Laka-Tavan

Thermal protection

U = 0,09 W/(m²K)

GEG 2020 Bestand*: U<0,2 W/(m²K)

excellent   insufficient

Moisture proofing

No condensate

excellent   insufficient
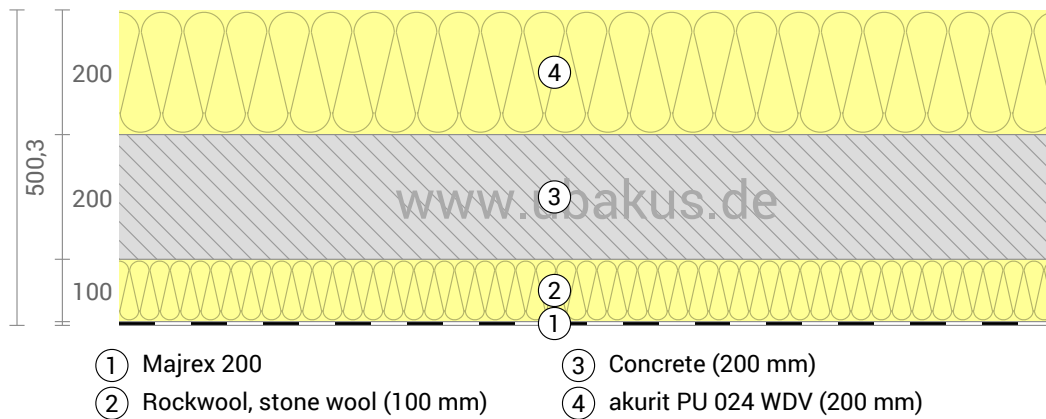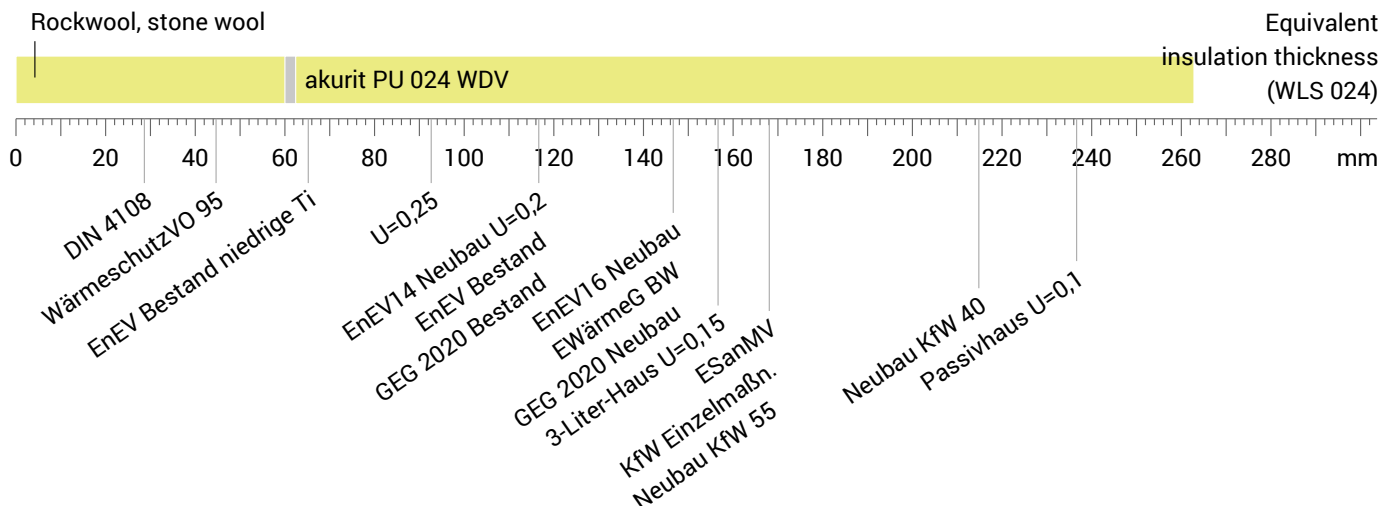
Heat protection

Temperature amplitude damping: >100
phase shift: non relevant
Thermal capacity inside: 351 kJ/m²K

excellent   insufficient

① Majrex 200
② Rockwool, stone wool (100 mm)
③ Concrete (200 mm)
④ akurit PU 024 WDV (200 mm)

## Impact of each layer and comparison to reference values

For the following figure, the thermal resistances of the individual layers were converted in millimeters insulation. The scale refers to an insulation of thermal conductivity 0,024 W/mK.

