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TECHNICAL CATALOG

THERMOFLOC®
Intelligent Insulation System

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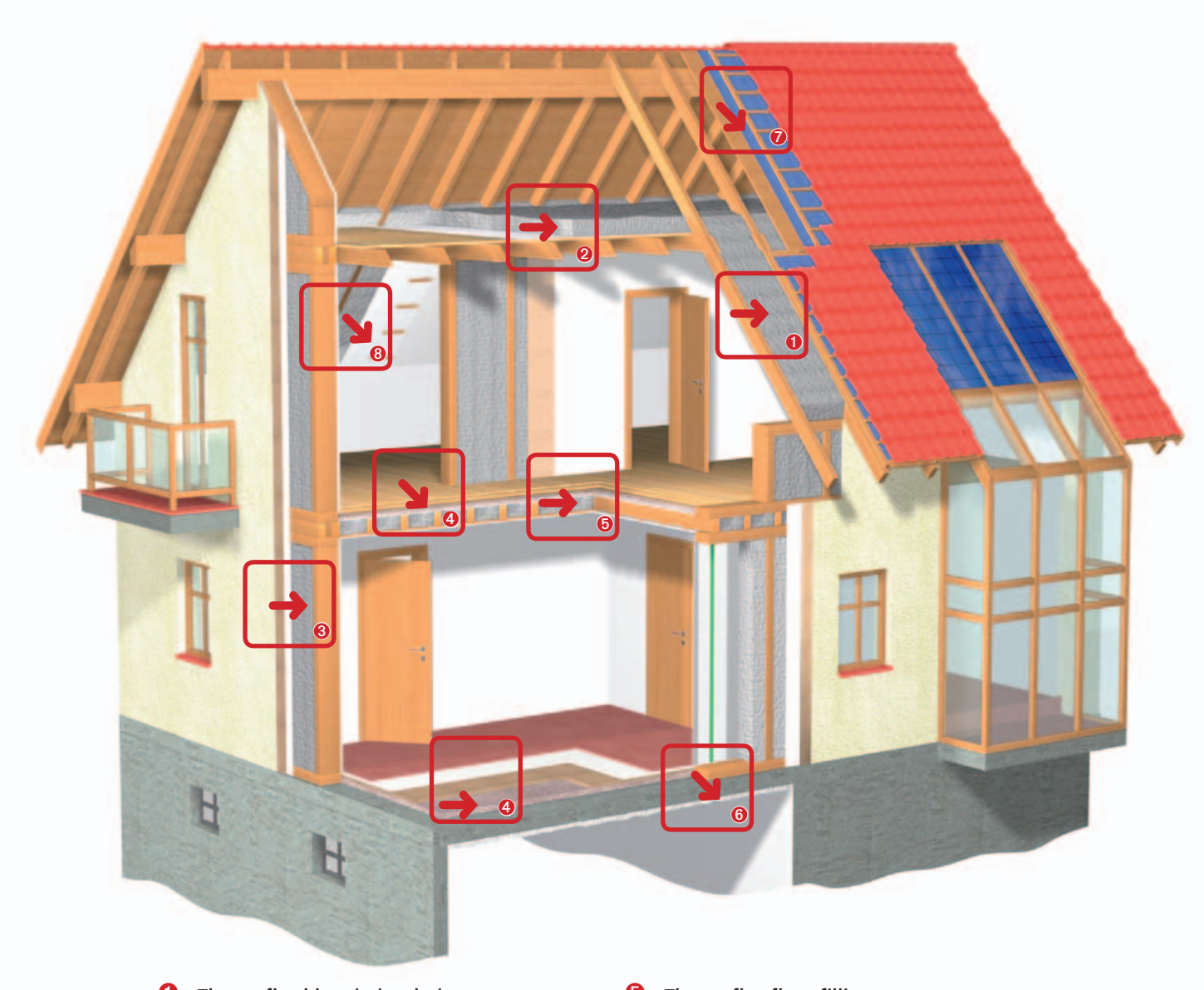
THERMOFLOC Insulating Systems - from the cellar to the roof!



1. **Thermofloc blow-in insulation**
   as insulation between the rafters in the roof
2. **Thermofloc blow-in insulation**
   blown on as an open layer to insulate ceilings on the top stories of buildings
3. **Thermofloc blow-in insulation**
   for insulating outer walls
4. **Thermofloc insulation pellets**
   as a supporting floor substructure
5. **Thermofloc floor filling**
   for insulating hollow spaces in intermediate ceilings
6. **Thermofloc blow-in insulation**
   sprayed onto the underside of cellar ceilings
7. **Thermofloc roof sheathing rolls**
8. **Thermofloc vapour-proof lining**

THERMOFLOC BLOW-IN INSULATION

Thermofloc blow-in insulation made of cellulose fibres - Efficient insulation for energy cost reduction under climate and ecology perspectives:

The blow-in insulation obtained from newspapers is characterised in particular by the fact that both in the cold as well as warm seasons, it insulates optimally and hence considerably reduces energy costs for heating in the winter and for air-conditioning in the summer. Building projects are being conducted in more than 18 European countries with natural Thermofloc insulation, and every day the number of builders increases who are convinced of the benefits of a Thermofloc insulation system.

THERMOFLOC FLOOR FILLING

Thermofloc floor filling – flakes made of cellulose fibres - In contrast to the blow-in insulation, Thermofloc floor filling is processed by hand and used exclusively as a non-pressure-resistant insulation at the horizontal level (ceiling on the top storey, between joists in a wood-joist floor construction). In order to ensure better manual processing, the insulation material is less compressed in the packaging. Thermofloc Floor Filling is available in 12 kg sacks, with 24 sacks per pallet. The insulation material is simply poured on evenly to achieve the desired insulation thickness and then spread to form a level surface. Material consumption is approx. 35 kg/m³. The technical data is identical to the blow-in insulation.

THERMOFLOC INSULATION PELLETS

Thermofloc insulation pellets, granules made of cellulose fibres - This can be used for floor construction. The granules with a grain size of 3–8 mm are simply poured to the desired overall height and then spread to form a level surface. That way under-floor constructions can be created with an overall height of 30 mm–100 mm. Thermofloc insulation pellets are suitable for the construction of load bearing insulation layers because of the material's high bulk weight (500 kg/m^3), and it has excellent sound insulation values. It doesn't matter whether you have a concrete slab or a wooden floor, with Thermofloc insulation pellets, the insulating properties can be improved considerably with both types of construction.

THERMOFLOC BLOW-IN TECHNIQUE

Thermofloc is installed by means of specially equipped blowing machines. The insulation is pumped into hoses under air pressure and transported further into the hollow spaces of the building components where it is compressed in accordance with the material handling instructions to produce an uninterrupted, complete insulation layer.

The special handling technique has considerable advantages both for the person installing the insulation as well as for the builder. The builder benefits through having an uninterrupted insulation layer that is free of thermal bridges.

www.thermofloc.com

Insulating Systems

Thermal Protection

Triggered by the oil crisis in the seventies, western countries started to develop a sustainable way to deal with energy. Through the crisis, in which one had to sharply limit energy consumption, western countries became aware of the dependency on fossil fuels. Reducing this dependency was the challenge shortly after the oil crisis. Since the provision of heating energy for our buildings demanded one-third of total energy consumption, the carefree way of dealing with energy consumption in buildings had also fallen under public scrutiny by then. The U-value moved into the foreground as a decisive key value for the energy requirement of a building. The term itself and the size of the U-value soon became synonymous with energy-saving construction.

In the past few years, there has been a thorough change in the motivation for having constantly lower U-values. Through the awareness of the greenhouse effect and the research for the causes of it, the still, relatively carefree way of dealing with energy has once again caught the public's eye. The greatest causes for the greenhouse effect were identified to be excessive emissions of carbon dioxide (CO^2) and simultaneous overexploitation of the rainforests. Reduction of the emission of CO^2 was agreed on in multinational summit meetings. All countries committed to reduce the emission of the greenhouse gas CO^2 by at least one-half by a specific point in time.

Thermal optimisation of a building shell provides a reduction of the energy required for heating by up to one-quarter. Due to the high proportion of the total energy requirement that goes into heating energy for buildings, the savings potential and hence the savings of CO^2 emissions are high. For these reasons, the requirements of the quality of the thermal shell of a building are becoming constantly greater in the form of thermal insulation regulations.

Basically, the most comfortable climate possible is to be created for the user of a building through optimised thermal insulation of the building shell. This comfortable climate, however, is not only determined by the lowest possible U-value of the exterior building components, but other factors also have a decisive affect. An attempt was made in some publications to specify limits for such a comfortable room climate. A multitude of input parameters were given in these publications that were to describe the subjective sensation of comfortableness. In addition to the temperature of the surrounding surfaces (that is directly connected to the U-value), the given parameters also included room humidity, air movement, the amount of activity, and also the clothing that is worn.

However, more than the winter months have to be taken into account for a comfortable climate in a building.
It is possible to have an uncomfortable climate in a room in the summer months as well. This is the result of excessive heating of the room cause by the influx of solar energy. In order to prevent this climate from occurring, which is often described as a barracks climate in wooden buildings, it is necessary to provide adequately dimensioned thermal masses in the structural elements. In the summer months, the sun warms the outside surface of the exterior building components during the course of the day. In the night, the exterior building components cool down once again.

As a result, there is a so-called thermal wave that "flows through" the building component. The duty of summer thermal protection is to find out how well the building component can dampen and delay this wave. With an appropriately large time delay of the maximum temperature peaks and/or suitable damping of the temperature peaks, one obtains a balanced and pleasant living and working climate.

For the summer thermal protection of a building component, it is not only the thermal conductivity of the component that is decisive, but the gross density and the specific thermal capacity as well. As popular term in this connection is the temperature conductivity.

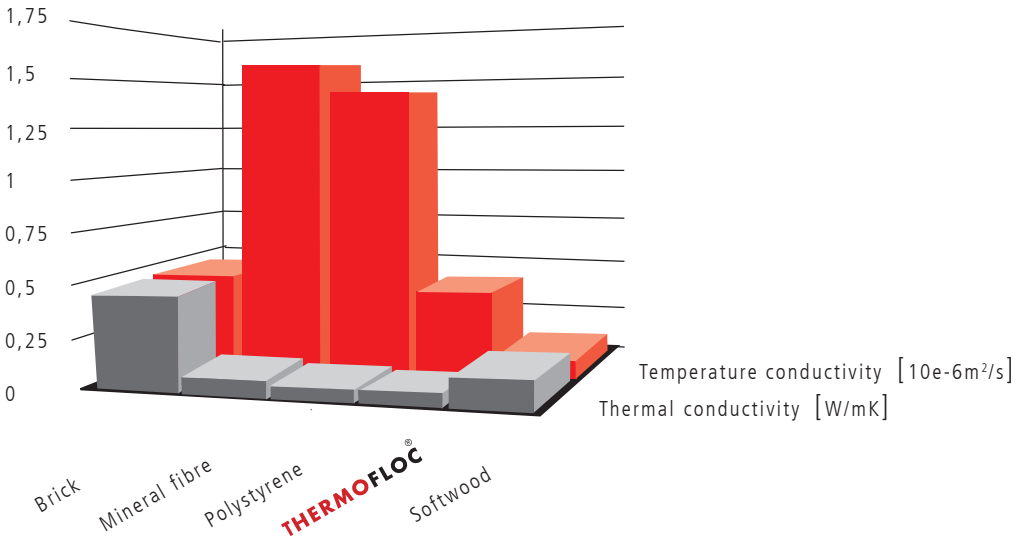
The temperature conductivity gives a simple overview of the suitability of different building materials.
The lower the thermometric conductivity, the better the effect on summer thermal protection.

$$a = \frac{\lambda}{c \cdot \rho} \left[\frac{m^2}{s} \right]$$

a Temperature conductivity
λ Thermal conductivity
c Thermal capacity
ρ Gross density

An insulating material should fulfil both requirements, i.e. low thermal conductivity for winter thermal protection and emission reduction as well as low temperature conductivity for summer thermal protection.

Thermofloc meets these two requirements to a very high degree. In winter, Thermofloc is a very good thermal insulation, and in the summer it helps to keep the temperatures in a building at a tolerable level.

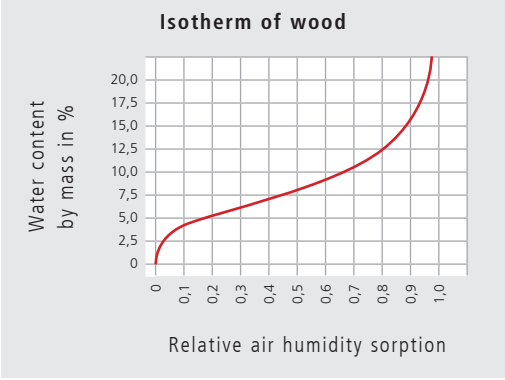


Moisture protection

The reason that a good room climate is ascribed to many wooden houses is only partly due to the very low temperature conductivity. The main reasons are the other positive characteristics of natural building materials. Wood can absorb and store moisture in a very wide range without being jeopardised by this increased moisture. This characteristic of building materials is called the sorption capacity. The course of how moisture is absorbed via the relative humidity of the room air at a constant temperature is called sorption isotherm.

During an increase of the room air humidity from 50% to 60%, wood can absorb 5 kg of water and also release it again. As a result, wooden surfaces that are untreated or treated with natural coatings have a balancing effect on the moisture balance and counteract humidity peaks.

Thermofloc has values that are similar to wood because it does originate from wood. This means that the use of Thermofloc in wooden houses results in a high moisture storage capacity potential because of the combined effect of the two building materials, i.e. wood and Thermofloc.



This potential, however, can only be exploited if the surfaces on the room side are not too sealed. Naturally, a good, moisture-storing building material cannot balance moisture that is present in a building in a volume that is too high. Lasting moisture penetration of the structure must be avoided in any case.

The avoidance of inadmissible quantities of moisture is grouped under the term ‚moisture protection'. In order to be able to assess the impact of moisture, the mechanisms that lead to the occurrence of moisture in a building must first be known.

There are three ways for moisture to get into a building:

- building moisture
- rainwater and leaks
- water vapour transport processes

Building moisture is the necessary quantity of water that exists in the built-in structural elements during the construction of a structure. Through this building moisture, large quantities of moisture get into the structure, especially for concrete structures or structures made of masonry.
With wooden structures, the quantity of moisture that is brought in through this process can usually be neglected. One exception is the use of fresh wood that has not been pre-dried. When using fresh wood, one must be sure to use open diffusing structures so that the moisture that is introduced can escape from the building once again.

Moisture that is brought into the structure through rainwater must be prevented through suitable sealing elements. In the event that rainwater unintentionally gets into the building, then one must make sure that the moisture can escape from the structure. Penetration of moisture through leaks in the installation lines or other fittings can never be completely excluded. The type of construction that is chosen must make it possible to quickly discover the location of a leak, and on the other hand not seriously hamper the moisture from escaping.

During water vapour transport processes, two transport processes are differentiated. One type of transport process is called water vapour diffusion and the other is called water vapour convection.

The moisture introduced through water vapour convection is approximately 10 times greater than through water vapour diffusion. Therefore, convection in buildings must be prevented through adequately well planned and executed sealing.

With water vapour diffusion, the loss of humidity (condensation) can take place through 4 processes:

- Primary condensation:
  Here, condensation appears in the back ventilation levels of a building through high exposure of water vapour to the cold outside surfaces of the building.
- Secondary condensation:
  Here, warm moist air is drawn into the back ventilation space and then forms on the still cold outside surfaces of the building. This secondary condensation often occurs in the transition months.
- Surface condensation:
  Here, the inside surface temperature of the exterior structural elements exceeds the threshold temperature of the room air and condensate occurs on the surface.
- Condensation on the inside of a building:
  Here, condensate forms on the inside of a building due to the unfavourable layer sequence.

An appropriately good thermal insulation of the exterior structural elements is sufficient to prevent surface condensate. The danger of surface condensation in modern structures can almost be excluded due to the very good standard of thermal insulation. Condensation on the inside of structural elements cannot always be prevented. Therefore, DIN 4108 contains information on how to assess the suitability of types of buildings.

Requirements as per DIN 4108:
DIN 4108 makes it possible to show the suitability of the construction with regard to moisture protection in two ways. It specifies structural elements for which no calculated confirmation is necessary. Since the part of the DIN that deals with climate-related moisture protection is currently being revised, and in the future more wooden structures will be considered to be exempt of confirmation both for the walls as well as the ceilings and roofs, we are only drawing reference to this future standard here.

