0131-L-18/2
2 August 2018

Test report

Clickfit EVO fastening system

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0131-L-18/2
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Test report

Clickfit EVO fastening system

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Date of order	3 May 2018
Project number	0131-L-18/2
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Subject	determination of the wind uplift resistance

Contents

1 Introduction

By order of Kiwa BDA Expert Centre Building Envelope, Kiwa BDA Testing B.V. has determined the wind uplift resistance of the **ClickFit EVO** fastening system in portrait and landscape direction.

The suppliers and the date of delivery of the products used are mentioned below.

Table 1 – Specifications of the products used

Product	**Supplier**		**Date of delivery**
	company	**person**	
Rafter	Kiwa BDA Testing B.V.	-	2018.05.14
Tile battens	St. Middelkoop & Zn. B.V.	-	2018.05.29
Fasteners for tile batten	Kiwa BDA Testing B.V.	-	2018.05.14
Tiles	Monier B.V.	-	2018.05.14
Fastening system	Esdec B.V.	-	2018.05.28
PV-modules	Libra Energy B.V.	-	2018.05.28

On the samples the following data were found.

Description rafter
- Product : rafter
- Producer : not revealed
- Dimensions : 150 mm × 55 mm
- Production code : not revealed

Description tile batten
- Product : tile batten
- Producer : not revealed
- Dimensions : 48 mm × 21 mm
- Production code : not revealed

Fasteners for tile battens
- Product : universal screw
- Producer : Spax®
- Dimensions : 4,0 mm × 50 mm
- Production code : not revealed

Tiles

- Product : Sneldek Novo+
- Producer : Monier B.V.
- Dimensions : 420 mm × 332 mm
- Production code : not revealed

Fastening system

- Product : ClickFit EVO
- Producer : Esdec B.V.
- Dimensions : see annex II
- Production code : Z97102

Description PV-modules

- Product : Boviet BVM6610P
- Producer : Boviet Solar Technology Co., Ltd
- Dimensions : 1640 mm × 992 mm × 40 mm
- Production code : see annex II

See annex II for photos and drawings of the products and further package data.

2 Construction of the test specimen

On 13 and 14 June 2018 the test specimens have been built up by Mr J. Weller of Esdec B.V. and Mr W.J.B. Middag and Mr A.R. Hameete of Kiwa BDA Testing B.V.

The specimens have been built up according to the prescription of Mr J. Weller of Esdec B.V. from the bottom up.

2.1 Test with PV-modules in portrait layout

- Substructure : Structure of wooden rafters, dimensions 150 mm × 70 mm, with a centre to centre spacing of 600 mm. On top of the rafters, tile battens, dimensions 48 mm × 35 mm, have been placed. The tile battens have been placed with a centre to centre spacing of 345 mm and have been fastened to the wooden rafters with 6 screws, dimensions 4,0 mm × 50 mm.

- Tiles : on top of the tile battens, tiles type Sneldek Novo+ have been placed. Six rows of eight tiles have been placed.

- Fastening system : six ClickFit EVO roof hooks universal have been positioned between the tiles and around the tile battens. The mutual centre to centre spacing in the horizontal direction has been set at 750 mm. The mutual centre to centre spacing in the vertical direction has been set at 690 mm. Each roof hook has been fastened with a torque wrench set at 4,5 Nm. On the upper three roof hooks and on the lower three roof hooks a mounting rail, length 2065 mm has been positioned horizontally. On top of each mounting rail three universal module clamps and two end caps have been positioned

- PV modules : on top of the two horizontally positioned mounting rails two PV-modules, dimensions 1640 mm × 992 mm, have been positioned in portrait layout. The left side of the left PV-module has been fastened with two module clamps covered with end caps. The right side of the left PV-module and the left side of the right PV-module have been fastened with two module clamps. The right side of the right PV-module has been fastened with two module clamps covered with end caps. Each module clamp has been fastened with a torque wrench set at 4,5 Nm.

2.2 Test with PV-modules in landscape layout

- Substructure : Structure of wooden rafters, dimensions 150 mm × 70 mm, with a centre to centre spacing of 600 mm. On top of the rafters, tile battens, dimensions 48 mm × 35 mm, have been placed. The tile battens have been placed with a centre to centre spacing of 345 mm and have been fastened to the wooden rafters with 6 screws, dimensions 4,0 mm × 50 mm.

- Tiles : on top of the tile battens, tiles type Sneldek Novo+ have been placed. Seven rows of eight tiles have been placed.

- Fastening system : six ClickFit EVO roof hooks universal have been positioned between the tiles and around the tile battens. The mutual centre to centre spacing in the horizontal direction has been set at 750 mm. The mutual centre to centre spacing in the vertical direction has been set at 690 mm between the lower and the middle roof hook and 1035 between the middle and the upper roof hook. Each roof hook has been fastened with a torque wrench set at 4,5 Nm. On the left three roof hooks and on the right three roof hooks a mounting rail, length 2065 mm has been positioned vertically. On top of each mounting rail three universal module clamps and two end caps have been positioned

- PV modules : on top of the two vertically positioned mounting rails two PV-modules, dimensions 1640 mm × 992 mm, are positioned in landscape layout. The lower side of the lower PV-module has been fastened with two module clamps covered with end caps. The upper side of the lower PV-module and the lower side of the upper PV-module have been fastened with two module clamps. The upper side of the upper PV-module has been fastened with two module clamps covered with end caps. Each module clamp has been fastened with a torque wrench set at 4,5 Nm.

3 Investigation

The determination of the wind uplift resistance has been performed in accordance with the requirements in:

- EN 14437:2004 – Determination of the uplift resistance of installed clay or concrete tiles for roofing – Roof system test method.

- NEN 7250:2014 – Zonne-energiesystemen – Integratie in daken en gevels – Bouwkundige aspecten[1].

The determination of the wind uplift resistance has been performed on a system containing two PV modules.

The wind uplift resistance has been determined in triplicate. The test has been performed at a slope of 45°. Preceding the actual tests an exploratory pre-test was performed to obtain an indication of the strength of the system and the corresponding collapse image.

According to NEN 7250 the system is considered to be collapsed when one of the following occurs.

- Collapse of the mechanical fixing on to the structure.
- Pulling out or breakage of any part of the installation kit of the product which is tested.
- Breakage of product which is tested.
- The displacement of any part exceeds the maximum of 100 mm.
- The remaining displacement of any roofing element after releasing the force to zero exceeds 5 mm. By order of the principal the test must be continued when the 5 mm limit is achieved until the applied load is at least 1,5 times the load measured at the 5 mm limit or until ultimate failure occurs
- The product which is tested gets loose from the substructure.
- The remaining displacement of any roofing element after releasing the force to zero degrades the weathertightness of the roof.

By request of the principal it was decided to measure the displacement at the following points:

Test with PV-modules in portrait layout:

Measuring points at the upper side of the test specimen
- LL = in the middle of the left (long) side of the left PV-module;
- ML = in the middle of the left PV-module;
- MR = in the middle of lower (short) side of the right PV-module;
- CR = in the right lower corner of the right PV-module.

Measuring points at the lower side of the test specimen
- rhLL = roof hook on the left side of the lower mounting rail;
- rhML = roof hook in the middle of the lower mounting rail;
- rhRL = roof hook on the right side of the lower mounting rail;
- rhLU = roof hook on the left side of the upper mounting rail;
- rhMU = roof hook in the middle of the upper mounting rail;
- rhRU = roof hook on the right side of the upper mounting rail.

[1] Solar energy systems – Intergration in roofs and facades – Building aspects.

Test with PV-modules in landscape layout:

Measuring points at the upper side of the test specimen
- LU = in the middle of the left (short) side of the upper PV-module;
- MU = in the middle of the upper PV-module;
- ML = in the middle of lower (long) side of the lower PV-module;
- CL = in the right lower corner of the lower PV-module.

