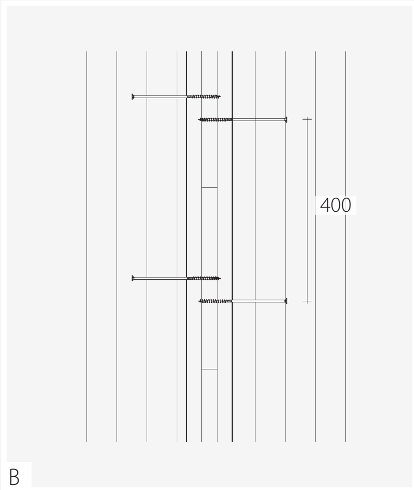


Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	19.0	16.7	9.6	14.5	12.0	10.8	8.7	11.2	10.2	13.9	14.3	16.1	17.9	17.7	18.5	19.9	**12.4**

T JUNCTIONS

DETAIL 5



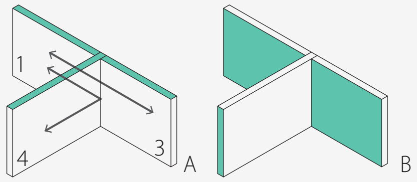


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 400 mm)

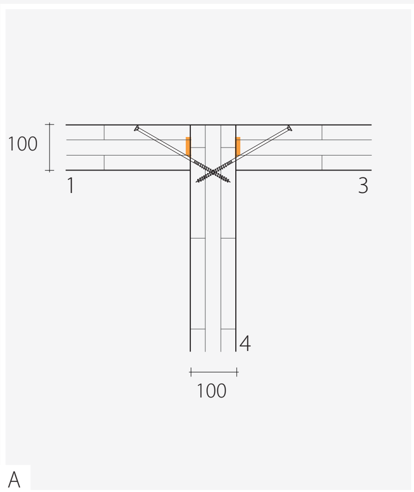
RESILIENT INTERLAYER

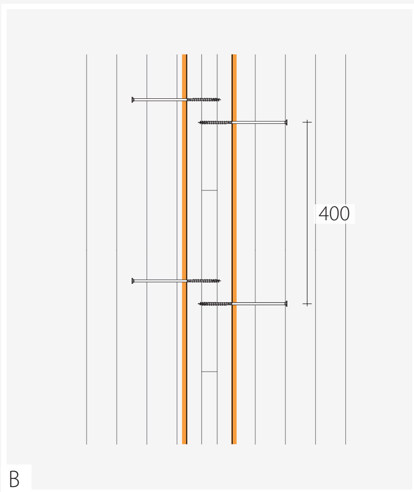
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{14} (dB)	6.9	7.6	5.9	5.5	5.9	5.9	7.3	8.0	11.0	10.8	12.8	12.6	14.6	16.0	18.2	19.2	**8.9**
K_{13} (dB)	8.6	9.2	7.2	7.7	10.3	9.8	12.6	16.0	20.9	21.2	25.6	28.1	29.6	33.4	34.9	37.8	**16.9**

DETAIL 6



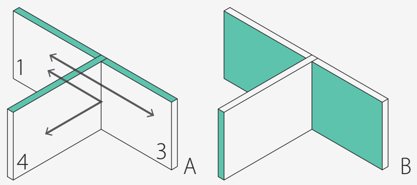


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 400 mm)

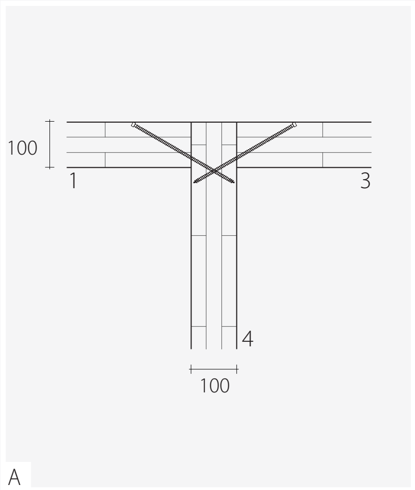
RESILIENT INTERLAYER

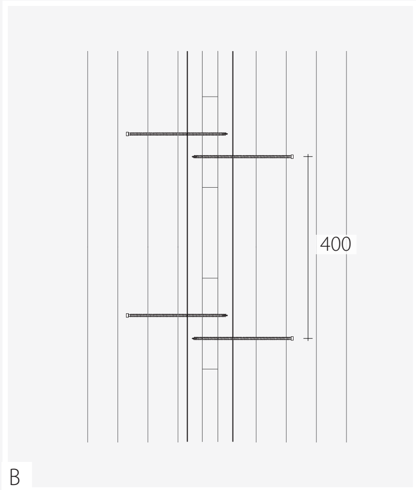
CONSTRUCTION SEALING



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{14} (dB)	4.4	4.3	3.5	5.8	7.4	3.7	7.6	12.4	12.0	15.9	16.7	18.4	19.1	20.5	24.3	26.2	**11.1**
K_{13} (dB)	10.3	8.2	2.6	3.3	9.8	7.3	15.0	18.6	18.3	27.9	25.9	30.6	30.7	37.4	39.7	41.2	**17.4**

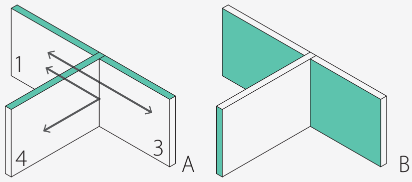
DETAIL 7





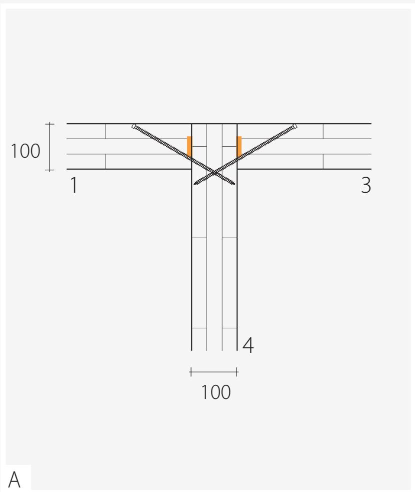
FIXING SYSTEM
VGZ screws Ø7 x 260 mm (step 400 mm)

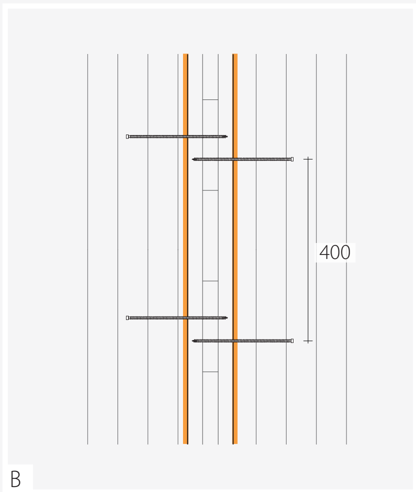
RESILIENT INTERLAYER
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{14} (dB)	1.3	4.7	4.2	5.1	5.8	1.3	9.5	9.5	12.0	12.9	14.8	16.5	16.5	20.8	24.0	25.6	**9.7**
K_{13} (dB)	3.7	4.3	7.5	5.2	5.6	4.3	14.9	15.4	17.6	19.5	26.4	27.8	27.8	34.2	38.8	43.8	**15.2**

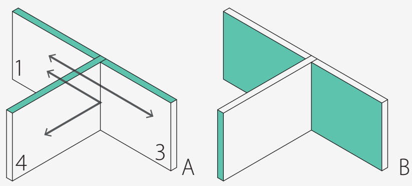
DETAIL 8





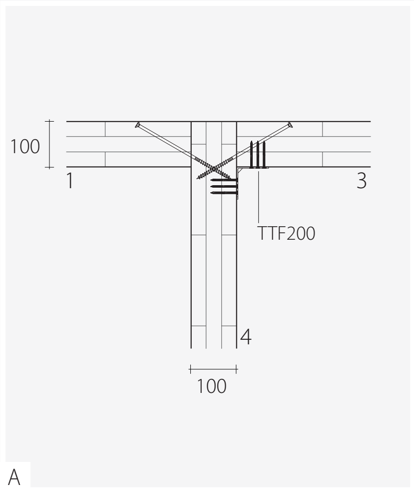
FIXING SYSTEM
VGZ screws Ø7 x 260 mm (step 400 mm)

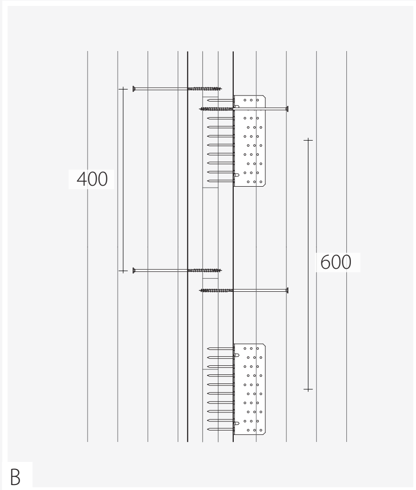
RESILIENT INTERLAYER
CONSTRUCTION SEALING



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{14} (dB)	4.6	2.6	2.0	4.3	4.8	4.1	10.2	11.0	13.2	15.3	15.3	17.4	17.2	21.7	24.7	25.8	**10.6**
K_{13} (dB)	7.3	5.1	3.3	6.7	6.9	7.2	14.5	18.0	17.9	20.2	25.6	30.8	31.4	37.4	39.3	41.1	**16.4**

DETAIL 9



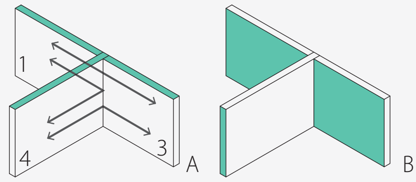


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 400 mm)
TTF200 (step 600 mm)

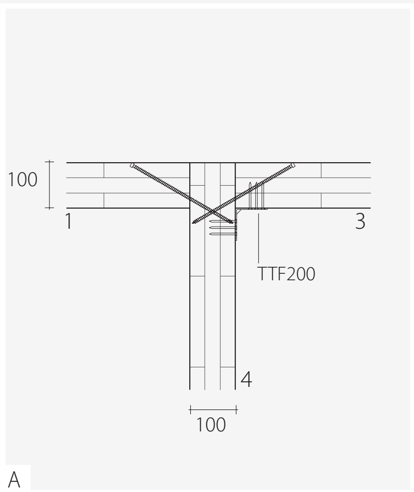
RESILIENT INTERLAYER

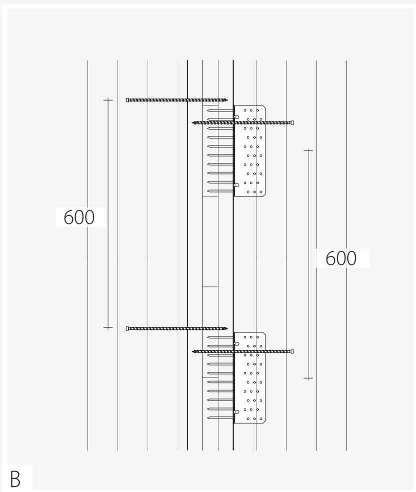
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{14} (dB)	8.1	12.6	6.2	8.7	11.0	8.4	10.0	13.2	18.9	16.7	16.2	13.4	16.2	24.5	23.5	28.3	**12.9**
K_{13} (dB)	4.4	-0.2	2.9	7.9	14.6	13.4	9.4	13.7	16.5	14.7	16.7	20.0	23.4	27.1	28.4	29.6	**14.1**
K_{34} (dB)	3.2	-1.7	-2.0	0.4	3.8	2.7	0.9	6.7	7.4	6.4	6.1	10.5	10.7	10.8	11.3	13.3	**5.0**

DETAIL 10



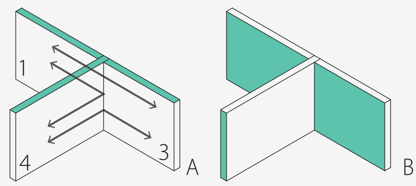


FIXING SYSTEM

VGZ screws Ø7 x 260 mm (step 600 mm)
TTF200 (step 600 mm)

RESILIENT INTERLAYER

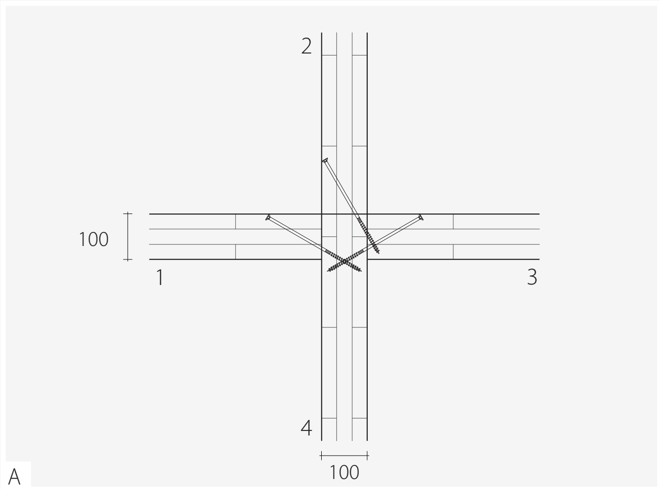
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{14} (dB)	6.3	9.3	9.6	9.9	9.8	5.7	8.7	11.5	12.6	12.1	14.5	15.1	15.2	20.1	24.1	22.6	**11.1**
K_{13} (dB)	7.4	9.8	12.1	11.9	13.4	9.9	14.5	15.4	16.1	18.5	22.2	21.0	21.8	26.2	28.7	29.2	**15.9**
K_{34} (dB)	7.9	12.0	7.3	6.6	8.2	4.3	6.3	7.8	8.4	9.4	11.2	11.0	11.2	14.9	16.0	15.5	**8.1**

X JUNCTIONS

DETAIL 11

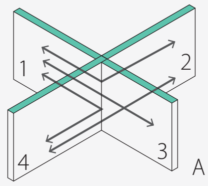


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 400 mm)

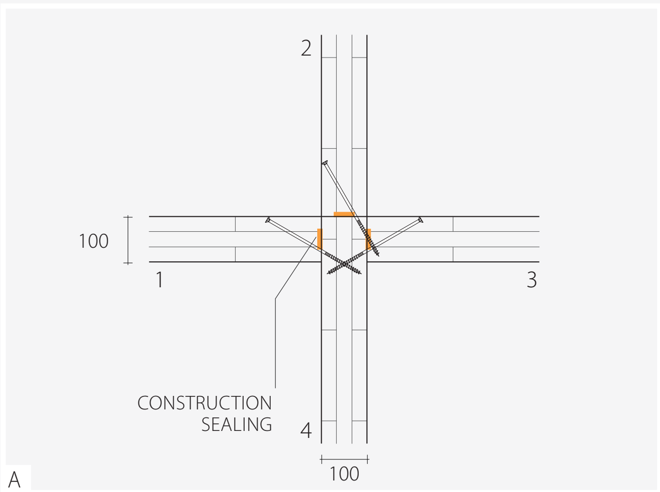
RESILIENT INTERLAYER

no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	13.1	12.4	13.7	10.8	13.2	12.2	12.8	14.4	15.9	17.0	19.7	21.2	25.0	27.9	29.7	32.6	**15.2**
K_{14} (dB)	9.9	10.4	8.7	8.0	9.8	7.7	8.4	9.4	11.2	10.1	11.5	12.3	15.0	16.8	18.0	21.2	**9.8**
K_{13} (dB)	12.5	12.1	12.7	12.3	14.6	13.3	11.9	14.0	16.8	16.8	20.5	21.7	23.9	27.5	28.3	31.6	**15.8**
K_{24} (dB)	12.9	11.2	11.6	9.8	12.7	12.5	11.6	11.9	13.8	12.6	13.4	13.9	16.8	18.6	20.7	22.9	**12.5**

DETAIL12

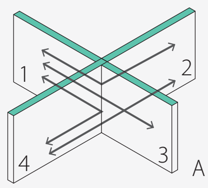


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 400 mm)

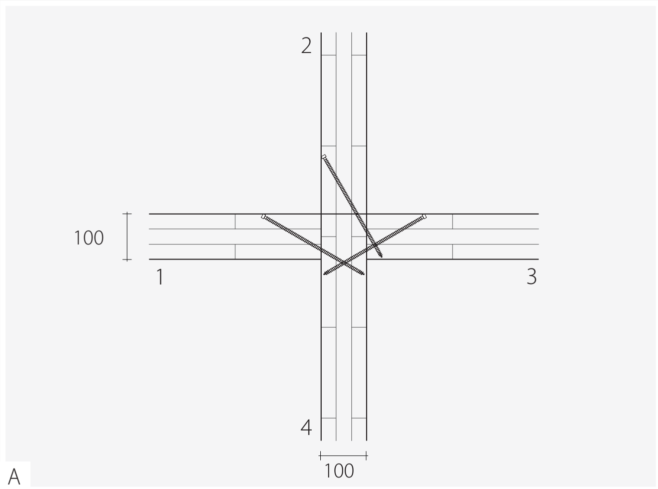
RESILIENT INTERLAYER

CONSTRUCTION SEALING



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	11.4	8.5	6.9	10.1	14.1	10.9	14.6	17.1	16.9	20.9	22.0	22.8	28.7	33.4	37.2	39.3	**16.6**
K_{14} (dB)	5.9	6.3	7.3	6.3	8.4	6.1	8.5	11.6	12.2	13.6	12.8	16.5	17.6	19.6	23.6	25.1	**10.7**
K_{13} (dB)	13.4	12.3	11.0	12.9	15.5	14.6	17.0	17.5	19.7	26.4	25.1	28.1	27.4	35.4	39.9	39.6	**19.6**
K_{24} (dB)	9.5	8.1	9.0	8.2	12.7	11.5	14.3	13.3	17.1	18.5	17.3	20.5	23.9	24.4	29.2	32.8	**14.8**

DETAIL 13

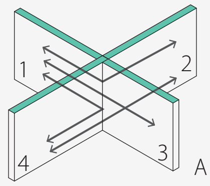


FIXING SYSTEM

VGZ screws Ø7 x 260 mm (step 400 mm)

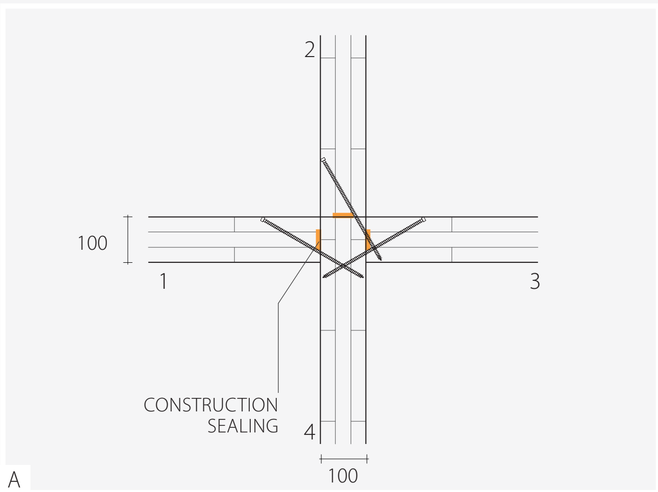
RESILIENT INTERLAYER

no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	11.0	8.6	8.9	9.7	10.1	7.1	12.3	13.4	15.1	17.8	19.8	23.3	24.9	30.8	33.7	37.3	**14.3**
K_{14} (dB)	7.8	8.7	7.1	6.5	6.7	3.3	8.7	10.0	13.1	12.5	16.1	17.0	17.2	21.2	20.2	24.3	**10.4**
K_{13} (dB)	9.8	9.6	13.6	12.0	9.5	8.7	15.9	17.5	18.7	20.8	26.7	28.2	27.9	35.7	36.4	42.6	**17.5**
K_{24} (dB)	13.0	9.8	5.5	5.6	7.8	8.0	11.8	9.6	13.6	17.6	18.3	20.8	19.8	27.4	30.3	29.1	**12.6**

DETAIL 14

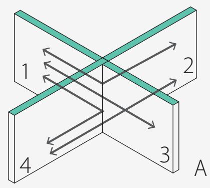


FIXING SYSTEM

VGZ screws Ø7 x 260 mm (step 400 mm)