For all other constructions that are not exempt from confirmation, a calculated confirmation of the condensate mass must be carried out as per DIN 4108-5. The calculated condensate mass must then meet the following requirements:
Requirements as per DIN 4108-3 3.2.1:

a) It must be possible for water that occurs on the inside of the structural element during the thawing period to escape back into the environment.
b) Building materials that come into contact with the condensate must not be damaged (e.g. through corrosion, mould).
c) For roof and wall structures, the condensate mass may not exceed a total of 1.0 kg/m^2.
d) If condensate forms on surfaces of contact that are not able to absorb the water, then a condensate mass of 0.5 kg/m^2 must not be exceeded to limit running off and dripping (e.g. surface of contact of fibre insulation or air layers on one side and a vapour barrier or concrete layers on the other side).
e) For wood, an increase of the moisture content of more than 5% by mass and 3% for wooden building materials is inadmissible (wood wool lightweight building panels and multilayer lightweight building panels according to DIN 1101 are excluded from this).

Sound Transmission

Different types of sound are differentiated in DIN 4109.

Airborne sound is sound that propagates in the air.

Structure-borne sound is sound that propagates in solid materials.

Impact sound is sound caused by walking on a floor, stairs, or the like, which occurs as structure-borne sound and partly as airborne sound in the room below.

The task of sound insulation is to protect the users of buildings against inadmissibly loud noises. The requirements are defined in DIN 4109. Here, the required sound insulation rate (req. $R'_{w,R}$) and the required impact sound insulation rate (req. $L'_{n,w}$) of a structural partition element are specified including the sound transmission via flanking structural elements.

STRUCTURAL ELEMENT	DIN 4109	
	erf. $R'_{w,R}$ db	erf. $L'_{n,w}$ db
Ceilings under generally useable attics, e.g. drying lofts, storage rooms and their accesses	53	53
Ceilings above cellars, hallways, staircases under common rooms	52	53
Ceilings above passages, driveways of common garages and the like under social rooms	55	53
Apartment partition walls and walls between different work rooms	53	-
Staircase walls and walls beside building hallways	52	-
Walls of playrooms or similar common rooms	55	-
Walls between bedrooms; walls between hallways and bedrooms	47	-
Ceilings between seminar rooms or similar rooms	55	53

Sound Insulation

In order to be able to gather strength for everyday life, people need quiet in their short amounts of free time. In our hectic world with constant background noise from computers, traffic, hi-fi systems and mobile telephones, this quiet is becoming rarer and more and more treasured.

Here, it is important to know that the perception of ambient noise is a very subjective perception. Two different noises with the same noise intensity can be perceived as pleasant (music) as well as unpleasant (the neighbour's hammer drill).

Even one and the same source of noise can trigger different feelings in different people (loud music in a disco).

We call unpleasant sounds 'noise'. It is the job of the sound insulation to prevent these unpleasant sounds. When considering sound insulation, some subjective assessment criteria must first be excluded. This is necessary to be able to give sound a measurable parameter.

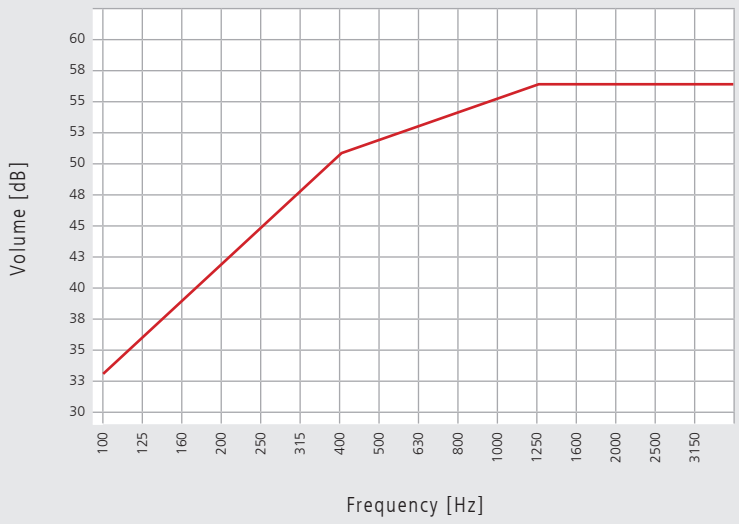
Sound refers to physical vibrations and waves in the air. These sound waves cause our eardrums to vibrate, which our brains interpret as sounds, tones or even noise. Through modern measuring methods, it is possible to record the noise vibrations exactly. However, the connection between the ear and perception cannot be captured with measuring devices.

Since people can perceive great differences in the sound pressure fluctuations of sound waves in the frequency range of human hearing (approx. 16 to 20,000 Hz), the noise level is given in dB instead of the absolute value of the sound pressure fluctuations. However, the loudness of a noise as perceived by someone is not solely dependent on these pressure fluctuations, but also on the corresponding frequency of the noise. In order to be able to classify the loudness of a noise with a single number, an assessment was introduced that is adapted to human auditory sensation.

The suitability can be proven through measurements including these byways or via the calculation method in Supplement 1 of DIN 4109.

Rating curve for single number value of noise (A-rating)

The single number value of the noise assessed according to the A-rating curve corresponds to the value at 500 Hz.



The following calculation method is given in Supplement 1 of DIN 4109:

$$R'_{w,R} = \left(10^{\frac{-R'_{w,R}}{10}} + \sum_{i-1}^{n} 10^{\frac{-R'_{L,w,R,i}}{10}}\right) \text{dB}$$

$R_{w,R}$ Calculation value in dB of the assessed sound insulation level of the structural partition element without longitudinal channelling via flanking structural elements

$R'_{L,w,R,i}$ Calculation value in dB of the assessed building longitudinal sound insulation level of the i-th flanking structural element in the building;

n is the number of flanking structural elements (usually n=4)

The mathematical determination of the assessed longitudinal sound insulation level $R'_{L,w,R,I}$ of a flanking structural element according to DIN 52 271 makes use of the following equation:

$$R'_{L,w,R,i} = R'_{L,w,R,i} + 10\lg \frac{S_T}{S_0} - 10\lg \frac{l_i}{l_0} \text{ dB}$$

$R_{L,w,R,i}$ Calculation value of the assessed laboratory sound insulation level in dB of the i-th flanking structural element according to DIN 52 217 from measurements or according to the application examples in DIN 4109

S_T Surface area of the partition wall in m^2

S_0 Reference surface area in m^2 (for walls S_0 = 10 m^2)

l_i Common edge length in m between the dividing structural element and the flanking structural element

l_0 Reference length in m
- for ceilings, suspended ceilings, floors 4.5 m
- walls 2.8 m

Insulating Systems

The logarithmic components are very small for rooms with a room height of approx. 2.5 m to 3 m and a partition wall width of approx. 4 m to 5 m. Hence, the equation can be simplified as follows:

$$R'_{L,w,R,i} = R'_{L,w,R,i}\ \mathrm{dB}$$

For the assessment of the impact sound insulation, three areas of a ceiling must be differentiated for the assessment of the building. The impact sound insulation of a ceiling is dependent on the quality of the actual supporting structure, the suitability of the floor construction, and the characteristics of a suspended ceiling, if there is one. The following calculation method is given in Supplement 1 of DIN 4109 to determine the assessed standard impact sound level;

$$L'_{n,w,R,i} = L'_{n,w,eq,R} - \Delta L_{w,R}$$

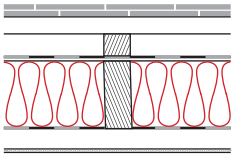
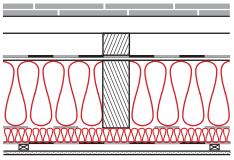
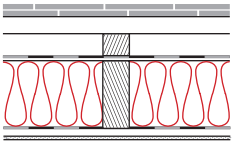
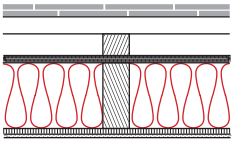
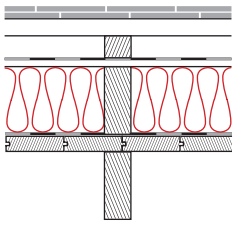
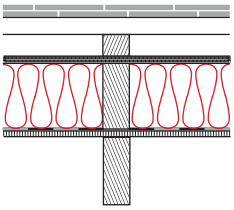
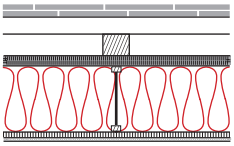
$$(TSM_R = TSM_{eq} = VM_R)$$

$L_{n,w,eq,R}$	Equivalent assessed standard impact sound level (equivalent impact sound insulation level) of the solid ceiling
$(TSM_{eq,R})$	without ceiling support (calculation value)
$dL_{w,R}$	Impact sound improvement level of the ceiling support (calculation value)
(VM_R)	

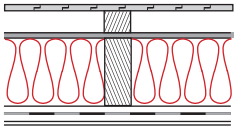
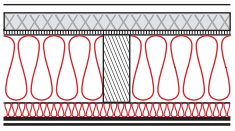
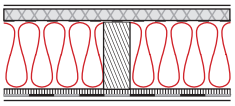
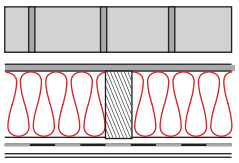
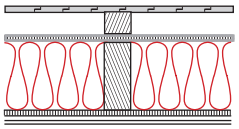
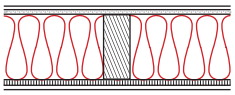
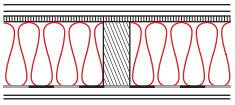
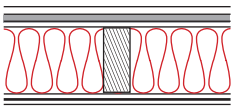
In the tables of Supplement 1 of DIN 4109, there are values for $L_{n,\ w,\ eq,R}$ for solid ceilings and wooden beam ceilings. Calculation values depending on the dynamic rigidity are given for the impact sound improvement level of the ceiling support in Supplement 1 of DIN 4109. According to the latest studies, Thermofloc insulation pellets can be classified with a rigidity class of up to 50 MN/m², and hence provide an impact sound improvement level of 22 dB for solid ceilings with screed.

Empirical values for sound insulation levels $R_{w,R}$ and $L_{n,w,R}$ for Thermofloc structures are given in this document. These values must be confirmed with measurements. Results from test bench measurements can be used as calculation values for longitudinal sound insulation level $R'_{L,w,R,i}$. Independent of this, these values can also be taken from Supplement 1 of DIN 4109.

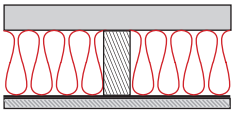
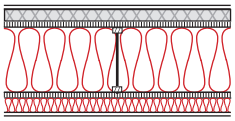
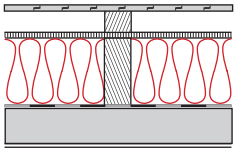
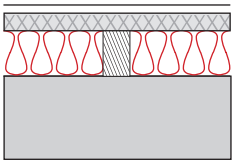
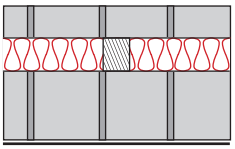
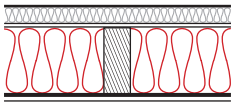
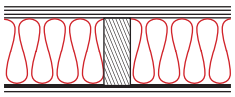
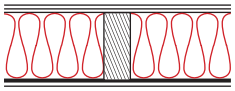
Roof Structures

No	PICTURE	CONSTRUCTION	Thickness [mm]	THERMOFLOC® Insulation thickness [mm]	U-value [W/m²k]	Diffusion assessment	Storage mass efficiency [kg/m²]	Storage capacity [W/m²k]	Amplitude damping [-]	Phase shift [h]	R_{WR} [dB]	$L_{n,w}$ [dB]	Fire protection
D1		Roof covering Roof lathing 4/5 Counter lathing 5/8 Underlay Roof sheathing Rafters/THERMOFLOC fibre Vapour barrier Lathing e=50 (Heraklith) Gypsum wallboard	40 50 23 140-300 0.1 50 15	140 160 180 200 220 240 260 280 300	0.21 0.19 0.17 0.16 0.15 0.13 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	36.9	2.8	64.1	16.0	48		F60-B
D2		Roof covering Roof lathing 4/5 Counter lathing 5/8 Roof sheathing Rafters/THERMOFLOC fibre Lathing 2-6 cm Vapour barrier Lathing, installation level Gypsum wallboard Possibly 2. layer gypsum wallboard	40 50 120-140 20-60 30 15 15	140 160 180 200 220 240 260 280 300	0.25 0.22 0.19 0.18 0.16 0.15 0.14 0.13 0.12	OK OK OK OK OK OK OK OK OK	18.8	1.4	19.4	12.6	43		F30-B
D3		Roof covering Roof lathing 4/5 Counter lathing 5/8 Roof sheathing Rafters/THERMOFLOC fibre Vapour barrier Balancing lathing Gypsum wallboard	40 50 140-300 0.1 24 12.5	140 160 180 200 220 240 260 280 300	0.25 0.22 0.19 0.18 0.16 0.15 0.14 0.13 0.12	OK OK OK OK OK OK OK OK OK	16.7	1.3	17.2	12.5	42		F30-B
D4		Roof covering Roof lathing 4/5 Counter lathing 5/8 bit. soft fibreboard Rafters/THERMOFLOC fibre OSB/Plywood Gypsum wallboard	40 50 19 140-300 12.5 12.5	140 160 180 200 220 240 260 280 300	0.22 0.20 0.18 0.16 0.15 0.14 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	33.9	2.6	41.0	13.7	49		F30-B
D5		Roof covering Roof lathing 4/5 Counter lathing 5/8 Underlay Roof sheathing On edge/THERMOFLOC fibre Vapour barrier Fireproof sheathing Rafters visible	40 50 24 140-300 0.1 38	140 160 180 200 220 240 260 280 300	0.23 0.20 0.18 0.17 0.15 0.14 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	51.1	3.9	71.1	15.5	44		F30-B
D6		Roof covering Roof lathing 4/5 Counter lathing 5/8 bit. soft fibreboard Rafters/THERMOFLOC fibre OSB/Plywood Rafters visible	40 50 19 140-300 12.5	140 160 180 200 220 240 260 280 300	0.22 0.20 0.18 0.16 0.15 0.14 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	24.1	1.8	29.4	13.9	41		F30-B
D7		Roof covering Roof lathing 4/5 Counter lathing 5/8 bit. soft fibreboard Doub. web T-beam/THERMOFLOC fibre Fibre OSB/Plywood Gypsum wallboard	40 50 35 140-360 15 12.5	140 180 220 260 300 340 400	0.22 0.18 0.15 0.13 0.11 0.10 0.09	OK OK OK OK OK OK OK	39.9	3.0	128.9	17.4	49		F30-B

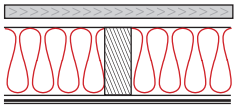
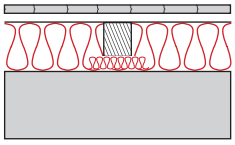
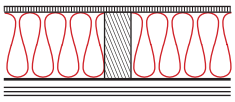
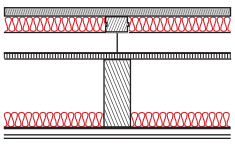
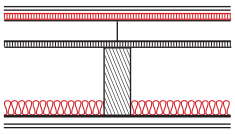
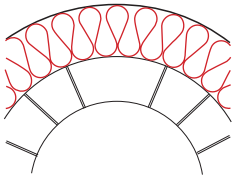
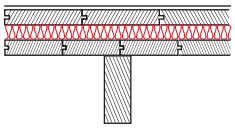
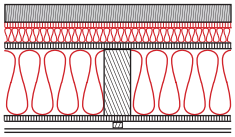
Wall Structures