Measuring points at the lower side of the test specimen
- rhLL = roof hook on the lower side of the left mounting rail;
- rhML = roof hook in the middle of the left mounting rail;
- rhUL = roof hook on the upper side of the left mounting rail;
- rhLR = roof hook on the lower side of the right mounting rail;
- rhMR = roof hook in the middle of the right mounting rail;
- rhUR= roof hook on the upper side of the right mounting rail.

On 13 and 14 June 2018 the tests have been performed in the laboratory of Kiwa BDA Testing B.V. by Mr W.J.B. Middag and Mr A.R. Hameete of Kiwa BDA Testing B.V. in the presence of Mr J. Weller of Esdec B.V.

In annex I a photo report of the test and the test results is given.

The mean value and the standard deviation of the resistance from all tests have been calculated by:

$$R_x = \frac{1}{n}\sum R_{r,i}$$

$$s_x^2 = \frac{1}{n-1}\sum (R_{r,i} - R_x)^2$$

Where:
R_x = is the mean uplift resistance;
$R_{r,i}$ = is the force preceding the force at which one mentioned collapse event occurs;
n = the number of tests that has been performed.

The characteristic value of the wind uplift resistance has been calculated by:

$$R_k = R_x - k_n s_x$$

Where:
R_k = the characteristic value of the wind uplift resistance;
k_n = the factor depending on the number of tests;
R_x = the mean value of the wind uplift resistance from all tests;
s_x = the standard deviation of the wind uplift resistance from all tests.

4 Results

4.1 Results of ClickFit EVO in portrait layout

Table 2 – ClickFit EVO in portrait layout, test 1

Force [N]	Movement [mm]							
	LL		ML		MR		CR	
	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement
0	0	0	0	0	0	0	0	0
4190	28,20	2,20	45,80	2,00	35,60	1,60	35,30	1,70
4490	30,30	2,70	49,20	2,90	38,40	2,10	38,10	2,10
4790	32,60	2,50	52,50	2,80	41,30	1,90	40,90	2,00
5090	34,90	2,90	56,10	3,40	44,20	2,20	43,80	2,10
5390	37,40	2,80	59,70	3,90	47,20	2,20	46,70	2,30
5690	40,10	3,10	63,60	4,30	50,10	2,50	49,60	2,50
5990	54,20	14,70 [1)]	77,40	16,90 [1)]	73,10	22,70 [1)]	83,40	31,18

Force [N]	Movement (Remaining displacement) [mm]					
	rhLL	rhML	rhRL	rhUL	rhMU	rhRU
0	0	0	0	0	0	0
4190	2,19	1,14	1,93	1,57	0,28	0,84
4490	2,36	1,56	2,37	2,00	0,43	1,35
4790	2,53	1,88	2,88	2,28	0,92	1,98
5090	3,42	2,08	3,15	2,91	0,80	1,96
5390	4,22	2,46	3,68	3,59	1,12	2,39
5690	4,95	3,19	4,58	4,32	1,47	3,16
5990	4,88	0,87	5,12 [1)]	5,09 [1)]	- 0,32	1,97

[1)] At a force of 5990 N the limit of max. 5 mm remaining deformation, has been achieved. The part for adjusting the height of the roof hooks at the left upper corner and at the right lower corner has been moved. Because the 5 mm limit is achieved the test is continued to 1,5 times the load measured at the 5 mm limit. Therefore the load is increased until 8985 N. At 8155 N the test specimen collapse because at 4 positions the mounting rail has been broken out of the roof hooks. The collapsed roof hooks are at the following positions; the left upper corner, the left lower corner, the middle of the upper mounting rail and the middle of the lower mounting rail.

Table 3 – ClickFit EVO in portrait layout, test 2

Force [N]	Movement [mm]							
	LL		ML		MR		CR	
	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement
0	0	0	0	0	0	0	0	0
4190	27,30	2,40	44,50	2,40	31,40	1,10	30,90	1,20
4490	29,80	2,50	48,00	2,60	34,10	1,50	33,80	1,70
4790	32,20	2,70	51,50	3,00	36,70	1,70	36,50	1,90
5090	34,40	2,80	54,50	3,00	39,40	1,70	39,30	1,90
5390	37,10	3,10	58,20	3,40	42,20	1,80	42,10	2,00
5690	38,20	2,30	62,80	4,80	41,60	3,80	40,00	5,20 [1)]

Force [N]	Movement (Remaining displacement) [mm]					
	rhLL	rhML	rhRL	rhUL	rhMU	rhRU
0	0	0	0	0	0	0
4190	1,52	0,84	1,91	1,45	0,90	1,21
4490	2,00	1,10	2,21	2,78	1,14	1,51
4790	2,39	1,14	2,34	3,14	1,39	1,98
5090	2,99	1,28	2,52	4,07	1,77	2,13
5390	3,53	1,82	3,18	4,01	1,94	2,57
5690	4,12	3,04	4,31	4,06	0,64	3,43

[1)] At a force of 5690 N the limit of max. 5 mm remaining deformation, has been achieved.
The part for adjusting the height, of the roof hooks at the left lower corner and in the middle of the lower mounting rail has been moved. Because the 5 mm limit is achieved the test is continued to 1,5 times the load measured at the 5 mm limit. Therefore the load is increased until 8535 N.
At 7810 N the test specimen collapse because at 1 position the mounting rail has been broken out of the roof hooks. The collapsed roof hook is at the following position; the left upper corner.

Table 4 – ClickFit EVO in portrait layout, test 3

Force [N]	Movement [mm]							
	LL		ML		MR		CR	
	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement
0	0	0	0	0	0	0	0	0
4190	27,30	1,40	44,10	2,50	32,50	1,30	31,40	1,90
4490	30,30	1,60	48,10	3,00	35,90	1,60	34,70	2,20
4790	32,90	1,70	51,80	3,60	39,00	1,70	37,80	2,40
5090	35,40	2,10	55,50	4,20	42,10	1,90	40,90	2,70
5390	38,00	2,30	59,10	4,90	44,90	2,10	43,70	2,90
5690	56,90	18,20 [1)]	75,10	17,50 [1)]	57,80	9,80 [1)]	47,00	1,30

Force [N]	Movement (Remaining displacement) [mm]					
	rhLL	rhML	rhRL	rhUL	rhMU	rhRU
0	0	0	0	0	0	0
4190	1,20	1,35	2,11	0,75	0,73	0,79
4490	1,65	1,57	2,30	1,12	1,34	1,30
4790	1,91	1,85	3,20	1,47	1,63	1,69
5090	2,32	2,14	3,40	1,69	2,00	1,63
5390	2,75	2,37	4,17	2,25	2,17	2,45
5690	3,74	4,98	5,52 [1)]	1,94	2,42	3,39

[1)] At a force of 5690 N the limit of max. 5 mm remaining deformation, has been achieved. The part for adjusting the height of the roof hooks at the left lower corner and in the middle of the lower mounting rail has been moved. Because the 5 mm limit is achieved the test is continued to 1,5 times the load measured at the 5 mm limit. Therefore the load is increased until 8535 N. At 7987 N the test specimen collapse because at 4 positions the mounting rail has been broken out of the roof hooks. The collapsed roof hooks are at the following positions; the left upper corner, the middle of the upper mounting rail, the right upper corner and the right lower corner.

The collapse force is 5990 N, 5690 N and 5690 N for the tests 1, 2 and 3 respectively.

The mean uplift resistance is (5690 N + 5390 N + 5390 N) : 3 = 5490 N.

The factor depending on the number of tests is 3,37 (3 tests).

The standard deviation s ($\sigma_{(n-1)}$) is 173 N.

The characteristic value of the wind uplift resistance is 4906 N (5490 N - (3,37 $\times$ 173 N)).

