

greenTEG

# gOMS II



GO MEASUREMENT  
SYSTEM II  
USER MANUAL

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**02** SET-UP

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# KIT CONTENTS



Upon opening your gOMS II Travel Case, you should find the following contents:

- 1 Base Station
- 2 Nodes
- 1 Inner Wall Heat Flux Sensor
- 1 Outer Wall Surface Sensor
- 2 Ambient Temperature Sensors
- 2 Ambient Sensor Mounting Clips
- 1 Roll of Double-Sided Adhesive Tape
- 1 Bag of Double-Sided Adhesive Water Repellent Strips
- 1 Scissors

NOTE for customers who have purchased more than one pair of nodes:

For every extra pair purchased, the products highlighted in green will double:

For example 2 pairs of Nodes (4 nodes) will mean:

2 Inner Wall Sensors, 2 Outer Wall Sensors, 4 Ambient Sensors etc.

# NODES OVERVIEW

There are two node configurations required for the measurement of the U-Value and/or R-Value.

One node is to be placed indoors (Type 1), and one node outdoors (Type 2):

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## NODE



gOMS II nodes have a battery lifetime of (at least) 2 years, and are adaptable to both Type 1 sensors, and Type 2 sensors.

Any node can take any sensor combination, and still remain adaptable for other sensors.

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## INNER NODE - TYPE 1



1x combined heatflux / surface temperature sensor

1x ambient air temperature sensor

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## OUTER NODE - TYPE 2



1x surface temperature sensor

1x ambient air temperature sensor

# BASE STATION OVERVIEW

gOMS II Base Stations have an autonomous Battery Life of 2 days, and can be connected to up to 10 Nodes at once.

For protection, it is covered in a removable silicone sleeve.

The antenna should not be removed at any stage.

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## TOGGLE BUTTON



Used to navigate Base Station interface.

The **toggle button** allows the operator to navigate through the device information in two ways.

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## NAVIGATION #1: "SINGLE PRESS"



Press toggle button **once** to go to the next page of information, within the same category.

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## NAVIGATION #2: "LONG PRESS"



**Hold down** the toggle button to see other menu options, and release to go to highlighted option. For instance, if you want to exit the main menu, and go to recording options. Hold down the toggle button until "**Record**" is highlighted, and let go of the toggle button to move to this page.

# BASE STATION OVERVIEW

## MAIN MENU OVERVIEW



1. Data logging Status  
R+ = Recording, R- = Not Recording
2. Nodes registered on Base Station  
+ = Measurement has been instantaneously received from this node

## NODE INFORMATION



- HF = Heat Flux [W/m<sup>2</sup>]  
Ts = Surface Temperature [°C]  
T = Ambient Temperature [°C]  
A = 1st Node Port  
B = 2nd Node Port

## LED DISPLAYS



1. Red: Measurement is received from a node
2. Orange: Base Station is charging
3. Blue: Base Station is recording

# BASE STATION OVERVIEW

## MAIN MENU OVERVIEW



Node Overview

Press toggle button to see individual node information.

## INFO



Displays Software Version, Base Station Serial Number.

Date and Time on next page.

## RECORD



Recording Status.

Press once to Start/Stop Recording.

Hold down button for option to cancel.

# BASE STATION OVERVIEW

## RESET



Resets Nodes registered on Base Station Press once to Reset. Hold down button for option to cancel.

## WIFI



Displays WiFi Connection Status. Press once to Disconnect/Reconnect. Hold down button for option to cancel.

## OFF



Base Station Display Screen turns off. NOTE: This does not stop recording, but turns off the screen display. Screen display will also turn off when unattended for some time.

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## 2.1 INSTALLATION OF NODES

**NOTE:** The instructions in this section are only a quick summary of node installation procedures. It is necessary to read the gOMS II Mounting Recommendations manual for more detailed instructions and precautions on all gOMS mounting options provided by greenTEG.

**Caution:** Sensor accuracy only performs as per specifications if greenTEG mounting solutions are used. Any other non-greenTEG approved mounting solutions will result in measurement errors and possibly even safety issues.