Rockwool, stone wool

akurit PU 024 WDV

Equivalent insulation thickness (WLS 024)

0   20   40   60   80   100   120   140   160   180   200   220   240   260   280   mm

DIN 4108
WärmeschutzVO 95
EnEV Bestand niedrige Ti
U=0,25
EnEV14 Neubau U=0,2
EnEV Bestand
GEG 2020 Bestand
EnEV16 Neubau
EWärmeG BW
GEG 2020 Neubau
3-Liter-Haus U=0,15
ESanMV
KfW Einzelmaßn.
Neubau KfW 55
Neubau KfW 40
Passivhaus U=0,1

Inside air :	20,0°C / 50%	
Outside air:	-5,0°C / 80%	
Surface temperature.:	19,4°C / -4,9°C	

sd-value: 51,3 m

Thickness:	50,0 cm
Weight:	493 kg/m²
Heat capacity:	471 kJ/m²K

Laka-Tavan, U=0,09 W/(m²K)

Temperature profile
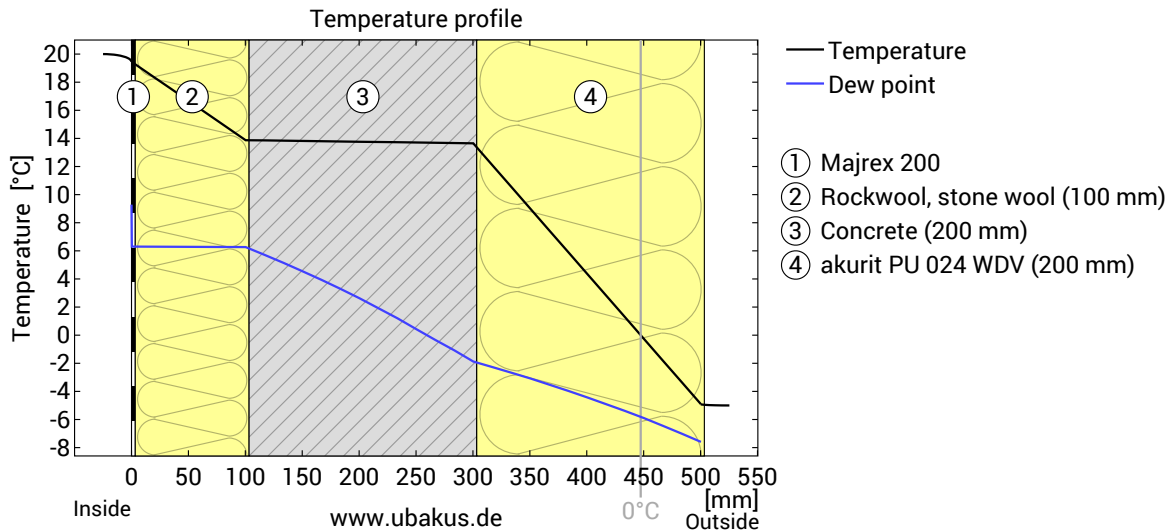
Temperature and dew-point temperature in the component. The dew-point indicates the temperature, at which water vapour condensates. As long as the temperature of the component is everywhere above the dew-point temperature, no condensation occurs. If the curves have contact, condensation occurs at the corresponding position.

Layers (from inside to outside)

#		Material	λ [W/mK]	R [m²K/W]	Temperatur [°C] min	max	Weight [kg/m²]
		Thermal contact resistance*		0,100	19,4	20,0	
1	0,03 cm	Majrex 200	2,300	0,000	19,4	19,4	0,2
2	10 cm	Rockwool, stone wool	0,040	2,500	13,9	19,4	6,0
3	20 cm	Concrete	2,000	0,100	13,7	13,9	480,0
4	20 cm	akurit PU 024 WDV	0,024	8,333	-4,9	13,7	6,8
		Thermal contact resistance*		0,040	-5,0	-4,9	
	50,03 cm	Whole component		11,073			493,0

*Thermal contact resistances according to DIN 6946 for the U-value calculation. Rsi=0,25 and Rse=0,04 according to DIN 4108-3 were used for moisture proofing and temperature profile.