4.2 Results of ClickFit EVO in landscape layout

Table 5 – ClickFit EVO in landscape layout, test 1

Force [N]	Movement [mm]							
	LL		ML		MR		CR	
	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement
0	0	0	0	0	0	0	0	0
4190	32,00	1,90	46,70	2,00	26,20	1,70	35,00	2,30
4490	35,30	2,10	50,80	2,50	27,70	1,90	37,80	2,60
4790	38,40	1,90	54,40	2,70	29,50	2,10	40,80	2,60
5090	41,80	1,90	58,40	3,60	31,40	2,20	43,30	2,70
5390	45,20	1,80	62,40	4,40	33,70	2,30	46,50	2,80
5690	49,20	1,30	67,30	7,30 [1)]	44,60	12,10 [1)]	71,40	31,10 [1)]

Force [N]	Movement (Remaining displacement) [mm]					
	rhLL	rhML	rhUL	rhLR	rhMR	rhUR
0	0	0	0	0	0	0
4190	1,51	1,68	2,32	1,27	1,32	2,64
4490	1,51	2,15	2,69	1,67	1,95	3,07
4790	1,70	2,81	3,10	2,00	2,39	3,51
5090	2,06	3,56	3,71	2,26	2,97	3,97
5390	2,36	4,40	4,17	2,43	3,25	4,16
5690	2,79	4,98	4,70	3,64	1,53	3,85

[1)] At a force of 5690 N the limit of max. 5 mm remaining deformation, has been achieved. The part for adjusting the height of the roof hooks at the right lower corner has been moved. Because the 5 mm limit is achieved the test is continued to 1,5 times the load measured at the 5 mm limit. Therefore the load is increased until 8535 N. At 8535 N the test specimen is still intact.

Table 6 – ClickFit EVO in landscape layout, test 2

Force [N]	Movement [mm]							
	LL		ML		MR		CR	
	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement
0	0	0	0	0	0	0	0	0
4190	31,00	1,70	47,00	1,90	25,50	1,90	31,00	2,00
4490	33,00	2,30	50,70	2,10	26,70	2,20	32,70	1,70
4790	35,80	2,70	54,30	4,00	27,80	2,40	34,60	1,90
5090	39,10	2,70	57,90	4,70	29,70	2,40	37,10	2,10
5390	42,10	2,20	61,70	5,20 [1)]	31,70	2,50	39,60	2,30

Force [N]	Movement (Remaining displacement) [mm]					
	rhLL	rhML	rhUL	rhLR	rhMR	rhUR
0	0	0	0	0	0	0
4190	2,12	1,68	1,22	1,61	2,17	2,99
4490	1,50	2,32	1,74	1,92	2,61	3,78
4790	1,53	2,61	1,86	1,99	2,99	4,19
5090	1,92	3,05	2,40	2,01	3,36	4,50
5390	2,09	3,65	3,08	2,18	3,84	5,14 [1)]

[1)] At a force of 5390 N the limit of max. 5 mm remaining deformation, has been achieved. The part for adjusting the height of the roof hooks at the right upper corner has been moved. Because the 5 mm limit is achieved the test is continued to 1,5 times the load measured at the 5 mm limit. Therefore the load is increased until 9085 N. At 8085 N the test specimen is still intact.

Table 7 – ClickFit EVO in landscape layout, test 3

Force [N]	Movement [mm]							
	LL		ML		MR		CR	
	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement	maximum displacement	remaining displacement
0	0	0	0	0	0	0	0	0
4190	33,70	1,50	47,00	2,10	25,70	1,10	27,70	1,70
4490	36,30	1,40	51,20	2,70	27,40	1,00	30,10	1,60
4790	39,20	1,50	54,80	3,30	29,40	1,10	32,50	1,60
5090	42,40	1,60	58,50	4,00	31,90	1,30	34,80	1,60
5390	45,70	1,70	62,20	4,60	34,00	1,40	37,30	1,70
5690	49,00	2,20	66,10	5,50 [1)]	36,40	1,50	40,00	1,70

Force [N]	Movement (Remaining displacement) [mm]					
	rhLL	rhML	rhUL	rhLR	rhMR	rhUR
0	0	0	0	0	0	0
4190	1,20	1,94	1,37	0,81	1,39	3,09
4490	1,43	2,48	1,72	1,14	1,64	3,48
4790	1,79	2,80	2,22	1,35	1,93	3,90
5090	2,04	3,09	2,78	1,71	2,12	4,40
5390	2,28	3,40	3,17	2,05	2,37	4,62
5690	2,58	3,63	3,65	2,42	2,78	5,09 [1)]

[1)] At a force of 5690 N the limit of max. 5 mm remaining deformation, has been achieved. The part for adjusting the height of the roof hooks at the right upper corner has been moved. Because the 5 mm limit is achieved the test is continued to 1,5 times the load measured at the 5 mm limit. Therefore the load is increased until 8535 N. At 7050 N the test specimen collapse by breaking of the tile batten at the position of the roof hook at the left lower corner.

The collapse force is 5690 N, 5390 N and 5690 N for the tests 1, 2 and 3 respectively.

The mean uplift resistance is (5390 N + 5090 N + 5390 N) : 3 = 5290 N.

The factor depending on the number of tests is 3,37 (3 tests).

The standard deviation s ($\sigma_{(n-1)}$) is 173 N.

The characteristic value of the wind uplift resistance is 4706 N (5290 N - (3,37 × 173 N)).

Remarks:

The results are only related to the investigated samples, products and/or systems. Kiwa BDA Testing B.V. is not liable for interpretations or conclusions that are made in consequence of the results obtained.

The uncertainty of measurement can be retrieved at Kiwa BDA Testing B.V.

If sampling was not performed by Kiwa BDA Testing B.V., no judgement can be given with regard to the origin and representativeness of the samples.

Gorinchem, 2 August 2018
The laboratory

A.R. Hameete
operational manager

Kiwa BDA Testing B.V.

C.W. van der Meijden MSc
technical director

I Photo report of the test and test results

Photo 1
Overview of the substructure.

Photo 2
Detail of the fastening of the tile battens to the rafters.

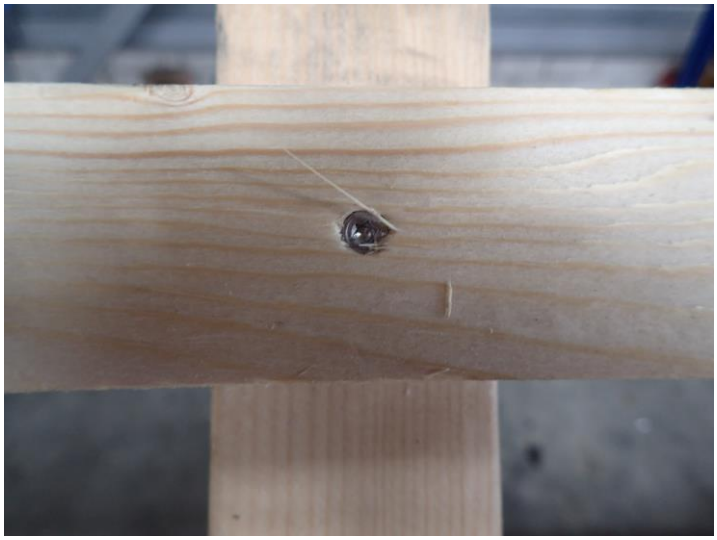


Photo 3
The roof hook is fastened.

Photo 4
The roof hook is finally fastened with a torque wrench.

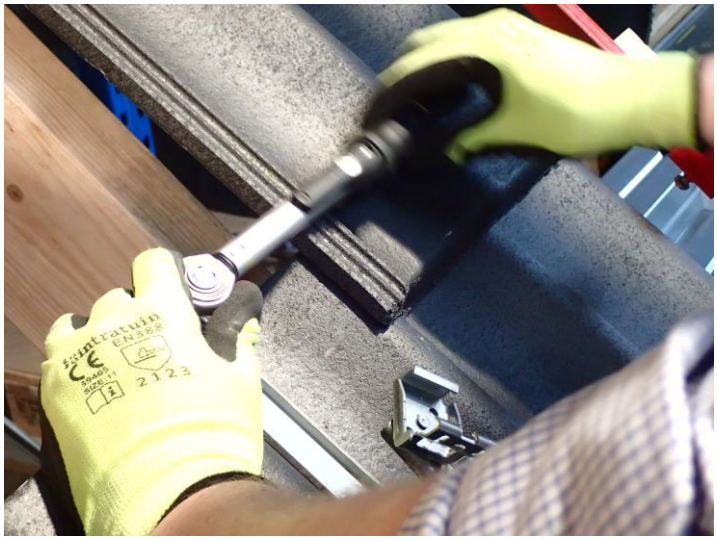


Photo 5
Overview of the system with roof hooks placed in position for a test on PV-modules in portrait layout.