**Optional:** Use thermographic imaging to help identify representative/interesting spots for the heat flux sensor placement on your building element

### Node Mounting:

**For a U-Value / R-Value Measurement, mount an inner node (type 1) configuration and outer node (Type 2) configuration on opposite sides of your building element. See "Nodes Overview" at beginning of manual for more information.**

1. Mount the node to the wall using the provided double-sided adhesive roll tapes, or place it on a suitable spot next to the wall (for example a shelf). Please ensure that the adhesive tape removal tabs stick out from the side of the measurement node.
2. Mount the Inner sensor with a strip of double-sided adhesive roll tape.  
**NOTE:** It is important that the removal tab points to the side of the sensor and not to the direction of the sensor cable.
3. Mount the ambient air temperature sensor using the provided sensor holder and one piece of double-sided adhesive tape.



**Node Mounting**



**Ambient Clip Mounting**



**Correct Mounting Setup**

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**Note for various Mounting Conditions:** Further instructions are available in the Mounting Guide.

**Wet Conditions:** Use the mounting strips provided

**Rough Surfaces:** Mount the node at the wall with thermal putty (Available on Request from greenTEG).

## 2.2 NODE ASSIGNMENT TO BASE STATION

There are two methods for assigning your nodes to your base station. Connect your base station to your PC and open your gOMS II software. Click **Configuration** - Here your Assignment Options will be displayed.

**Konfiguration** Konfiguration

**Option 1:** Up to 10 nodes within proximity of the Base Station will be assigned with the Base Station. This is suitable when you have a maximum of 10 nodes in your environment.

Akzeptierte Nodes:

Bis zu 10 beliebige Nodes akzeptieren (Standard)

**Option 2:** Manually Enter the Serial Numbers (S/N) of the nodes for pairing. This number is found on the front of your nodes.

Akzeptierte Nodes:

Bis zu 10 beliebige Nodes akzeptieren (Standard)

Festgelegte Liste (Whitelist)

SN 1. Node	<input type="text" value="10001"/>	SN 6. Node	<input type="text"/>
SN 2. Node	<input type="text" value="10002"/>	SN 7. Node	<input type="text"/>
SN 3. Node	<input type="text" value="10003"/>	SN 8. Node	<input type="text"/>
SN 4. Node	<input type="text" value="10004"/>	SN 9. Node	<input type="text"/>
SN 5. Node	<input type="text"/>	SN 10. Node	<input type="text"/>

Once your preferred assignment method is selected, click **Write** at the bottom of the screen so confirm this. To cancel, click **Home**.

**NOTE:** On the bottom of the Configuration page you will see WiFi options, You may enter your WiFi details manually into this box if you wish. This feature will not fully be realised until the cloud storage feature is released.

WLAN:

WLAN aktiv

Wifi-Einstellungen schreiben

Network (SSID)

Network Key (WPA2)   Passwort schreiben

Server name / IP

MAC  [Für Details siehe Manual](#)

## 2.3 STARTING YOUR MEASUREMENTS

Start your Measurement by clicking **Start logging**

<b>Start Record</b>	Record starten (nur mit Logger)
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A Blue Light will flash from the Base Station logger to indicate that it is in logging mode.



You may now disconnect the Base Station from your PC. It is recommended that you keep your Base Station charging during measurements, as the Autonomous Battery Life is approximately 48 hours; Below the minimum required 72 hours for an ISO 9869 conforming measurement.

**NOTE:** If you wish to check that measurements are being taken, then click **Real-time measurement** on the Home Page to see the incoming signals. Readings may not show up straight away if node is set to send measurements ever 10 mins however.

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### BASE STATION PLACEMENT RECOMMENDATIONS

- The ideal placement for the Base Station is in a direct line-of-sight with the measurement nodes.
- greenTEG observed an **indoor** range of **50m** with the signal travelling through concrete walls, and an **outdoor** signal range of over **200m**.
  - This Range can worsen with the amount of obstacles between the measurement nodes and the Base Station. Range is particularly worsened by **Thick Walls**, and those made from **Concrete**.
- If Measurements are being taken on Different Floors/Stories, avoid placing the Base Station directly above/below Nodes.