RESILIENT INTERLAYER

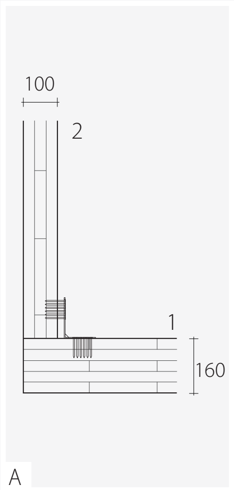
CONSTRUCTION SEALING

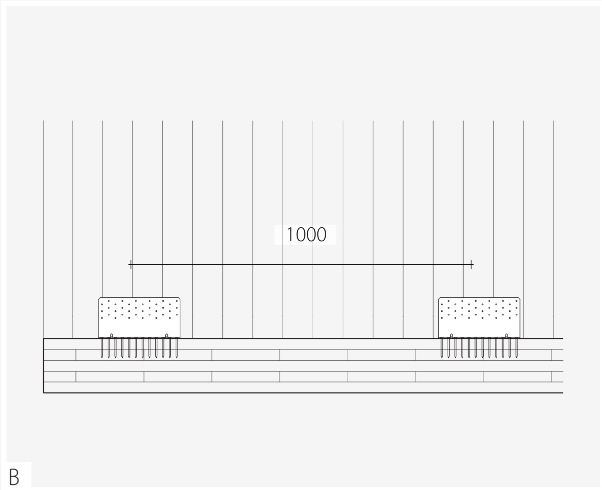


Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	10.5	7.2	5.1	6.0	9.9	8.1	11.5	14.3	16.8	18.4	22.0	25.1	27.5	33.5	36.1	36.4	**14.7**
K_{14} (dB)	7.4	5.1	1.7	4.3	5.1	4.4	9.8	11.8	12.9	14.2	15.8	17.5	16.9	22.2	26.1	25.4	**10.7**
K_{13} (dB)	10.2	9.9	2.5	9.9	12.2	10.1	14.1	18.5	19.8	21.8	26.1	31.8	31.9	38.6	42.7	42.0	**18.3**
K_{24} (dB)	10.1	7.9	9.0	5.7	11.0	11.1	15.1	16.5	19.4	19.2	21.7	23.8	24.4	32.7	34.7	35.3	**15.9**

L JUNCTIONS

DETAIL 15



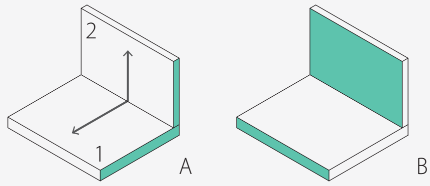


FIXING SYSTEM

TTN240 angle brackets (step 1000 mm)

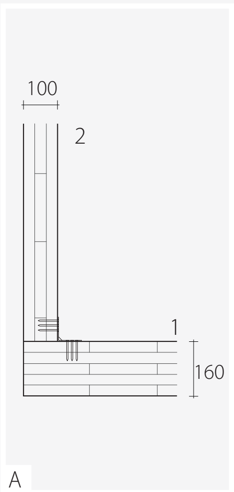
RESILIENT INTERLAYER

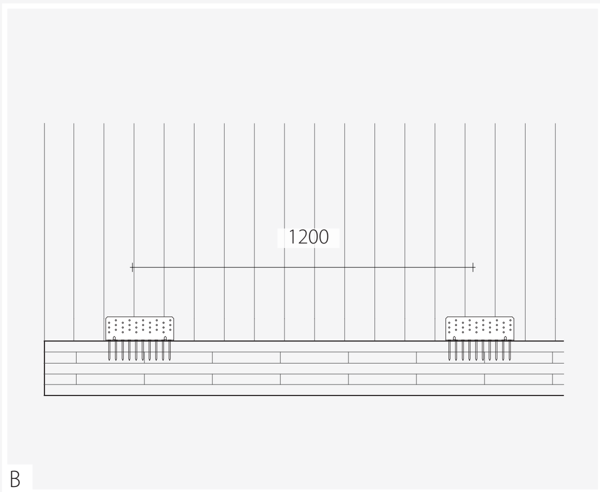
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	9.7	8.0	11.8	7.5	10.0	7.6	11.4	11.1	10.4	10.0	9.8	12.3	15.9	16.5	17.4	13.3	**10.0**

DETAIL16



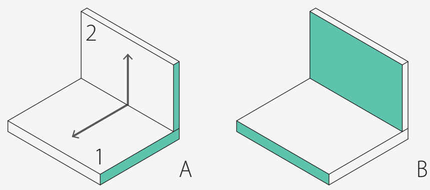


FIXING SYSTEM

TTF200 angle brackets (step 1200 mm)

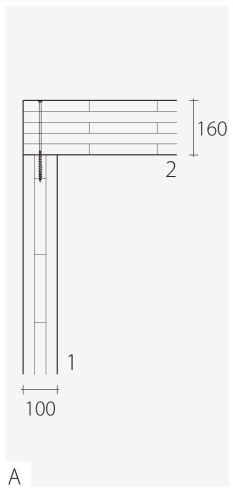
RESILIENT INTERLAYER

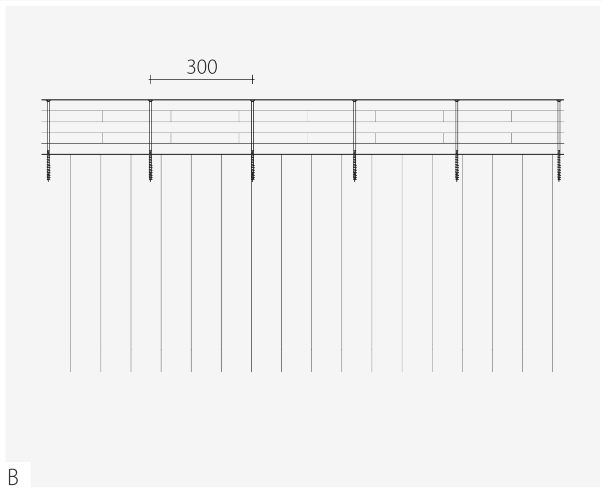
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	8.4	10.0	12.1	6.5	11.3	6.0	10.3	10.1	8.6	7.7	8.3	11.3	15.2	15.9	16.4	14.2	**8.9**

DETAIL 17



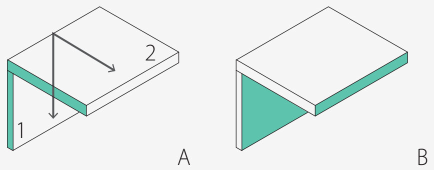


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)

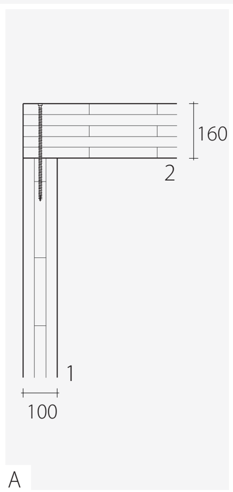
RESILIENT INTERLAYER

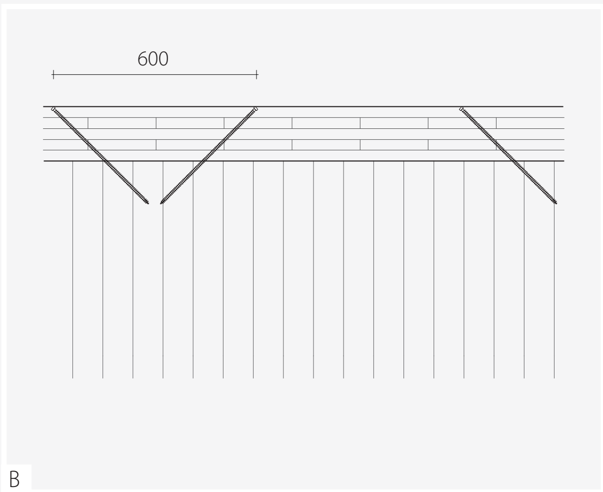
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	11.7	15.6	12.1	9.4	11.9	10.1	9.5	11.0	7.0	10.1	9.9	12.8	14.8	15.4	17.3	18.6	**10.2**

DETAIL 18



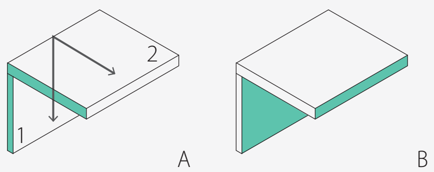


FIXING SYSTEM

VGZ screws Ø9 x 400 mm (step 600 mm)

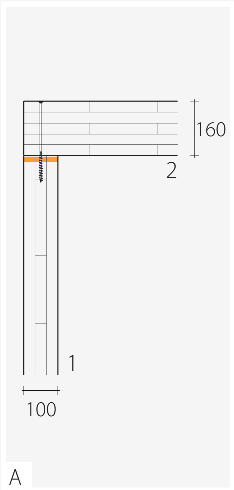
RESILIENT INTERLAYER

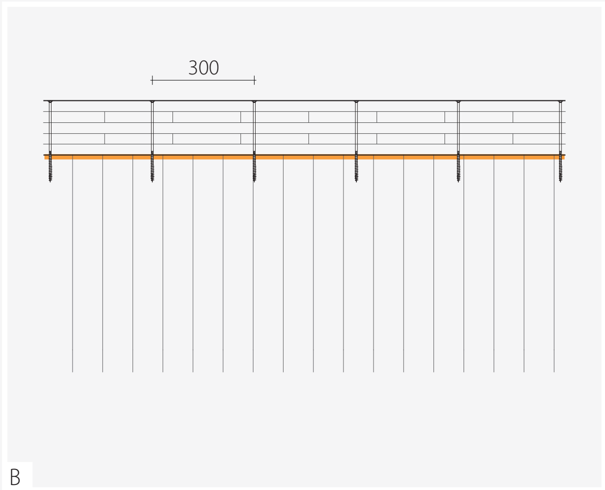
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	18.5	10.8	12.3	11.5	12.8	10.1	12.0	12.9	10.4	10.0	8.7	14.8	16.9	21.3	21.2	23.2	**11.5**

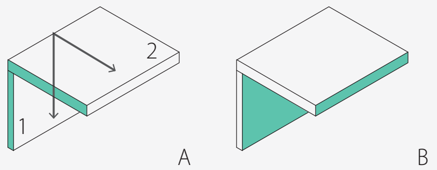
DETAIL 19





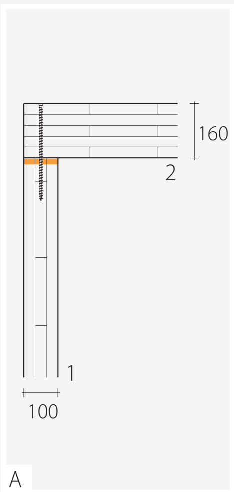
FIXING SYSTEM
HBS screws Ø8 x 240 mm (step 300 mm)

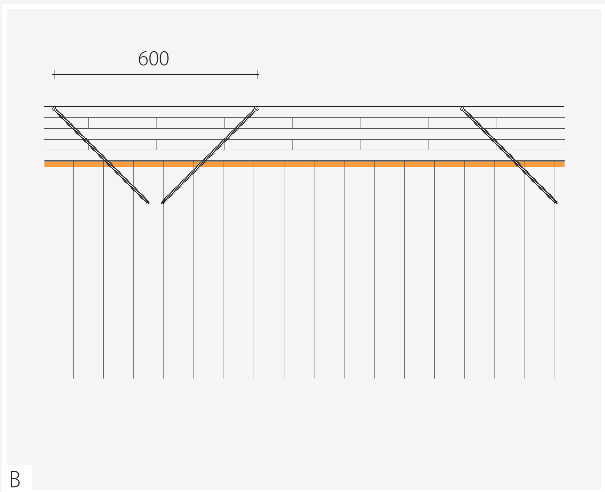
RESILIENT INTERLAYER
XYLOFON



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	12.6	10.8	13.6	11.1	9.2	13.3	11.3	16.5	10.2	14.6	14.9	17.4	19.6	25.0	28.5	25.1	**13.2**

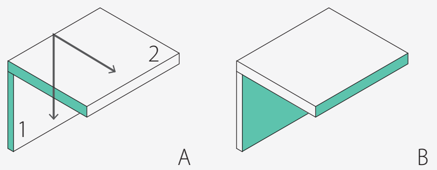
DETAIL 20





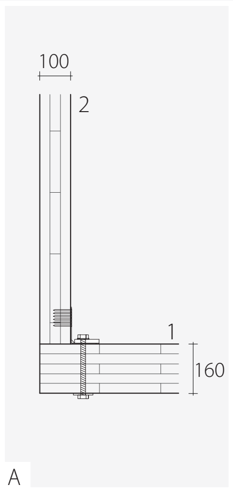
FIXING SYSTEM
VGZ screws Ø9 x 400 mm (step 600 mm)

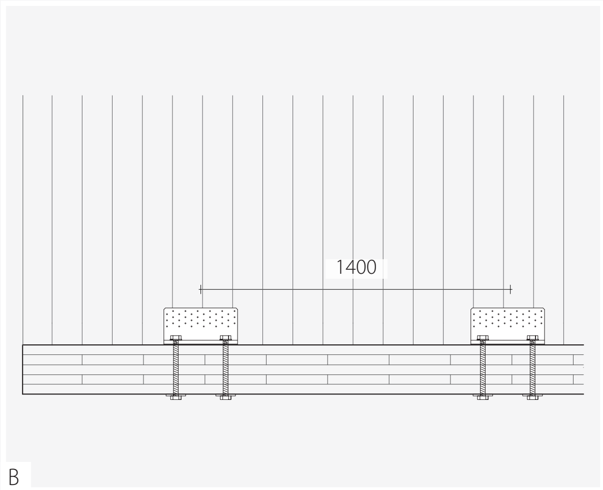
RESILIENT INTERLAYER
XYLOFON



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	15.3	11.2	10.6	9.5	11.7	11.5	13.8	15.1	12.0	14.5	13.0	18.6	21.6	22.0	20.8	23.7	**13.3**

DETAIL 21



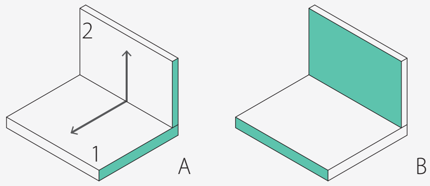


FIXING SYSTEM

TCN240 angle brackets + TCW240 (step 1400 mm)

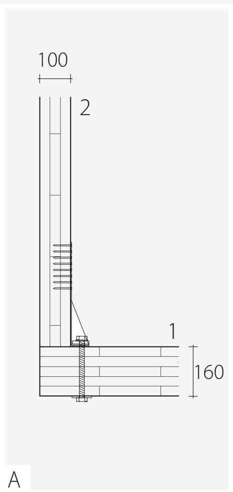
RESILIENT INTERLAYER

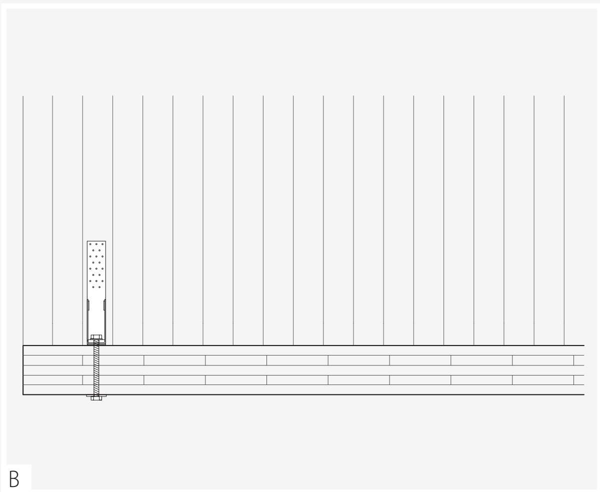
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	8.6	11.6	11.5	6.8	9.9	6.8	9.7	10.0	9.0	10.5	9.8	11.4	14.1	17.0	18.5	15.5	**9.3**

DETAIL 22



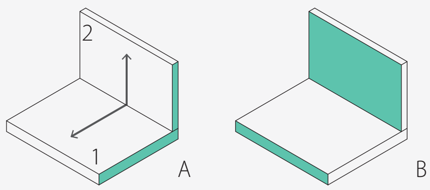


FIXING SYSTEM

WHT340 hold-down

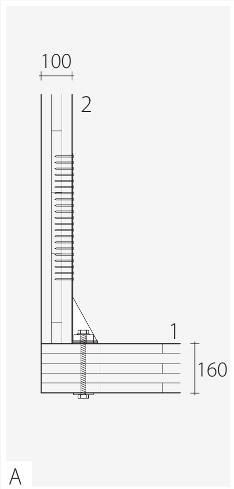
RESILIENT INTERLAYER

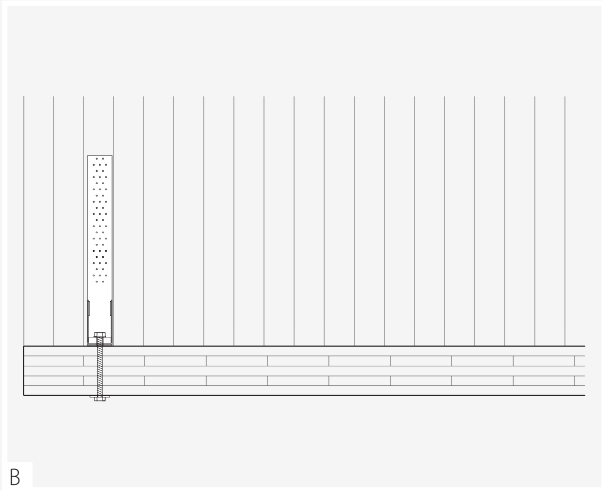
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	9.0	11.5	13.7	9.3	9.3	8.5	9.7	8.7	10.6	11.0	11.3	11.9	12.8	14.3	15.0	16.5	**10.0**

DETAIL 23



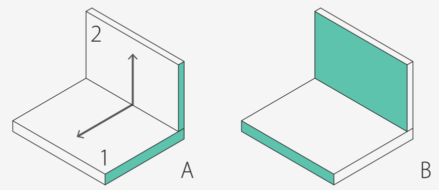


FIXING SYSTEM

WHT620 hold-down
* partial fixing (33 screws)
** total fixing (55 screws)

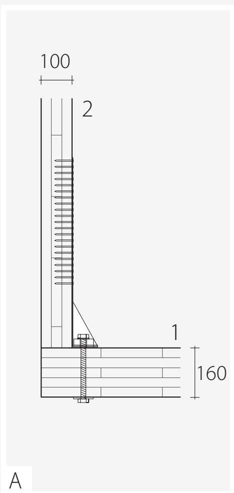
RESILIENT INTERLAYER

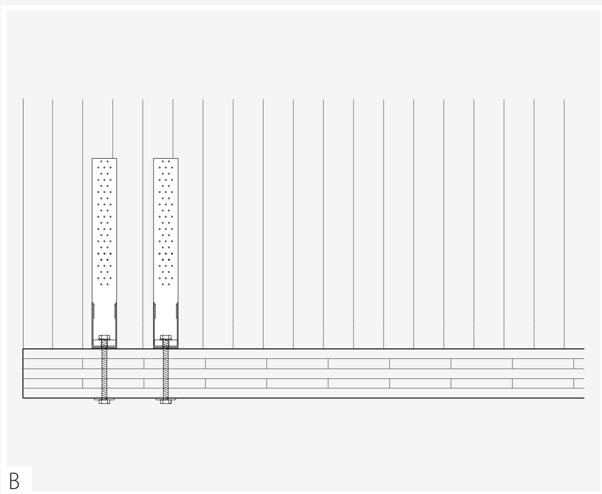
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB) *	9.1	15.8	9.4	9.3	9.2	7.1	14.7	11.5	13.5	10.7	13.4	11.7	14.4	14.4	16.8	18.2	**11.3**
K_{12} (dB) **	15.6	11.7	12.4	8.7	10.2	8.0	13.2	12.5	9.2	10.8	10.3	12.5	13.8	14.6	15.1	16.7	**10.6**

DETAIL 24



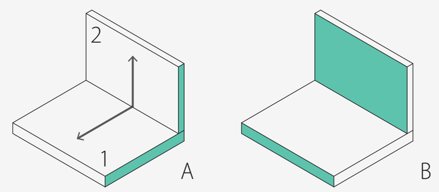


FIXING SYSTEM

2 WHT620 hold-down

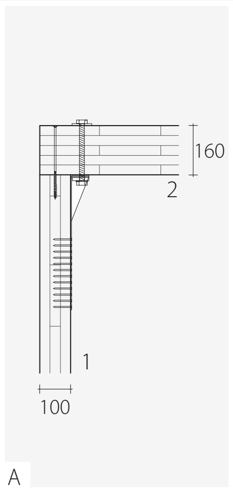
RESILIENT INTERLAYER

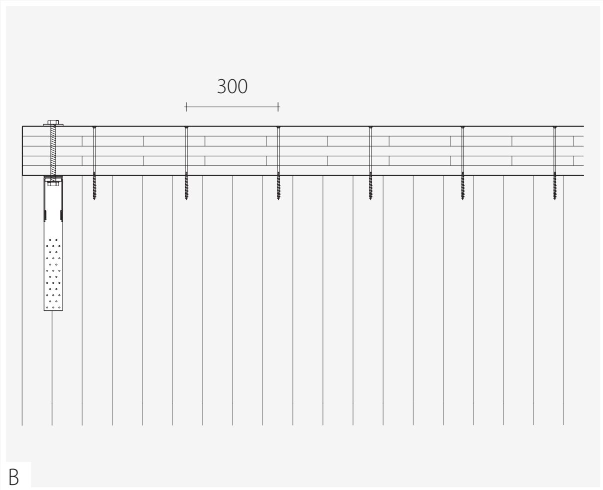
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	12.3	11.6	10.1	8.4	7.9	7.2	10.0	8.8	9.4	11.1	11.9	11.8	13.7	13.5	16.7	15.4	**9.6**