Photo 6
The mounting rails are fixed on the roof hooks.

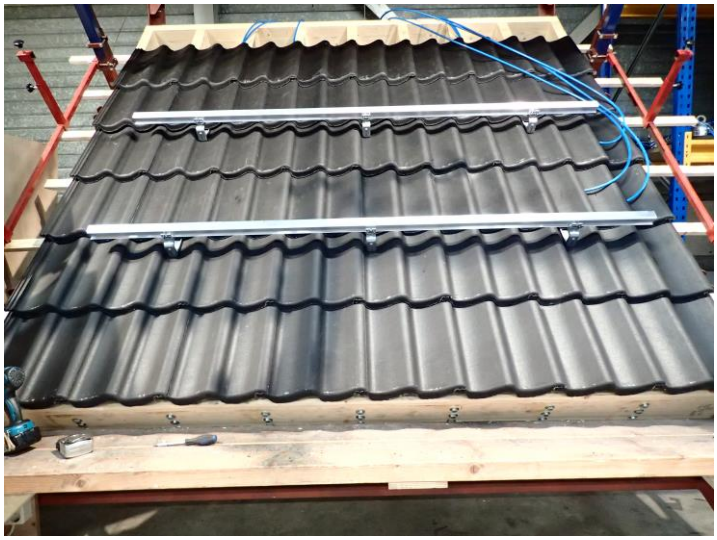


Photo 7
Two PV-modules are placed on the mounting rails and fastened.

Photo 8
The suction cups are placed in position and the test specimen is ready for testing.

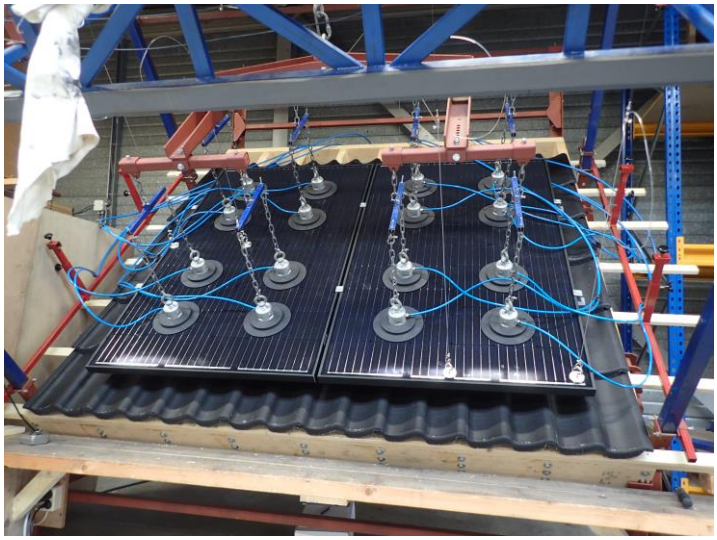


Photo 9
Detail of the part, for adjusting the height, at the start of the test.

Photo 10
Detail of the part, for adjusting the height, after it has been moved.

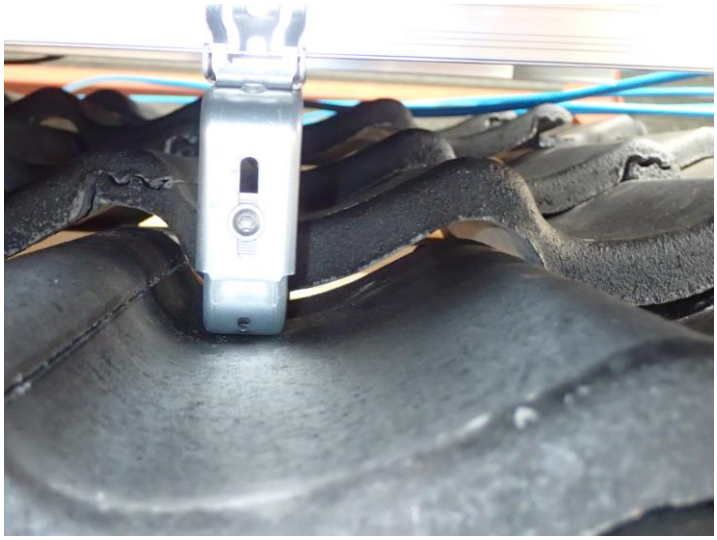


Photo 11
Detail of a connected roof hook to the mounting rail (before testing).

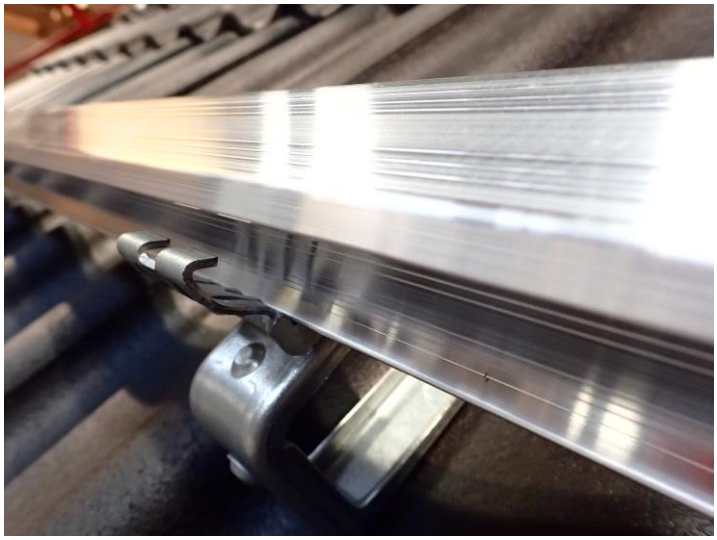


Photo 12
Detail of a mounting rail after is has been broken out of a roof hook (after testing).

Photo 13
Overview of the system with the roof hooks placed in position for a test on PV-modules in landscape layout.

Photo 14
A mounting rail is positioned on the roof hooks.

Photo 15
The mounting rail is locked with a screw to the lower roof hook.

Photo 16
Detail of the locked mounting rail.

Photo 17
Two PV-modules have been placed on the mounting rail and have been fastened.
Also the suction cups are positioned.