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## 3.1 ACCESSING YOUR MEASUREMENTS

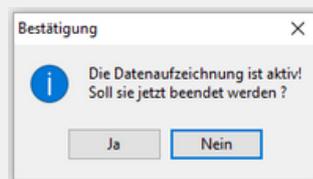
There are two methods for reading your measurement records.

### 1. Base Station is plugged into PC.

Click **Read record**.

<b>Read Record</b>	Record auslesen und Analyse (nur mit Logger)
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If your Base Station is still recording you will be given the option to end the measurement. You can only analyse reports of measurements that have ceased recording.



A list of all recorded measurements stored on the Base Station will be shown. Choose your desired File and click **Readout**.

Record	Startzeit	Seiten
<input checked="" type="checkbox"/> 1	2022-03-17 16:55:47	1
<input type="checkbox"/> 2	2022-03-14 10:23:57	1
<input type="checkbox"/> 3	2022-03-02 14:29:40	708
<input type="checkbox"/> 4	2022-02-23 10:20:57	1
<input type="checkbox"/> 5	2022-02-18 16:57:40	1000
<input type="checkbox"/> 6	2022-02-14 11:43:29	471
<input type="checkbox"/> 7	2022-01-27 08:37:52	1699
<input type="checkbox"/> 8	2022-01-26 09:55:11	1
<input type="checkbox"/> 9	2022-01-26 09:44:48	4
<input type="checkbox"/> 10	2022-01-26 09:40:09	1
<input type="checkbox"/> 11	2022-01-24 17:16:47	109
<input type="checkbox"/> 12	2022-01-24 16:29:36	3

### 2. Reading Files already Stored on Your PC

<b>Analyse</b>	Analyse (ohne Logger, nur Datei)
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Click **Analysis** to access gOMS II Measurement Files already stored on your PC.

## 3.2 ANALYSING YOUR MEASUREMENT

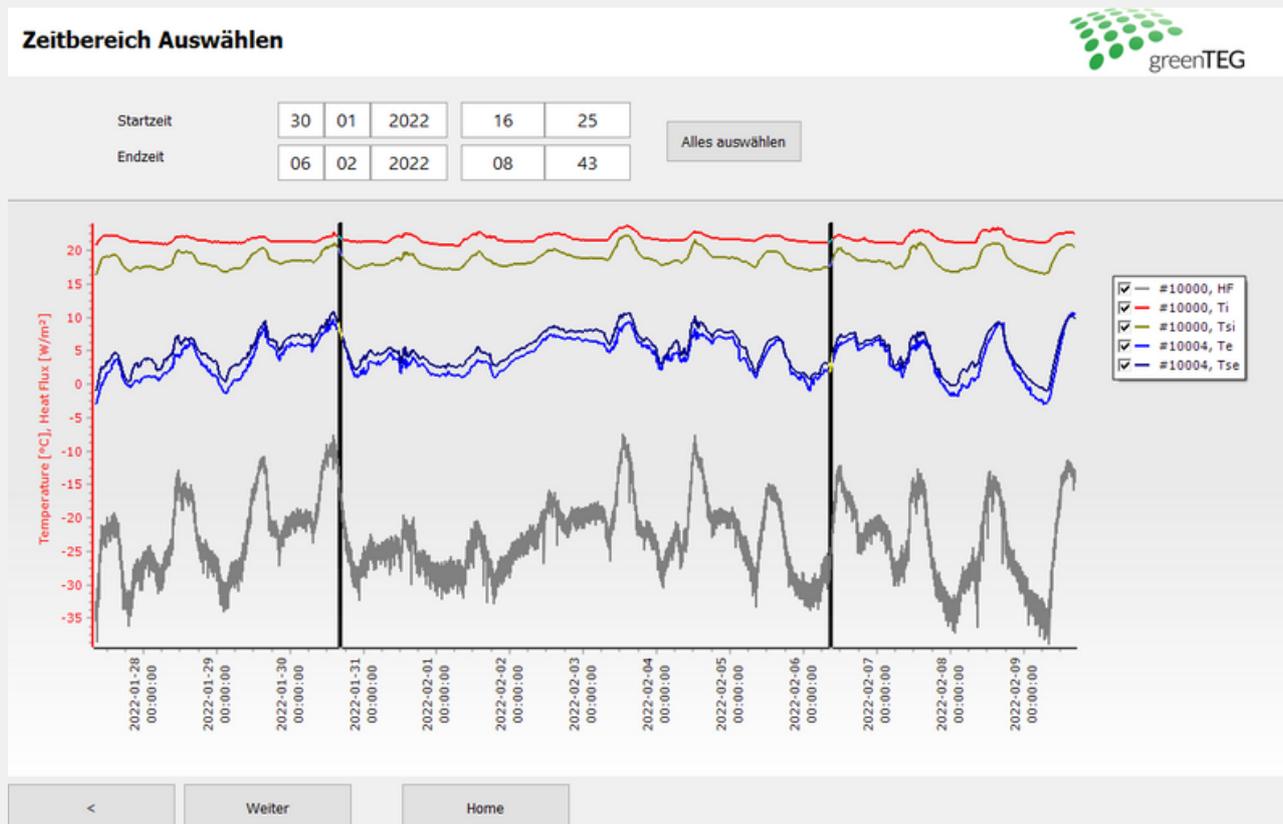
To view a Measurement, select the corresponding Inner Node and Outer node pairs you would like to analyse. The values shown to the right of the Serial Number (S/N) will indicate the starting measurement Date and Time, and the ending measurement Date and Time.