DETAIL 25



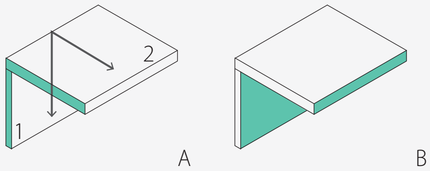


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
WHT440 hold-down

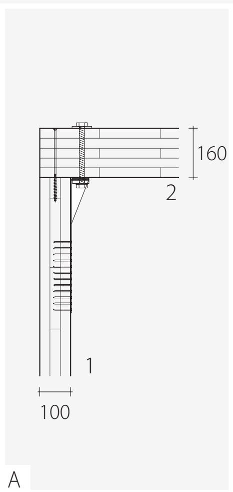
RESILIENT INTERLAYER

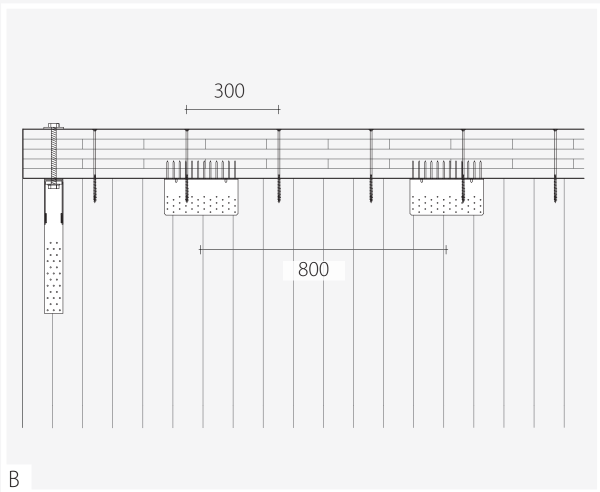
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	AVG$_{200-1250}$
K_{12} (dB)	8.4	15.5	9.8	9.2	9.6	9.3	6.2	7.3	7.2	10.4	11.5	12.1	14.6	14.2	18.9	17.3	**9.2**

DETAIL 26



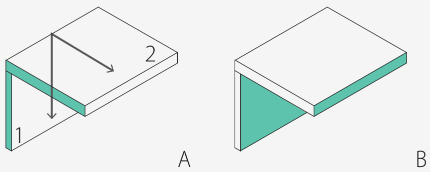


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

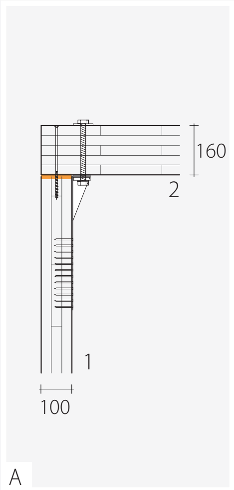
RESILIENT INTERLAYER

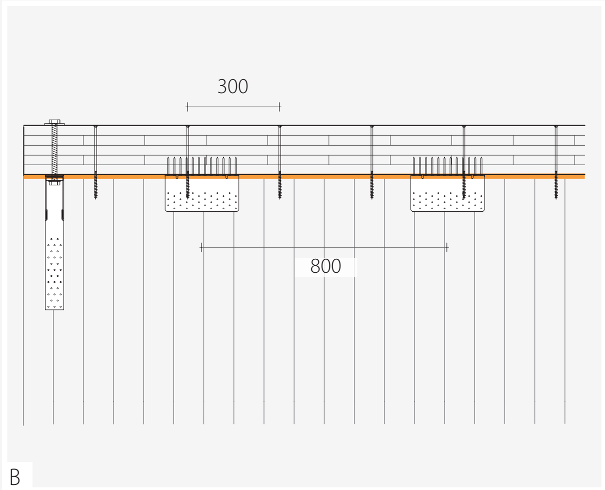
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	AVG$_{200-1250}$
K_{12} (dB)	10.6	14.2	10.0	10.3	9.9	7.8	8.5	8.3	8.7	10.5	10.6	12.1	13.1	12.6	14.4	15.6	**9.6**

DETAIL 27



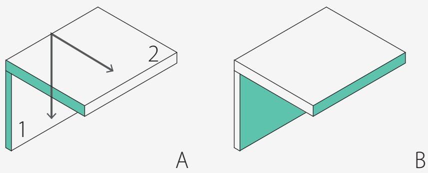


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

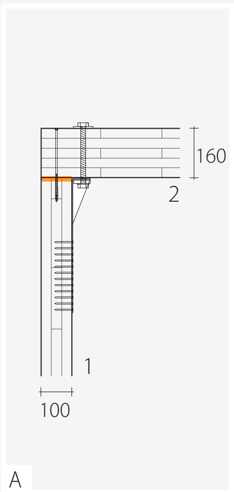
RESILIENT INTERLAYER

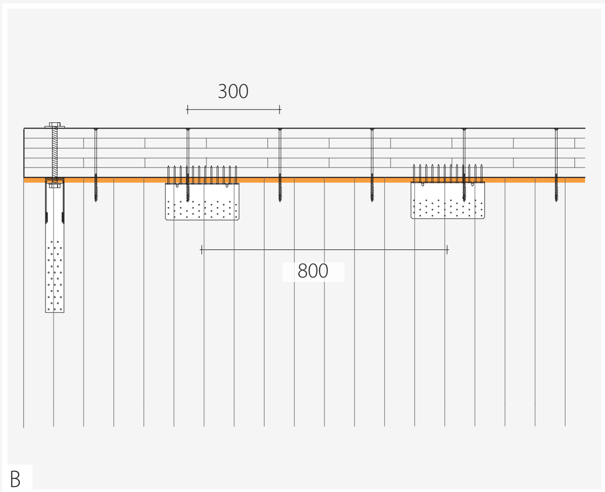
XYLOFON



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	10.9	8.9	7.1	10.6	7.4	9.6	10.2	12.5	11.8	14.1	14.8	15.3	17.1	17.4	21.5	21.2	**11.8**

DETAIL 28



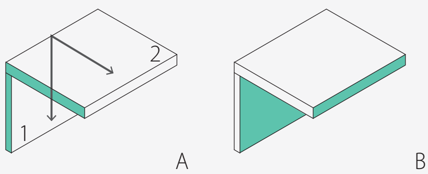


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

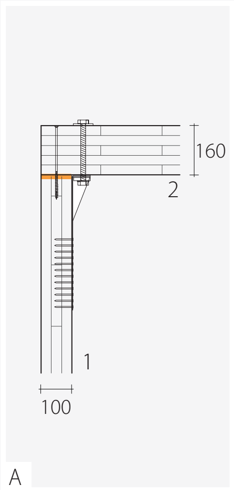
RESILIENT INTERLAYER

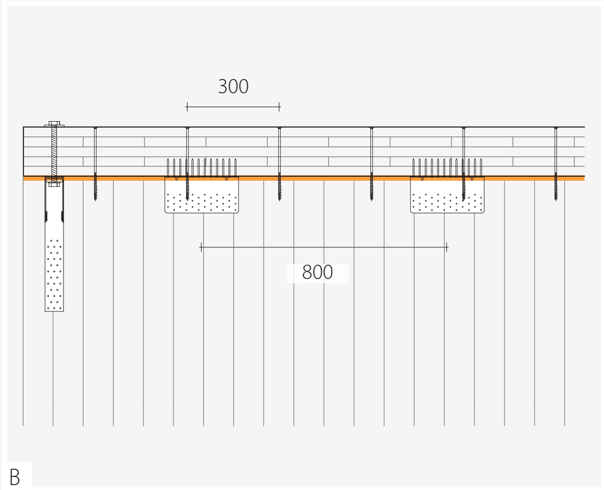
XYLOFON + TITAN SILENT



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	11.6	9.4	11.6	12.0	7.2	11.0	10.3	13.7	11.9	15.1	15.6	16.7	17.9	22.2	25.6	22.1	**12.6**

DETAIL 29



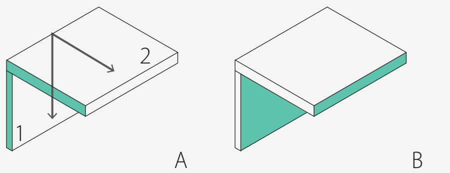


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

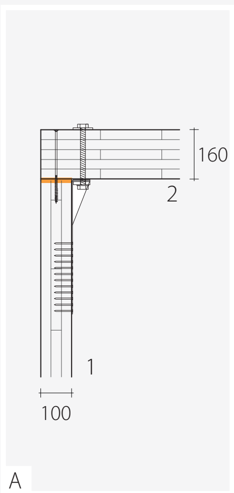
RESILIENT INTERLAYER

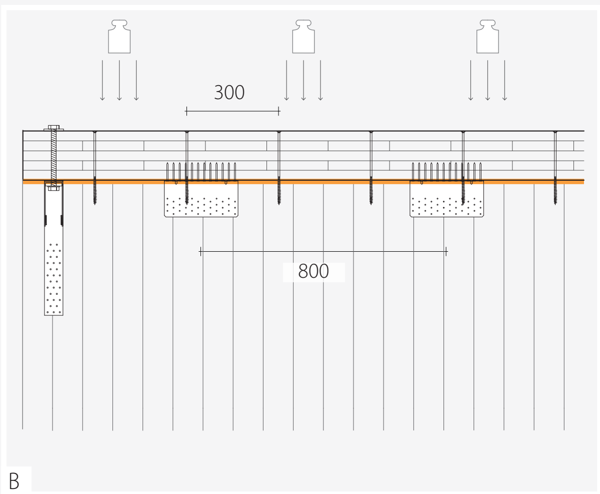
ALADIN STRIPE



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	8.7	14.4	8.7	10.0	10.7	9.5	6.1	9.8	9.4	14.1	16.1	18.1	18.1	17.8	21.3	19.1	**11.5**

DETAIL 30



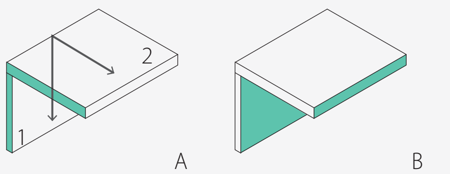


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

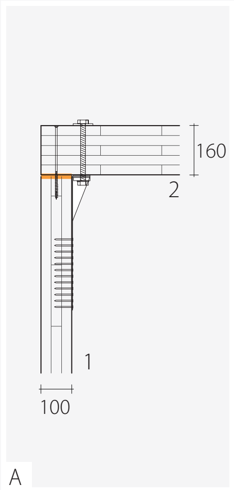
RESILIENT INTERLAYER

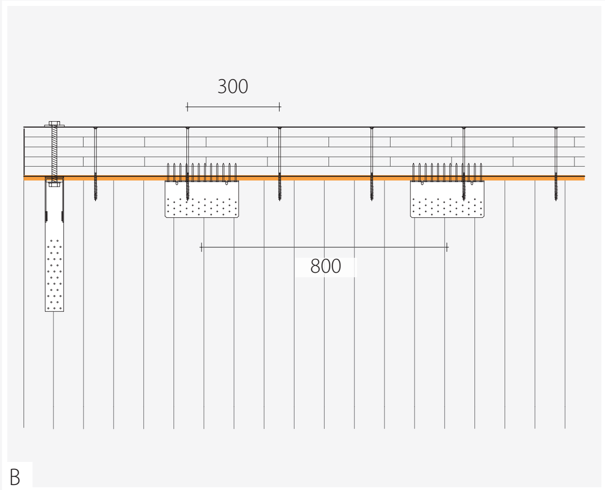
ALADIN STRIPE + 2 kN/m static load



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	9.5	13.6	8.7	11.8	9.0	10.1	7.2	8.7	10.4	14.2	17.0	16.5	18.4	20.0	23.1	19.7	**11.7**

DETAIL 31



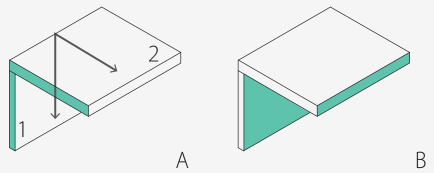


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

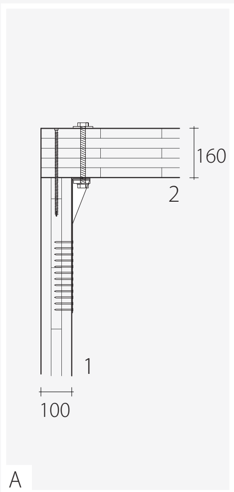
RESILIENT INTERLAYER

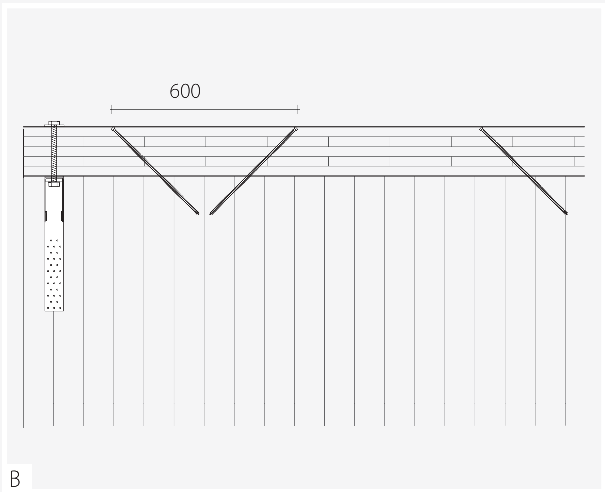
ALADIN STRIPE + TITAN SILENT



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	9.7	15.3	9.0	11.2	9.2	9.3	6.6	10.6	9.7	14.0	16.3	15.8	16.7	17.8	22.1	21.8	**11.4**

DETAIL 32



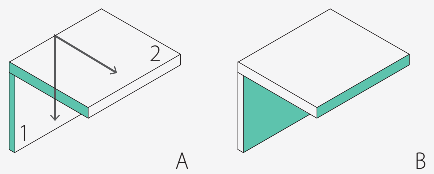


FIXING SYSTEM

VGZ screws Ø9 x 400 mm (step 600 mm)
WHT440 hold-down

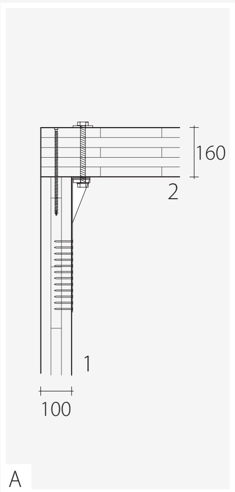
RESILIENT INTERLAYER

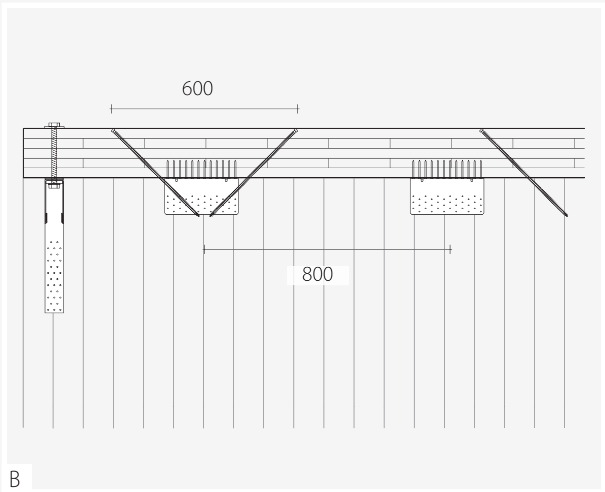
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	15.2	10.6	10.1	11.2	10.5	9.3	8.7	9.2	10.6	10.3	10.3	14.1	16.7	20.2	22.8	21.9	**10.5**

DETAIL 33



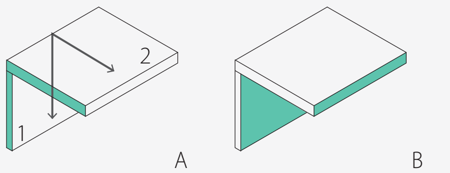


FIXING SYSTEM

VGZ screws Ø9 x 400 mm (step 600 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

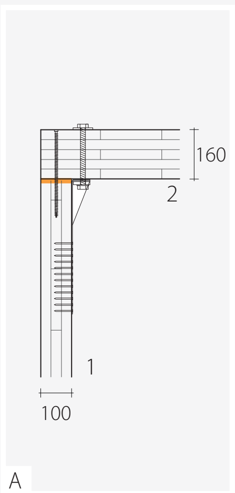
RESILIENT INTERLAYER

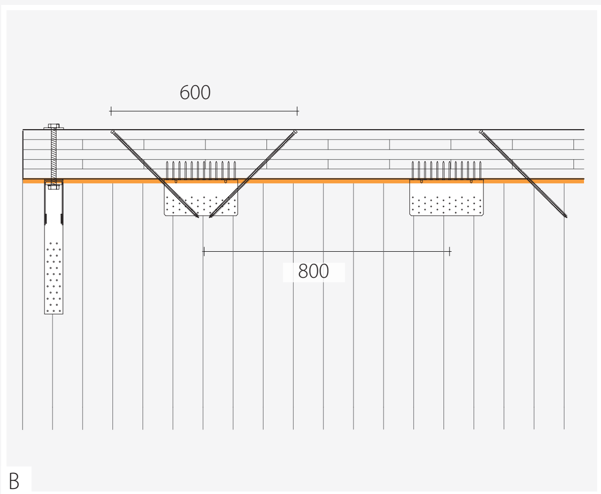
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	13.8	14.6	10.6	11.5	10.4	7.0	5.9	7.7	9.7	9.7	10.0	12.6	15.2	18.0	21.2	18.2	**9.4**

DETAIL 34



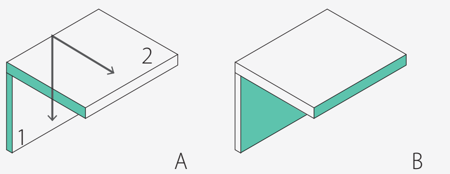


FIXING SYSTEM

VGZ screws Ø9 x 400 mm (step 600 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

RESILIENT INTERLAYER

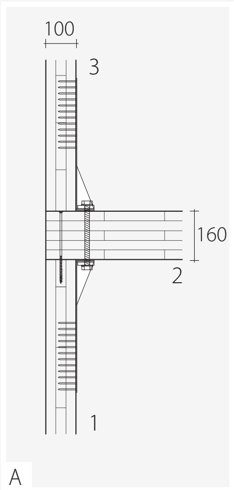
XYLOFON

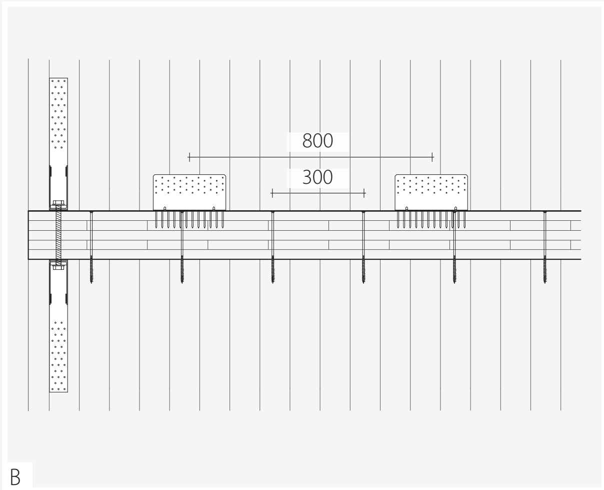


Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	10.6	15.0	8.8	9.6	9.2	8.4	7.7	10.0	11.3	14.3	14.2	16.3	20.0	18.6	20.8	18.7	**11.2**