No	PICTURE	CONSTRUCTION	Thickness [mm]	THERMOFLOC® Insulation thickness [mm]	U-value [W/m²k]	Diffusion assessment	Storage mass efficiency [kg/m²]	Storage capacity [W/m²k]	Amplitude damping [-]	Phase shift [h]	R_{WR} [dB]	L_{nW} [dB]	Fire protection
W1		Wood cladding Lathing Wood fibre insulation board Crossbar/THERMOFLOC Fibre Evenly spaced slats Vapour barrier Lathing (installation level) Gypsum wallboards	20 40 15 140-300 23 0.1 30 15	140 160 180 200 220 240 260 280 300	0.23 0.21 0.19 0.17 0.15 0.14 0.13 0.12 0.12	OK OK OK OK OK OK OK OK OK	35.6	2.7	18.5	7.5	45		F30-B
W2		Cement-lime mortar Wood-wool lightweight building panels OSB/Plywood Crossbar/THERMOFLOC Fibre Lathing/THERMOFLOC Fibre Vapour barrier Gypsum wallboards	25 50 19 120-240 20-60 0.1 15	140 160 180 200 220 240 260 280 300	0.21 0.19 0.17 0.16 0.15 0.14 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	18.8	1.4	51.8	18.1	50		F30-B
W3		Cement-lime mortar Wood-wool lightweight building panels Crossbar/THERMOFLOC Fibre OSB/Plywood Vapour barrier Gypsum wallboard	15 35 140-300 12.5 0,1 12.5	140 160 180 200 220 240 260 280 300	0.22 0.20 0.18 0.16 0.15 0.14 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	33.9	2.6	46.4	15.4	46		F30-B
W4		Facing masonry Lathing Wood fibre insulation board Crossbar/THERMOFLOC Fibre Evenly spaced slats Vapour barrier Lathing Gypsum wallboard	125 40 15 140-300 23 0.1 30 15	140 160 180 200 220 240 260 280 300	0.22 0.20 0.18 0.16 0.15 0.14 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	35.8	2.7	38.2	17.2	52		F90-B F30-B
W5		Facades (clinker, wood, plaster) Lathing bit. soft fibreboard Crossbar/THERMOFLOC Fibre OSB/Plywood Gypsum wallboard	20 40 19 140-300 12.5 12.5	140 160 180 200 220 240 260 280 300	0.22 0.20 0.18 0.16 0.15 0.14 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	18.8	1.4	32.6	15.8	43		F30-B
W6		Gypsum wallboard Gypsum fibreboard Crossbar/THERMOFLOC Fibre OSB/Plywood Gypsum wallboard	12.5 20 140 12.5 12.5	80 100 120 140 160 180 200	0.24 0.22 0.19 0.17 0.16 0.15 0.14	OK OK OK OK OK OK OK	33.2	2.5	12.6	9.6	46		F30-B
W7		Cement-lime mortar Gypsum wallboards OSB/Plywood Crossbar/THERMOFLOC Fibre Vapour barrier Lathing Gypsum wallboards	12.5 12.5 15 140-300 0.1 30 15	140 160 180 200 220 240 260 280 300	0.24 0.21 0.19 0.17 0.16 0.15 0.13 0.13 0.12	OK OK OK OK OK OK OK OK OK	35.8	2.7	6.9	6.8	46		F30-B
W8		Cement-lime mortar Wood soft fibre board Gypsum wallboards Crossbar/THERMOFLOC Fibre Gypsum wallboards Vapour barrier Gypsum wallboards	12.5 12.5 15 140-300 15 0.1 15	140 160 180 200 220 240 260 280 300	0.23 0.21 0.19 0.17 0.15 0.14 0.13 0.12 0.12	OK OK OK OK OK OK OK OK OK	26.8	2.0	18.5	7.5	46		F90-B

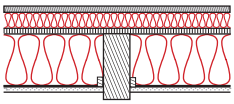
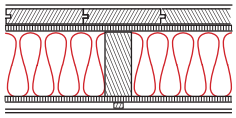
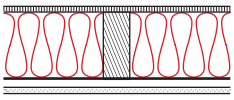
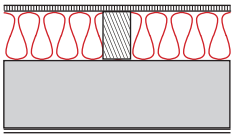
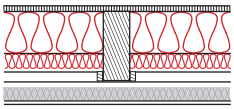
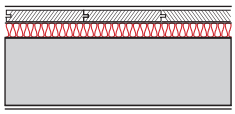
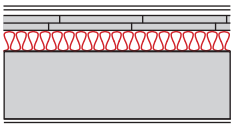
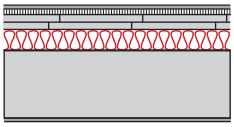
Wall Structures

No	PICTURE	CONSTRUCTION	Thickness [mm]	THERMOFLOC® Insulation thickness [mm]	U-value [W/m²k]	Diffusion assessment	Storage mass efficiency [kg/m²]	Storage capacity [W/m²k]	Amplitude damping [-]	Phase shift [h]	R_{WR} [dB]	$L_{n,w}$ [dB]	Fire protection
W9		Square-cut log Crossbar/THERMOFLOC Fibre Vapour barrier Profile timber formwork	70 80-200 0.1 30	80 100 120 140 160 180 200	0.33 0.28 0.24 0.21 0.19 0.17 0.16	OK OK OK OK OK OK OK	49.4	3.8	41.3	11.7	41		F30-B
W 10		Cement-lime mortar Wood-wool lightweight building panels Soft fibreboard Crossbar/THERMOFLOC Fibre OSB/Plywood Lathing/THERMOFLOC Fibre Gypsum wallboard	12,5 25 16 140-360 18 60 15	200 220 240 260 300 340 380 420	0.16 0.15 0.14 0.13 0.11 0.10 0.09 0.08	OK OK OK OK OK OK OK OK	19.2	1.5	292.3	22.6	50		F30-B
W 11		Wood casing Lathing Soft fibreboard Lathing/THERMOFLOC Fibre Plywood board Gypsum wallboard	20 40 19 140-300 95 15	140 160 180 200 220 240 260 280 300	0.20 0.18 0.16 0.15 0.14 0.13 0.12 0.11 0.11	OK OK OK OK OK OK OK OK OK	53.2	4.1	99.7	11.0	45		F30-B
W 12		Cement-lime mortar Wood-wool lightweight building panels Lathing/THERMOFLOC Fibre Masonry	10 25 40-200 360	40 60 80 100 120 140 160 180 200	0.40 0.33 0.28 0.24 0.21 0.19 0.17 0.16 0.15	OK OK OK OK OK OK OK OK OK	61.2	4.7	294.3	16.9	54		F90
W 13		Vertically perforated bricks THERMOFLOC Fibre Vertically perforated bricks Interior plaster	125 60-220 250 15	60 80 100 120 140 160 180 200 220	0.37 0.31 0.26 0.23 0.21 0.19 0.17 0.15 0.14	OK OK OK OK OK OK OK OK OK	78.6	6.0	151.5	15.1			F90
W 14		Plastering system MW thermal insul. composite system Gypsum fibreboard Crossbar/THERMOFLOC Fibre Vapour barrier Gypsum fibreboard	1 40 12.5 140-300 0.1 12.5	140 160 180 200 220 240 260 280 300	0.20 0.18 0.16 0.15 0.14 0.13 0.12 0.11 0.11	OK OK OK OK OK OK OK OK OK	7.5	0.6	13.7	13.5			F30-B F90-B
W 15		Gypsum fibreboard Gypsum fibreboard Gypsum fibreboard Crossbar/THERMOFLOC Fibre Vapour barrier Gypsum fibreboard	12.5 12.5 12.5 140-300 0.1 12.5	140 160 180 200 220 240 260 280 300	0.24 0.22 0.19 0.18 0.16 0.15 0.14 0.13 0.12	OK OK OK OK OK OK OK OK OK	7.5	0.6	7.8	11.1	63		F30-B F90-B
W 16		Calcium silicate board Gypsum fibreboard Crossbar/THERMOFLOC Fibre Vapour barrier Gypsum fibreboard	10 15 140-300 0.1 12.5	140 160 180 200 220 240 260 280 300	0.25 0.22 0.19 0.18 0.16 0.15 0.14 0.13 0.12	OK OK OK OK OK OK OK OK OK	7.4	0.6	7.6	10.7	63		F30-B F90-B

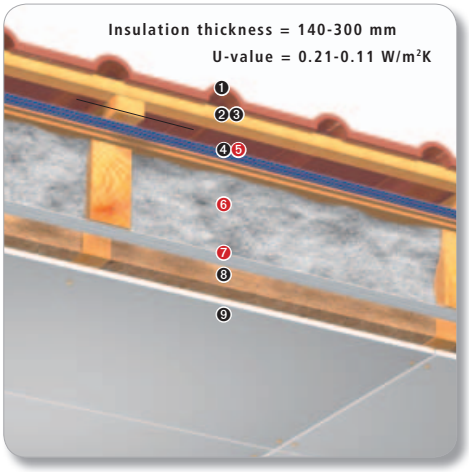
Ceiling and Floor Structures

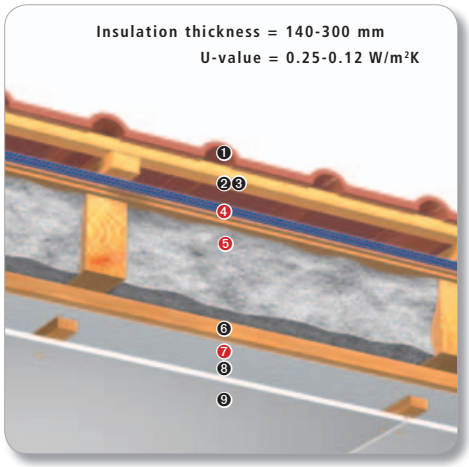
No	PICTURE	CONSTRUCTION	Thickness [mm]	THERMOFLOC® Insulation thickness [mm]	U-value [W/m²k]	Diffusion assessment	Storage mass efficiency [kg/m²]	Storage capacity [W/m²k]	Amplitude damping [-]	Phase shift [h]	R_{WR} [dB]	L_{nW} [dB]	Fire protection
DB1		Wood wool board Subfloor Tie beams/THERMOFLOC Fibre Evenly spaced slats Vapour barrier Gypsum wallboards	35 23 140-300 23 0.1 15	140 160 180 200 220 240 260 280 300	0.22 0.20 0.18 0.16 0.15 0.14 0.13 0.12 0.11	OK OK OK OK OK OK OK OK OK	13.8	1.1	7.4	7.4	48	73	F30-B
DB2		Strip flooring Subfloor Cushioning wd./THERMOFLOC Fibre Solid ceiling	22 24 50-160 180	50 60 70 80 90 100 120 140 160	0.48 0.43 0.38 0.35 0.32 0.29 0.25 0.22 0.20	OK OK OK OK OK OK OK OK OK	318.1	24.2	185.7	11.8	55	51	F90
DB3		OSB/Plywood Beams/THERMOFLOC Fibre Vapour barrier Spring rails Gypsum wallboard, 2-layer	19 140-300 0.1 30 30	140 160 180 200 220 240 260 280 300	0.24 0.21 0.19 0.17 0.16 0.15 0.14 0.13 0.12	OK OK OK OK OK OK OK OK OK	18.7	1.4	21.3	13.3	52	59	F60-B
DB4		Timber floor Wood fibre insulation board Concrete paving stone OSB/Plywood Beams/THERMOFLOC Fibre Spring rails Gypsum wallboards	21 40 50 22 60-220 30 12.5	60 80 100 120 140 160 180 200 220	0.32 0.27 0.24 0.21 0.19 0.17 0.16 0.15 0.13	OK OK OK OK OK OK OK OK OK	11.7	0.9	43.4	13.0	55	53	F30-B
DB5		Gypsum fibre dry screed Impact sound insulation board Concrete paving stone OSB/Plywood Beams/THERMOFLOC Fibre Spring rails Gypsum wallboards	25 20 50 22 60-220 30 12.5	60 80 100 120 140 160 180 200 220	0.36 0.30 0.26 0.23 0.20 0.18 0.17 0.15 0.14	OK OK OK OK OK OK OK OK OK	11.7	0.9	28.1	12.3	57	50	F30-B
DB6		THERMOFLOC Fibre Natural stone	140-300 250	140 160 180 200 220 240 260 280 300	0.23 0.20 0.18 0.17 0.15 0.14 0.13 0.12 0.12	OK OK OK OK OK OK OK OK OK	117.2	8.9	217.2	10.8			
DB7		Timber floor board Soft fibre N-F Soft fibre cover panel THERMOFLOC Pellets Waterproof layer Fireproof sheathing	25 40 8 30-100 0.1 40	30 40 50 60 70 80 90 100	0.48 0.45 0.42 0.40 0.38 0.36 0.34 0.32	OK OK OK OK OK OK OK OK	49.4	3.8	10.7	8.3	40	73	F30-B
DB8		Screed Impact sound insulation board THERMOFLOC Pellets OSB/Plywood Beams/THERMOFLOC Fibre OSB/Plywood Lathing	50 20 30-100 22 220 22 30 12.5	25 26 27 28 29 30 31 32	0.20 0.20 0.19 0.19 0.18 0.18 0.17 0.17	OK OK OK OK OK OK OK OK	47.2	3.6	420.2	5.7	58	51	F30-B

Ceiling and Floor Structures

No	PICTURE	CONSTRUCTION	Thickness [mm]	THERMOFLOC® Insulation thickness [mm]	U-value [W/m²k]	Diffusion assessment	Storage mass efficiency [kg/m²]	Storage capacity [W/m²k]	Amplitude damping [-]	Phase shift [h]	R_{VR} [dB]	L_{nW} [dB]	Fire protection
DB9		Timber floor board THERMOFLOC Pellets OSB/Plywood Beams/THERMOFLOC Fibre Panelling	20 30-100 30 160 25	190 200 210 220 230 240 250 260	0.18 0.18 0.17 0.17 0.17 0.16 0.16 0.15	OK OK OK OK OK OK OK OK	38.1	2.9	82.1	15.3	50	67	F30-B
DB 10		Timber floor board Soft fibre N-F Soft fibre cover panel OSB/Plywood Beams/THERMOFLOC Fibre OSB/Plywood Lathing Gypsum wallboard	20 40 8 19 180-340 19 30 15	180 200 220 240 260 280 300 320 340	0.23 0.22 0.20 0.19 0.18 0.17 0.16 0.16 0.15	OK OK OK OK OK OK OK OK OK	47.2	3.6	422.4	23.9	48	73	F30-B
DB 11		OSB/Plywood Beams/THERMOFLOC Fibre Waterproof layer Laths Gypsum wallboard	19 140-300 0.1 30 15	140 160 180 200 220 240 260 280 300	0.38 0.35 0.31 0.29 0.27 0.25 0.23 0.22 0.20	OK OK OK OK OK OK OK OK OK	13.9	1.1	4.2	6.8	48	73	F30-B
DB 12		Timber floor board Lathing/THERMOFLOC Fibre Reinforced concrete ceiling Ceiling plaster	20 60-220 160 10	60 80 100 120 140 160 180 200 220	0.70 0.58 0.50 0.44 0.39 0.35 0.32 0.29 0.27	OK OK OK OK OK OK OK OK OK	301.1	22.9	93.6	9.1	60	57	F90
DB 13		OSB/Plywood Beams/THERMOFLOC Pellets + Fibre Curtain insulation layer Lathing Air Plaster base Ceiling plaster	19 110-190 30 30 50 35 10	110 120 130 140 150 160 170 180 190	0.26 0.25 0.24 0.24 0.22 0.21 0.21 0.21 0.20	OK OK OK OK OK OK OK OK OK	31.3	2.4	450.6	23.1	48	65	F60-B
DB 14		Timber floor board Soft fibre N-F Soft fibre cover panel THERMOFLOC Pellets Concrete ceiling	20 40 8 30-100 160	30 40 50 60 70 80 90 100	0.54 0.50 0.47 0.44 0.41 0.39 0.37 0.35	OK OK OK OK OK OK OK OK	310.9	23.7	44.7	8.7	55	54	F90
DB 15		Stoneware Gypsum fibreboard Wood soft fibre board THERMOFLOC Pellets Reinforced concrete ceiling	25 2x20 80-160 160	80 90 100 110 120 130 140 150 160	0.33 0.32 0.30 0.29 0.28 0.27 0.26 0.25 0.24	OK OK OK OK OK OK OK OK OK	314.0	23.9	125.5	10.2	54	57	F90
DB 16		Floor Covering Flooring panel Wood soft fibre board THERMOFLOC Pellets Reinforced concrete ceiling	18 2x20 80-160 160	80 90 100 110 120 130 140 150 160	0.41 0.39 0.36 0.35 0.33 0.32 0.30 0.29 0.28	OK OK OK OK OK OK OK OK OK	313.8	23.9	93.5	8.9	54	57	F90

ROOF





Roof system D1, full rafter insulation
additional storage mass efficiency inside

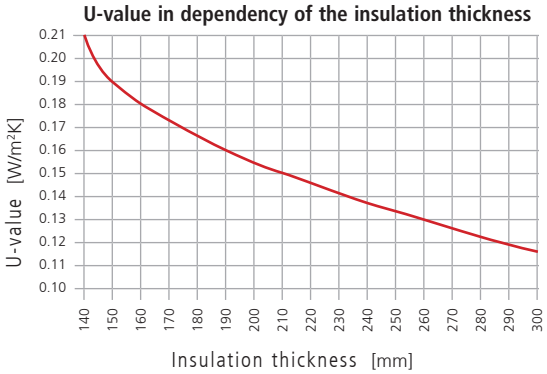
- ❶ Roof covering
- ❷ Roof lathing 4/5
- ❸ Counter lathing 5/8
- ❹ Underlay
- ❺ THERMOFLOC Roof sheathing
- ❻ Rafters/THERMOFLOC Fibre
- ❼ THERMOFLOC Vapour barrier
- ❽ Lathing e=50 (Heraklith)
- ❾ Gypsum wallboard

Roof system D2, full rafter insulation
with installation level

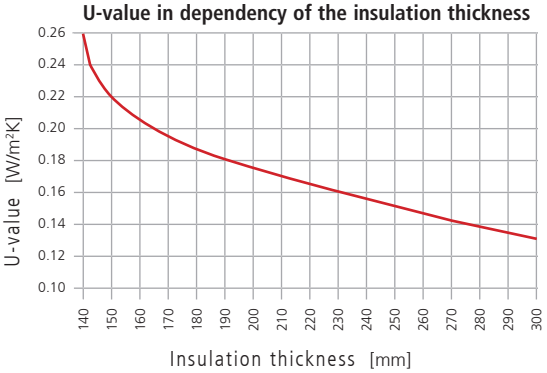
- ❶ Roof covering
- ❷ Roof lathing 4/5
- ❸ Counter lathing 5/8
- ❹ THERMOFLOC Roof sheathing
- ❺ Rafters/THERMOFLOC Fibre
- ❻ Lathing 2-6 cm
- ❼ THERMOFLOC Vapour barrier
- ❽ Lathing, installation level
- ❾ Gypsum wallboard, Possibly 2. layer gypsum wallb.

