



## FAQ: U-value measurement

### Norms and requirements

*What is the ISO 9869 norm?*

The ISO norm is established to secure the reliability of a heat flux measurement. If a measurement is conducted in line with ISO 9869, the measurement results can be considered as accurate.

*What are the ISO 9869 requirements?*

About the measurement itself ISO 9869 states that a measurement of a wall should last at least 72 hours and a maximum difference of 5% is tolerated between the last value and the value 24 hours before. For further guidance please refer to our instruction manual.

*How is the U-value calculated by greenTEG's U-Value KIT software?*

The U-value is calculated according to the moving average method as described in ISO 9869. Therefore, the measured heat flow rate is divided by the temperature difference for all data points. The average of these calculations (taken over a long time period) represents the actual U-value of a building envelope.

*Why do I need to measure a wall at least 72h according to ISO 9869?*

A wall has a thermal mass which enables it to store heat. Due to temperature fluctuations inside and outside the building, the amount of heat stored in the wall is fluctuating too. The influence of the thermal mass of the building envelope on the outcome of the U-value calculations is getting smaller over time as the average of more data points is taken. Under the right circumstances the calculated average is reaching the actual U-value of the building envelope.

*Is it possible to get reliable measurement results for a wall in less than 72 hours?*

Yes. However, the inside temperature should be kept as constant as possible during the measurement to diminish the effect of the thermal capacity of the wall. Moreover, the measurement should preferably last a multiple of 24 hours.

### Measurement specifics

*Can I measure glass (windows) as well?*

Yes, however, since glass has different thermal characteristics, the measurement procedure is a bit different. According to ISO 9869 three subsequent night measurements (e.g. of 7 hours) should be conducted. An example of such an assessment can be found in our application note (<http://shop.greenteg.com/shop/building/u-value-kit/>).

*Can I measure the whole year through?*

When the difference between the inside temperature and the outside temperature is too small, the measurement results become unreliable. Therefore, we advise a minimum temperature difference of roughly 5° C degrees over the whole measurement time. This means usually that an assessment of a wall cannot be made during the summer months. As glass measurements are conducted over night, these measurement can usually be conducted during the whole year.

*Can I measure during sunny days?*



Yes, if certain aspects are taken into account, solar radiation will have no influence. You should try to avoid measuring the south wall of a building and always cover the temperature sensor to block any direct sunlight if necessary.

## Measurement routine & analytics

*Does a measurement has any impact on the daily routines of building occupants?*

The measurement set-up is rather small. If the sensor is located properly, it won't bother any building occupant. To increase the accuracy of the obtained data building occupants might try to keep the inside temperature as constant as possible (e.g. by not switching the radiator off during the nights or limit the opening of the window).

*I measured more than 72 hours but the measurement is not in line with ISO 9869. Why is this?*

This means that the average U-value still fluctuates significantly and a stable value has not been reached yet. Unstable external conditions or a very small temperature difference (< 5 C) could be reasons why it takes longer to reach the actual U-value of the building envelope. You could decide to extend the measurement or start a new measurement when conditions are better.

*My measurement set-up is not fully in line with ISO 9869, is the measured U-value unreliable?*

Such a measurement could still be rather reliable. However, it requires some more in-depth interpretations of the measurement results. The length of the measurement and the volatility of the data should be considered. If the overall standard deviation and the deviation during the last 24 hours are not too high, the measurement results are likely to give a good representation of the measured results.

*The measurement outcome seems to be unrealistic but in line with ISO 9869. Why?*

First, you should make sure that the measurement set-up meets all requirements as described in our instruction manual. A reason for a unrealistic good U-value might be that the sensor does not have a good contact with the wall surface. If all criteria were taken into account, the U-value can be considered as correct. Values can be different than expected due to the heterogeneity of the walls or thermal bridges. Moreover, walls in historic buildings tend to have a better U-value than is expected by most models.