T JUNCTIONS

DETAIL 35



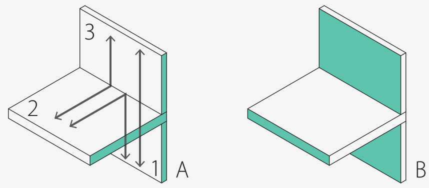


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

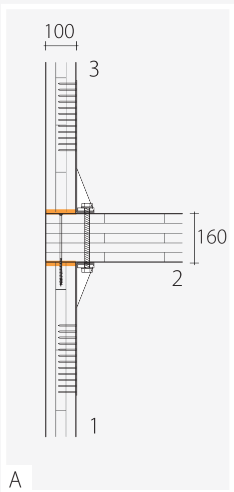
RESILIENT INTERLAYER

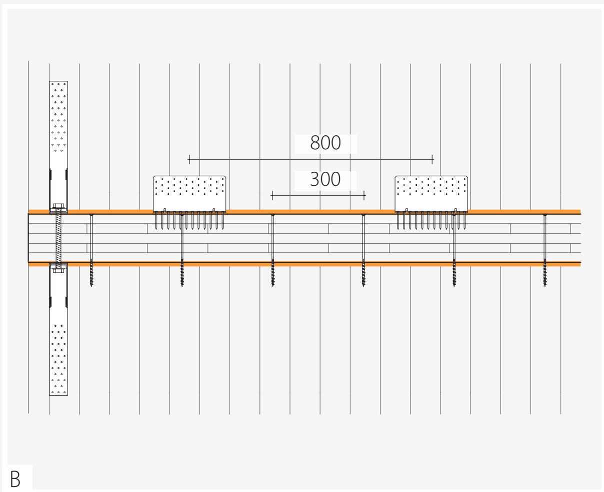
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	16.8	19.9	9.6	14.5	14.5	10.8	8.1	11.4	17.6	18.5	18.3	17.8	20.5	27.9	28.1	35.1	**14.6**
K_{13} (dB)	23.8	26.9	16.6	21.5	21.5	17.8	15.1	18.4	24.6	25.5	25.3	24.8	27.5	34.9	35.1	42.1	**21.6**
K_{23} (dB)	11.9	5.6	1.4	6.3	7.2	5.0	-1.0	4.9	6.0	8.2	8.2	14.9	15.1	14.2	15.9	20.2	**6.6**

DETAIL 36



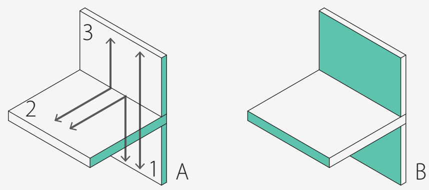


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

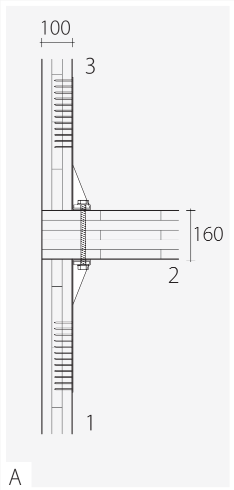
RESILIENT INTERLAYER

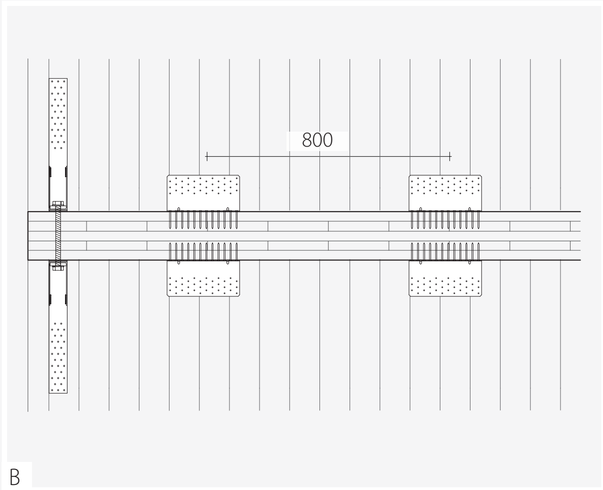
XYLOFON + TITAN SILENT



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	17.4	14.8	9.0	15.5	11.9	13.2	9.9	16.2	20.6	22.5	22.9	21.7	24.9	35.1	37.3	41.2	**17.2**
K_{13} (dB)	24.4	21.8	16.0	22.5	18.9	20.2	16.9	23.2	27.6	29.5	29.9	28.7	31.9	42.1	44.3	48.2	**24.2**
K_{23} (dB)	12.5	0.5	0.7	7.2	4.6	7.5	0.7	9.7	9.1	12.3	12.8	18.8	19.5	21.3	25.1	26.3	**9.2**

DETAIL 37



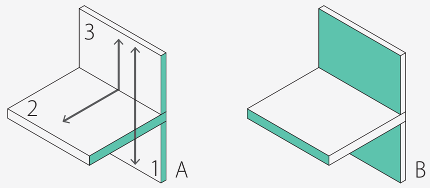


FIXING SYSTEM

TTN240 angle brackets (step 800 mm)
WHT440 hold-down

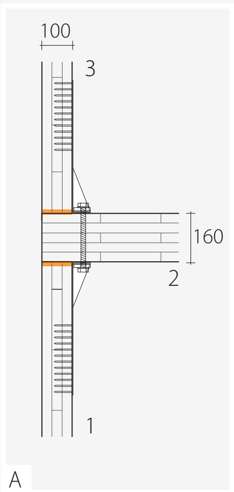
RESILIENT INTERLAYER

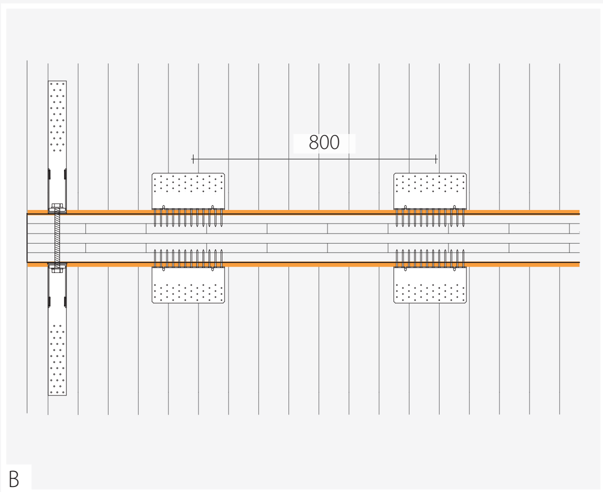
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{13} (dB)	26.9	26.7	18.3	20.6	19.1	12.9	8.8	12.4	15.1	17.5	19.7	22.8	24.6	30.7	34.3	32.0	**16.5**
K_{23} (dB)	19.9	19.7	11.3	13.6	12.1	5.9	1.8	5.4	8.1	10.5	12.7	15.8	17.6	23.7	27.3	25.0	**9.5**

DETAIL 38



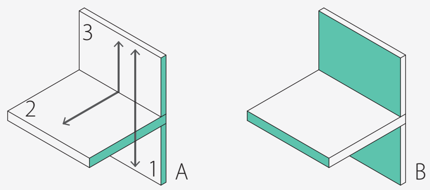


FIXING SYSTEM

TTN240 angle brackets (step 800 mm)
WHT440 hold-down

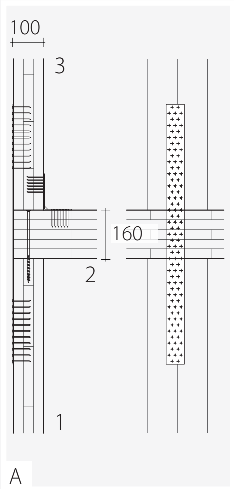
RESILIENT INTERLAYER

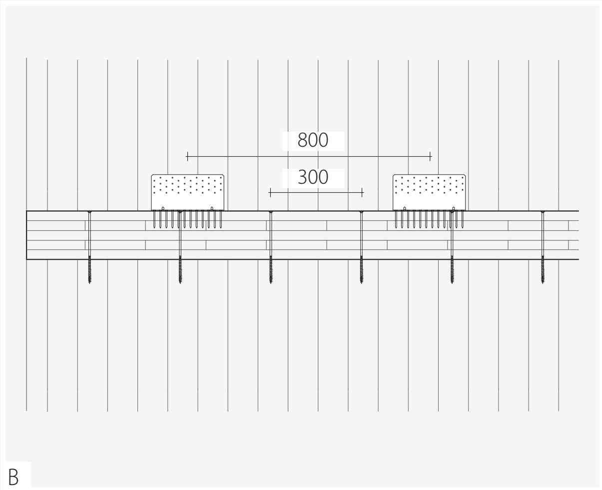
XYLOFON + TITAN SILENT



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{13} (dB)	23.6	27.1	16.5	18.7	18.0	14.2	10.6	14.6	16.7	22.0	24.0	26.6	29.4	31.4	34.0	32.5	**18.4**
K_{23} (dB)	16.6	20.1	9.5	11.7	11.0	7.2	3.6	7.6	9.7	15.0	17.0	19.6	22.4	24.4	27.0	25.5	**11.4**

DETAIL 39



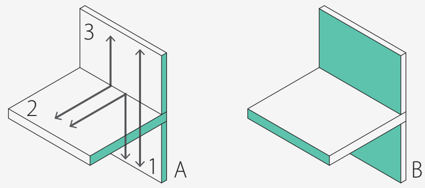


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 400 mm)
TTN240 angle brackets (step 800 mm)
LBV perforated plate

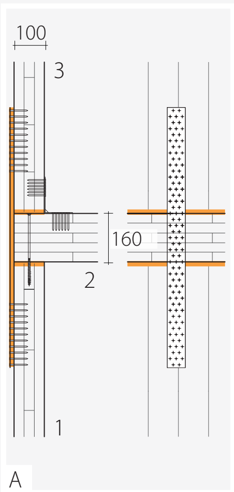
RESILIENT INTERLAYER

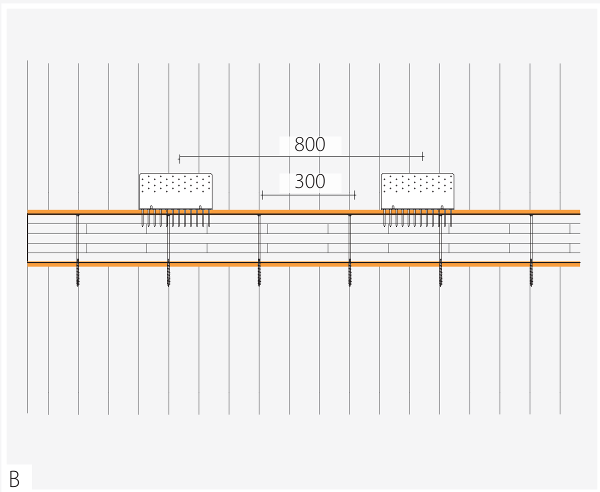
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200\text{-}1250}$
K_{12} (dB)	13.6	14.9	4.4	9.4	11.4	7.0	8.9	9.0	14.5	18.2	17.4	20.2	21.9	28.9	28.3	36.7	**12.9**
K_{13} (dB)	22.5	25.3	15.7	16.5	15.0	12.6	13.4	15.8	21.1	18.6	19.3	18.8	23.5	29.0	27.5	32.3	**16.8**
K_{23} (dB)	4.8	-1.3	-4.1	4.7	5.7	1.2	-3.7	2.2	6.5	8.5	9.0	17.5	16.0	16.6	17.3	22.7	**5.7**

DETAIL 40



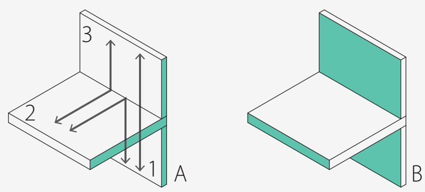


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
LBV perforated plate

RESILIENT INTERLAYER

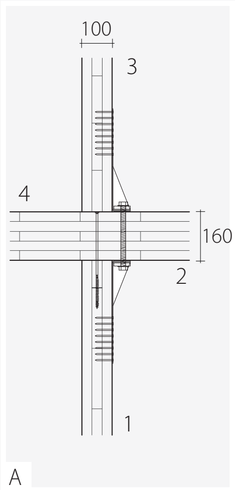
XYLOFON + TITAN SILENT

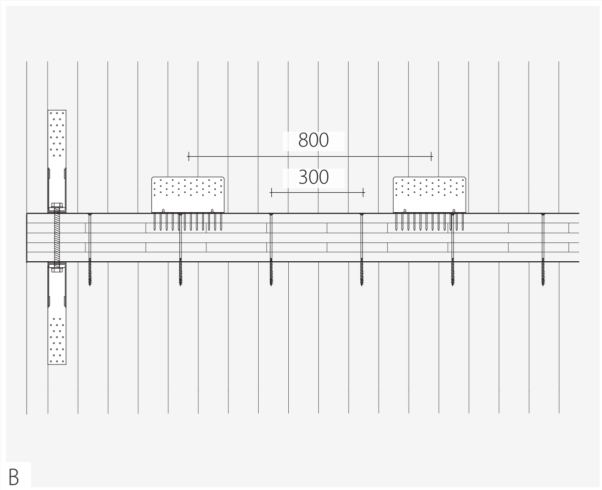


Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200\text{-}1250}$
K_{12} (dB)	17.4	13.1	7.0	11.1	10.8	11.5	10.5	15.6	20.4	22.4	21.9	24.7	24.5	38.4	38.6	41.0	**16.6**
K_{13} (dB)	23.9	24.5	18.3	20.6	16.3	18.2	19.4	19.6	25.7	27.2	25.6	21.9	24.5	41.7	44.9	49.0	**21.6**
K_{23} (dB)	7.1	-3.1	-2.5	6.2	6.0	6.4	0.7	9.7	9.5	12.5	12.7	19.3	16.8	21.8	25.2	27.2	**9.2**

X JUNCTIONS

DETAIL 41



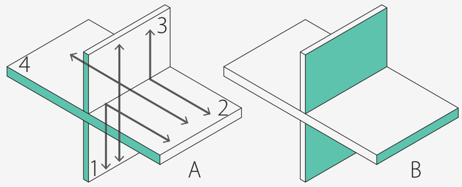


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

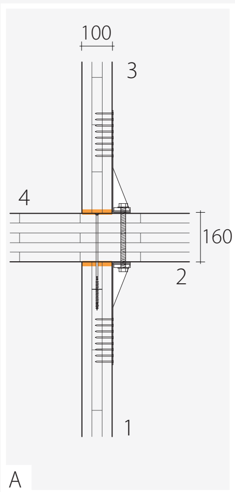
RESILIENT INTERLAYER

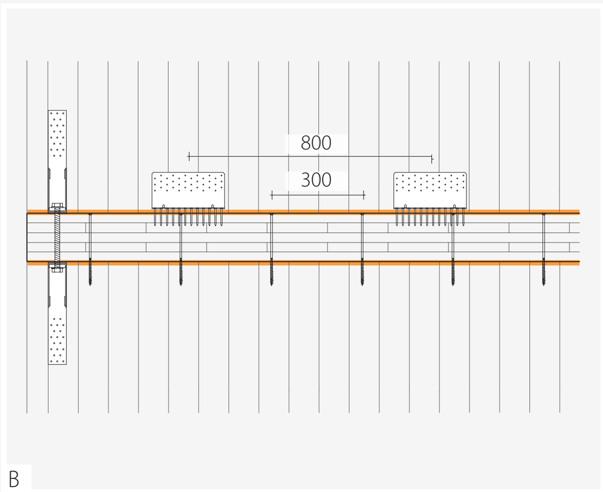
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	AVG$_{200-1250}$
K_{12} (dB)	19.8	22.9	12.6	17.5	17.5	13.8	11.1	14.4	20.6	21.5	21.3	20.8	23.5	30.9	31.1	38.1	**17.6**
K_{23} (dB)	14.9	8.6	4.4	9.3	10.2	8.0	2.0	7.9	9.0	11.2	11.2	17.9	18.1	17.2	18.9	23.2	**9.6**
K_{13} (dB)	24.8	27.9	17.6	22.5	22.5	18.8	16.1	19.4	25.6	26.5	26.3	25.8	28.5	35.9	36.1	43.1	**22.6**
K_{24} (dB)	10.3	10.0	9.6	9.3	9.0	8.6	8.3	8.0	7.6	7.3	7.0	6.7	6.3	6.0	5.7	5.3	**8.0**

DETAIL 42



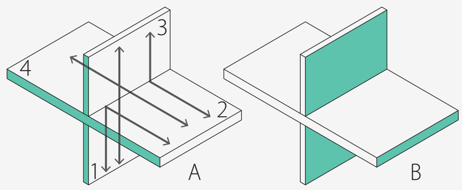


FIXING SYSTEM

HBS screws Ø8 x 240 mm (step 300 mm)
TTN240 angle brackets (step 800 mm)
WHT440 hold-down

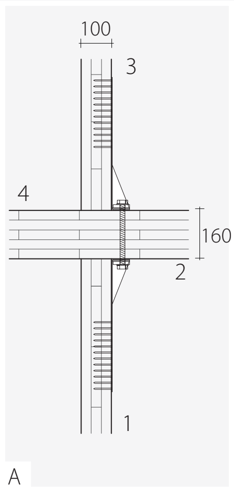
RESILIENT INTERLAYER

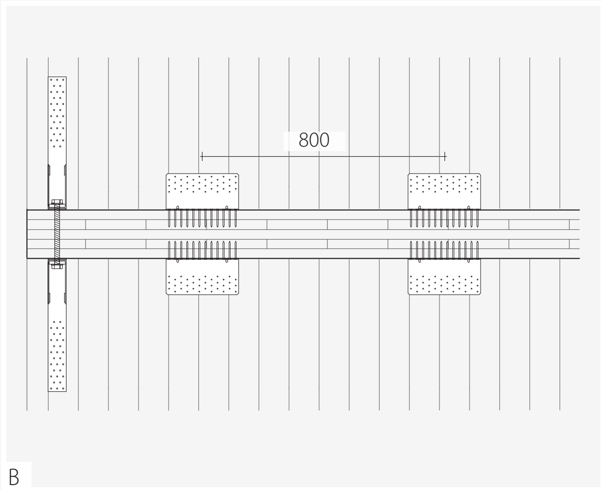
XYLOFON + TITAN SILENT



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	AVG$_{200-1250}$
K_{12} (dB)	20.4	17.8	12.0	18.5	14.9	16.2	12.9	19.2	23.6	25.5	25.9	24.7	27.9	38.1	40.3	44.2	**20.2**
K_{23} (dB)	15.5	3.5	3.7	10.2	7.6	10.5	3.7	12.7	12.1	15.3	15.8	21.8	22.5	24.3	28.1	29.3	**12.2**
K_{13} (dB)	25.4	22.8	17.0	23.5	19.9	21.2	17.9	24.2	28.6	30.5	30.9	29.7	32.9	43.1	45.3	49.2	**25.2**
K_{24} (dB)	10.3	10.0	9.6	9.3	9.0	8.6	8.3	8.0	7.6	7.3	7.0	6.7	6.3	6.0	5.7	5.3	**8.0**

DETAIL 43



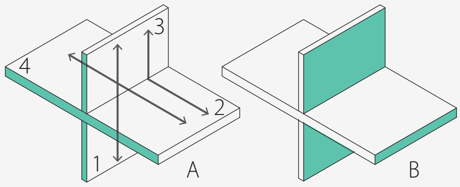


FIXING SYSTEM

TTN240 angle brackets (step 800 mm)
WHT440 hold-down

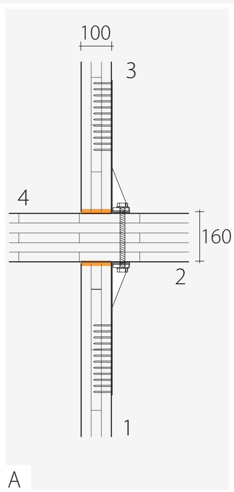
RESILIENT INTERLAYER

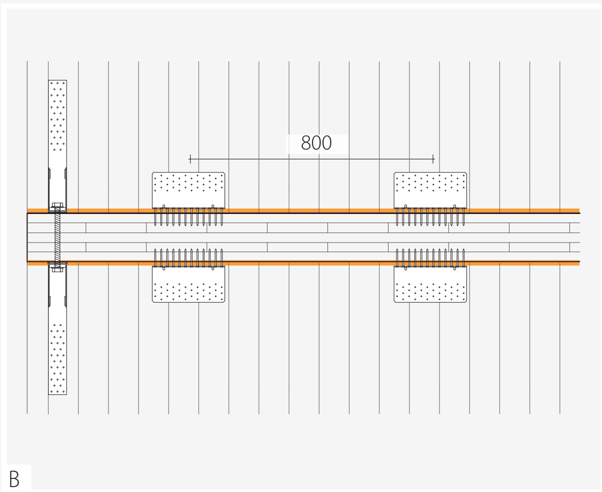
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{13} (dB)	27.9	27.7	19.3	21.6	20.1	13.9	9.8	13.4	16.1	18.5	20.7	23.8	25.6	31.7	35.3	33.0	**17.5**
K_{23} (dB)	22.9	22.7	14.3	16.6	15.1	8.9	4.8	8.4	11.1	13.5	15.7	18.8	20.6	26.7	30.3	28.0	**12.5**
K_{24} (dB)	10.3	10.0	9.6	9.3	9.0	8.6	8.3	8.0	7.6	7.3	7.0	6.7	6.3	6.0	5.7	5.3	**8.0**