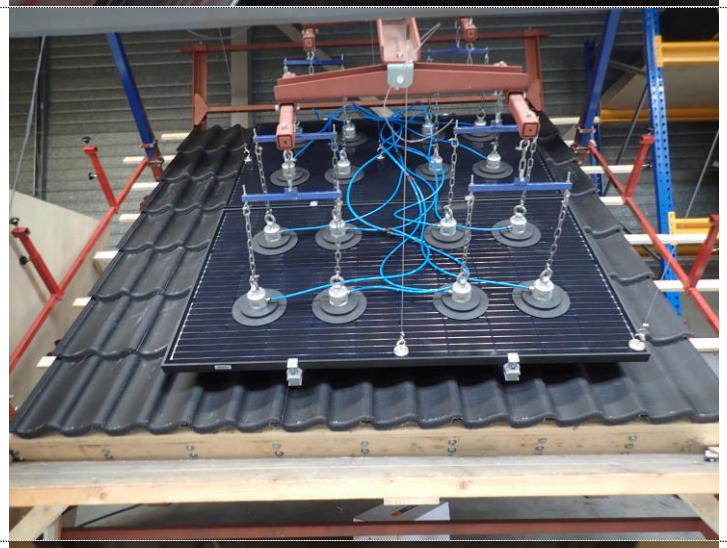
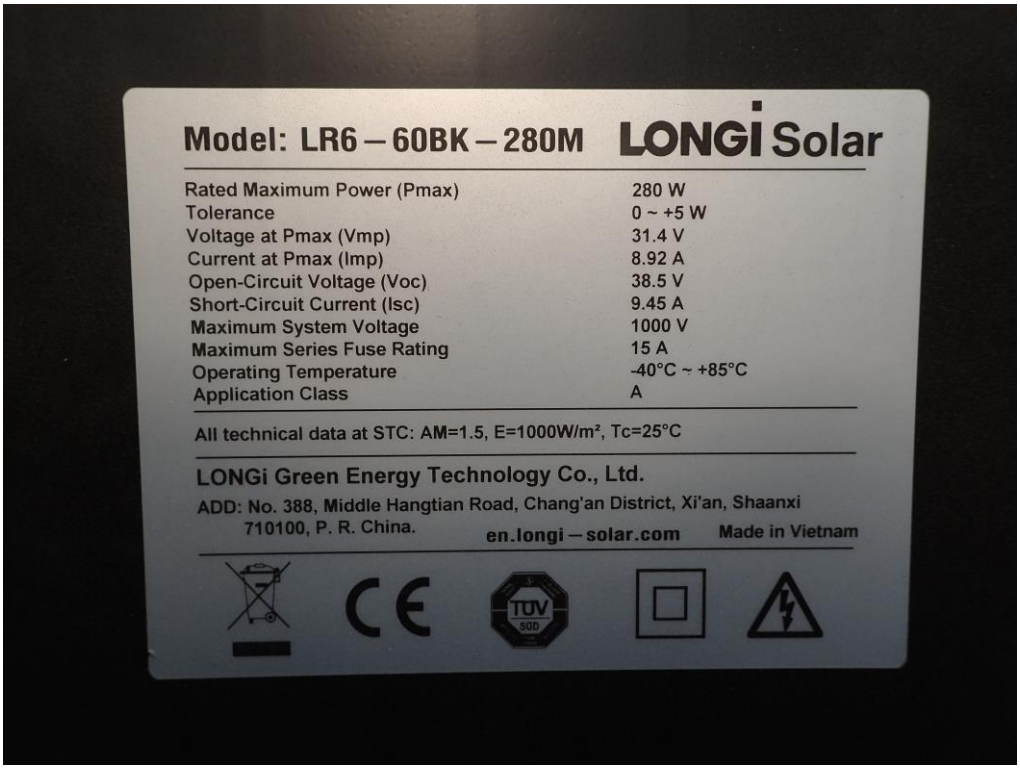


Photo 18
Detail of the breaking of the tile batter at test 3 in landscape layout.

II Drawings and photos of the products and further package data

PV-modules



BOVIET

60 Cell Poly 265-285W(5BB)

BVM6610P

0~+5W
Power Tolerance

17.5%
Maximum Efficiency

265-285W
Power Output Range

High Quality and Reliable Modules
- Withstand up to 5400 Pa snow load and 2400 Pa wind load
- 1000/1500V DC TUV certified
- 2 EL inspections per cell/module for defect-free consistency
- Fire Rating Class C by TUV Rheinland
- High salt and ammonia resistance certified by TUV Rheinland
- 0-+5 W guaranteed positive tolerance
- Rugged design for long-term durability; passed extended reliability tests

Warranty
- 12-year product warranty
- 25-year linear power output warranty

Comprehensive Certificates for Products and Management
- UL 1703, IEC 61215, IEC 61730, CEC listed, MCS and CE
- ISO 9001 for Quality Management Systems
- ISO 14001 for Environmental Management Systems
- ISO 18001 Occupational Health and Safety System

1640 x 992 x 40 mm
Silver Frame / White Backsheet

Boviet Solar www.boviet. com
B5, B6 , Song Khe Industrial Zone, Noi Hoang District Bac Giang Province, 21000 Vietnam

Electrical Characteristics STC

	BVM6610P-265	BVM6610P-270	BVM6610P-275	BVM6610P-280	BVM6610P-285
Maximum Power (Pmax)	265W	270W	275W	280W	285W
Maximum Power Current (Imp)	8.61A	8.71A	8.82A	8.92A	9.02A
Maximum Power Voltage (Vmp)	30.8V	31.0V	31.2V	31.4V	31.6V
Short Circuit Current (Isc)	9.07A	9.16A	9.25A	9.34A	9.45A
Open Circuit Voltage (Voc)	38.1V	38.3V	38.5V	38.7V	39.0V
Module Efficiency	16.3%	16.6%	16.9%	17.2%	17.5%
Power Tolerance	0~+5W	0~+5W	0~+5W	0~+5W	0~+5W
STC: AM1.5, Irradiance 1000W/m², 25°C					

Electrical Characteristics NOCT

	BVM6610P-265	BVM6610P-270	BVM6610P-275	BVM6610P-280	BVM6610P-285
Maximum Power (Pmax)	197W	201W	205W	208W	212W
Maximum Power Current (Imp)	6.85A	6.93A	7.02A	7.10A	7.18A
Maximum Power Voltage (Vmp)	28.8V	29.0V	29.2V	29.4V	29.6V
Short Circuit Current (Isc)	7.25A	7.32A	7.39A	7.46A	7.55A
Open Circuit Voltage (Voc)	35.7V	36.0V	36.2V	36.4V	36.7V
NOCT: AM1.5, Irradiance 800W/m², 20°C, Wind speed 1m/s					

Mechanical Characteristics

Solar Cell	Polycrystalline 156.75x156.75mm, 60 (6 x 10) pcs in series
Glass	High transparency, low iron, tempered glass 3.2 mm
Frame	Anodized aluminum alloy
Junction Box	IP67 rated, with 3 bypass diode
Output Cable	4 mm² (EU)/900/1000 mm long
Connector	MC4 compatible
Dimension	1640x992x40 mm
Weight	18.5KG

Thermal Characteristics

Pmax Temperature Coefficient	-0.41%/K
Voc Temperature Coefficient	-0.31%/ K
Isc Temperature Coefficient	+0.05%/K
NOCT	45±2°C

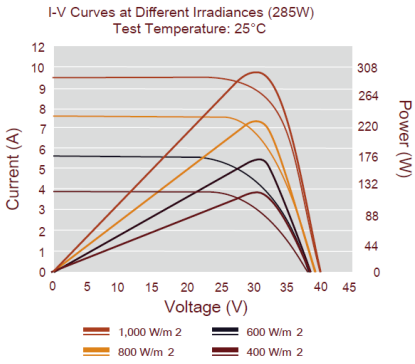
Maximum Ratings

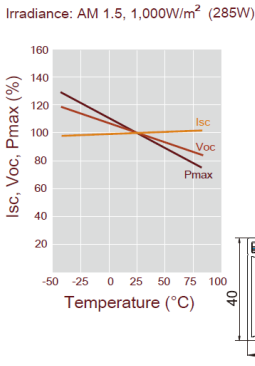
Operating Temperature	-40~85°C
Maximum Series Fuse Rating	15A
Maximum System Voltage	1000/1500V DC

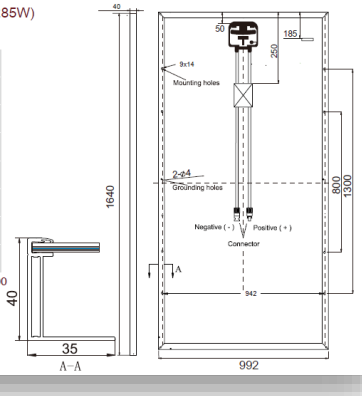
Packing Information

Pieces per pallet	26
Pallets per container (40HQ)	28
Pieces per container (40HQ)	728
Pallet weight/size	534KG/1690*1130*1135mm