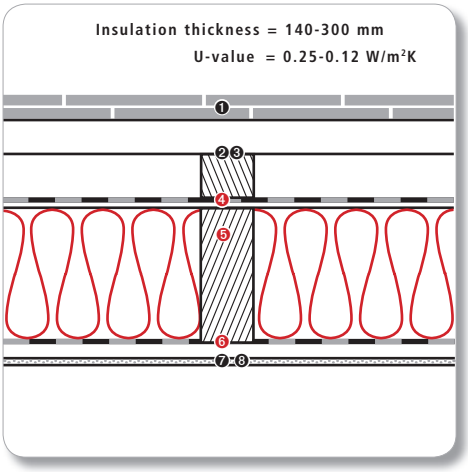
TECHNICAL DATA				
Thermal Protection	U= 0.13 [W/m²K]	DIN 4108	U= 0.14 [W/m²K]	DIN 4108
Storage mass efficiency	38.99 [kg/m²]		18.77 [kg/m²]	
Storage capacity	2.82 [W/m²K]		1.43 [W/m²K]	
Phase shift	15.99 [h]		12.61 [h]	
Amplitude damping	64.14 [-]		19.44 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F60-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 48 dB	DIN 4109	R_{WR}= 43 dB	DIN 4109

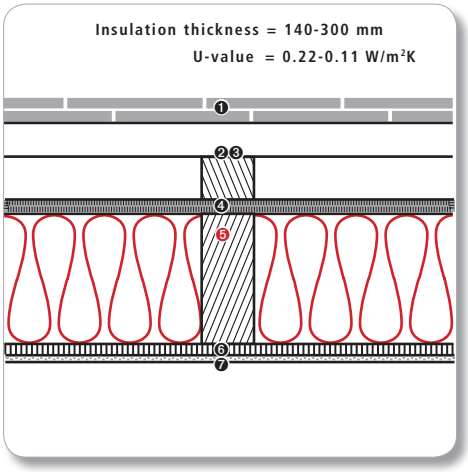
U-value in dependency of the insulation thickness



U-value in dependency of the insulation thickness







Roof system D3, full rafter insulation
with balancing lathing and roof sheathing

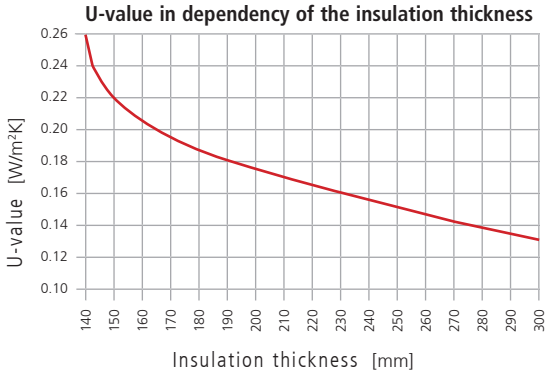
- ❶ Roof covering
- ❷ Roof lathing 4/5
- ❸ Counter lathing 5/8
- ❹ THERMOFLOC Roof sheathing
- ❺ Rafters/THERMOFLOC Fibre
- ❻ THERMOFLOC Vapour barrier
- ❼ Balancing lathing
- ❽ Gypsum wallboard

Roof system D4, full rafter insulation
with OSB and soft fibreboard

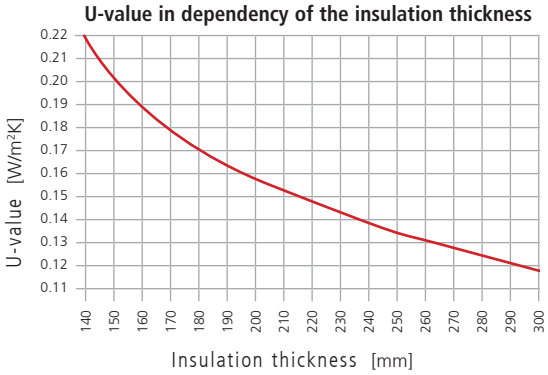
- ❶ Roof covering
- ❷ Roof lathing 4/5
- ❸ Counter lathing 5/8
- ❹ bit. soft fibreboard
- ❺ Rafters/THERMOFLOC Fibre
- ❻ OSB/Plywood
- ❼ Gypsum wallboard

TECHNICAL DATA				
Thermal Protection	U= 0.14 [W/m²K]	DIN 4108	U= 0.13 [W/m²K]	DIN 4108
Storage mass efficiency	16.70 [kg/m²]		38.89 [kg/m²]	
Storage capacity	1.27 [W/m²K]		2.58 [W/m²K]	
Phase shift	12.47 [h]		13.66 [h]	
Amplitude damping	17.21 [-]		40.99 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 42 dB	DIN 4109	R_{WR}= 49 dB	DIN 4109

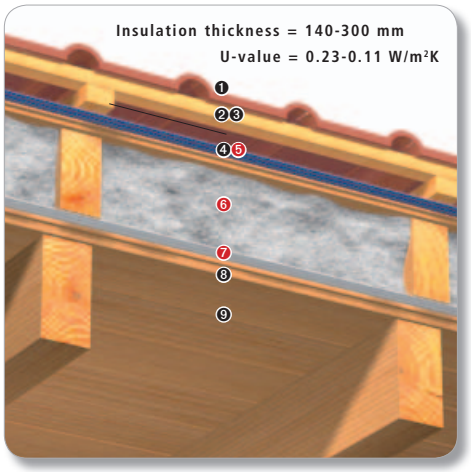
U-value in dependency of the insulation thickness

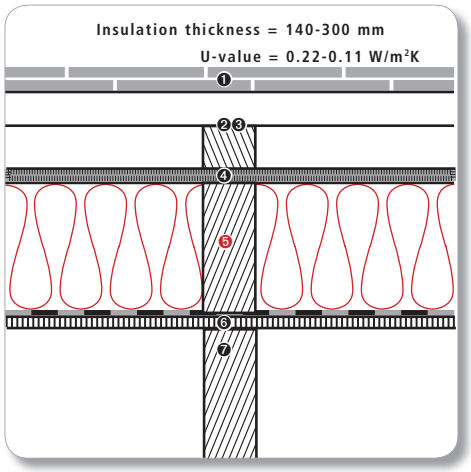


U-value in dependency of the insulation thickness



ROOF





Roof Structure with Insulation above Rafters D5, outside roof sheathing, open diffusing roof sheathing

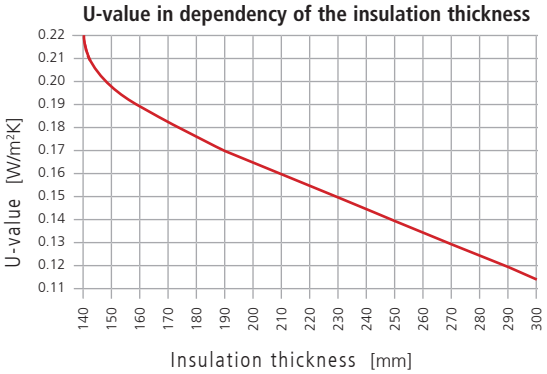
- ❶ Roof covering
- ❷ Roof lathing 4/5
- ❸ Counter lathing 5/8
- ❹ Underlay
- ❺ THERMOFLOC Roof sheathing
- ❻ On edge/THERMOFLOC Fibre
- ❼ THERMOFLOC Vapour barrier
- ❽ Fireproof sheathing
- ❾ Rafters visible

Roof Structure with Insulation above Rafters D6 with OSB and soft fibreboard

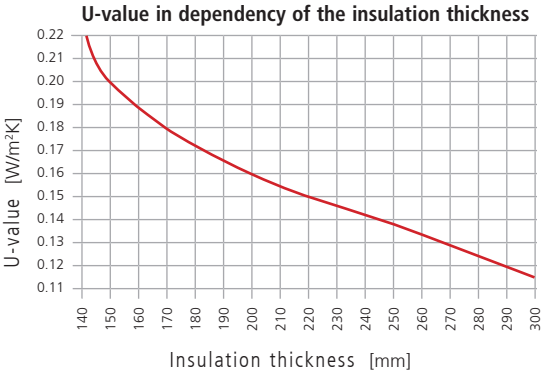
- ❶ Roof covering
- ❷ Roof lathing 4/5
- ❸ Counter lathing 5/8
- ❹ bit. soft fibreboard
- ❺ Rafters/THERMOFLOC Fibre
- ❻ OSB/Plywood
- ❼ Rafters visible

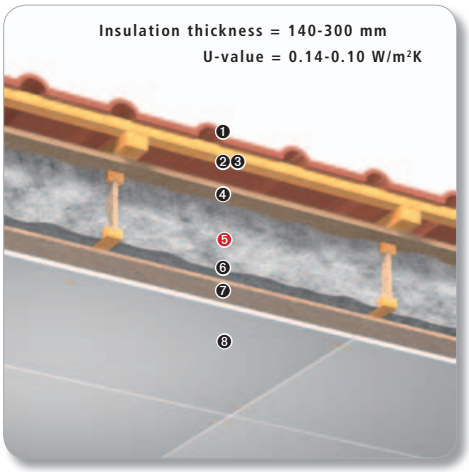
TECHNICAL DATA				
Thermal Protection	U= 0.13 [W/m²K]	DIN 4108	U= 0.13 [W/m²K]	DIN 4108
Storage mass efficiency	24.07 [kg/m²]		13.9 [kg/m²]	
Storage capacity	1.83 [W/m²K]		1.83 [W/m²K]	
Phase shift	13.90 [h]		13.90 [h]	
Amplitude damping	29.42 [-]		29.4 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 41 dB	DIN 4109	R_{WR}= 41 dB	DIN 4109

U-value in dependency of the insulation thickness



U-value in dependency of the insulation thickness



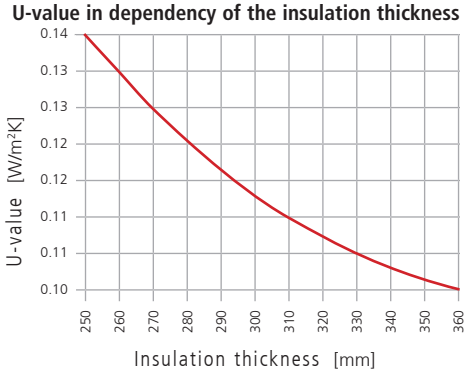


Roof Structure, Passive House D7

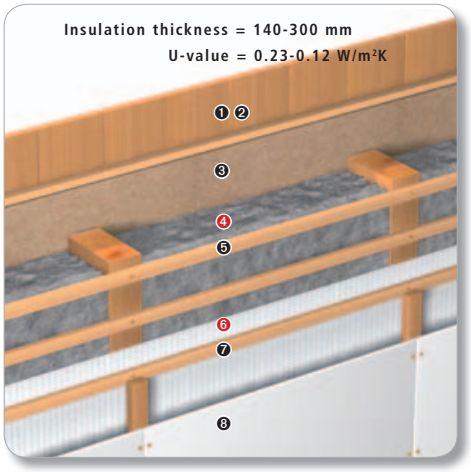
❶ Roof covering
❷ Roof lathing 4/5
❸ Counter lathing 5/8
❹ bit. soft fibreboard
❺ Double web T-beam/THERMOFLOC Fibre
❻ Fibre
❼ OSB/Plywood
❽ Gypsum wallboard

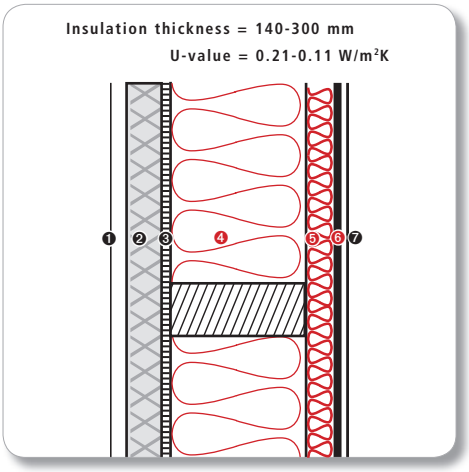
TECHNICAL DATA		
Thermal Protection	U= 0.10 [W/m²K]	DIN 4108
Storage mass efficiency	39.93 [kg/m²]	
Storage capacity	3.04 [W/m²K]	
Phase shift	17.44 [h]	
Amplitude damping	128.8 [-]	
Moisture protection	suitable	DIN 4108
Fire	F30-B	DIN 4102
Noise	RWR= 49 dB	DIN 4109

U-value in dependency of the insulation thickness



WALL





Outside Wall with Wood Covering W1

outside lathing diagonal,
wood cladding vertical or horizontal

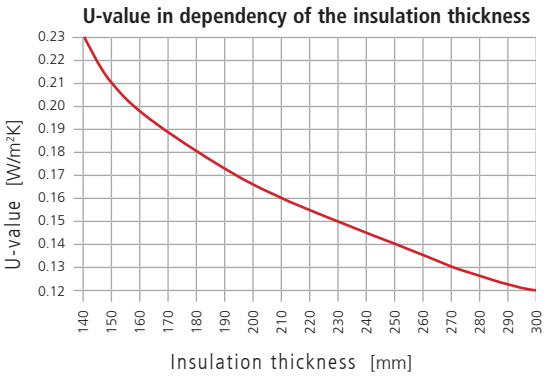
- ❶ Wood cladding
- ❷ Lathing
- ❸ Wood fibre insulation board
- ❹ Crossbar/THERMOFLOC Fibre
- ❺ Evenly spaced slats
- ❻ THERMOFLOC Vapour barrier
- ❼ Lathing (installation level)
- ❽ Gypsum wallboards

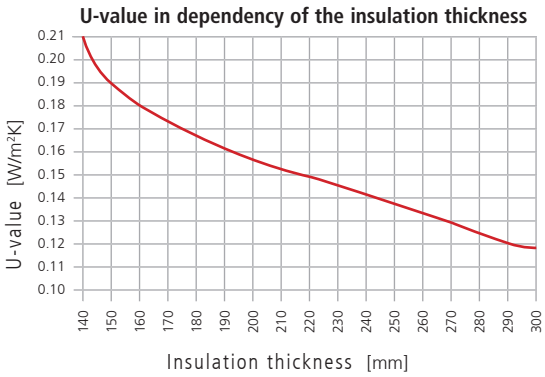
Outside Wall, Plastered W2

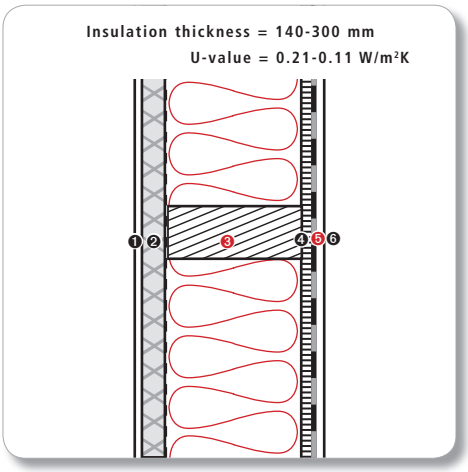
Mineral plaster on wood wool lightweight building panel