DETAIL 44



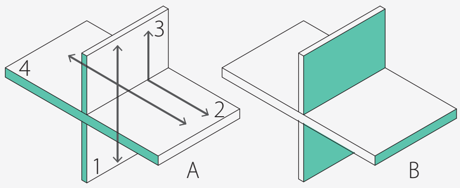


FIXING SYSTEM

TTN240 angle brackets (step 800 mm)
WHT440 hold-down

RESILIENT INTERLAYER

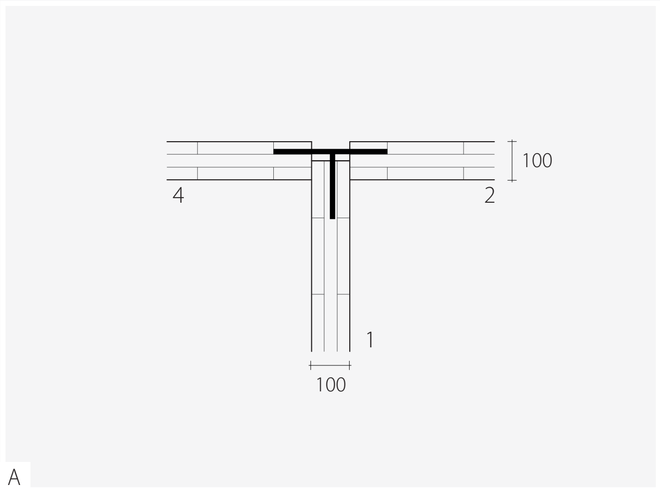
XYLOFON + TITAN SILENT



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{13} (dB)	24.6	28.1	17.5	19.7	19.0	15.2	11.6	15.6	17.7	23.0	25.0	27.6	30.4	32.4	35.0	33.5	**19.4**
K_{23} (dB)	19.6	23.1	12.5	14.7	14.0	10.2	6.6	10.6	12.7	18.0	20.0	22.6	25.4	27.4	30.0	28.5	**14.4**
K_{24} (dB)	10.3	10.0	9.6	9.3	9.0	8.6	8.3	8.0	7.6	7.3	7.0	6.7	6.3	6.0	5.7	5.3	**8.0**

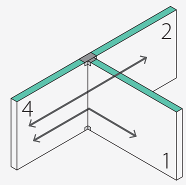
X-RAD: WALL-WALL JUNCTIONS

DETAIL 45 | T vertical junction



FIXING SYSTEM
X-PLATE BASE T, X-PLATE TOP T

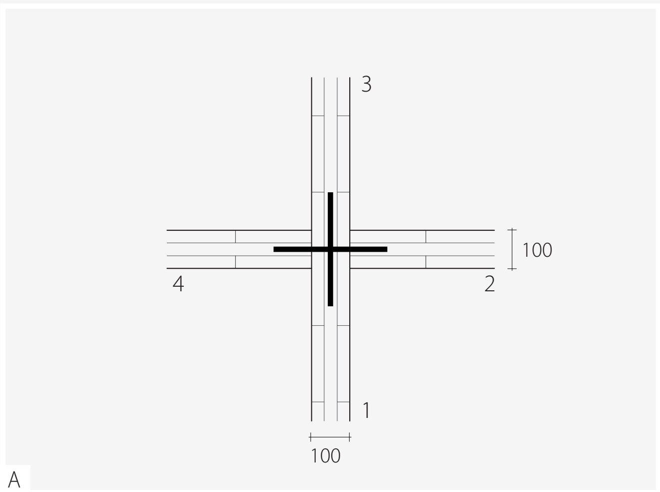
RESILIENT INTERLAYER
no



A

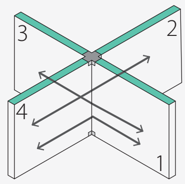
Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{14} (dB)	10.2	7.0	8.1	6.4	6.4	5.1	6.7	7.6	7.3	7.9	8.2	9.7	12.7	12.9	12.6	15.5	**7.3**
K_{24} (dB)	15.7	16.0	13.6	6.5	6.4	8.8	9.5	15.2	18.4	17.7	20.2	18.9	24.7	24.7	23.4	28.5	**13.5**

DETAIL 46 | X vertical junction



FIXING SYSTEM
X-PLATE BASE X, X-PLATE TOP X

RESILIENT INTERLAYER
no

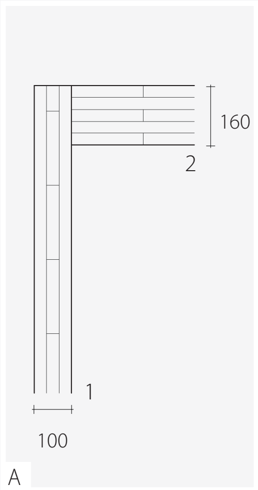


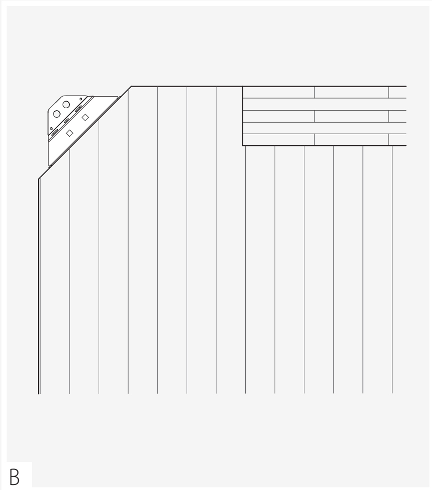
A

Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{14} (dB)	12.7	11.4	10.2	8.5	8.5	7.0	8.1	10.7	11.5	9.5	11.1	12.5	15.8	17.5	17.5	21.6	**9.7**
K_{24} (dB)	18.9	12.0	13.3	9.7	8.7	8.8	6.6	11.1	13.1	11.7	13.4	12.6	13.8	14.4	12.4	16.9	**10.6**
K_{13} (dB)	15.0	13.7	13.6	12.0	11.8	9.3	8.2	12.6	15.4	13.3	12.6	13.2	19.0	21.6	24.0	31.4	**12.0**

X-RAD: WALL-FLOOR JUNCTIONS

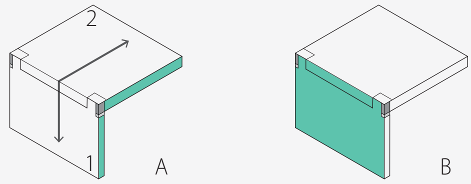
DETAIL 47 | L horizontal junction





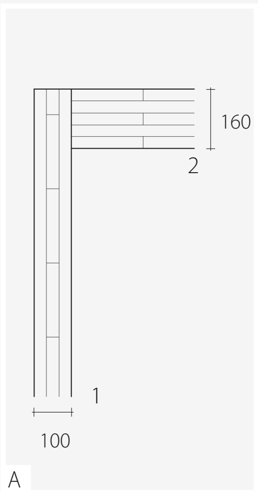
FIXING SYSTEM
X-PLATE BASE O

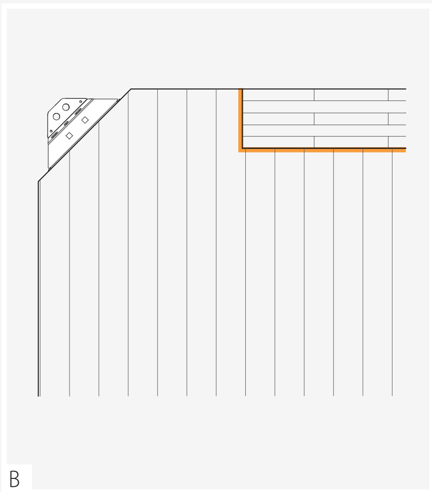
RESILIENT INTERLAYER
no



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB)	13.1	13.8	14.2	10.6	11.6	12.8	12.2	10.6	12.2	9.7	8.1	11.2	9.9	10.2	11.2	13.5	**11.0**

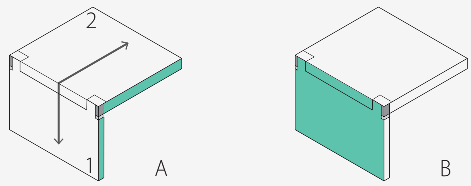
DETAIL 48 | L horizontal junction





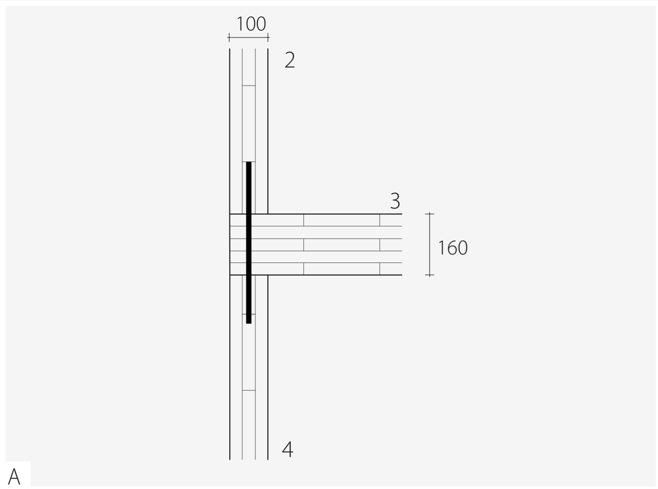
FIXING SYSTEM
X-PLATE BASE O

RESILIENT INTERLAYER
XYLOFON*, ALADIN STRIPE**



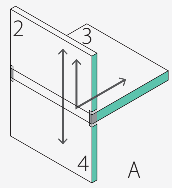
Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{12} (dB) *	12.0	14.6	11.8	13.2	12.8	15.2	15.9	14.9	15.7	15.9	13.9	12.6	16.2	18.5	17.8	17.5	**14.4**
K_{12} (dB) **	16.3	13.7	14.4	13.8	13.4	12.7	11.4	10.0	13.3	14.3	13.3	14.3	15.9	13.9	16.2	21.9	**13.0**

DETAIL 49 | T horizontal junction



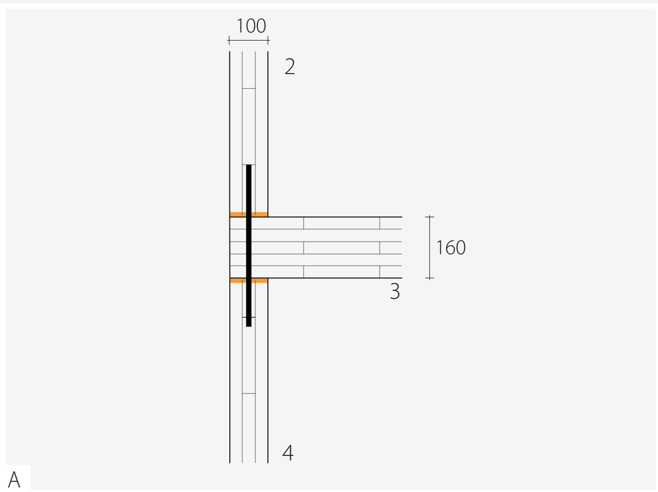
FIXING SYSTEM
X-PLATE BASE O, X-PLATE MID O

RESILIENT INTERLAYER
no



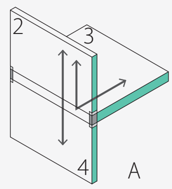
Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{23} (dB)	17.2	13.0	13.1	10.4	9.5	7.1	7.7	7.6	8.3	9.9	11.3	13.7	17.8	18.9	19.6	23.5	**9.5**
K_{24} (dB)	24.2	20.0	20.1	17.4	16.5	14.1	14.7	14.6	15.3	16.9	18.3	20.7	24.8	25.9	26.6	30.5	**16.5**

DETAIL 50 | T horizontal junction



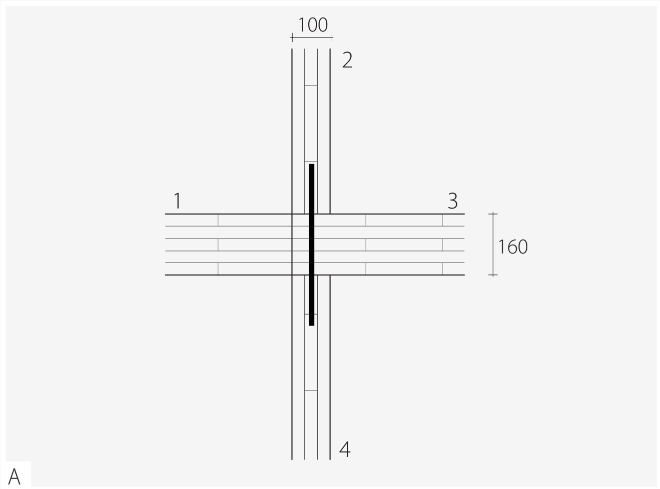
FIXING SYSTEM
X-PLATE BASE O, X-PLATE MID O

RESILIENT INTERLAYER
XYLOFON



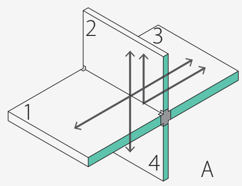
Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	$AVG_{200-1250}$
K_{23} (dB)	16.0	13.8	10.7	13.0	10.6	9.5	11.4	11.9	11.9	16.1	17.1	15.0	24.1	27.2	26.3	27.4	**12.9**
K_{24} (dB)	23.0	20.8	17.7	20.0	17.6	16.5	18.4	18.9	18.9	23.1	24.1	22.0	31.1	34.2	33.3	34.4	**19.9**

DETAIL 51 | X horizontal junction



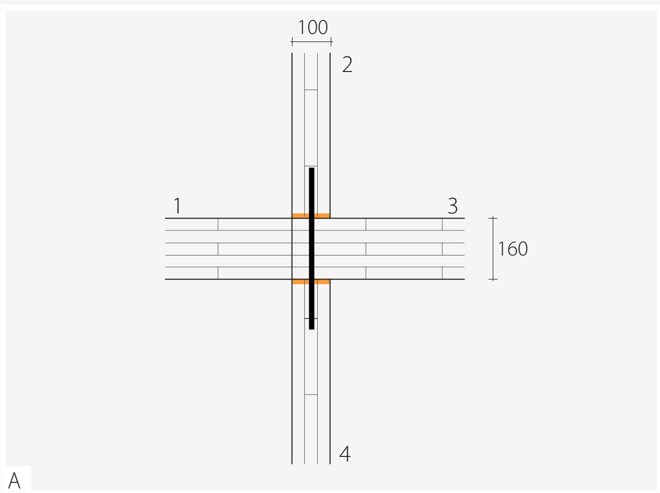
FIXING SYSTEM
X-PLATE BASE O, X-PLATE MID O

RESILIENT INTERLAYER
no



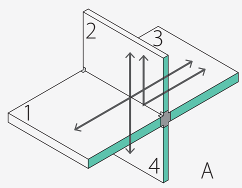
Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	AVG
K_{23} (dB)	19.7	17.4	15.1	12.4	11.5	9.0	9.1	10.7	12.5	11.6	14.1	16.5	20.8	23.5	24.5	29.6	**11.9**
K_{13} (dB)	13.0	11.7	11.5	10.0	9.7	7.2	6.2	10.6	13.4	11.3	10.6	11.1	17.0	19.6	22.0	29.3	**10.0**
K_{24} (dB)	19.9	13.0	14.3	10.7	9.7	9.8	7.6	12.1	14.1	12.7	14.4	13.6	14.8	15.4	13.4	17.9	**11.6**

DETAIL 52 | X horizontal junction



FIXING SYSTEM
X-PLATE BASE O, X-PLATE MID O

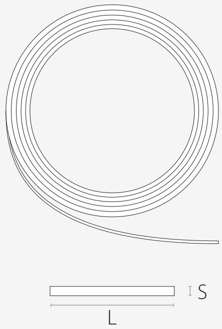
RESILIENT INTERLAYER
XYLOFON



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	AVG
K_{23} (dB)	18.6	18.2	12.7	15.1	12.7	11.4	12.8	15.1	16.0	17.8	19.9	17.8	27.1	31.8	31.1	33.5	**15.4**
K_{13} (dB)	13.0	11.7	11.5	10.0	9.7	7.2	6.2	10.6	13.4	11.3	10.6	11.1	17.0	19.6	22.0	29.3	**10.0**
K_{24} (dB)	18.8	13.8	11.9	13.4	10.8	12.2	11.3	16.4	17.7	18.9	20.2	15.0	21.2	23.7	20.1	21.8	**15.1**

XYLOFON

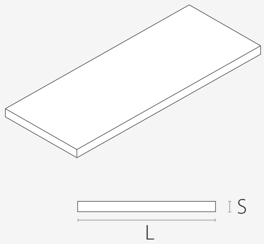
CODES AND DIMENSIONS



CODE	EX CODE	version	length	width (L)	thickness (S)	pcs/pack
XYL35100	D82411	35	3.66 m	100 mm	6 mm	1
XYL50100	D82412	50	3.66 m	100 mm	6 mm	1
XYL70100	D82413	70	3.66 m	100 mm	6 mm	1
XYL80100	D82414	80	3.66 m	100 mm	6 mm	1
XYL90120	D82415	90	3.66 m	120 mm	6 mm	1

XYLOFON MEGA

CODES AND DIMENSIONS

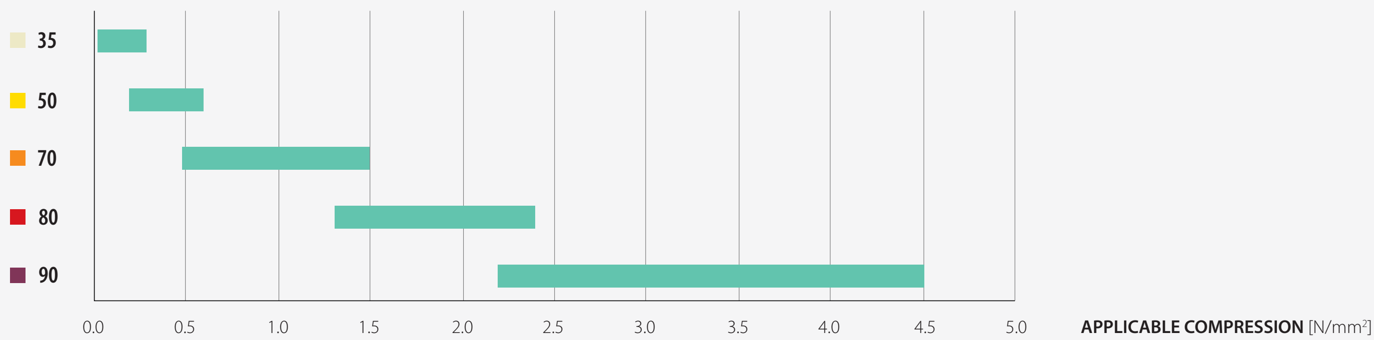


CODE	EX CODE	version	length	width (L)	thickness (S)	pcs/pack
XYL351000	D82421	35	3.66 m	1000 mm	6 mm	1
XYL501000	D82422	50	3.66 m	1000 mm	6 mm	1
XYL701000	D82423	70	3.66 m	1000 mm	6 mm	1
XYL801000	D82424	80	3.66 m	1000 mm	6 mm	1
XYL901000	D82425	90	3.66 m	1000 mm	6 mm	1

TABLE OF USE

In table of use ("Soundproofing solutions" product catalogue) the loads are optimized with respect to the dynamic behaviour of the material and considering a deflection within the range 1-10%.
The preferred loads reported here are optimized with respect to the static load, evaluated in compression and considering the effect of friction, and the resonance frequency, chosen to range between 20 and 30 Hz, with a maximum deflection of 12%.