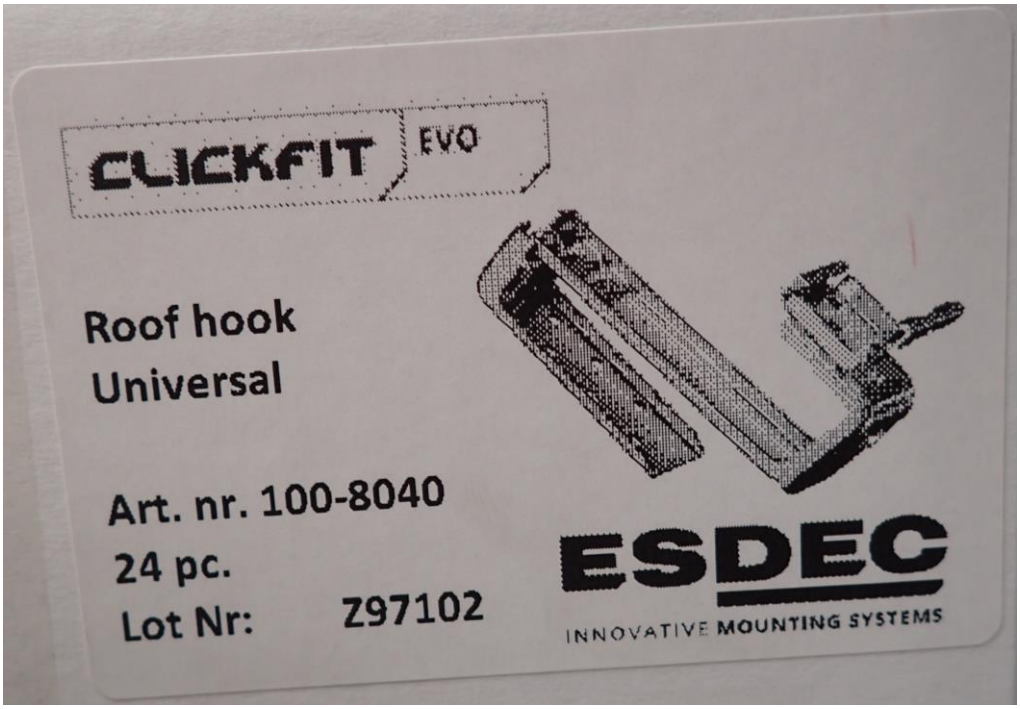
Specifications in this datasheet are subject to change without prior notice.