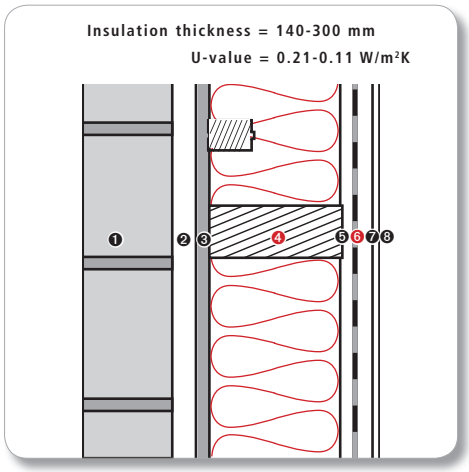
- ❶ Cement-lime mortar
- ❷ Wood-wool lightweight building panels
- ❸ OSB/Plywood
- ❹ Crossbar/THERMOFLOC Fibre
- ❺ Lathing/THERMOFLOC Fibre
- ❻ THERMOFLOC Vapour barrier
- ❼ Gypsum wallboards

TECHNICAL DATA				
Thermal Protection	U= 0.13 [W/m²K]	DIN 4108	U= 0.13 [W/m²K]	DIN 4108
Storage mass efficiency	35.6 [kg/m²]		18.8 [kg/m²]	
Storage capacity	2.7 [W/m²K]		1.4 [W/m²K]	
Phase shift	7.5 [h]		18.1 [h]	
Amplitude damping	18.5 [-]		51.8 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 45 dB	DIN 4109	R_{WR}= 50 dB	DIN 4109









Outside Wall, Plastered W3

Mineral plaster on gypsum lath, installation level inside

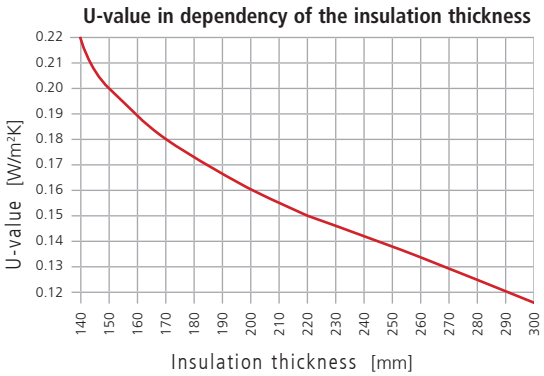
❶ Cement-lime mortar
❷ Wood-wool lightweight building panels
❸ Crossbar/THERMOFLOC Fibre
❹ OSB/Plywood
❺ THERMOFLOC Vapour barrier
❻ Gypsum wallboard

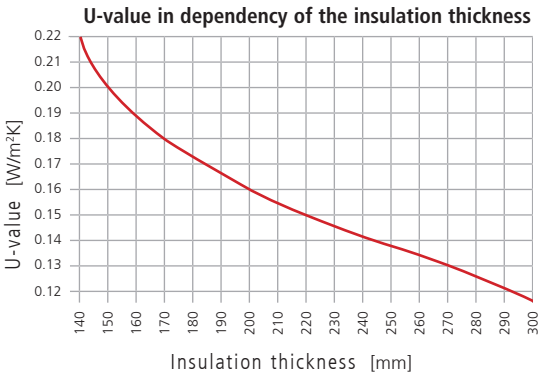
Outside Wall with Face Walling W4

❶ Facing masonry
❷ Lathing
❸ Wood fibre insulation board
❹ Crossbar/THERMOFLOC Fibre
❺ Evenly spaced slats
❻ THERMOFLOC Vapour barrier
❼ Lathing
❽ Gypsum wallboard

TECHNICAL DATA

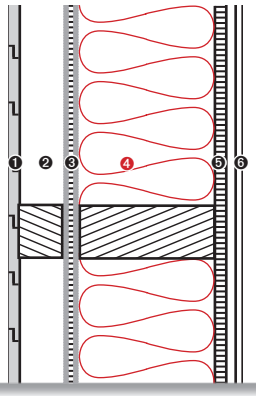
Thermal Protection	U= 0.13 [W/m²K]	DIN 4108	U= 0.13 [W/m²K]	DIN 4108
Storage mass efficiency	39.1 [kg/m²]		35.8 [kg/m²]	
Storage capacity	2.6 [W/m²K]		2.7 [W/m²K]	
Phase shift	15.4 [h]		17.2 [h]	
Amplitude damping	46.4 [-]		38.2 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F30-B/F90-B	DIN 4102
Noise	R_{WR}= 46 dB	DIN 4109	R_{WR}= 52 dB	DIN 4109



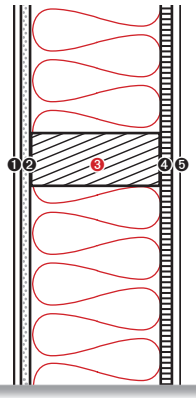


WALL

Insulation thickness = 140-300 mm
U-value = 0.22-0.11 W/m²K



Insulation thickness = 80-200 mm
U-value = 0.24-0.14 W/m²K



Outside Wall W5

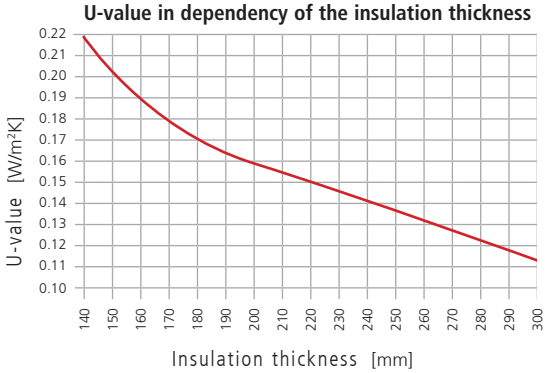
❶ Facades (clinker, wood, plaster)
❷ Lathing
❸ bit. soft fibreboard
❹ Crossbar/THERMOFLOC Fibre
❺ OSB/Plywood
❻ Gypsum wallboard

Building Partition Wall W6 (F30-B/F90-B)

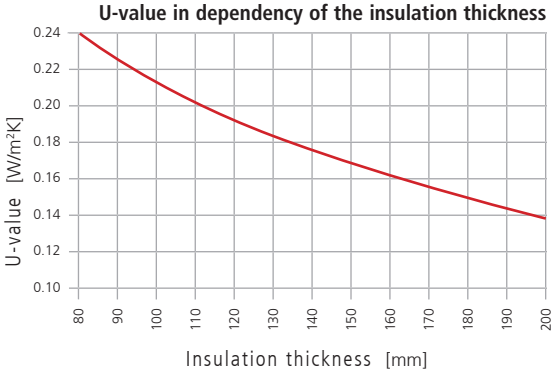
❶ Gypsum wallboard
❷ Gypsum fibreboard
❸ Crossbar/THERMOFLOC Fibre
❹ OSB/Plywood
❺ Gypsum wallboard

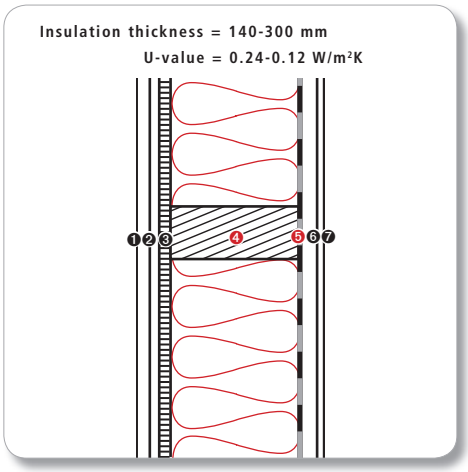
TECHNICAL DATA				
Thermal Protection	U= 0.13 [W/m²K]	DIN 4108	U= 0.17 [W/m²K]	DIN 4108
Storage mass efficiency	18.8 [kg/m²]		33.2 [kg/m²]	
Storage capacity	1.4 [W/m²K]		2.5 [W/m²K]	
Phase shift	15.8 [h]		9.6 [h]	
Amplitude damping	32.6 [-]		12.6 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 43 dB	DIN 4109	R_{WR}= 46 dB	DIN 4109

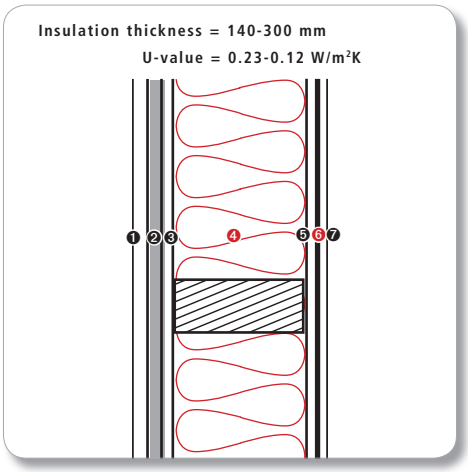
U-value in dependency of the insulation thickness



U-value in dependency of the insulation thickness







Outside Wall, Plastered W7

Mineral plaster on gypsum lath, installation level inside

- ❶ Cement-lime mortar
- ❷ Gypsum wallboards
- ❸ OSB/Plywood
- ❹ Crossbar/THERMOFLOC Fibre
- ❺ THERMOFLOC Vapour barrier
- ❻ Lathing
- ❼ Gypsum wallboards

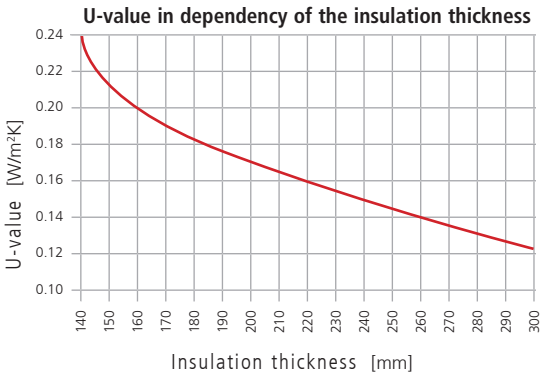
Outside Wall, Plastered W8

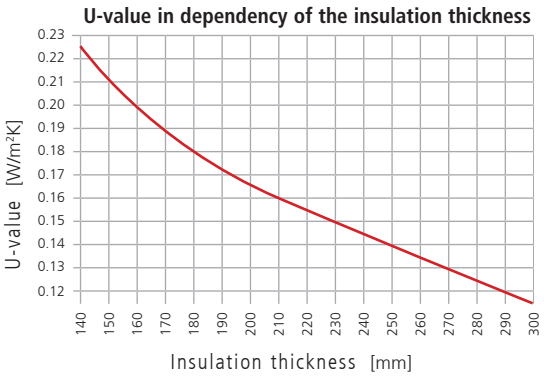
Mineral plaster on gypsum lath, F90-B

- ❶ Cement-lime mortar
- ❷ Wood soft fibre board
- ❸ Gypsum wallboards
- ❹ Crossbar/THERMOFLOC fibre
- ❺ Gypsum wallboards
- ❻ THERMOFLOC Vapour barrier
- ❼ Gypsum wallboards

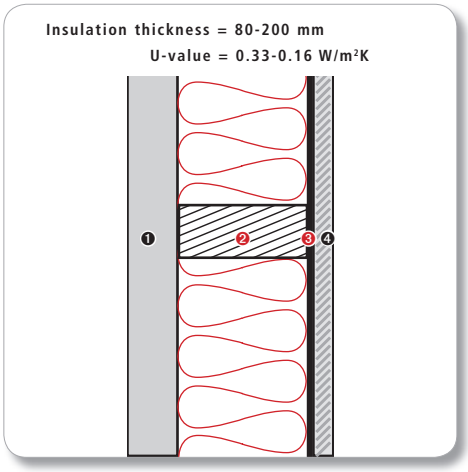
TECHNICAL DATA

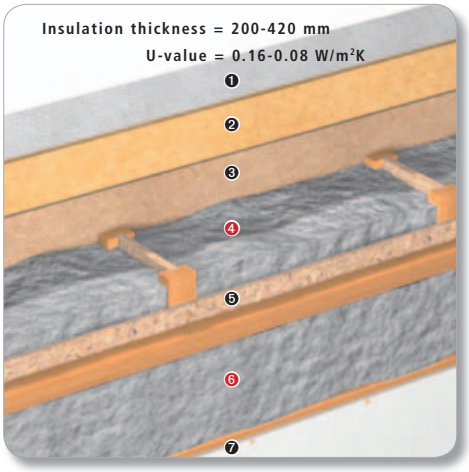
Thermal Protection	U= 0.13 [W/m²K]	DIN 4108	U= 0.13 [W/m²K]	DIN 4108
Storage mass efficiency	35.8 [kg/m²]		26.8 [kg/m²]	
Storage capacity	2.7 [W/m²K]		2.0 [W/m²K]	
Phase shift	6.8 [h]		7.5 [h]	
Amplitude damping	6.9 [-]		18.5 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F90-B	DIN 4102
Noise	R_{WR}= 46 dB	DIN 4109	R_{WR}= 46 dB	DIN 4109





WALL





Outside Wall, Log House W9

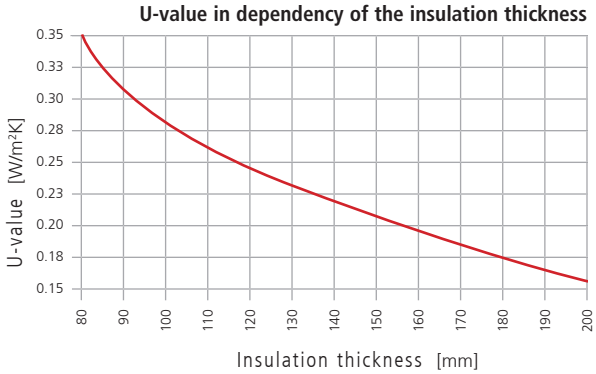
❶ Square-cut log
❷ Crossbar/THERMOFLOC Fibre
❸ THERMOFLOC Vapour barrier
❹ Profile timber formwork

Outside Wall, Passive House W10

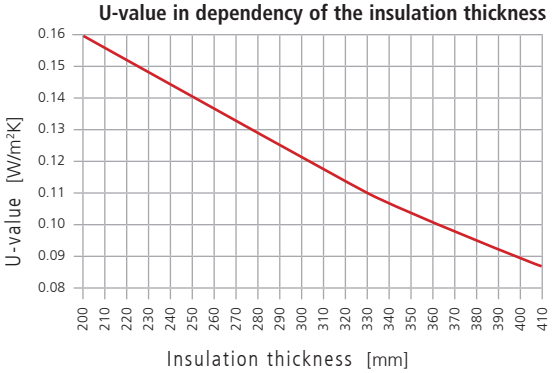
❶ Cement-lime mortar
❷ Wood-wool lightweight building panels
❸ Soft fibreboard
❹ Crossbar/THERMOFLOC Fibre
❺ OSB/Plywood
❻ Lathing/THERMOFLOC Fibre
❼ Gypsum wallboard

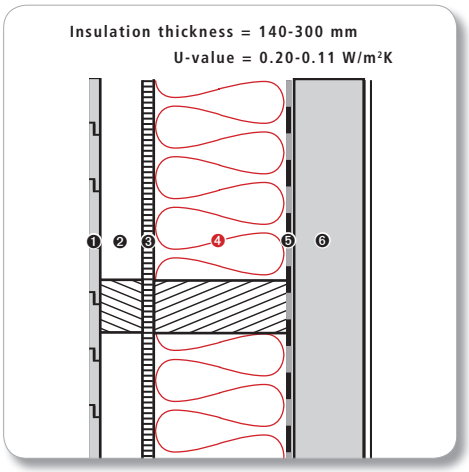
TECHNICAL DATA				
Thermal Protection	U= 0.16 [W/m²K]	DIN 4108	U= 0.10 [W/m²K]	DIN 4108
Storage mass efficiency	49.4 [kg/m²]		19.2 [kg/m²]	
Storage capacity	3.8 [W/m²K]		1.5 [W/m²K]	
Phase shift	11.7 [h]		22.6 [h]	
Amplitude damping	41.3 [-]		292.3 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 41 dB	DIN 4109	R_{WR}= 50 dB	DIN 4109

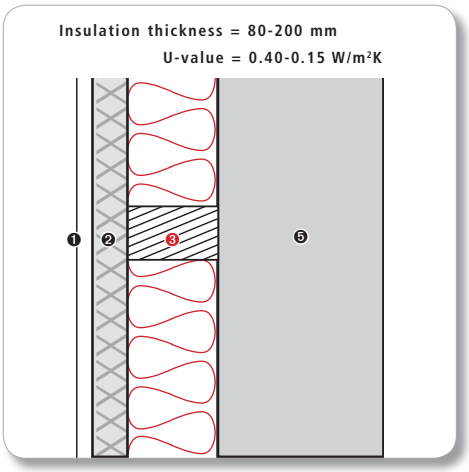
U-value in dependency of the insulation thickness