Auswahl der Nodes

Innen-Node: SN10000,2022-01-27 08:37:56 .. 2022-02-09 16:31:01

Aussen-Node: SN10004,2022-01-27 08:38:30 .. 2022-02-09 16:30:47

Select the Measurement Period that you wish to analyse. This can be done by either manually entering the time at the top of the page, or by sliding the bars horizontally along the graph. In the legend on the righthand side of the graph, you will see each node's measurement. When your desired period is selected, click **Next**.



# 3.3 ANALYSING YOUR MEASUREMENT

All Relevant Details of your Analysis can be found at the top of your Graph. The most important ones being the U-Value and R-Value, highlighted in Bold.

Underneath these values, the ISO conformity is displayed.

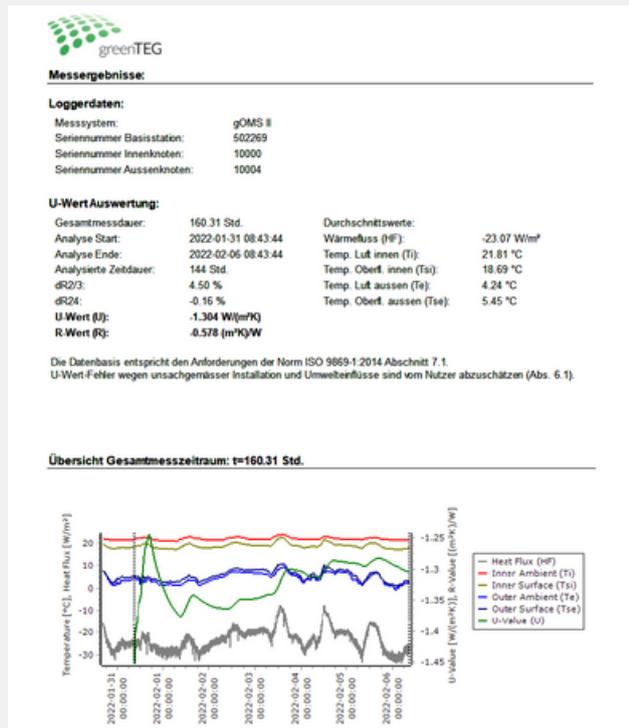
You can select and deselect which values you would like displayed on the graph, with the legend on the righthand side of the graph.

Click **Report** to create a pdf of your Analysis.