	APPLICABLE COMPRESSION [N/mm²]		DEFORMATION [mm]		APPLICABLE LINEAR LOAD [kN/m]		
VERSION	from	to	min	max	CODE	from	to
35	0.027	0.275	0.06	0.60	**XYL35100** (100 mm)	2.7	27.5
50	0.180	0.605	0.16	0.62	**XYL50100** (100 mm)	18.0	60.5
70	0.455	1.500	0.13	0.44	**XYL70100** (100 mm)	45.5	150.0
80	1.300	2.400	0.32	0.59	**XYL80100** (100 mm)	130.0	240.0
90	2.200	4.500	0.30	0.62	**XYL90120** (120 mm)	264.0	540.0

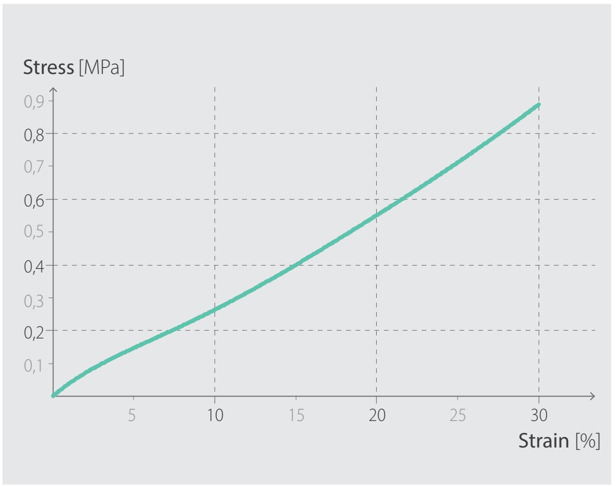


35 SHORE

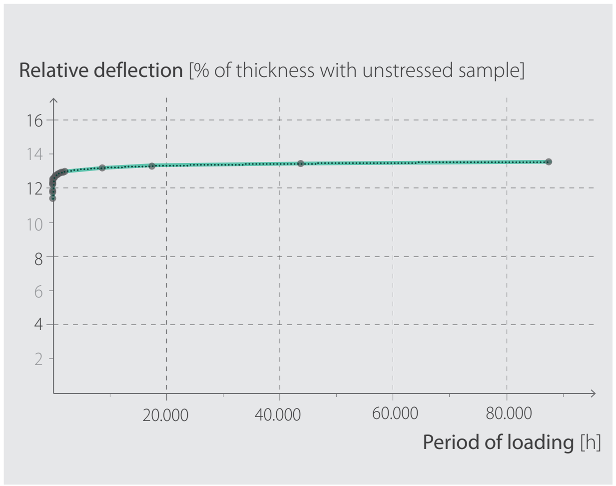
PROPERTY	STANDARD	XYL35100 XYL351000
Hardness	-	35 shore
Elastic modulus 10% (compression)	ISO 604	2.74 MPa
Dynamic stiffness s'	ISO 9052	1262 MN/m^3
Creep	EN 1606	< 0.5 %
Compression deformation DVR	ISO 1856	1.5 %
Dynamic elasticity modulus E', 10 Hz (DMA)	ISO 4664	2.16 MPa
Dynamic shear modulus G', 10 Hz (DMA)	ISO 4664	1.13 MPa
Damping factor Tan δ	ISO 4664	0.177
Max processing temperature (TGA)	-	200 °C
Reaction to fire	EN 13501-1	class E

LEGEND	CHART 4 - 6	CHART 3	CHART 5
	tan d (1,0 Hz)	E' (1,0 Hz/MPa)	G' (1,0 Hz/MPa)
	tan d (5,0 Hz)	E' (5,0 Hz/MPa)	G' (5,0 Hz/MPa)
	tan d (10,0 Hz)	E' (10,0 Hz/MPa)	G' (10,0 Hz/MPa)
	tan d (20,0 Hz)	E' (20,0 Hz/MPa)	G' (20,0 Hz/MPa)
	tan d (33,3 Hz)	E' (33,3 Hz/MPa)	G' (33,3 Hz/MPa)
	tan d (50,0 Hz)	E' (50,0 Hz/MPa)	G' (50,0 Hz/MPa)

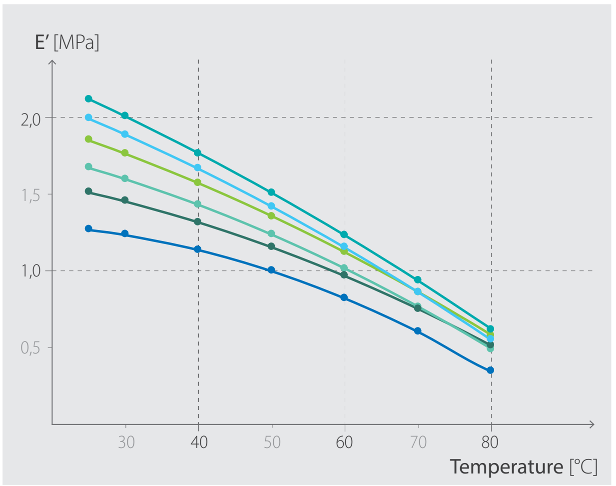
1 | STRESS STRAIN (COMPRESSION)



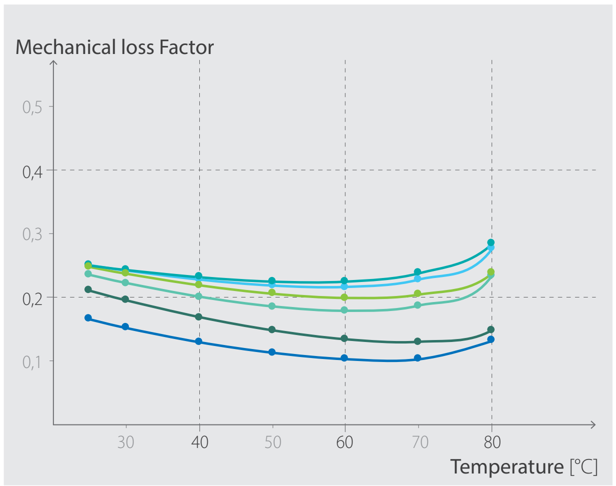
2 | CREEP



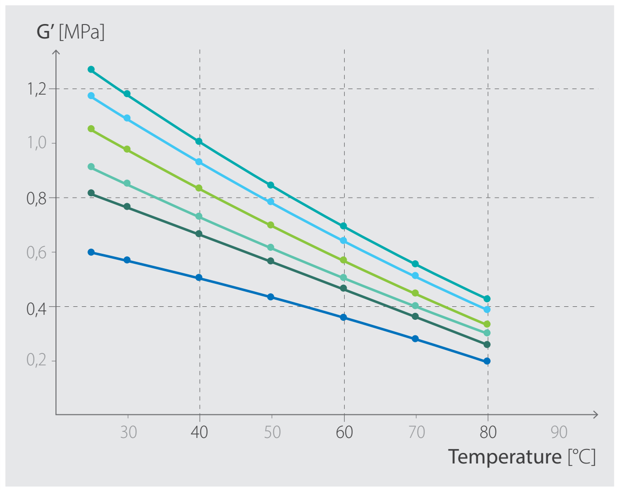
3 | DYN E-MODULUS TENSIL MODE DMTA



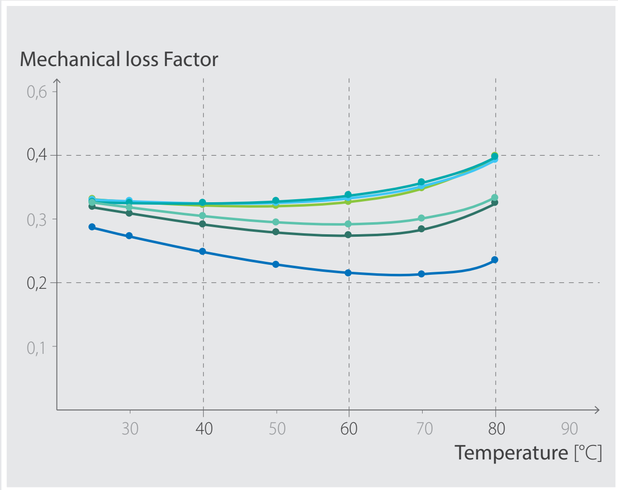
4 | TAN δ TENSIL MODE DMTA



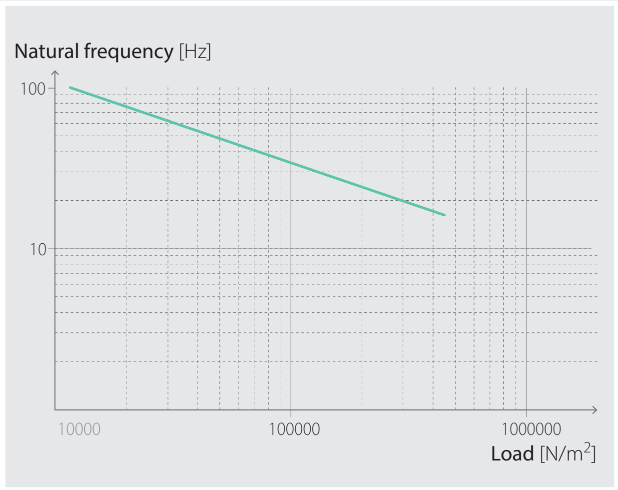
5 | DYN G-MODULUS SHEAR MODE DMTA



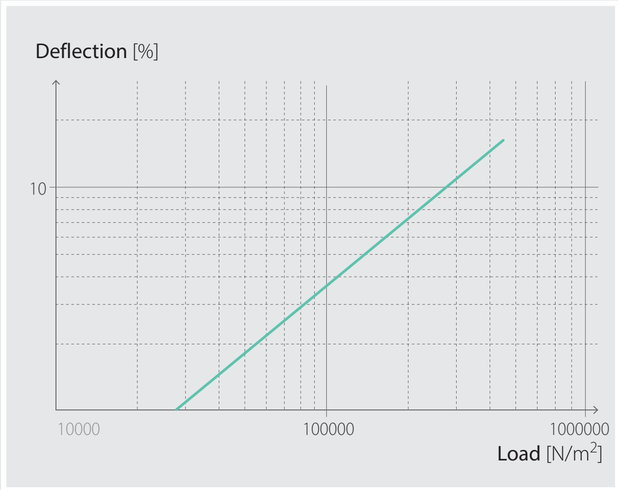
6 | TAN δ SHEAR MODE DMTA



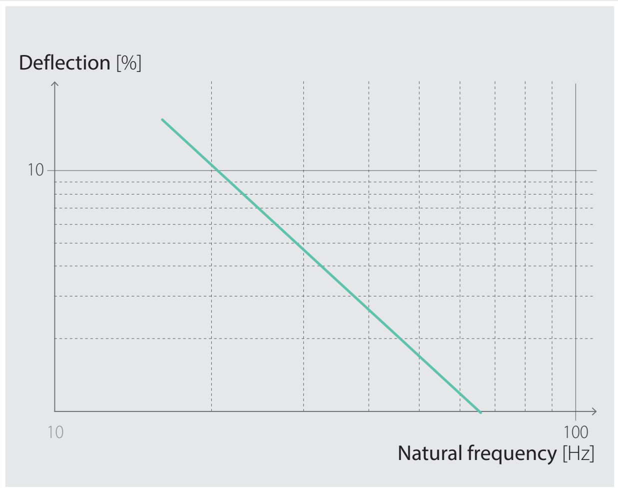
7 | NATURAL FREQUENCY AND LOAD



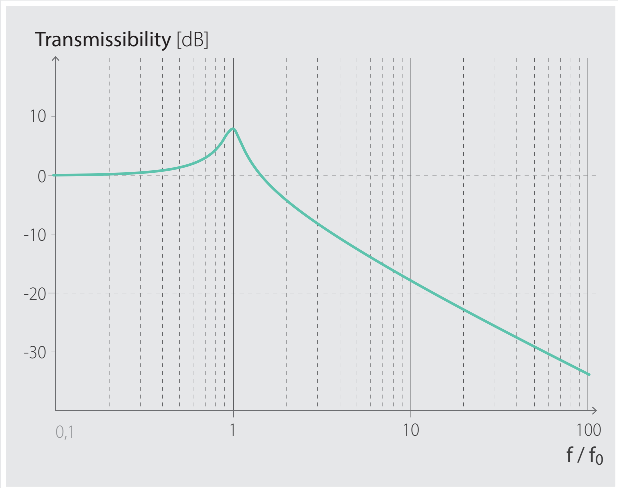
8 | DEFLECTION AND LOAD



9 | DEFLECTION AND NATURAL FREQUENCY



10 | TRANSMISSIBILITY



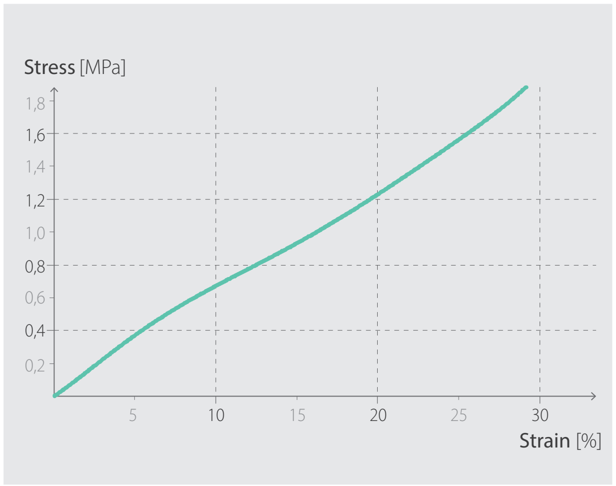
Normalized respect to the resonance frequency.
Elastic modulus from compression tests with 10% deflection.

50 SHORE

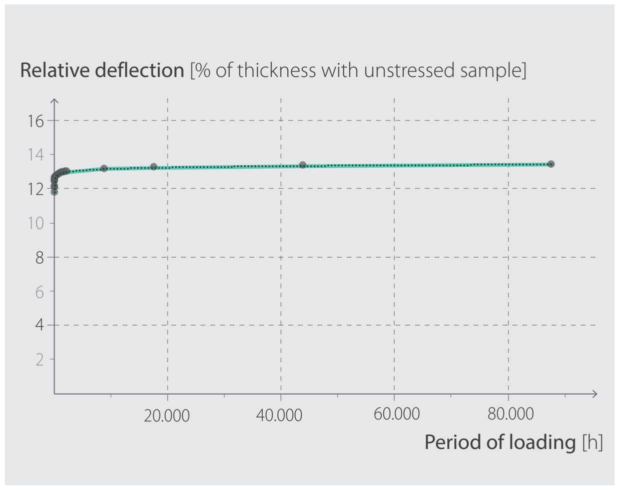
PROPERTY	STANDARD	XYL50100 XYL501000
Hardness	-	50 shore
Elastic modulus 10% (compression)	ISO 604	6.74 MPa
Dynamic stiffness s'	ISO 9052	1455 MN/m³
Creep	EN 1606	< 0.5 %
Compression deformation DVR	ISO 1856	0.5 %
Dynamic elasticity modulus E', 10 Hz (DMA)	ISO 4664	3.53 MPa
Dynamic shear modulus G', 10 Hz (DMA)	ISO 4664	1.18 MPa
Damping factor Tan δ	ISO 4664	0.132
Max processing temperature (TGA)	-	> 200 °C
Reaction to fire	EN 13501-1	class E

LEGEND	CHART 4 - 6	CHART 3	CHART 5
	tan d (1,0 Hz)	E' (1,0 Hz/MPa)	G' (1,0 Hz/MPa)
	tan d (5,0 Hz)	E' (5,0 Hz/MPa)	G' (5,0 Hz/MPa)
	tan d (10,0 Hz)	E' (10,0 Hz/MPa)	G' (10,0 Hz/MPa)
	tan d (20,0 Hz)	E' (20,0 Hz/MPa)	G' (20,0 Hz/MPa)
	tan d (33,3 Hz)	E' (33,3 Hz/MPa)	G' (33,3 Hz/MPa)
	tan d (50,0 Hz)	E' (50,0 Hz/MPa)	G' (50,0 Hz/MPa)

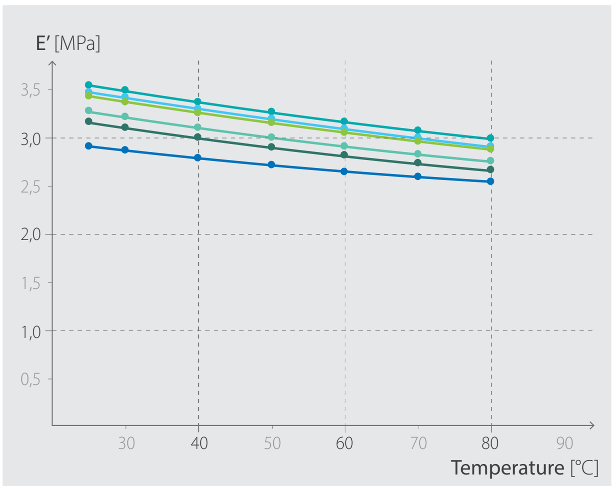
1 | STRESS STRAIN (COMPRESSION)