U-value in dependency of the insulation thickness







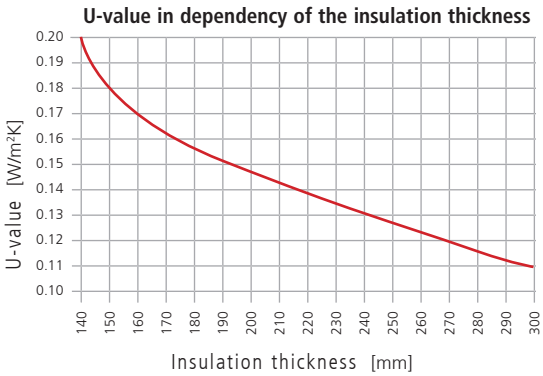
Outside Wall, Solid Wood Panels W11

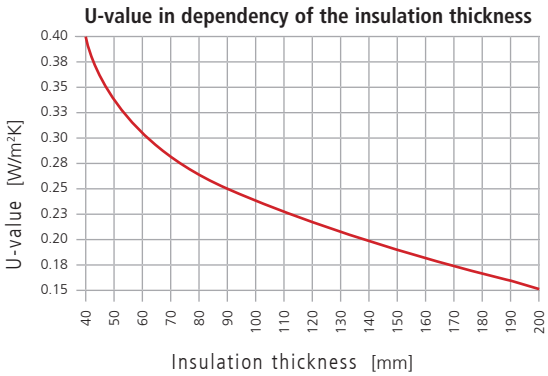
❶ Wood casing
❷ Lathing
❸ Soft fibreboard
❹ Lathing/THERMOFLOC Fibre
❺ Plywood board
❻ Gypsum wallboard

Outside Wall, Outside Insulation W12
on solid masonry

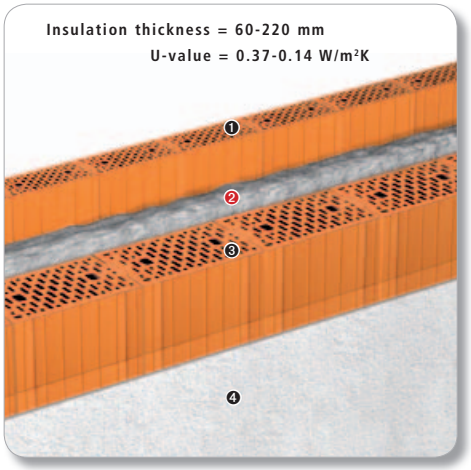
❶ Cement-lime mortar
❷ Wood-wool lightweight building panels
❸ Lathing/THERMOFLOC Fibre
❹ Masonry

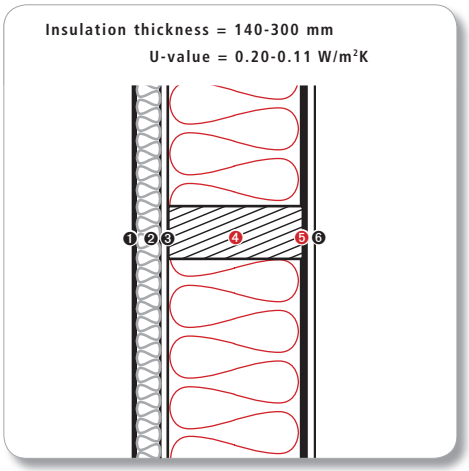
TECHNICAL DATA				
Thermal Protection	U= 0.12 [W/m²K]	DIN 4108	U= 0.17 [W/m²K]	DIN 4108
Storage mass efficiency	53.2 [kg/m²]		61.2 [kg/m²]	
Storage capacity	4.1 [W/m²K]		4.7 [W/m²K]	
Phase shift	11.0 [h]		16.9 [h]	
Amplitude damping	99.7 [-]		294.3 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F90	DIN 4102
Noise	R_{WR}= 45 dB	DIN 4109	R_{WR}= 54 dB	DIN 4109





WALL





Outside Wall with Core Insulation W13

❶ Vertically perforated bricks
❷ THERMOFLOC Fibre
❸ Vertically perforated bricks
❹ Interior plaster

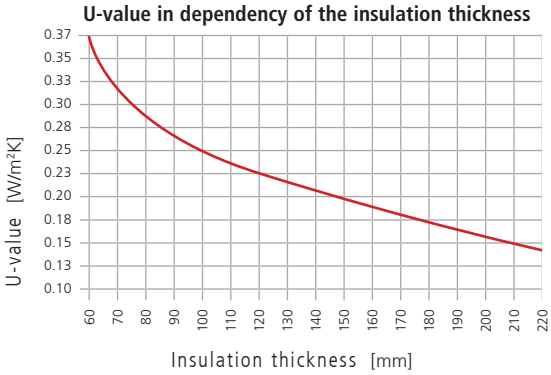
Building End Wall W14 (F30-B/F90-B)

Mineral wool thermal insulation composite system

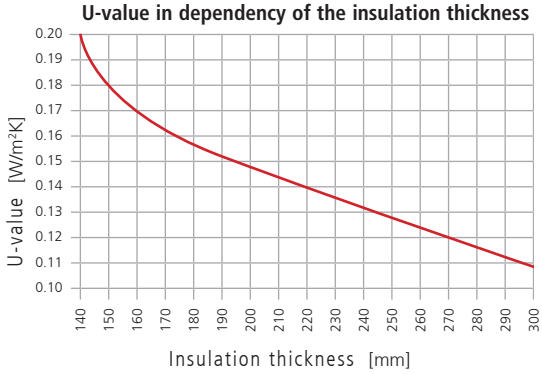
❶ Plastering system
❷ MW thermal insul. composite system
❸ Gypsum fibreboard
❹ Crossbar/THERMOFLOC Fibre
❺ THERMOFLOC Vapour barrier
❻ Gypsum fibreboard

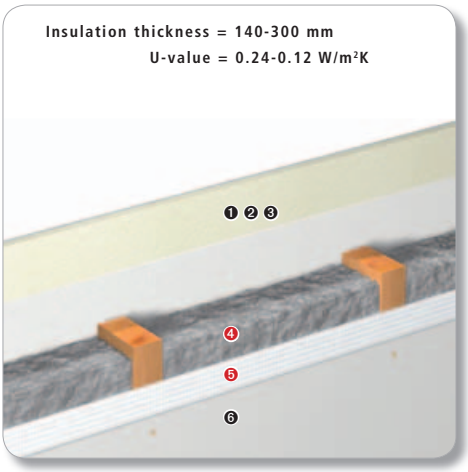
TECHNICAL DATA				
Thermal Protection	U= 0.26 [W/m²K]	DIN 4108	U= 0.14 [W/m²K]	DIN 4108
Storage mass efficiency	78.6 [kg/m²]		7.5 [kg/m²]	
Storage capacity	6.0 [W/m²K]		0.6 [W/m²K]	
Phase shift	15.1 [h]		13.5 [h]	
Amplitude damping	151.5 [-]		13.7 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F90	DIN 4102	F30-B/F90-B	DIN 4102
Noise	not determined	DIN 4109	not determined	DIN 4109

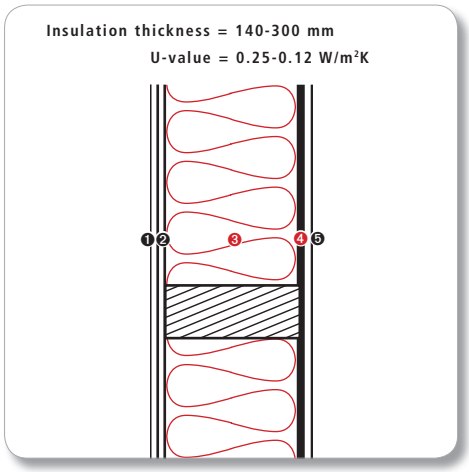
U-value in dependency of the insulation thickness



U-value in dependency of the insulation thickness

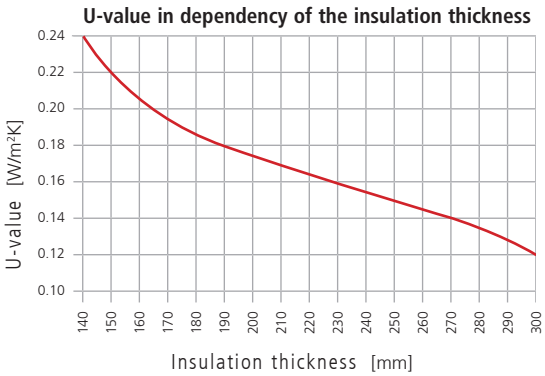


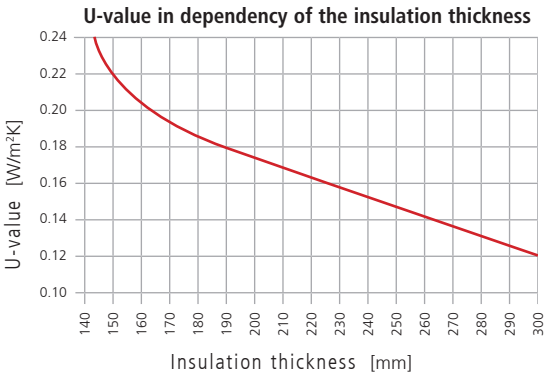




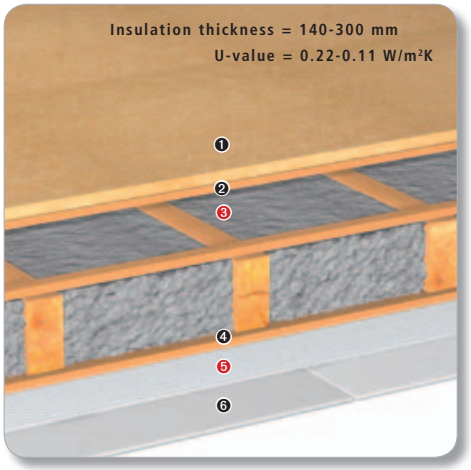
Building End Wall W15 (F30-B/F90-B) 3x planking	Building End Wall W16 (F30-B/F90-B) with calcium silicate board
❶ Gypsum fibreboard	❶ Calcium silicate board
❷ Gypsum fibreboard	❷ Gypsum fibreboard
❸ Gypsum fibreboard	❸ Crossbar/THERMOFLOC Fibre
❹ Crossbar/THERMOFLOC Fibre	❹ THERMOFLOC Vapour barrier
❺ THERMOFLOC Vapour barrier	❺ Gypsum fibreboard
❻ Gypsum fibreboard	

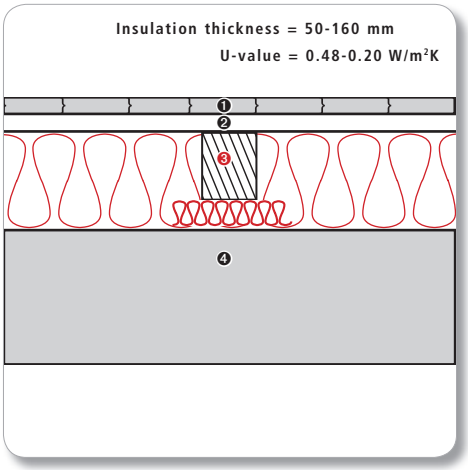
TECHNICAL DATA				
Thermal Protection	U= 0.14 [W/m²K]	DIN 4108	U= 0.14 [W/m²K]	DIN 4108
Storage mass efficiency	7.5 [kg/m²]		7.4 [kg/m²]	
Storage capacity	0.6 [W/m²K]		0.6 [W/m²K]	
Phase shift	11.1 [h]		10.7 [h]	
Amplitude damping	7.8 [-]		7.6 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B/F90-B	DIN 4102	F30-B/F90-B	DIN 4102
Noise	R_{WR}= 63 dB	DIN 4109	R_{WR}= 63 dB	DIN 4109





CEILINGS FLOORS





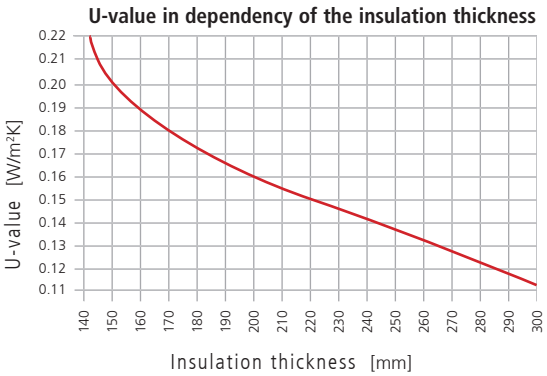
Braced Ceiling DB1
uppermost storey ceiling, possible to walk on top

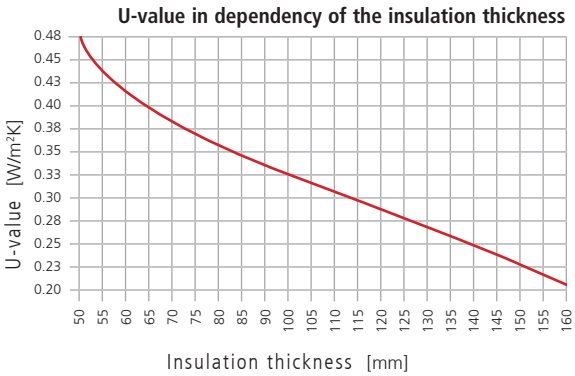
❶ Wood wool board
❷ Subfloor
❸ Tie beams/THERMOFLOC Fibre
❹ Evenly spaced slats
❺ THERMOFLOC Vapour barrier
❻ Gypsum wallboards

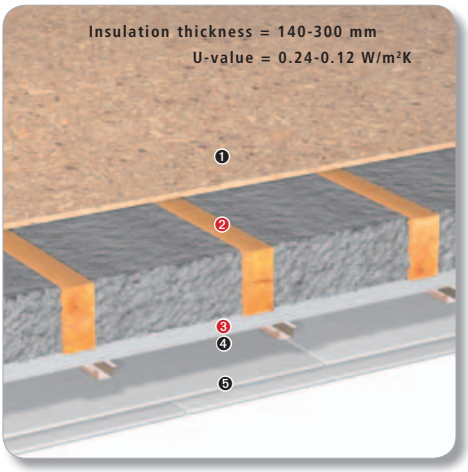
Storey Ceiling DB2
Storey ceiling with subfloor on cushioning wood between living rooms

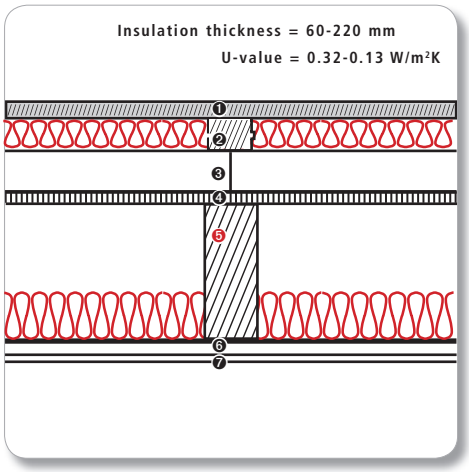
❶ Strip flooring
❷ Subfloor
❸ Cushioning wd./THERMOFLOC Fibre
❹ Solid ceiling

TECHNICAL DATA				
Thermal Protection	U= 0.13 [W/m²K]	DIN 4108	U= 0.25 [W/m²K]	DIN 4108
Storage mass efficiency	13.8 [kg/m²]		318.1 [kg/m²]	
Storage capacity	1.1 [W/m²K]		24.2 [W/m²K]	
Phase shift	7.4 [h]		11.8 [h]	
Amplitude damping	7.4 [-]		185.7 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F90	DIN 4102
Noise	R_{WR}= 48 dB, L_{NW}= 73 dB	DIN 4109	R_{WR}= 55 dB, L_{NW}= 51 dB	DIN 4109









Storey Ceiling DB3
with suspended counter ceiling

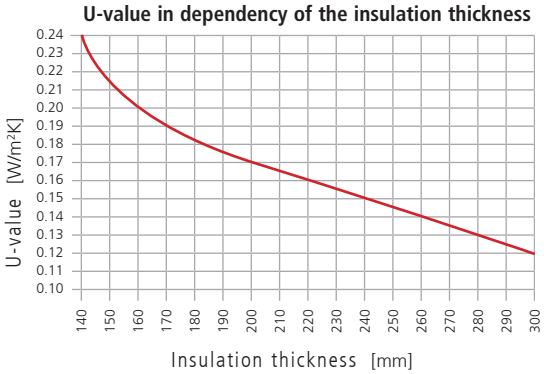
- ❶ OSB/Plywood
- ❷ Beams/THERMOFLOC Fibre
- ❸ THERMOFLOC Vapour barrier
- ❹ Spring rails
- ❺ Gypsum wallboard, 2-layer