On the next page, you will see a preview of your pdf, with the option to print, or go back to the previous page.

Drucken      PDF erstellen      Abbrechen

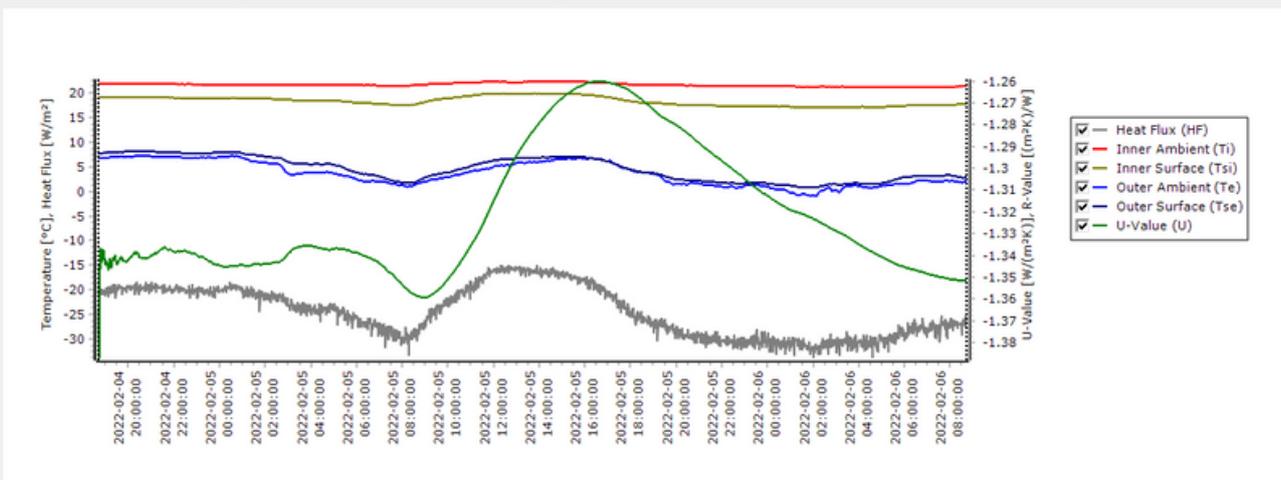


# 3.3 ANALYSING YOUR MEASUREMENT

## Non-Conforming ISO Measurements

If your measurement is not conforming to the ISO-9869 standard, it will be displayed as seen below.

Systemdaten:	Letzte Messwerte	U-Wert Auswertung
Messsystem: gOMS II	Wärmefluss (HF): -24.42 W/m <sup>2</sup>	Analyseperiode: (2022-02-04 18:41:05 - 2022-02-06 08:43:44) 38 Std.
Basisstation: 502269	T Luft innen (Ti): 21.67 °C	R-Wert Abweichung erste und letzte 2/3 der Analyseperiode (dR2/3):
Innenknoten: 10000	T Oberfl. innen (Tsi): 18.34 °C	R-Wert Abweichung ohne letzte 24h der Analyseperiode (dR24):
Aussenknoten: 10004	T Luft aussen (Te): 3.60 °C	<b>U-Wert (U): -1.352 W/(m<sup>2</sup>K)      R-Wert (R): -0.565 (m<sup>2</sup>K)/W</b>
	T Oberfl. aussen (Tse): 4.53 °C	Die Datenbasis ist gemäss ISO 9869-1:2014 ungeeignet (siehe Bericht).
	Messdauer (t): 38.04 Std.	



