Prüfbericht-Nr.: *Test report no.:*	**21252348.001**	**Auftrags-Nr.:** *Order no.:*	2125 2348	Seite 1 von 24 *Page 1 of 24*
Kunden-Referenz-Nr.: *Client reference no.:*	2313351	**Auftragsdatum:** *Order date:*	26/02/2021	
Auftraggeber: *Client:*	Solarstone OÜ, 16-8 Tartu, 65605 Viljandi, Estonia			
Prüfgegenstand: *Test item:*	Pitched roof installation kits			
Bezeichnung / Typ-Nr.: *Identification / Type no.:*	Solarstone "Click-on Kit - Full Roof PV System" (For more details of the tested system compare the summary in section 4 and the photo appendix)			
Auftrags-Inhalt: *Order content:*	Wind uplift test following MCS 012			
Prüfgrundlage: *Test specification:*	EN 14437:2004 "Determination of the uplift resistance of installed clay or concrete tiles for roofing – Roof system test method"			

Wareneingangsdatum: *Date of sample receipt:*	05/03/2021 + 14/04/2021 + 23/07/2021
Prüfmuster-Nr.: *Test sample no:*	see clause 6
Prüfzeitraum: *Testing period:*	31/08/2021 - 01/09/2021
Ort der Prüfung: *Place of testing:*	Cologne
Prüflaboratorium: *Testing laboratory:*	Solar Energy Assessment Center
Prüfergebnis*: *Test result*:*	Siehe Sonstiges / See Other

Detaillierte Fotodokumentation
siehe Anlage zu diesem Bericht

Detailed photo documentation
see appendix to this report

geprüft von: *tested by:*	X	**genehmigt von:** *authorized by:*	X
Datum: *Date:* 22/10/2021		**Ausstellungsdatum:** *Issue date:* 22/10/2021	
Stellung / Position:	N.Schwarze, Project Manager	**Stellung** / Position:	J. Stang, Team Manager

Sonstiges / *Other:* For the results and more details of the tested system compare the summary in section 4.

Zustand des Prüfgegenstandes bei Anlieferung: *Condition of the test item at delivery:* Prüfmuster vollständig und unbeschädigt *Test item complete and undamaged*

* Legende:	P(ass) = entspricht o.g. Prüfgrundlage(n)	F(ail) = entspricht nicht o.g. Prüfgrundlage(n)	N/A = nicht anwendbar	N/T = nicht getestet
** Legend:*	*P(ass) = passed a.m. test specification(s)*	*F(ail) = failed a.m. test specification(s)*	*N/A = not applicable*	*N/T = not tested*

TÜV Rheinland LGA Products GmbH Tillystraße 2 D - 90431 Nürnberg
Mail: service@de.tuv.com · Web: www.tuv.com

Anmerkungen
Remarks

A	Alle eingesetzten Prüfmittel waren zum angegebenen Prüfzeitraum gemäß eines festgelegten Kalibierungsprogramms unseres Prüfhauses kalibriert. Sie entsprechen den in den Prüfprogrammen hinterlegten Anforderungen. Die Rückverfolgbarkeit der eingesetzten Prüfmittel ist durch die Einhaltung der Regelungen unseres Managementsystems gegeben. Detaillierte Informationen bezüglich Prüfkonditionen, Prüfequipment und Messunsicherheiten sind im Prüflabor vorhanden und können auf Wunsch bereitgestellt werden. *The equipment used during the specified testing period was calibrated according to our test laboratory calibration program. The equipment fulfils the requirements included in the relevant standards. The traceability of the test equipment used is ensured by compliance with the regulations of our management system.* *Detailed information regarding test conditions, equipment and measurement uncertainty is available in the test laboratory and could be provided on request.*
B	Wie vertraglich vereinbart, wurde dieses Dokument nur digital unterzeichnet. Der TÜV Rheinland hat nicht überprüft, welche rechtlichen oder sonstigen diesbezüglichen Anforderungen für dieses Dokument gelten. Diese Überprüfung liegt in der Verantwortung des Benutzers dieses Dokuments. Auf Verlangen des Kunden kann der TÜV Rheinland die Gültigkeit der digitalen Signatur durch ein gesondertes Dokument bestätigen. Diese Anfrage ist an unseren Vertrieb zu richten. Eine Umweltgebühr für einen solchen zusätzlichen Service wird erhoben. *As contractually agreed, this document has been signed digitally only. TUV Rheinland has not verified and unable to verify which legal or other pertaining requirements are applicable for this document. Such verification is within the responsibility of the user of this document. Upon request by its client, TUV Rheinland can confirm the validity of the digital signature by a separate document. Such request shall be addressed to our Sales department. An environmental fee for such additional service will be charged.*
C	Prüfklausel mit der Note * wurden an qualifizierte Unterauftragnehmer vergeben und sind unter der jeweiligen Prüfklausel des Berichts beschrieben. Abweichungen von Prüfspezifikation(en) oder Kundenanforderungen sind in der jeweiligen Prüfklausel im Bericht aufgeführt. *Test clauses with remark of * are subcontracted to qualified subcontractors and descripted under the respective test clause in the report.* *Deviations of testing specification(s) or customer requirements are listed in specific test clause in the report.*