Storey Ceiling DB4
for apartment partition ceilings, timber floors

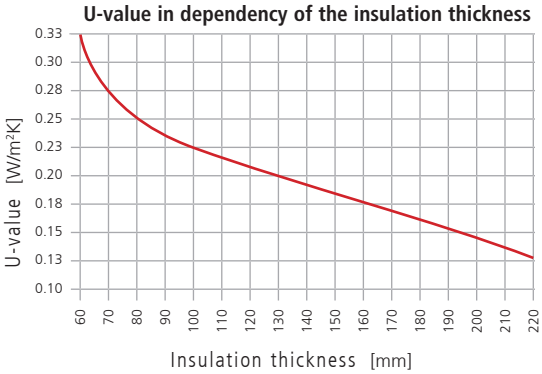
- ❶ Timber floor
- ❷ Wood fibre insulation board
- ❸ Concrete paving stone
- ❹ OSB/Plywood
- ❺ Beams/THERMOFLOC Fibre
- ❻ Spring rails
- ❼ Gypsum wallboards

TECHNICAL DATA				
Thermal Protection	U= 0.14 [W/m²K]	DIN 4108	U= 0.16 [W/m²K]	DIN 4108
Storage mass efficiency	18.7 [kg/m²]		11.7 [kg/m²]	
Storage capacity	1.4 [W/m²K]		0.9 [W/m²K]	
Phase shift	13.3 [h]		13.0 [h]	
Amplitude damping	21.3 [-]		43.4 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F60-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 52 dB, L_{NW}= 59 dB	DIN 4109	R_{WR}= 55 dB, L_{NW}= 53 dB	DIN 4109

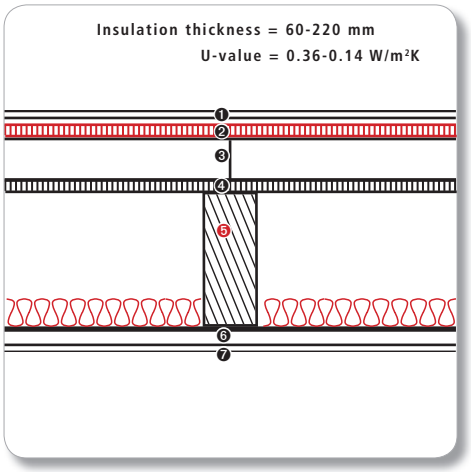
U-value in dependency of the insulation thickness

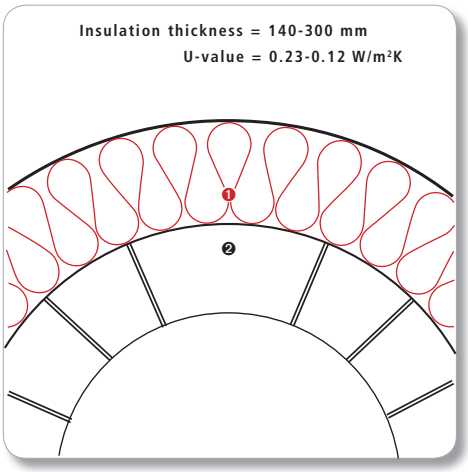


U-value in dependency of the insulation thickness



CEILINGS FLOORS

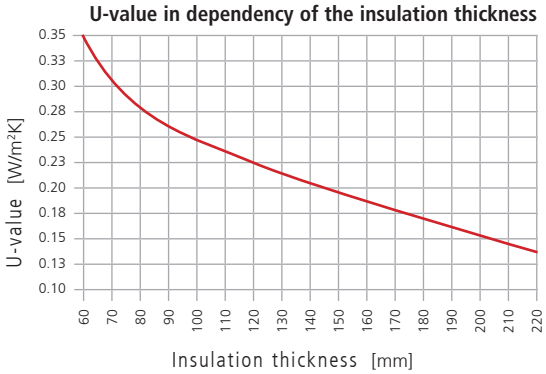




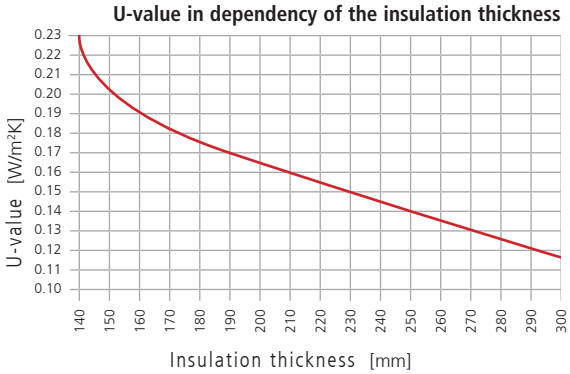
Storey Ceiling DB5 for apartment partition ceilings, dry screed	**Vaulted Ceiling DB6**
❶ Gypsum fibre dry screed	❶ THERMOFLOC Fibre
❷ Impact sound insulation board	❷ Natural stone
❸ Concrete paving stone	
❹ OSB/Plywood	
❺ Beams/THERMOFLOC Fibre	
❻ Spring rails	
❼ Gypsum wallboards	

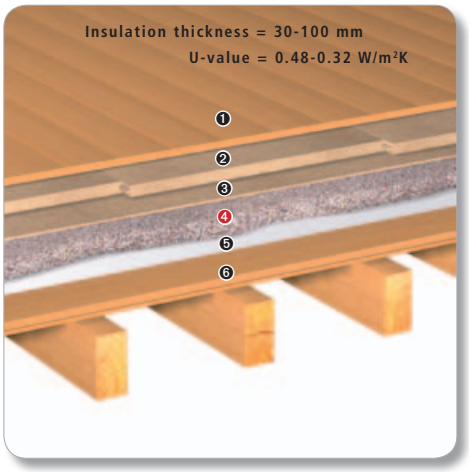
TECHNICAL DATA				
Thermal Protection	U= 0.17 [W/m²K]	DIN 4108	U= 0.13 [W/m²K]	DIN 4108
Storage mass efficiency	11.7 [kg/m²]		117.2 [kg/m²]	
Storage capacity	0.9 [W/m²K]		8.9 [W/m²K]	
Phase shift	12.3 [h]		10.8 [h]	
Amplitude damping	28.1 [-]		217.2 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102		DIN 4102
Noise	R_{WR}= 57 dB, L_{NW}= 50 dB	DIN 4109	not determined	DIN 4109

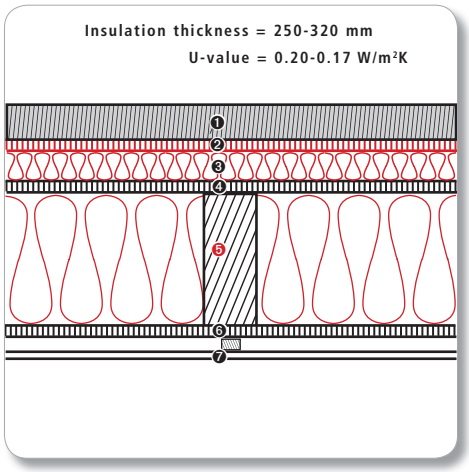
U-value in dependency of the insulation thickness



U-value in dependency of the insulation thickness







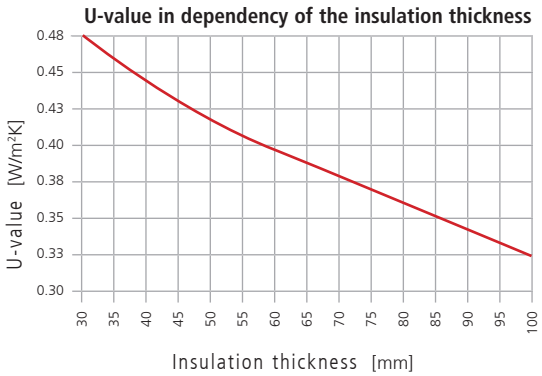
Storey Ceiling DB7
Exposed beam ceiling

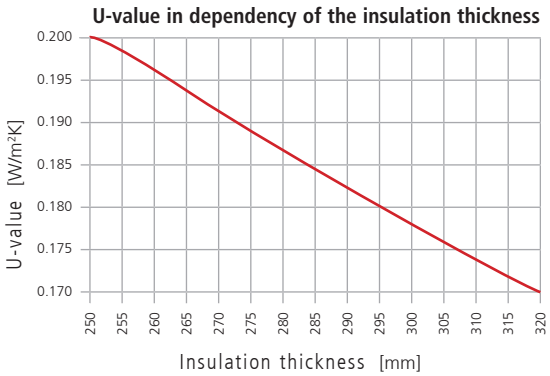
- ❶ Timber floor board
- ❷ Soft fibre N-F
- ❸ Soft fibre cover panel
- ❹ THERMOFLOC Pellets
- ❺ Waterproof layer
- ❻ Fireproof sheathing

Storey Ceiling DB8
Wooden beam ceiling with concrete screed

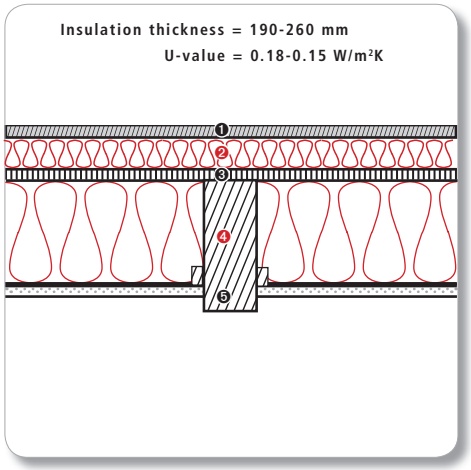
- ❶ Screed
- ❷ Impact sound insulation board
- ❸ THERMOFLOC Pellets
- ❹ OSB/Plywood
- ❺ Beams/THERMOFLOC Fibre
- ❻ OSB/Plywood
- ❼ Lathing

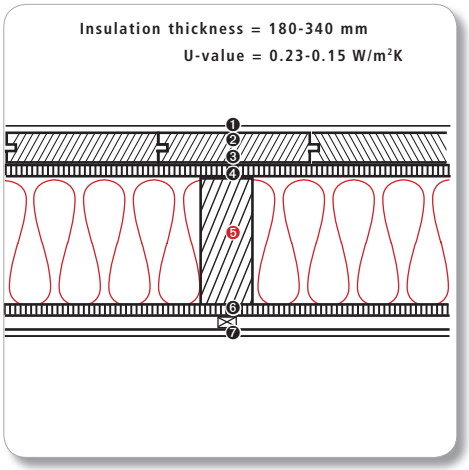
TECHNICAL DATA				
Thermal Protection	U= 0.36 [W/m²K]	DIN 4108	U= 0.18 [W/m²K]	DIN 4108
Storage mass efficiency	49.4 [kg/m²]		47.2 [kg/m²]	
Storage capacity	3.8 [W/m²K]		3.6 [W/m²K]	
Phase shift	8.3 [h]		5.7 [h]	
Amplitude damping	10.7 [-]		420.2 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 40 dB, L_{NW}= 73 dB	DIN 4109	R_{WR}= 58 dB, L_{NW}= 51 dB	DIN 4109





CEILINGS FLOORS





Storey Ceiling DB9
Floating timber floor

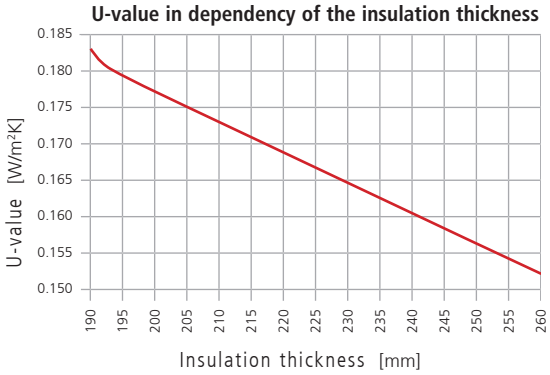
❶ Timber floor board
❷ THERMOFLOC Pellets
❸ OSB/Plywood
❹ Beams/THERMOFLOC Fibre
❺ Panelling

Storey Ceiling DB10
Wooden beam ceiling with dry screed

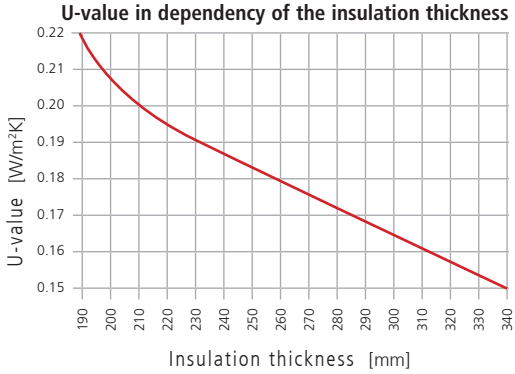
❶ Timber floor board
❷ Soft fibre N-F
❸ Soft fibre cover panel
❹ OSB/Plywood
❺ Beams/THERMOFLOC Fibre
❻ OSB/Plywood
❼ Lathing
❽ Gypsum wallboard

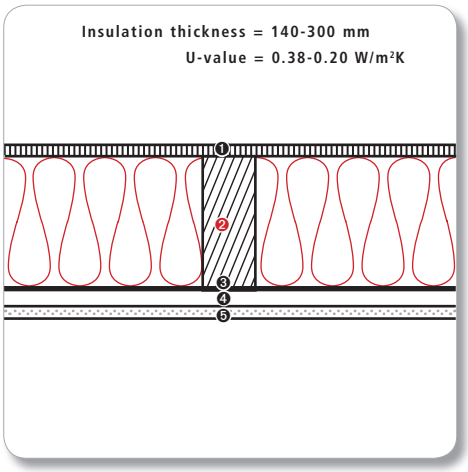
TECHNICAL DATA				
Thermal Protection	U= 0.16 [W/m²K]	DIN 4108	U= 0.16 [W/m²K]	DIN 4108
Storage mass efficiency	38.1 [kg/m²]		47.2 [kg/m²]	
Storage capacity	2.9 [W/m²K]		3.6 [W/m²K]	
Phase shift	15.3 [h]		23.9 [h]	
Amplitude damping	82.1 [-]		422.4 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F30-B	DIN 4102
Noise	R_{WR}= 50 dB, L_{NW}= 67 dB	DIN 4109	R_{WR}= 48 dB, L_{NW}= 73 dB	DIN 4109

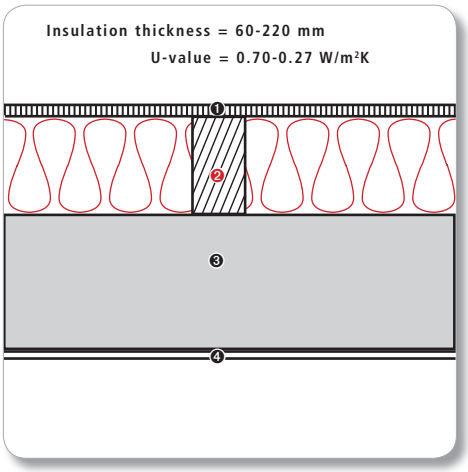
U-value in dependency of the insulation thickness



U-value in dependency of the insulation thickness







Storey Ceiling DB11
Wooden beam ceiling

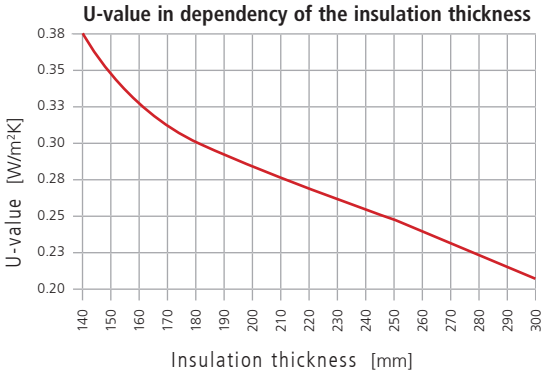
❶ OSB/Plywood
❷ Beams/THERMOFLOC Fibre
❸ Waterproof layer
❹ Laths
❺ Gypsum wallboard

Storey Ceiling DB12
Solid cellar ceiling

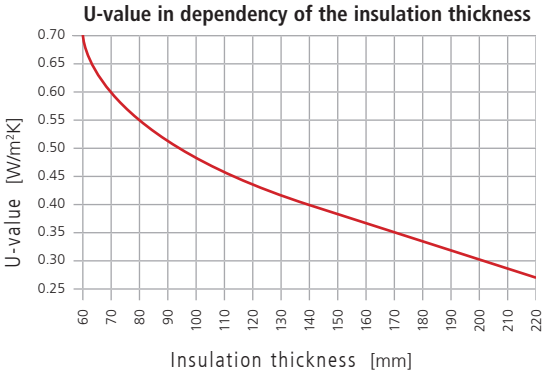
❶ Timber floor board
❷ Lathing/THERMOFLOC Fibre
❸ Reinforced concrete ceiling
❹ Ceiling plaster