< Bericht Home

The reason for non-conformity is displayed upon report generation:

**Die Datenbasis ist für eine aussagekräftige U-Wert-Berechnung gemäss ISO 9869-1:2014 ungeeignet. Messdauer ist kürzer als 72 Stunden (Siehe Norrtext Abschnitt 7.1).**

**greenTEG**

**Messergebnisse:**

**Loggerdaten:**  
 Messsystem: gOMS II  
 Seriennummer Basisstation: 502269  
 Seriennummer Innenknoten: 10000  
 Seriennummer Aussenknoten: 10004

**U-Wert Auswertung:**  
 Gesamtmessdauer: 38.04 Std.      Durchschnittswerte:  
 Analyse Start: 2022-02-04 18:41:05      Wärmefluss (HF): -24.42 W/m<sup>2</sup>  
 Analyse Ende: 2022-02-06 08:43:44      Temp. Luft innen (Ti): 21.67 °C  
 Analyierte Zeitdauer: 38 Std.      Temp. Oberfl. innen (Tsi): 18.34 °C  
 dR2/3:      Temp. Luft aussen (Te): 3.60 °C  
 dR24:      Temp. Oberfl. aussen (Tse): 4.53 °C  
**U-Wert (U): -1.352 W/(m<sup>2</sup>K)**  
**R-Wert (R): -0.565 (m<sup>2</sup>K)/W**

**Die Datenbasis ist für eine aussagekräftige U-Wert-Berechnung gemäss ISO 9869-1:2014 ungeeignet. Messdauer ist kürzer als 72 Stunden (Siehe Norrtext Abschnitt 7.1).**

**Übersicht Gesamtmesstzeitraum: t=38.04 Std.**

The graph displays six data series over a 38-hour period. The left y-axis represents Temperature [°C] ranging from -30 to 20. The right y-axis represents Heat Flux [W/m²] and U-Value [W/(m²K)], R-Value [(m²K)/W] ranging from -1.38 to -1.26. The x-axis shows time from 2022-02-05 00:00:00 to 2022-02-06 06:00:00. The series include: Heat Flux (HF) in grey, Inner Ambient (Ti) in red, Inner Surface (Tsi) in yellow, Outer Ambient (Te) in blue, Outer Surface (Tse) in purple, and U-Value (U) in green.

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## 4.1 Appendix A

### Requirements according ISO 9869-1:2014

The appendix highlights key elements of the ISO 9869-1:2014 on which the data analysis of the software is based. Even though the software is capable of analysing the measurement data, it is the user of the system who has to ensure applicability of the ISO test conditions to measurement data. The most important aspects for an ISO 9869 compliant U-value measurement are listed. For more detailed information please refer to the complete ISO 9869 documentation.

#### Requirements according ISO 9869-1:2014

The standard ISO 9869-1:2014 states in section 6 how a measurement apparatus must be installed for proper measurement and in section 7 how the measurement data must be analysed.

The ISO standard highlights the following important points for the **installation**:

- Heat flux meters (HFM) and temperature sensors shall be mounted at a location **that is representative** of the whole element (previous inspection using thermography cameras are mentioned).
- HFMs shall not be
  - installed close to thermal bridges, cracks or similar sources of error
  - under direct influence of a heating or of a cooling device or under the draught of a fan
- The outer surface of the element should be protected from
  - Rain
  - Snow
  - Direct solar radiation
- Protection of the outer surface may be achieved through artificial screening.
- Data acquisition intervals should be less than 30min.

The analysis of the measurement data is separated into two methods. The first analysis method (the average method) is introduced in section 7.1 of the standard. It is the method used in the current software. The average method is valid if certain conditions are met:

- The heat content of the element is the same at the beginning and at the end of a measurement (same temperatures and moisture distribution)
- The HFM is not exposed to direct solar radiation.
- False results might be obtained if the external face of the element is exposed to solar radiation
- The thermal conductance of the element is constant during the test

If the above conditions are not met, misleading results can be obtained. It is the responsibility of the user to ensure that the conditions are met.

Data analysis (average method) for heavier elements with a specific heat per square meter greater than 20kJ/(m<sup>2</sup>K) according to section 7.1 shall be carried out over a period of integer multiple of 24h.

The measurement shall be ended only when the conditions are fulfilled as follows:

1. Duration of the measurement > 72h
2. R-value obtained at the end of the test does not deviate more than 5% from the value obtained 24h before (dR24)
3. The R-value obtained during the first 2/3 of the overall measurement period (which needs to be an integer of 24h, too) does not deviate more than 5% from the values obtained during the last 2/3 of the overall measurement period (also an integer multiple from 24h).
4. The change in heat stored in the wall is <= 5% of the heat passing through the wall

While test conditions 1 – 3 are validated by greenTEG's software, the condition 4 is not tested. greenTEG's measurement system does not allow measurement of heat storage changes of the wall.