Surface temperature inside (min / average / max):   19,4°C   19,4°C   19,4°C
Surface temperature outside (min / average / max):   -4,9°C   -4,9°C   -4,9°C

Laka-Tavan, U=0,09 W/(m²K)

Moisture proofing

For the calculation of the amount of condensation water, the component was exposed to the following constant climate for 90 days: inside: 20°C und 50% Humidity; outside: -5°C und 80% Humidity. This climate complies with DIN 4108-3.

This component is free of condensate under the given climate conditions.

#		Material	sd-value [m]	Condensate [kg/m²]	[Gew.-%]	Weight [kg/m²]
1	0,03 cm	Majrex 200	13,00	-		0,2
2	10 cm	Rockwool, stone wool	0,14	-		6,0
3	20 cm	Concrete	26,00	-		480,0
4	20 cm	akurit PU 024 WDV	12,20	-		6,8
	50,03 cm	Whole component	51,34	0		493,0

Humidity

The temperature of the inside surface is 19,4 °C leading to a relative humidity on the surface of 52%.Mould formation is not expected under these conditions.
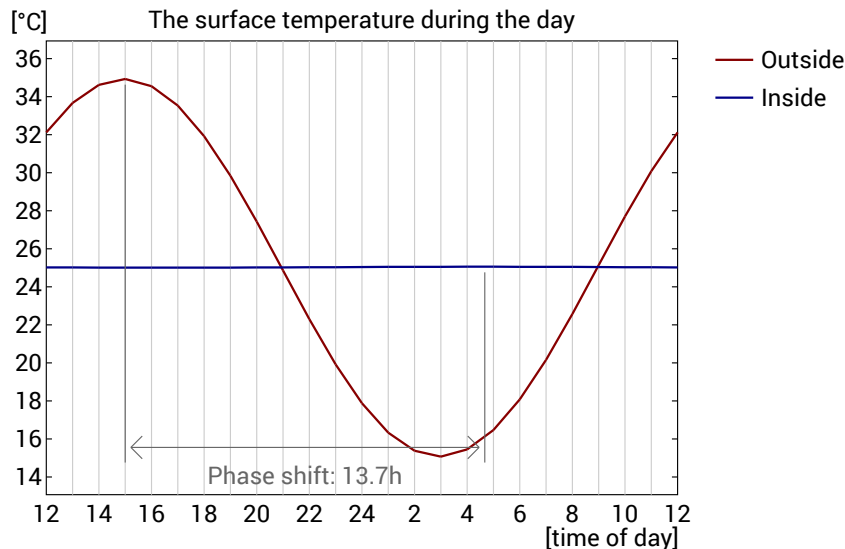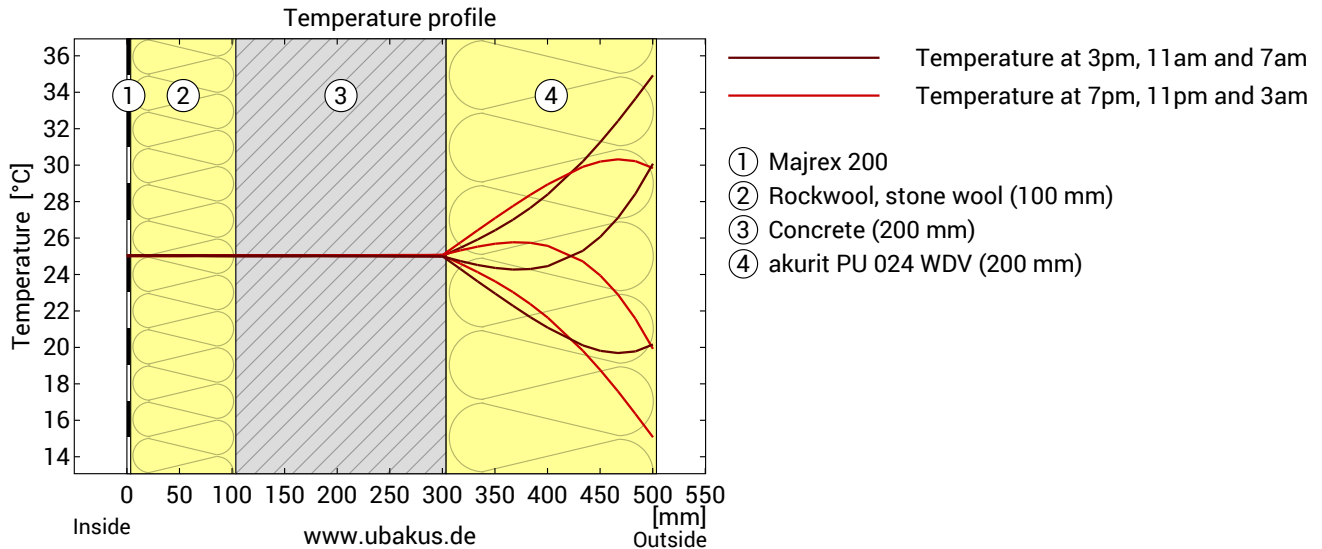The following figure shows the relative humidity inside the component.
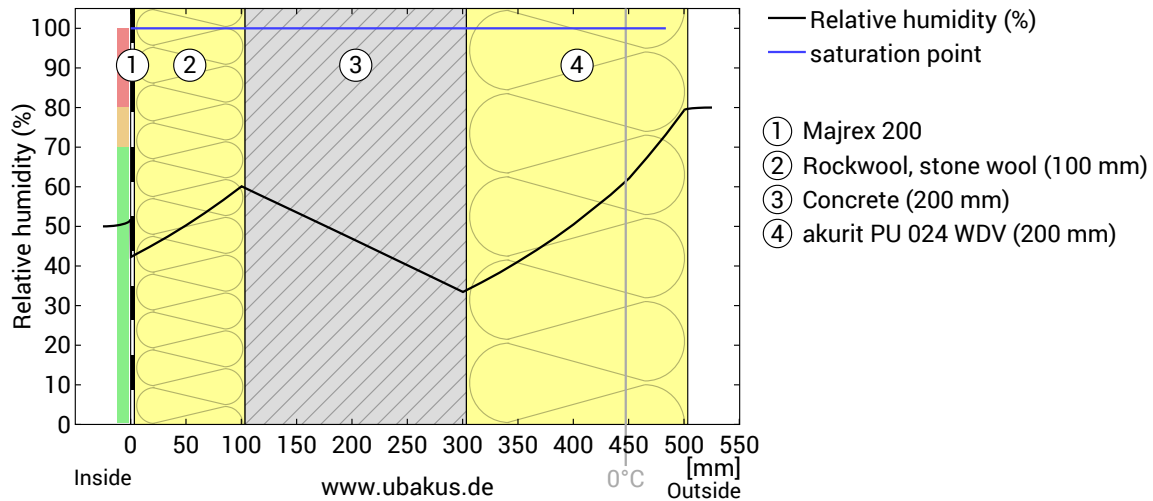
Notes: Calculation using the Ubakus 2D-FE method. Convection and the capillarity of the building materials were not considered. The drying time may take longer under unfavorable conditions (shading, damp / cool summers) than calculated here.