TECHNICAL DATA				
Thermal Protection	U= 0.23 [W/m²K]	DIN 4108	U= 0.32 [W/m²K]	DIN 4108
Storage mass efficiency	13.9 [kg/m²]		301.1 [kg/m²]	
Storage capacity	1.1 [W/m²K]		2.4 [W/m²K]	
Phase shift	6.8 [h]		9.1 [h]	
Amplitude damping	4.2 [-]		93.6 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F30-B	DIN 4102	F90	DIN 4102
Noise	R_{WR}= 48 dB, L_{NW}= 73 dB	DIN 4109	R_{WR}= 55 dB, L_{NW}= 57 dB	DIN 4109

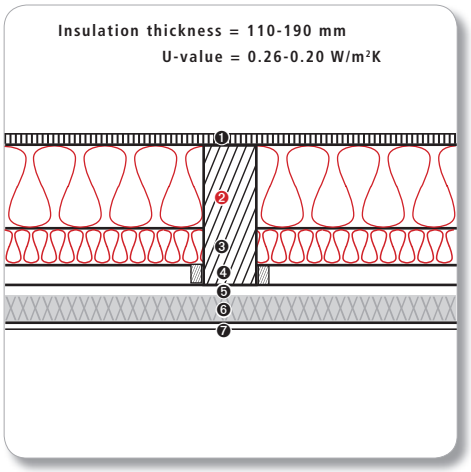
U-value in dependency of the insulation thickness

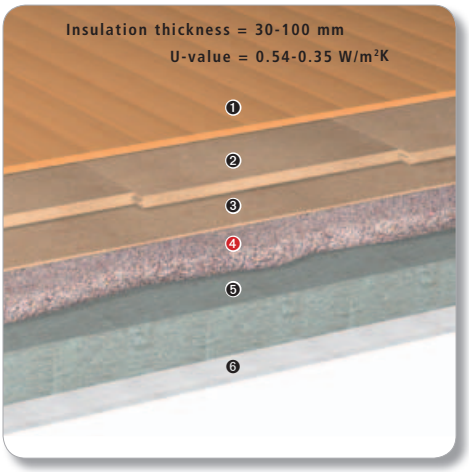


U-value in dependency of the insulation thickness



CEILINGS FLOORS





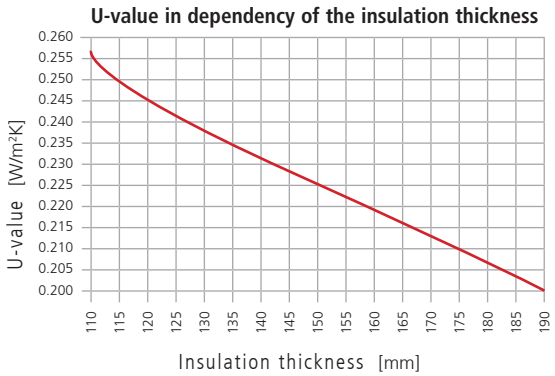
Storey Ceiling DB13
Wooden beam ceiling, old stock

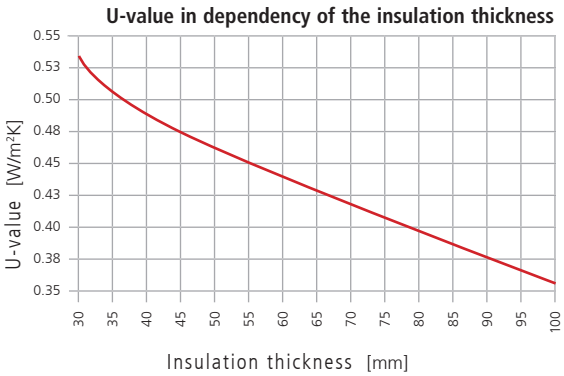
- ❶ OSB/Plywood
- ❷ Beams/THERMOFLOC Pellets + Fibre
- ❸ Curtain insulation layer
- ❹ Lathing
- ❺ Air
- ❻ Plaster base
- ❼ Ceiling plaster

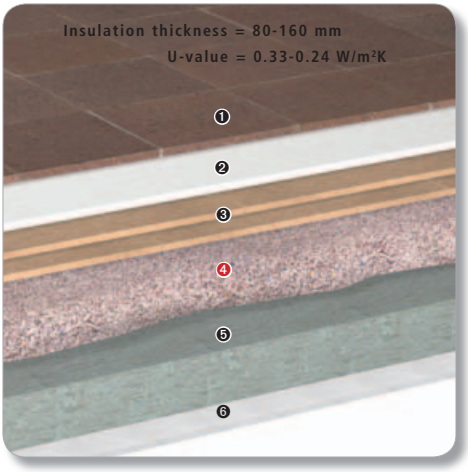
Storey Ceiling DB14
Solid ceiling

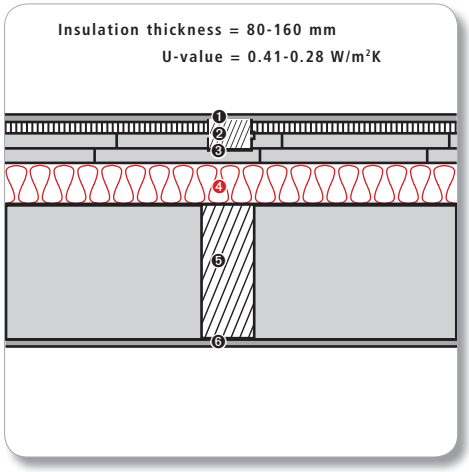
- ❶ Timber floor board
- ❷ Soft fibre N-F
- ❸ Soft fibre cover panel
- ❹ THERMOFLOC Pellets
- ❺ Concrete ceiling
- ❻ Ceiling plaster

TECHNICAL DATA				
Thermal Protection	U= 0.21 [W/m²K]	DIN 4108	U= 0.39 [W/m²K]	DIN 4108
Storage mass efficiency	31.3 [kg/m²]		310.9 [kg/m²]	
Storage capacity	2.4 [W/m²K]		23.7 [W/m²K]	
Phase shift	23.1 [h]		23.1 [h]	
Amplitude damping	450.6 [-]		450.6 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F60-B	DIN 4102	F90	DIN 4102
Noise	R_{WR}= 48 dB, L_{NW}= 65 dB	DIN 4109	R_{WR}= 55 dB, L_{NW}= 54 dB	DIN 4109









Storey Ceiling DB15
Wet room with dry screed

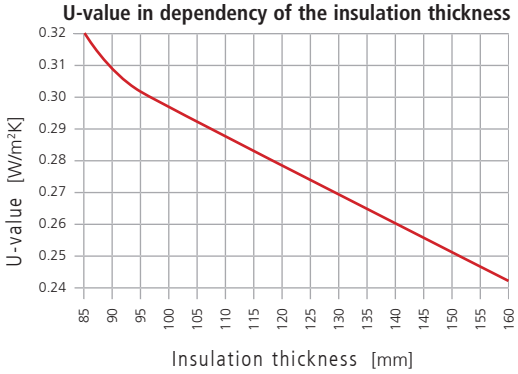
- ❶ Stoneware
- ❷ Gypsum fibreboard
- ❸ Wood soft fibre board
- ❹ THERMOFLOC Pellets
- ❺ Reinforced concrete ceiling
- ❻ Ceiling plaster

Storey Ceiling DB16
Dry screed

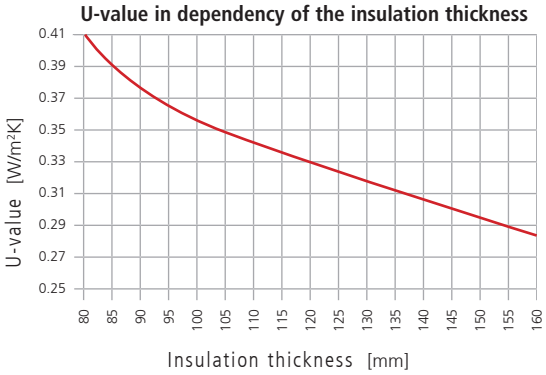
- ❶ Floor Covering
- ❷ Flooring panel
- ❸ Wood soft fibre board
- ❹ THERMOFLOC Pellets
- ❺ Reinforced concrete ceiling
- ❻ Ceiling plaster

TECHNICAL DATA				
Thermal Protection	U= 0.26 [W/m²K]	DIN 4108	U= 0.30 [W/m²K]	DIN 4108
Storage mass efficiency	314.0 [kg/m²]		313.8 [kg/m²]	
Storage capacity	23.9 [W/m²K]		23.9 [W/m²K]	
Phase shift	10.2 [h]		8.9 [h]	
Amplitude damping	125.5 [-]		93.5 [-]	
Moisture protection	suitable	DIN 4108	suitable	DIN 4108
Fire	F90	DIN 4102	F90	DIN 4102
Noise	R_{WR}= 54 dB, L_{NW}= 57 dB	DIN 4109	R_{WR}= 54 dB, L_{NW}= 57 dB	DIN 4109

U-value in dependency of the insulation thickness



U-value in dependency of the insulation thickness



COMPARISON OF DIFFERENT INSULATING MATERIALS					
Comparison criterion	Units	Thermofloc	Rock wool	Glass wool	Polystyrene (EPS)
1.) SYSTEMATICS OF INSULATING MATERIALS					
Classification based on raw material		organic/natural	inorganic/synthetic	inorganic/synthetic	organic/synthetic
Raw materials		90% newspaper and 10% boron salts	95% diabase, basalt, 5% binding agent, phenol formaldehyde-resin, mineral oil	quartz sand, soda, borax, sodium-sulph., formaldehyde-resin, mineral oil	styrene (from mineral oil), benzene, pentane, bromine compound
Delivery unit		loose in a sack	slab, mat, felt	slab, mat, felt	slab
2.) MECHANICAL PROPERTIES					
Available thickness in	mm	20 - 400	20 - 180	20 - 220	10 - 40
Density	kg/m³	30 - 80	30 - 90	15 - 50	12 - 20
Tensile strength	N/mm²	-	0.0007 - 0.8	0.005	0.15 - 0.52
Bond strength	N/mm²	-	0.00012 - 0.0075	0.005 - 0.015	0.09 - 0.22
3.) THERMAL PROTECTION RELATED PROPERTIES					
Thermal conductivity	W/(mK)	0.037	0.035 - 0.040	0.035 - 0.040	0.035 - 0.040
Insulation thickness for U-value of 0.30	mm	130	130	130	130
Application temperature range Min/Max	°C	-50 to 100	-100 to 750	-100 to 500	-100 to 100
Specific thermal capacity	J/kgK	1946	850	850	1210
Temperature conductivity		13	90	90	26
Temperature amplitude ratio (TAR) for 10 cm thickness	%	77	92	95	98
Time lag (1/TAR) for 10 cm thickness	h	3.4	1.9	1.5	1
4.) MOISTURE-RELATED PROPERTIES					
Water vapour diffusion resistance factor	µ	1/2	1	1	50 bis 100
Equilibrium moisture content at 23°C/80% r.h.	masses %	10-20	0.1 - 1.5	0.1 - 1	5
Sorption capacity	(yes/no)	yes	no	no	no
Normal dampness	masses %	10	1.5	1.5	2
Hydroscopicity	(yes/no)	yes	no	no	no
pH value		7.8 - 8.3	7/9	8/10	6.5 - 7.5
5.) FIRE PROTECTION RELATED CRITERIA					
Fire protection class	A,B1,B2	B2 - B1	B1 - A	B1 - A	B2 - B1
Fire resistance class		F30 - F90	F30 - F90	F30 - F90	F30 - F90
Smoke formation	(yes/no)	no	yes	yes	yes
Drop formation	(yes/no)	no	yes	yes	yes
Fire behaviour in the event of a fire		does not melt	melts	melts	melts
Flashpoint	°C	260	-	390	388
6.) SOUND INSULATION RELATED CRITERIA					
Absorptive capacity at 125 Hz	-	0.12	0.05 - 0.19	0.10 - 0.79	-
Absorptive capacity at 250 Hz	-	0.8	0.34 - 0.88	0.26 - 0.79	-
Absorptive capacity at 1,000 Hz	-	0.85	0.92 - 0.99	0.71 - 0.97	-
Absorptive capacity at 2,000 Hz	-	0.95	0.92 - 1.06	0.96 - 0.95	-
Longitudinal flow resistance	kPa s/m²	8 - 19	-	5 - 35	-
Dynamic stiffness	MN/m²	50*	-	25/5	60 - 100
		* only insulation pellets			
7.) PROCESSING-RELATED CRITERIA					
Practical use		very good	satisfactory	satisfactory	good
Processing method		automatic	manual	manual	manual
Waste	(yes/no)	no	yes	yes	yes
Fine dust pollution during installation		low to medium	low to medium	low to medium	no pollution
Suitable for do-it-yourselfers	(yes/no)	no	yes	yes	yes
Health protection when working		Dust mask	Dust mask, gloves	Dust mask, gloves	not necessary
8.) ECOLOGICAL CRITERIA					
Energy consumption during manufacture	kWh/m³	5	600	550	650
MI value		1.7	4	4.7	11
Environmental mark		IBO	Blauer Engel	Blauer Engel	
Packaging		PE and paper sack	PE packaging	PE packaging	PE packaging
Reusability		yes	conditional	conditional	conditional
Disposal		compostable	dump	dump	dump
Primary energy amortisation time	month	1.5	6	2.5	8
Raw material availability		unlimited	unlimited	unlimited	limited
9.) BUILDING BIOLOGY CRITERIA					
Gas emissions		none	not known	not known	not known
10.) USABILITY					
Expected usability time	years	60	30 - unlimited	30 - unlimited	50

T1 (OPEN INJECTION IN CEILING OR FLAT ROOF AREAS)

Cellulose insulation, thermal conductivity 0.040, fire class B2, with reduced borate content (max. 10 M%), insulation thickness ……..cm, delivery and with 10% surcharge for open injection to the desired insulation thickness in the ceiling or flat roof areas in accordance with the manufacturer's processing guidelines.

Amount in m²: .....

e.g. Thermofloc B2 or equivalent: .....

Wages .....
Miscellaneous .....
Flat price ...../m² Flat price .....

T2 (CONDENSED INJECTION IN ROOF AREAS)

Cellulose insulation, thermal conductivity 0,040, fire classification B2, with reduced borate content (max. 10 M%), insulation thickness …….cm, delivery and with compacting factors in accordance with the manufacturer's processing guidelines in the roof area between the rafters applied joint-free, cavity filling, and settlement free – incl. open and airtight sealing of the injection openings.

Amount in m²: .....

e.g. Thermofloc B2 or equivalent: .....

Wages .....
Miscellaneous .....
Flat price ...../m² Flat price .....

T3 (CONDENSED INJECTION IN WALL AREAS)

Cellulose insulation, thermal conductivity 0,040, fire classification B2, with reduced borate content (max. 10 M%), insulation thickness …….cm, delivery and with compacting factors in accordance with the manufacturer's processing guidelines in the wall area between the rafters applied joint-free, cavity filling, and settlement free – incl. open and airtight sealing of the injection openings.

Amount in m²: .....

e.g. Thermofloc B2 or equivalent: .....

Wages .....
Miscellaneous .....
Flat price ...../m² Flat price .....

T4 (CONDENSED INJECTION IN CEILING AREA)

Cellulose insulation, thermal conductivity 0,040, fire classification B2, with reduced borate content (max. 10 M%), insulation thickness …….cm, delivery and with compacting factors in accordance with the manufacturer's processing guidelines in the ceiling area applied joint-free, cavity filling, and settlement free – incl. open and airtight sealing of the injection openings.

Amount in m²: .....

e.g. Thermofloc B2 or equivalent: .....

Wages .....
Miscellaneous .....
Flat price ...../m² Flat price .....

T5 (CSO SPRAYING PROCESS)

Cellulose insulation, thermal conductivity 0,040, fire classification B2, with reduced borate content (max. 10 M%), insulation thickness …….cm, delivery and with compacting factors in accordance with the manufacturer's processing guidelines on walls sprayed on joint-free, cavity filling, and settlement free by means of the CSO process.

Amount in m²: .....

e.g. Thermofloc B2 or equivalent: .....

Wages .....
Miscellaneous .....
Flat price ...../m² Flat price .....

:: Technical Catalog

THERMOFLOC®
Intelligent Insulation System

Thermofloc/Feistritz/Drau Ref. TK: (ENG) 01 15/01/2010

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