## 4.1 Appendix A

### Requirements according ISO 9869-1:2014

#### Mounting of the surface temperature sensor and the (combined) surface temperature/heat flux sensor

- Always use the supplied double-sided adhesive tapes to mount the sensor since it has been calibrated for it.
- Inside and outside sensors must be mounted exactly opposite to each other at the same wall for good results.

#### Mounting of the ambient temperature sensor

- Use the supplied sensor clips to mount the sensor.
- Avoid direct solar radiation onto the sensor.
- Place the sensor between 5-10cm next to the heat flux or surface temperature sensor.

#### General

- The duration of the measurement should be at least 72h.
- A temperature difference between inside and outside temperature of at least 5°C during the entire period is recommended.
- If surrounding conditions are strongly fluctuating it might take longer than 72h to assess an ISO 9869 compliant U-value. In this case a multitude of 24h is recommended on top of the 72h time period.

#### Charging of the Measurement System

With the supplied power supply, it takes approximately 5 hours to charge the Base Station, however we recommend it not to be unplugged as battery life is only 48 hours.

The node battery lasts approximately 2 years and can be replaced once empty.

For additional chargers and batteries visit our e-shop or contact us.

**DISCLAIMER:** The above restrictions, recommendations, materials, etc. do not cover all possible cases and items. This document is not to be considered complete and is subject to change without prior notice. In particular, greenTEG assumes no liability for damages caused by the installation/de-installation of the system to/from the wall.

## 4.2 Appendix B

### Data Analysis Details

The software carries out the data analysis according to the ISO 9869-1 2014 standard section 7.1. It starts with analysing the longest possible multiple of the 24h measurement interval. If this interval does not fulfil the conditions specified within the ISO standard, the software seeks for the longest measurement interval fulfilling the specifications. If no interval >72h fulfils the specifications, then the software will flag the measurement as non ISO conformal.

U-Wert Auswertung:			
Gesamtmessdauer:	38.04 Std.	Durchschnittswerte:	
Analyse Start:	2022-02-04 18:41:05	Wärmefluss (HF):	-24.42 W/m <sup>2</sup>
Analyse Ende:	2022-02-06 08:43:44	Temp. Luft innen (Ti):	21.67 °C
Analyse Zeitdauer:	38 Std.	Temp. Oberfl. innen (Tsi):	18.34 °C
dR2/3:		Temp. Luft aussen (Te):	3.60 °C
dR24:		Temp. Oberfl. aussen (Tse):	4.53 °C
U-Wert (U):	-1.352 W/(m <sup>2</sup> K)		
R-Wert (R):	-0.565 (m <sup>2</sup> K)/W		

	Day 1	Day 2	Day 3	Day 4	Day 5	Day 6	Day 7	Day 8	Day 9									
	Measurement period																	
	Analysis period																	
	R (from t=12h to 204h)																	
	R24 (from t=12h to t=180h)																	
	R2/3s (from t=12h to 132h)																	
	R2/3e (from t=60h to T=204h)																	
Time [h]	0	12	24	36	48	60	72	84	96	108	120	132	144	156	168	180	192	204

The above figure demonstrates an example of a visualization of the data analysis procedure for a measurement duration of 8.5 days. The analysis period of the R-Value is calculated by taking the integer multiple of 24h from the measurement period (i.e. 8\*24h). The R24 period is the same as the U-value analysis time without the last 24h. R2/3s and R2/3e periods are the integer multiple of 24h of the first and the last 2/3 of the analysis period.