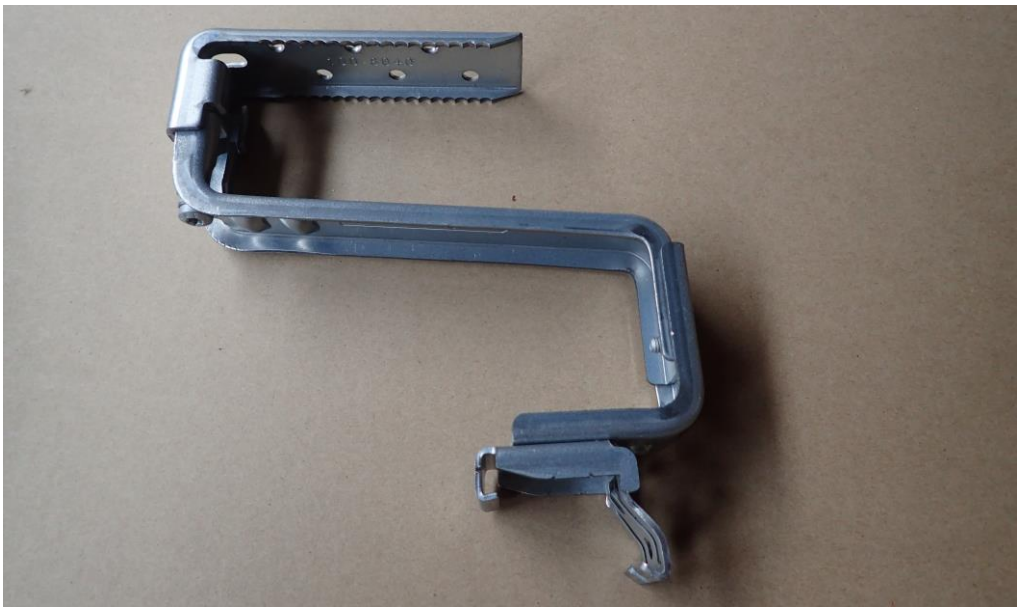


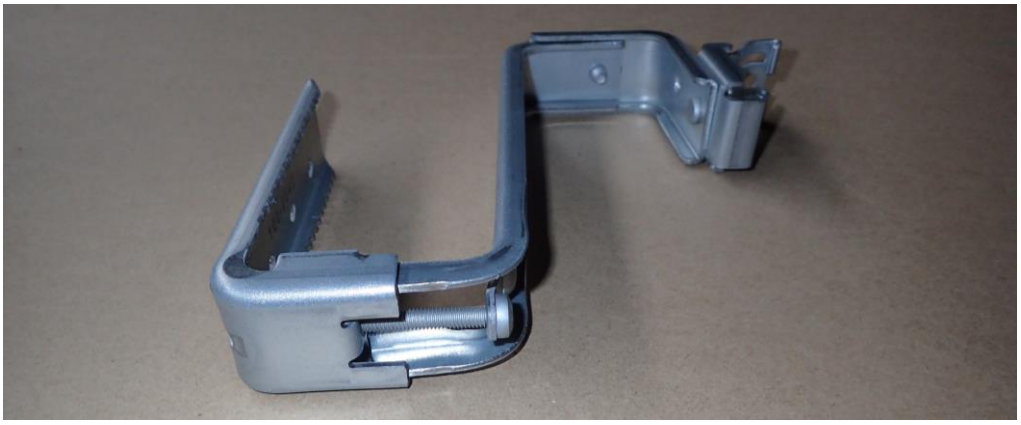


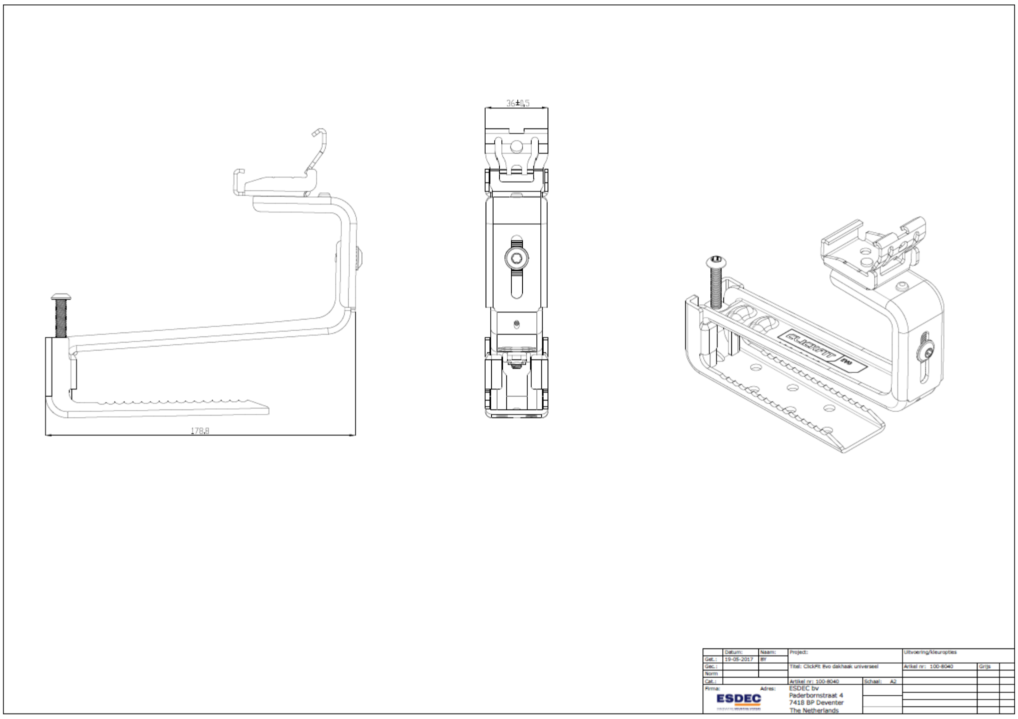


ClickFit EVO universal roof hook

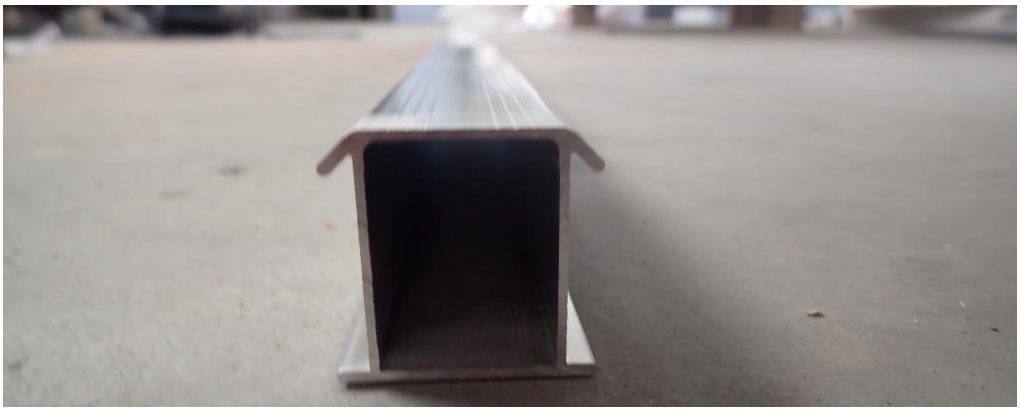


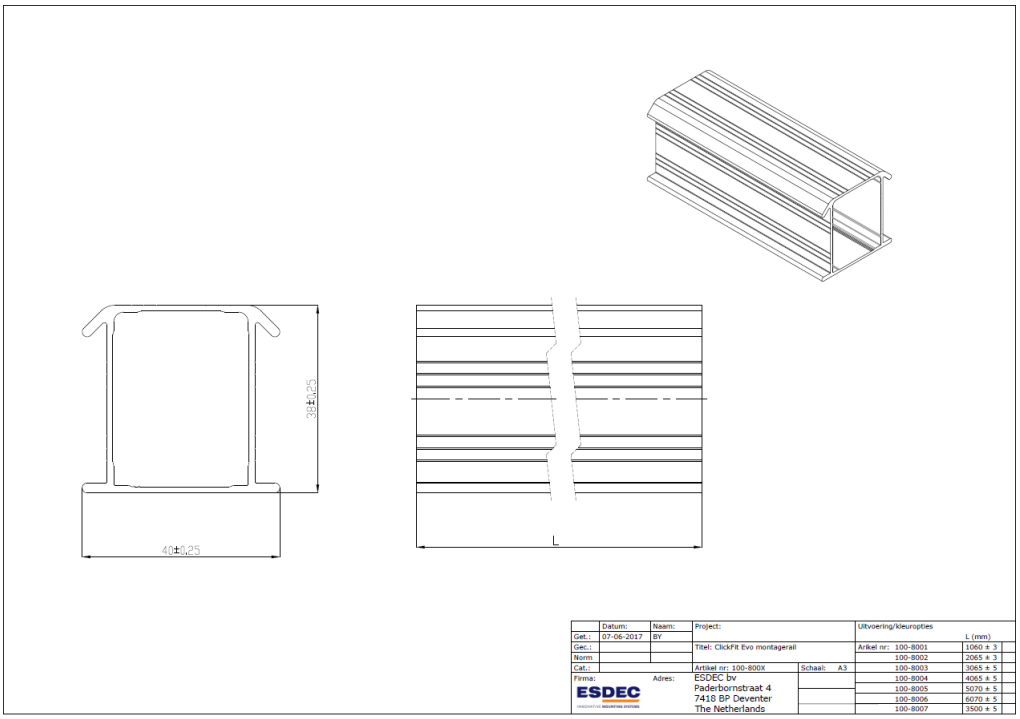





36±0,5
178,8
Datum:
Naam:
Project:
Uitvoering/kleuropties
Get.:
19-05-2017
BY
Gec.:
Titel: ClickFit Evo dakhaak universeel
Artikel nr: 100-8040
Grijs
Norm
Cat.:
Artikel nr: 100-8040
Schaal: A2
Firma:
Adres:
ESDEC bv
Paderbornstraat 4
7418 BP Deventer
The Netherlands