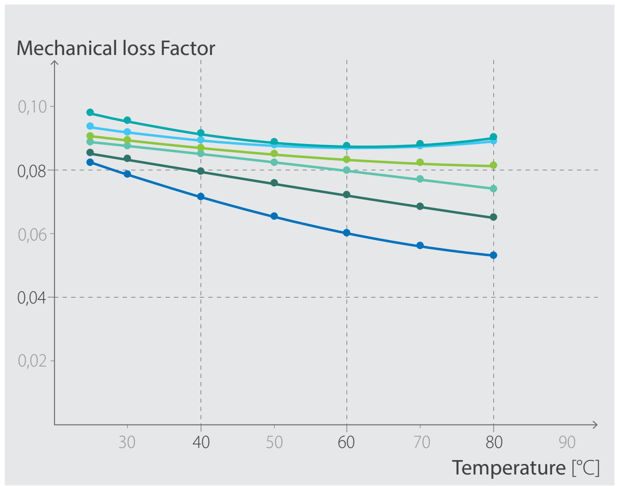
2 | CREEP



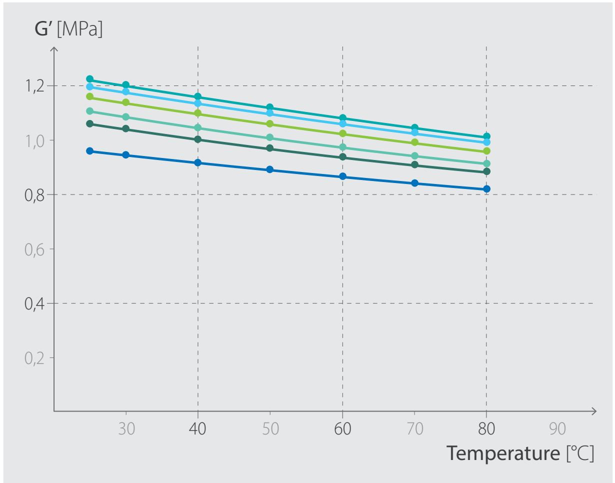
3 | DYN E-MODULUS TENSIL MODE DMTA



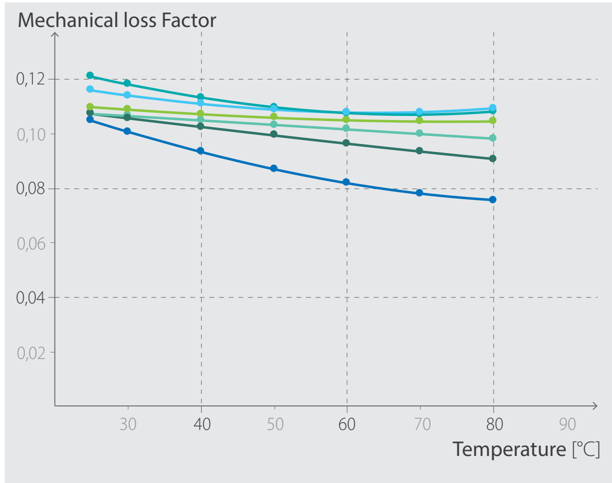
4 | TAN δ TENSIL MODE DMTA



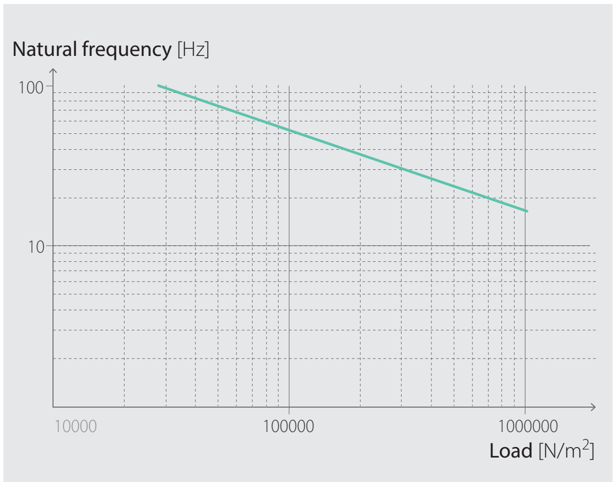
5 | DYN G-MODULUS SHEAR MODE DMTA



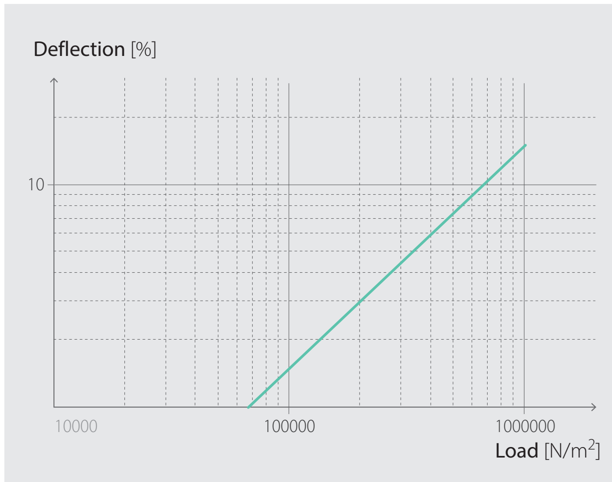
6 | TAN δ SHEAR MODE DMTA



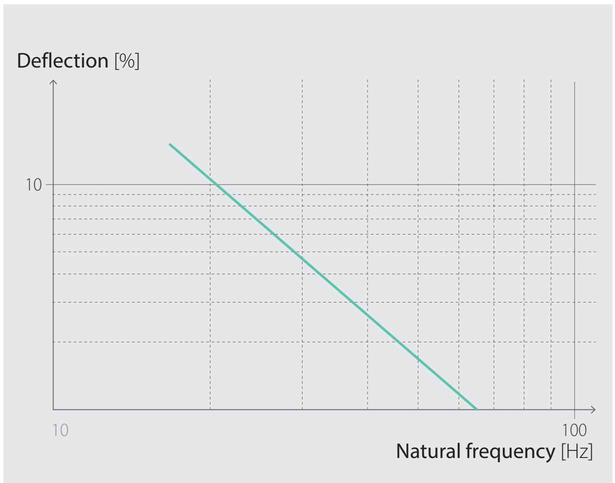
7 | NATURAL FREQUENCY AND LOAD



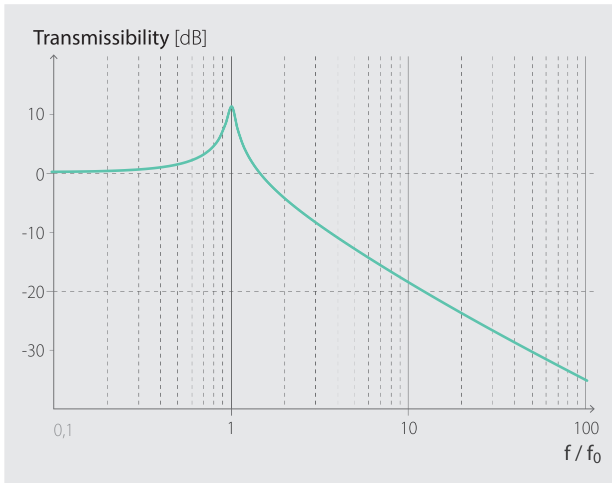
8 | DEFLECTION AND LOAD



9 | DEFLECTION AND NATURAL FREQUENCY



10 | TRANSMISSIBILITY



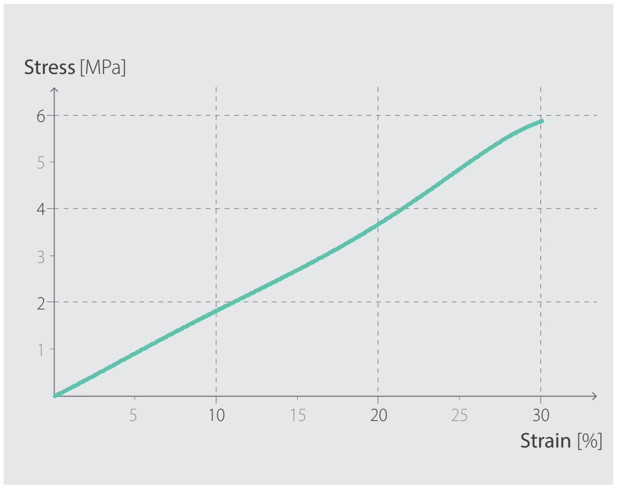
Normalized respect to the resonance frequency.
Elastic modulus from compression tests with 10% deflection.

70 SHORE

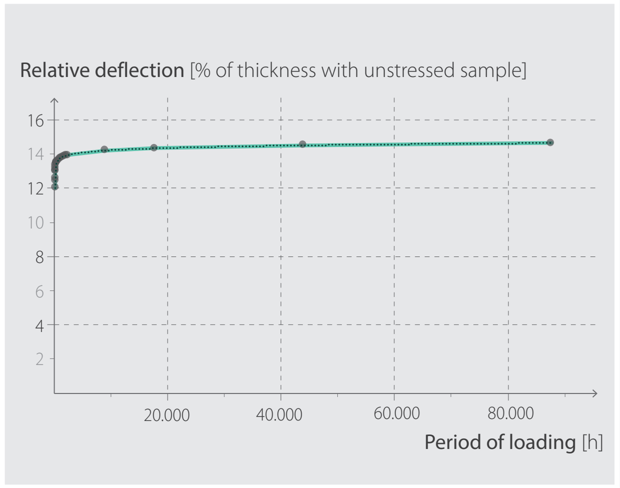
PROPERTY	STANDARD	XYL70100 XYL701000
Hardness	-	70 shore
Elastic modulus 10% (compression)	ISO 604	20.5 MPa
Dynamic stiffness s'	ISO 9052	1822 MN/m^3
Creep	EN 1606	< 0.5 %
Compression deformation DVR	ISO 1856	0.3 %
Dynamic elasticity modulus E', 10 Hz (DMA)	ISO 4664	10.1 MPa
Dynamic shear modulus G', 10 Hz (DMA)	ISO 4664	3.24 MPa
Damping factor Tan δ	ISO 4664	0.101
Max processing temperature (TGA)	-	> 200 °C
Reaction to fire	EN 13501-1	class E

LEGEND	CHART 4 - 6	CHART 3	CHART 5
	tan d (1,0 Hz)	E' (1,0 Hz/MPa)	G' (1,0 Hz/MPa)
	tan d (5,0 Hz)	E' (5,0 Hz/MPa)	G' (5,0 Hz/MPa)
	tan d (10,0 Hz)	E' (10,0 Hz/MPa)	G' (10,0 Hz/MPa)
	tan d (20,0 Hz)	E' (20,0 Hz/MPa)	G' (20,0 Hz/MPa)
	tan d (33,3 Hz)	E' (33,3 Hz/MPa)	G' (33,3 Hz/MPa)
	tan d (50,0 Hz)	E' (50,0 Hz/MPa)	G' (50,0 Hz/MPa)

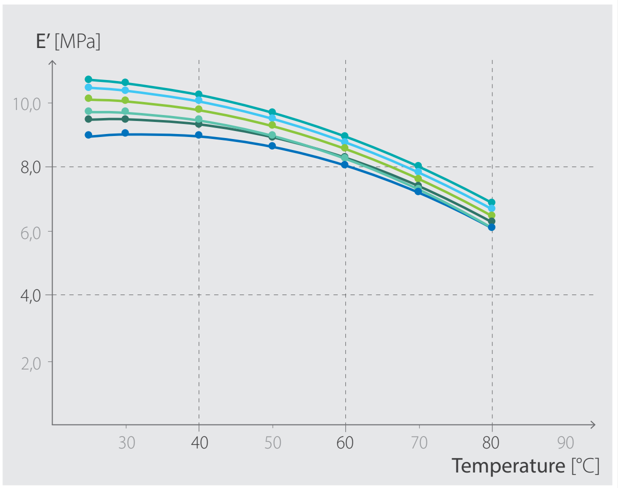
1 | STRESS STRAIN (COMPRESSION)



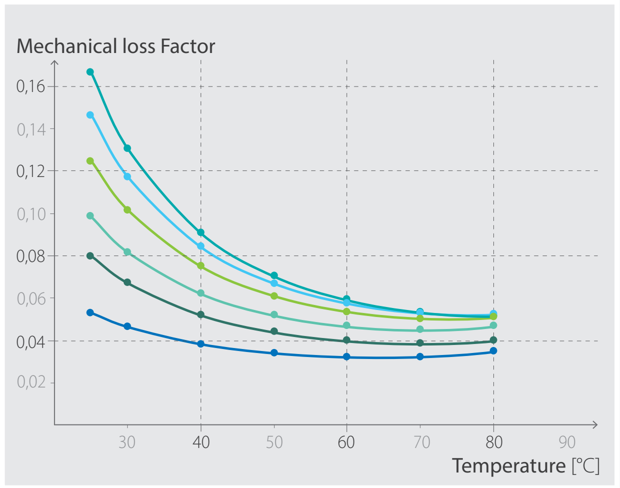
2 | CREEP



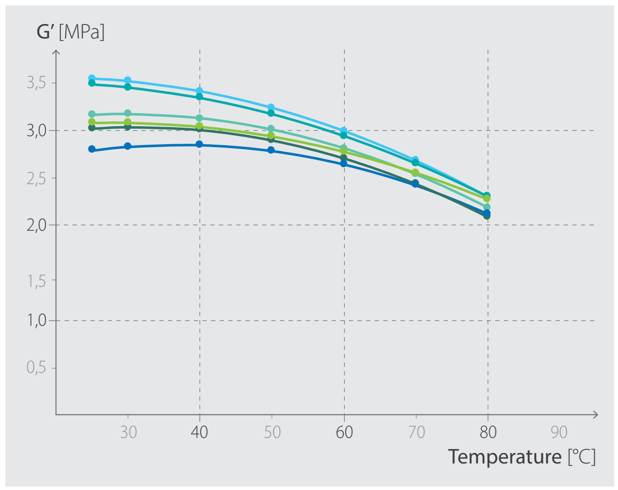
3 | DYN E-MODULUS TENSIL MODE DMTA



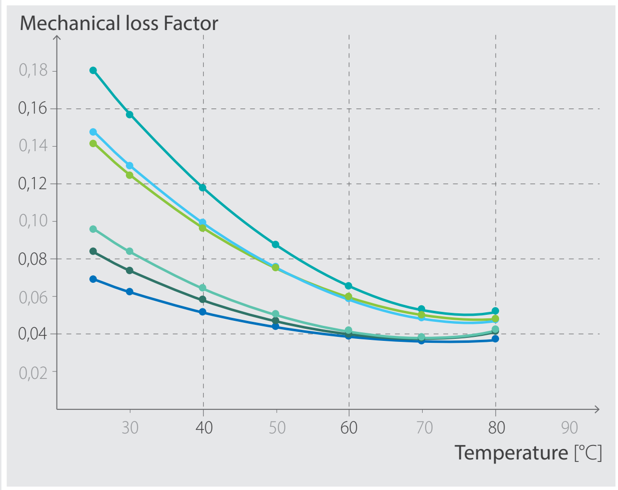
4 | TAN δ TENSIL MODE DMTA



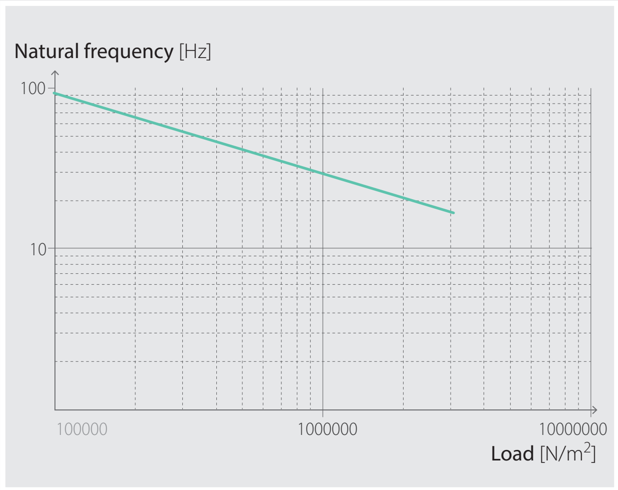
5 | DYN G-MODULUS SHEAR MODE DMTA



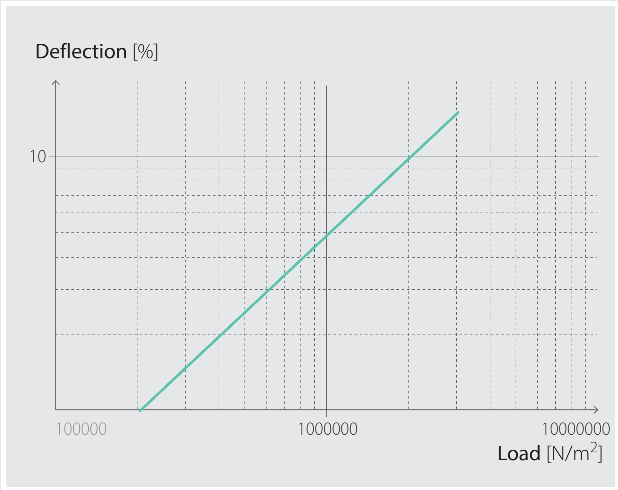
6 | TAN δ SHEAR MODE DMTA



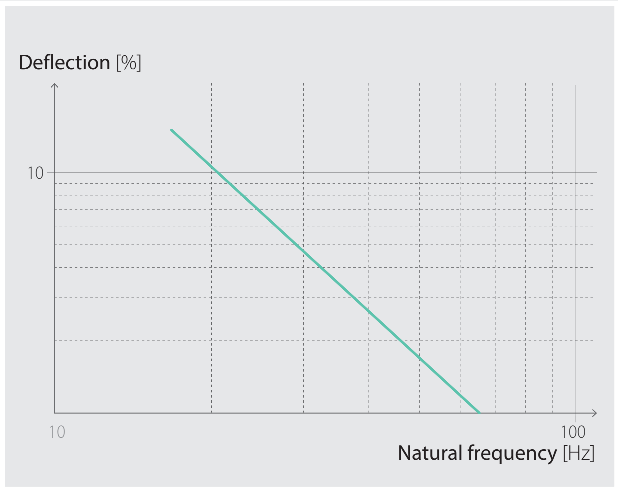
7 | NATURAL FREQUENCY AND LOAD



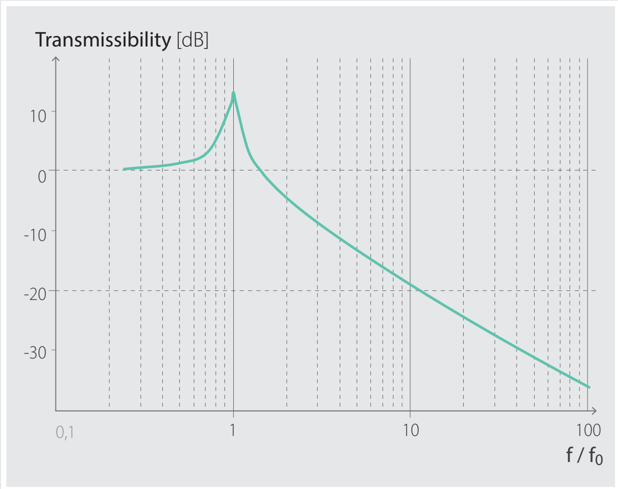
8 | DEFLECTION AND LOAD



9 | DEFLECTION AND NATURAL FREQUENCY



10 | TRANSMISSIBILITY



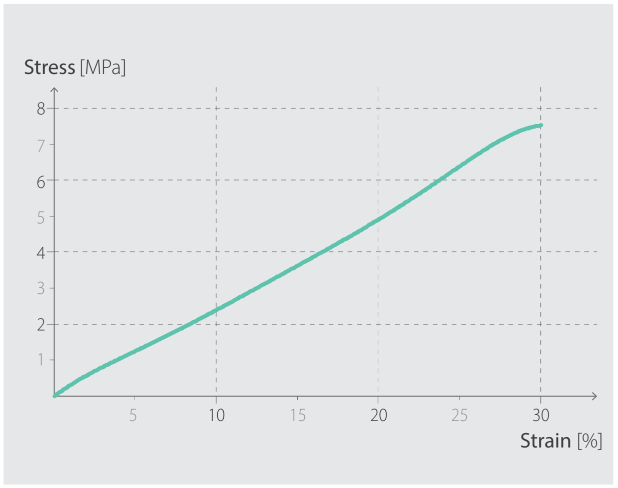
Normalized respect to the resonance frequency.
Elastic modulus from compression tests with 10% deflection.

80 SHORE

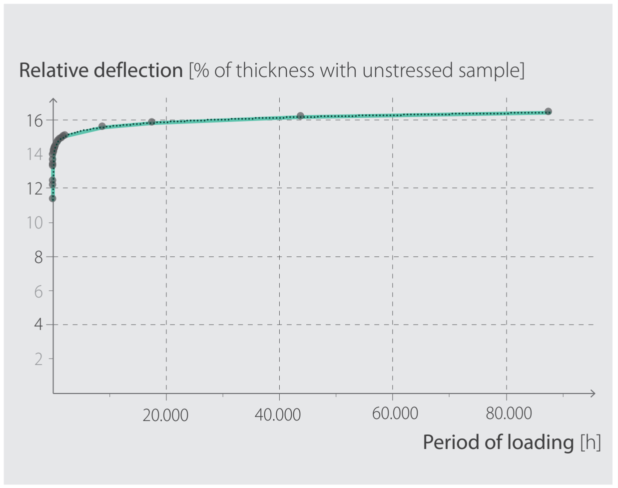
PROPERTY	STANDARD	XYL80100 XYL801000
Hardness	-	80 shore
Elastic modulus 10% (compression)	ISO 604	24.3 MPa
Dynamic stiffness s'	ISO 9052	2157 MN/m³
Creep	EN 1606	< 0.5 %
Compression deformation DVR	ISO 1856	0.9 %
Dynamic elasticity modulus E', 10 Hz (DMA)	ISO 4664	19 MPa
Dynamic shear modulus G', 10 Hz (DMA)	ISO 4664	6.5 MPa
Damping factor Tan δ	ISO 4664	0.134
Max processing temperature (TGA)	-	> 200 °C
Reaction to fire	EN 13501-1	class E

LEGEND	CHART 4 - 6	CHART 3	CHART 5
	tan d (1,0 Hz)	E' (1,0 Hz/MPa)	G' (1,0 Hz/MPa)
	tan d (5,0 Hz)	E' (5,0 Hz/MPa)	G' (5,0 Hz/MPa)
	tan d (10,0 Hz)	E' (10,0 Hz/MPa)	G' (10,0 Hz/MPa)
	tan d (20,0 Hz)	E' (20,0 Hz/MPa)	G' (20,0 Hz/MPa)
	tan d (33,3 Hz)	E' (33,3 Hz/MPa)	G' (33,3 Hz/MPa)
	tan d (50,0 Hz)	E' (50,0 Hz/MPa)	G' (50,0 Hz/MPa)

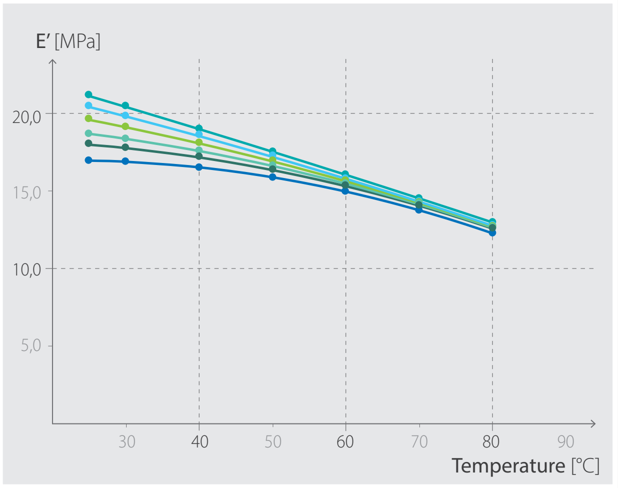
1 | STRESS STRAIN (COMPRESSION)