Laka-Tavan, U=0,09 W/(m²K)

Heat protection

The following results are properties of the tested component alone and do not make any statement about the heat protection of the entire room:

Temperature profile

Temperature at 3pm, 11am and 7am
Temperature at 7pm, 11pm and 3am

① Majrex 200
② Rockwool, stone wool (100 mm)
③ Concrete (200 mm)
④ akurit PU 024 WDV (200 mm)

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Inside / Outside

The surface temperature during the day

— Outside
— Inside

Phase shift: 13.7h

Top: Temperature profile within the component at different times. From top to bottom, brown lines: at 3 pm, 11 am and 7 am and red lines at 7 pm , 11 pm and 3 am.

Bottom: Temperature on the outer (red) and inner (blue) surface in the course of a day. The arrows indicate the location of the temperature maximum values . The maximum of the inner surface temperature should preferably occur during the second half of the night.

Phase shift*	non relevant	Heat storage capacity (whole component):	471 kJ/m²K
Amplitude attenuation **	>100	Thermal capacity of inner layers:	351 kJ/m²K
TAV ***	0,003		

* The phase shift is the time in hours after which the temperature peak of the afternoon reaches the component interior.
** The amplitude attenuation describes the attenuation of the temperature wave when passing through the component. A value of 10 means that the temperature on the outside varies 10x stronger than on the inside, e.g. outside 15-35 °C, inside 24-26 °C.
***The temperature amplitude ratio TAV is the reciprocal of the attenuation: TAV = 1 / amplitude attenuation

Note: The heat protection of a room is influenced by several factors, but essentially by the direct solar radiation through windows and the total amount of heat storage capacity (including floor, interior walls and furniture). A single component usually has only a very small influence on the heat protection of the room.