## 4.3 Appendix C

### Detailed explanations of the parameters used in the report

Designator	Description	How to calculate / formula
<b>Measurement time</b>	Total length of the measurement period	(Measurement end time) – (measurement start time)
<b>Analysis Period</b>	Duration of the period used for data analysis (must be a multiple of 24 h) - (inside)	Measurement period rounded down to a multiple of 24h. corresponds to: (analysis end time) – (analysis start time)
<b>Analysis start time</b>	Since analysis period is shorter than measurement period a part of the measurement data must be discarded. The first part is discarded in our software since it is usually more prone to fluctuations than the last part of the measurement period	
<b>Analysis end time</b>	Always corresponds to the end of the measurement period	
<b>U-value (U)</b>	U-value calculated by using the data of the full analysis period	$\frac{\sum_{j=1}^n q_j}{\sum_{j=1}^n (T_{ij} - T_{ej})}$ Where q <sub>j</sub> = Heat Flux at time j T <sub>ij</sub> = Inside air temperature at time j T <sub>ej</sub> = Outside air temperature at time j
<b>U24 (not in report)</b>	U-value calculated by using the data without the last 24h	See calculation of U-value
<b>U2/3s (not in report)</b>	U-value calculated by using the first 2/3 of the analysis period in days	Number of days of this period is calculated using INT(2 /3* D), where D stands for the duration in days of the analysis period
<b>U2/3e (not in report)</b>	U-value calculated by using the last 2/3 of the analysis period in days	Number of days of this period is calculated using INT(2 /3* D), where D stands for the duration in days of the analysis period
<b>dU24</b>	Deviation between U and U24	$dU24 = 2 * (U - U24) / (U + U24)$
<b>dU2/3</b>	Deviation between U2/3s and U2/3e	$dU2/3 = 2 * ([U2/3s] - [U2/3e]) / ([U2/3s] + [U2/3e])$
<b>R-value (R)</b>	R-Value calculated by using data of the full analysis period	$\frac{\sum_{j=1}^n q_j}{\sum_{j=1}^n (T_{sij} - T_{sej})}$ Where q <sub>j</sub> = Heat Flux at time j T <sub>sij</sub> = Inside surfacetemperature at time j T <sub>sej</sub> = Outside surface temperature at time j
<b>R24 (not in Report)</b>	R-value calculated by using the data without the last 24h	See above
<b>R2/3s</b>	R-value calculated by using the first 2/3 of the analysis period in days	Analogous to U2/3s
<b>R2/3e</b>	R-value calculated by using the last 2/3 of the analysis period in days	Analogous to U2/3e
<b>dR24</b>	R-value deviation calculated from R24-value	$dR24 = 2 * (R - R24) / (R + R24)$
<b>dR2/3</b>	R-value deviation calculated from R2/3-value	$dR2/3 = 2 * ([R2/3s] - [R2/3e]) / ([R2/3s] + [R2/3e])$

## 4.4 NODE MEASUREMENT FREQUENCY

**NOTE:** Each node is **automatically** set to logging **every 1 minute**. If you wish to change to ten minutes follow this step. Elsewise proceed to step 2.

Measurements can be taken every **1 minute** or every **10 minutes**. This can be changed by the user.

To change the measurement frequency, take a **PH0 screwdriver**, and unscrew the screws at the back of the nodes.

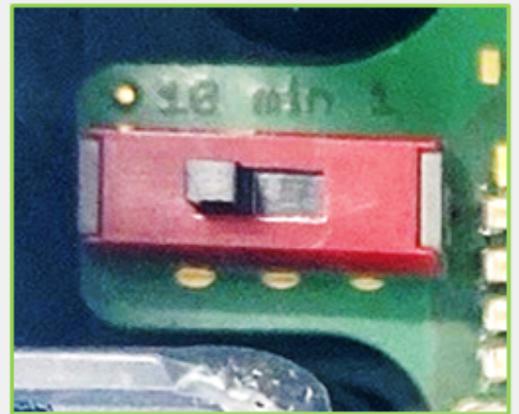
There is a switch inside the node-housing which can be alternated between 1 min and 10 mins. Flick this switch to change frequency.



Opening of the Node-Housing



Change the Frequency of Measurements by alternating the Switch circled above





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## Revision history

Date	Revision	Changes
01.03.2022	0.1 (preliminary	Initial Version