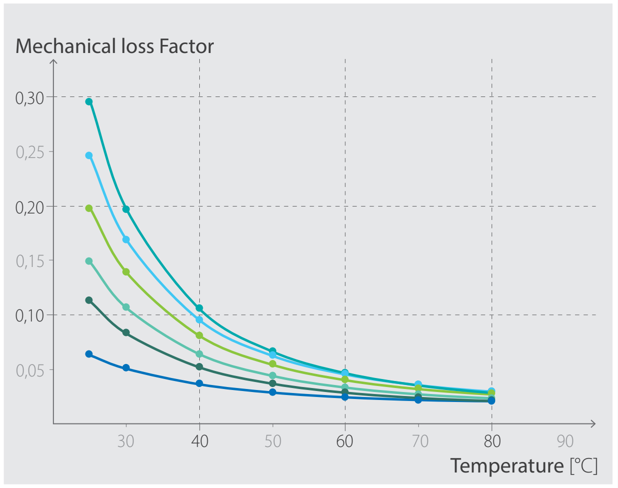
2 | CREEP



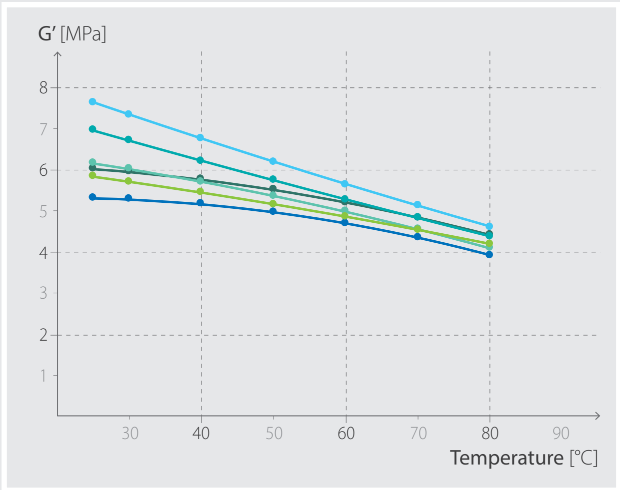
3 | DYN E-MODULUS TENSIL MODE DMTA



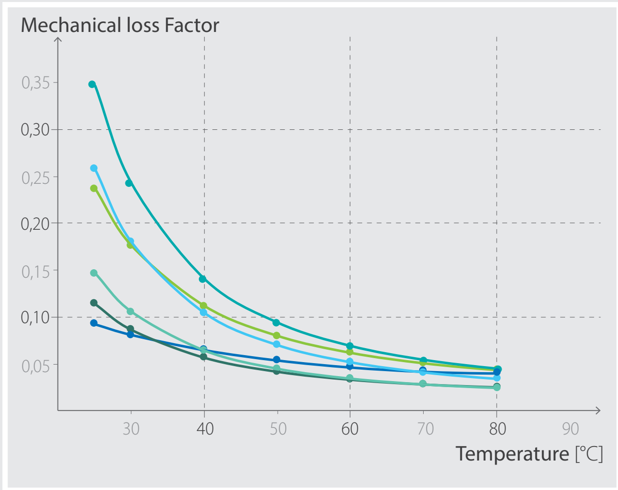
4 | TAN δ TENSIL MODE DMTA



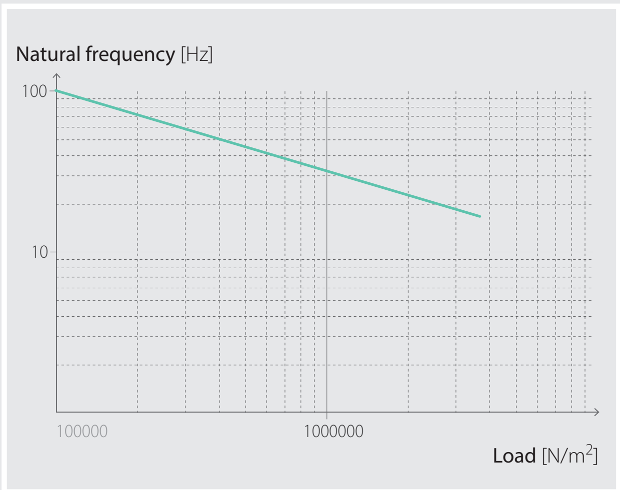
5 | DYN G-MODULUS SHEAR MODE DMTA



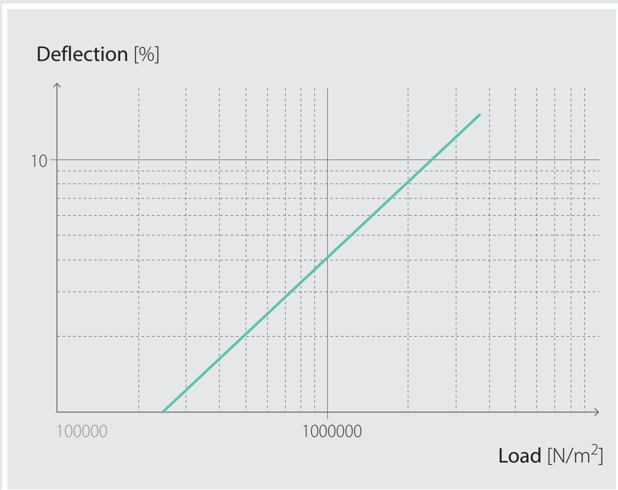
6 | TAN δ SHEAR MODE DMTA



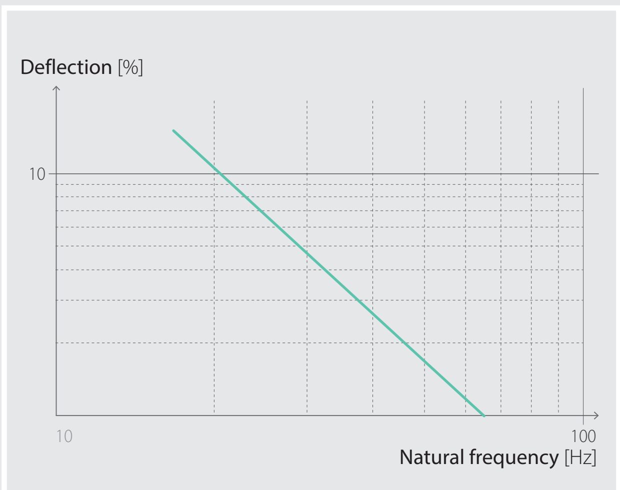
7 | NATURAL FREQUENCY AND LOAD



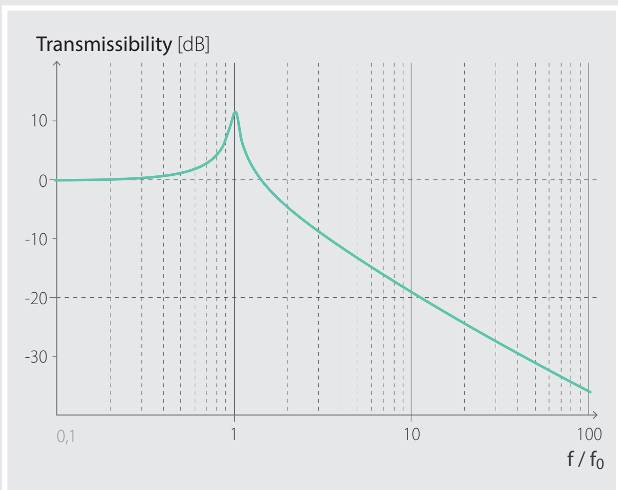
8 | DEFLECTION AND LOAD



9 | DEFLECTION AND NATURAL FREQUENCY



10 | TRANSMISSIBILITY



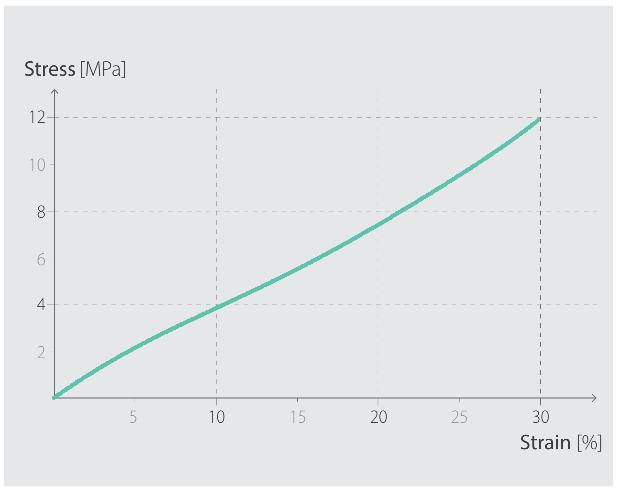
Normalized respect to the resonance frequency.
Elastic modulus from compression tests with 10% deflection.

90 SHORE

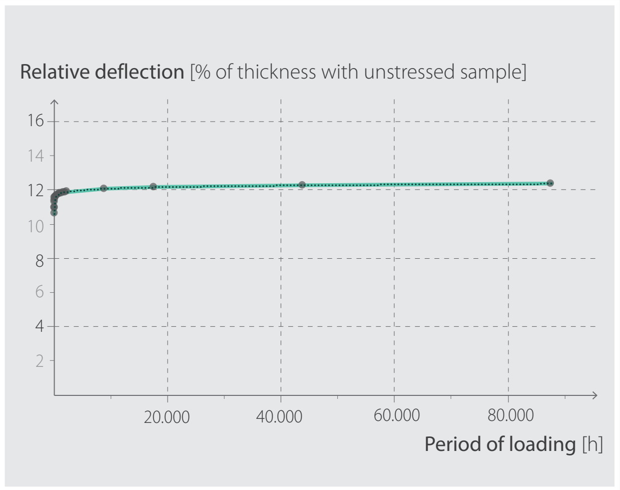
PROPERTY	STANDARD	XYL90120 XYL901000
Hardness	-	90 shore
Elastic modulus 10% (compression)	ISO 604	43.5 MPa
Dynamic stiffness s'	ISO 9052	> 2200 MN/m^3
Creep	EN 1606	< 0.5 %
Compression deformation DVR	ISO 1856	3.7 %
Dynamic elasticity modulus E', 10 Hz (DMA)	ISO 4664	43 MPa
Dynamic shear modulus G', 10 Hz (DMA)	ISO 4664	16.7 MPa
Damping factor Tan δ	ISO 4664	0.230
Max processing temperature (TGA)	-	> 200 °C
Reaction to fire	EN 13501-1	class E

LEGEND	CHART 4 - 6	CHART 3	CHART 5
	tan d (1,0 Hz)	E' (1,0 Hz/MPa)	G' (1,0 Hz/MPa)
	tan d (5,0 Hz)	E' (5,0 Hz/MPa)	G' (5,0 Hz/MPa)
	tan d (10,0 Hz)	E' (10,0 Hz/MPa)	G' (10,0 Hz/MPa)
	tan d (20,0 Hz)	E' (20,0 Hz/MPa)	G' (20,0 Hz/MPa)
	tan d (33,3 Hz)	E' (33,3 Hz/MPa)	G' (33,3 Hz/MPa)
	tan d (50,0 Hz)	E' (50,0 Hz/MPa)	G' (50,0 Hz/MPa)

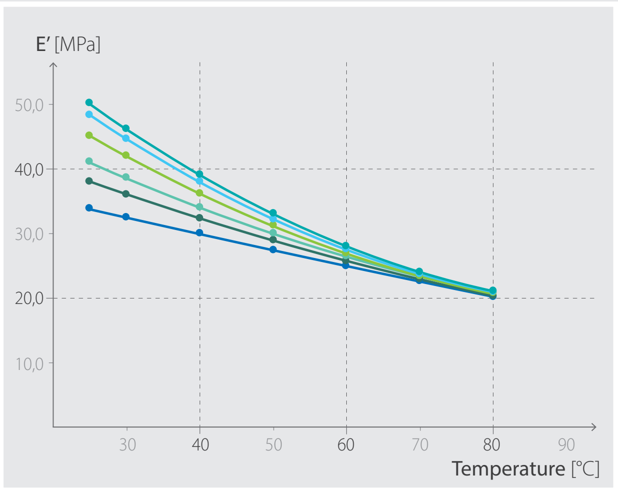
1 | STRESS STRAIN (COMPRESSION)



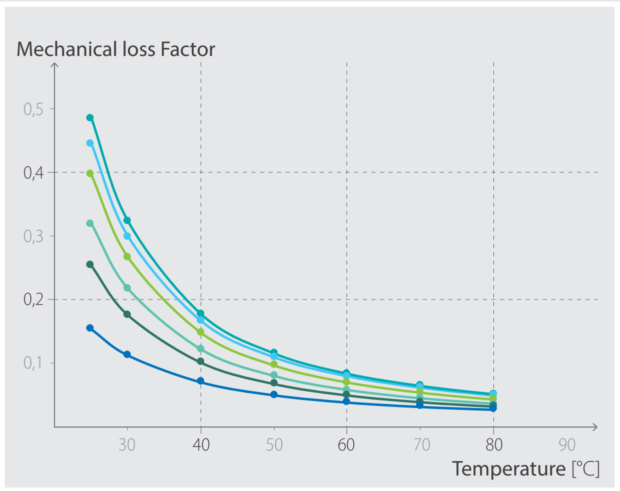
2 | CREEP



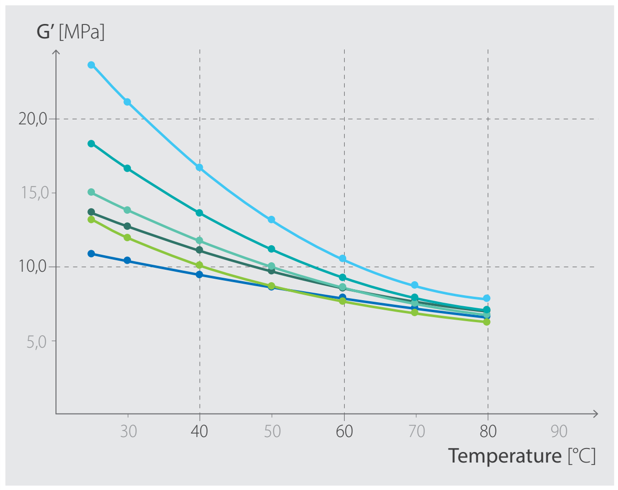
3 | DYN E-MODULUS TENSIL MODE DMTA



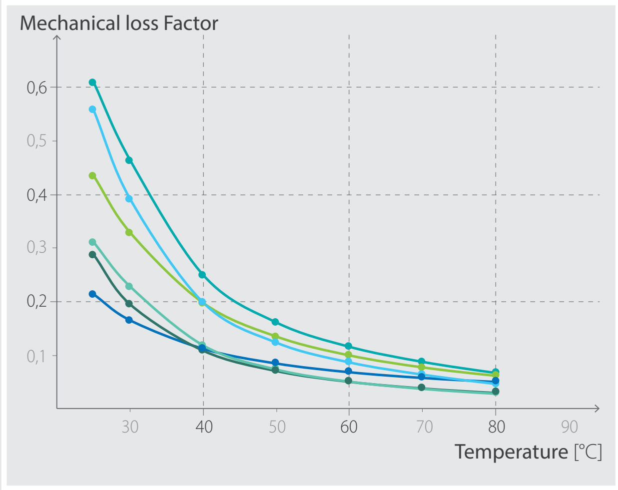
4 | TAN δ TENSIL MODE DMTA



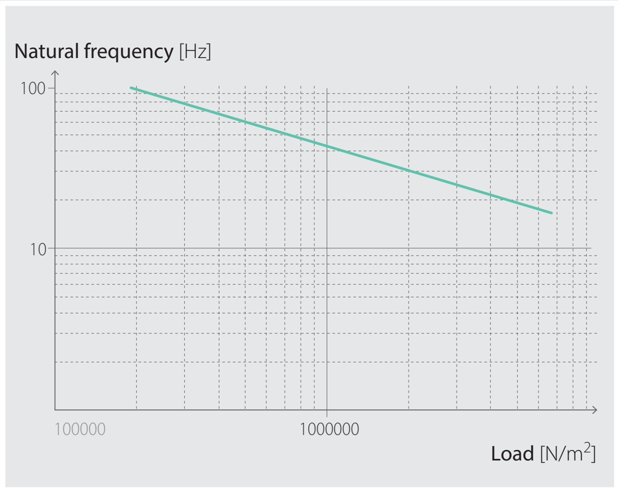
5 | DYN G-MODULUS SHEAR MODE DMTA



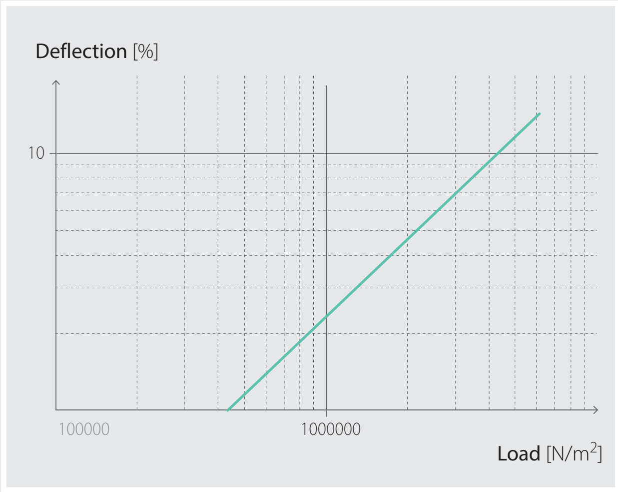
6 | TAN δ SHEAR MODE DMTA



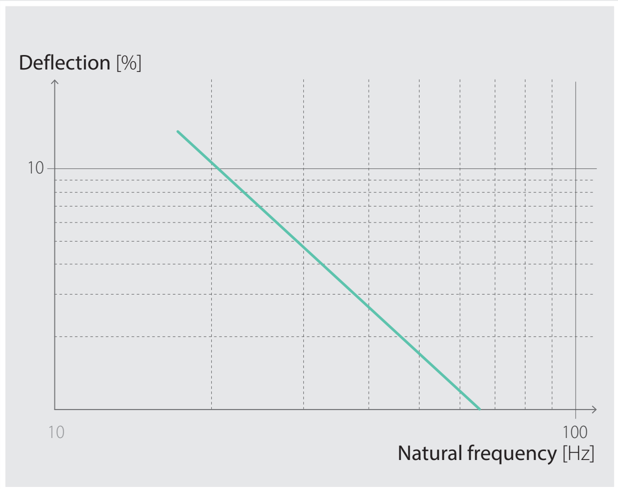
7 | NATURAL FREQUENCY AND LOAD



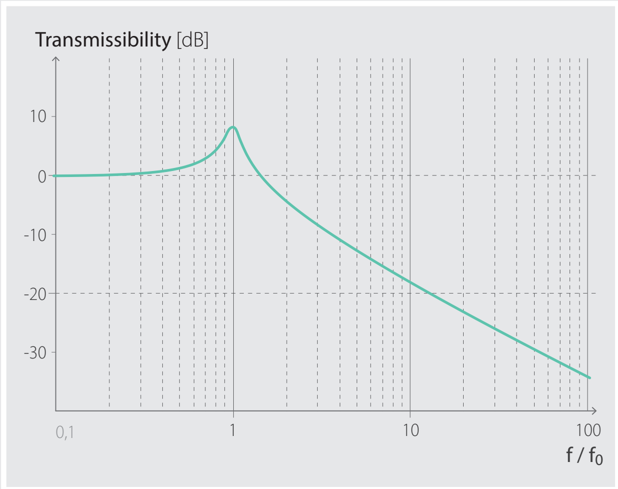
8 | DEFLECTION AND LOAD



9 | DEFLECTION AND NATURAL FREQUENCY

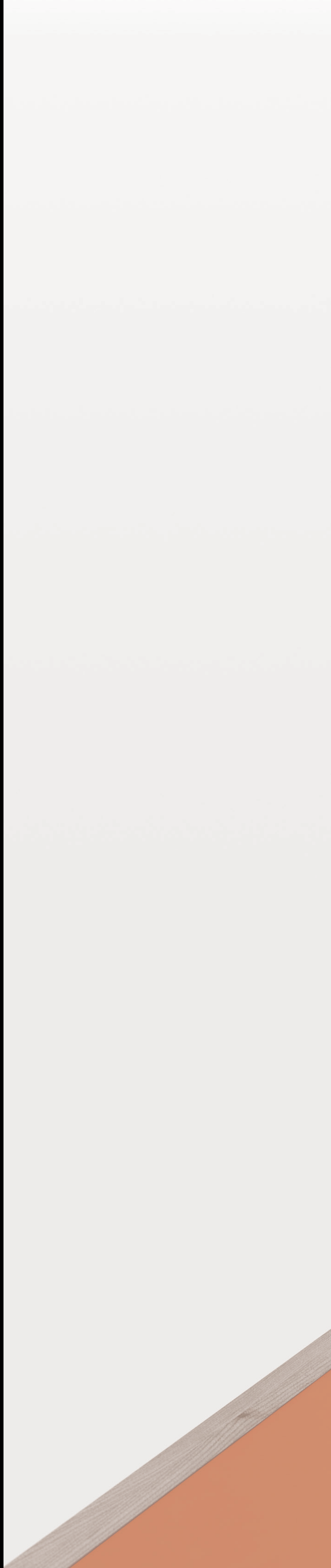


10 | TRANSMISSIBILITY



Normalized respect to the resonance frequency.
Elastic modulus from compression tests with 10% deflection.

NOTES



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