Produktbeschreibung
Product description

I	**General**
1	**Produktdetails** *Product details* Pitched roof mounting system Solarstone "Click-on Kit – Full Roof PV system" Detailed information to product specification not available. For more details of the tested system compare the summary (section 4) and the photo appendix.
2	**Verwendete Materialien** *Used materials* The installation was done based on the Layout, provided by Solarstone on the 23rd of August 2021. (Compare the attachment) Position of clamps and screws were obtained from customer's information and partly also following the click-on installation guide, revision number 1, provided in January 2021 by Solarstone. Compare the attachment for the drawings of the clamps. No further information were provided by customer. Compare the photos for the installed system.
3	**Adresse(n) der Fertigungsstätte(n)** *Address(es) of the manufacturing site(s)* - no factory inspection performed.

Produktbeschreibung
Product description

4 Zusammenfassung der Prüfergebnisse

Summary of test results

This report describes the tests performed to determine the characteristic wind uplift resistance of the roof integrated mounting system from Solarstone OÜ following MCS012.

In a first attempt on the 04th of May 2021 the system was tested with:

- seven starter clamps (with roof hooks) for the lowest row
- seven overlap clamps for the middle row
- seven screws to fix the upper row

on two Solarstone Click-On PV modules (approximate size: 1705mm x1050mm x 35mm; used pv panel for testing: Talesun "TP660M-305") in parallel (landscape) and four Solarstone Click-on dummy modules (approximate size: 650mm x 1050mm x 35mm respectively 680mm x 1050mm x 35mm).

However, after performing the first cycle Solarstone decided to repeat the test with stronger overlap clamps for the middle row.

This test was repeated on the 31st of August and 01st of September 2021.

In the repeated test the design uplift resistance of the system was tested with the same design as for the first attempt, except of the overlap clamps for the middle row, which were replaced by strengthened overlap clamps. The mounting was done following the updated layout of SolarStone, provided on the 23rd of August 2021. (Compare the attachment for the layout as well as for photos of the mounting.)

When installed as described in this report the design uplift resistance is **2891 Pa**.

- The Click-on PV modules and dummy modules were placed on 3 battens with 90x50mm (as no battens with 90x50mm could be obtained, instead for each batten 3 battens with 30x50mm were combined with screws) which are mounted on rafters with dimension of 80x100mm.
- The distance between the lower edge of the lowest batten and the upper edge of the middle batten are approximately 990mm, while the distance between the upper edge of the middle batten and the upper edge of the upper batten are 990mm. Compare the photos in the attachment.
- The mounting system was installed on rafters with dimension of 80x100mm at a distance from rafter to rafter of 600mm on the left side, 900mm in the middle and 600mm on the right side.
- The approximate distances between the clamps are as follows: From right edge of right dummy module to clamp 10cm, 39cm to next clamp, 20cm to next clamp, 71cm to next clamp, 71cm to next clamp, 20cm to next clamp and 36cm to next clamp (in each case shortest distance between inside of clamp to inside of clamp)
- width of one clamp: 30mm

See next page for continuation of summary.

Produktbeschreibung
Product description

4	**Zusammenfassung der Prüfergebnisse (Fortsetzung)** *Summary of test results (continuation)* MCS012 does not have pass/fail criteria for the wind uplift resistance pf PV mounting systems. Remarks: The test results presented in this report are only applicable to the mounting system as tested. This test report includes measurement reports and a photo documentation in the appendix. Throughout this report a *point* is used as the decimal separator.