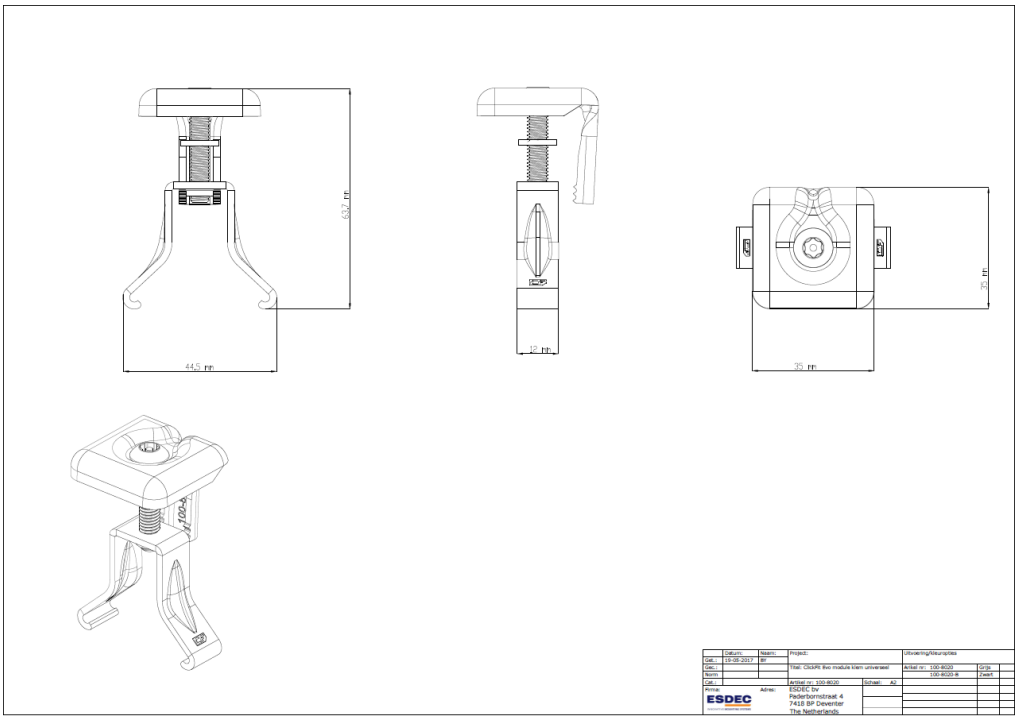
Mounting rail



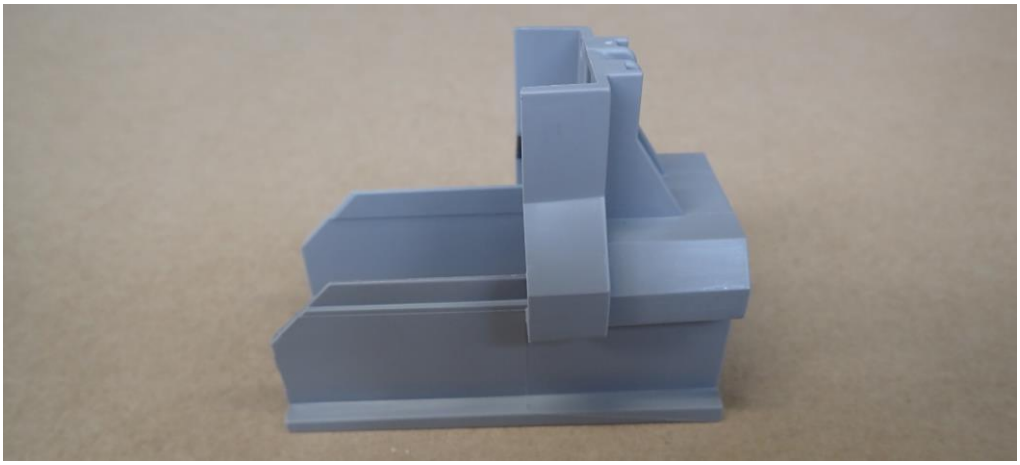


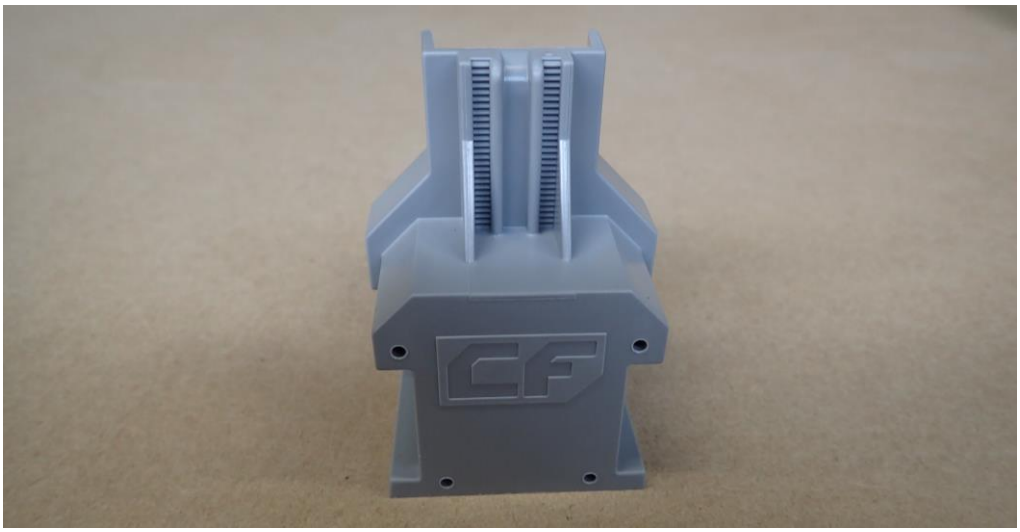
	Datum:	Naam:	Project:	Uitvoering/kleuropties	
Get.:	07-06-2017	BY			L (mm)
Gec.:			Titel: ClickFit Evo montagerail	Artikel nr: 100-8001	1060 ± 3
Norm				100-8002	2065 ± 3
Cat.:			Artikel nr: 100-800X Schaal: A3	100-8003	3065 ± 5
Firma:		Adres:	ESDEC bv	100-8004	4065 ± 5
ESDEC			Paderbornstraat 4	100-8005	5070 ± 5
			7418 BP Deventer	100-8006	6070 ± 5
			The Netherlands	100-8007	3500 ± 5

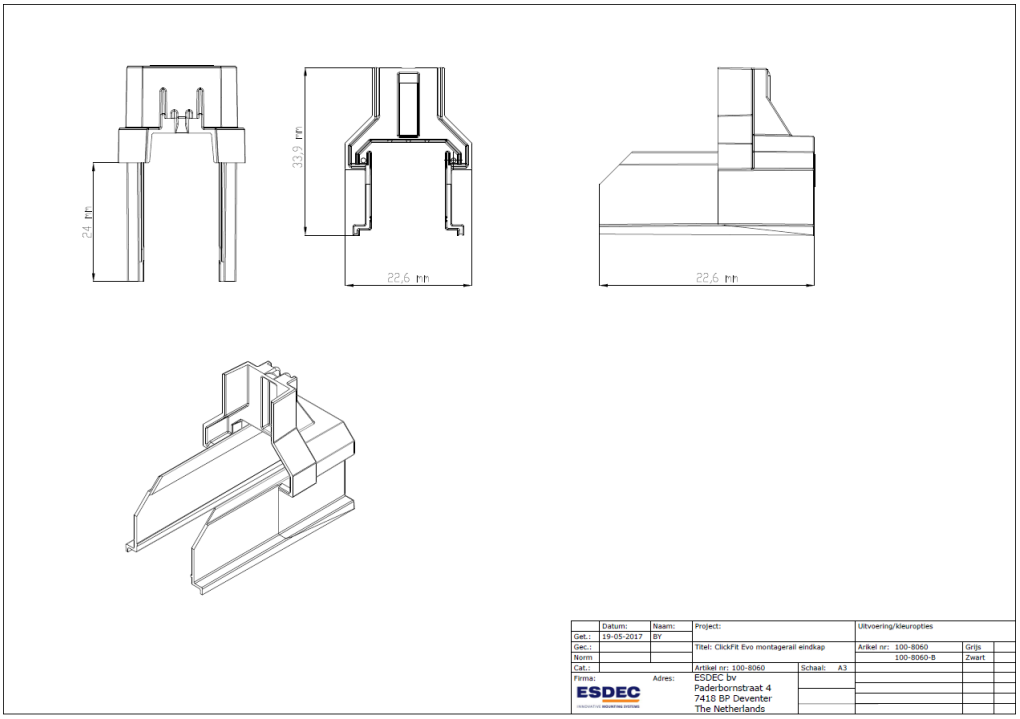
Universal module clamp



End cap







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Get.:	19-05-2017	BY				
Gec.:			Titel: ClickFit Evo montagerail eindkap	Artikel nr: 100-8060	Grijs	
Norm				100-8060-B	Zwart	
Cat.:			Artikel nr: 100-8060 Schaal: A3			
Firma:		Adres:	ESDEC bv Paderbornstraat 4 7418 BP Deventer The Netherlands			

Tiles

SNELDEK

MONIER

Monier, altijd meer mogelijk.

Part of **BMI Group**

Sneldek

U houdt van degelijk: een dak moet betrouwbaar zijn. Jaar in jaar uit, weer of geen weer. De Sneldek is een tijdloze pan die zijn sporen heeft verdiend. Hij wordt al tientallen jaren toegepast op woningen en levert een herkenbaar, vriendelijk dak op. Behalve een prima prijs-kwaliteitverhouding biedt de Sneldek u het comfort van jarenlange zekerheid.

DAKPANNEN

O INGEKLEURDE BODY

GLAZURON® 1

nero/zwart

azzurro

grijs

bruin

herfstkleur
TWP nuance

koper

rosso

Trots op het DUBOkeur

Bij Monier vinden we duurzaamheid belangrijk. We beschikken over het DUBOkeur voor dit model. Kiest u voor deze beton dakpan, dan weet u dus zeker dat u bijdraagt aan de bescherming van het milieu!

* Al deze producten zijn voorzien van DUBOKEUR®

DAKPANNEN

O DOOR-EN-DOOR GEKLEURD

NOVO+ [1]

zwart

antraciet

leigrijs

herfstkleur
RBB nuance

nieuw rustiek
nuance

hollands rood

ENKELE HULPSTUKKEN

Gevelpan links en rechts

Halve pan

Uni-vorst

Uni-begin- / eindvorst

Uni-hoekkeperbeginvorst

TECHNISCHE GEGEVENS

Betondakpan	
Afmeting (l x b)	420 x 332 mm
Gemiddelde werkende breedte (panspeling ± 1 mm)	300 mm
Gewicht	4,2 kg
Aantal per m² (overlap 75 mm)	9,7 - 11,3
Gemiddeld gewicht per m² (overlap 75 mm)	ca. 44 kg
Dakhelling minimaal	17,5°
van 15° tot 17,5° advies vragen bij de afdeling Dakservice	

Latafstand*		
dakhelling (°)	max. latafstand (mm)	min. overlapping (mm)
>_ 30	345	75
25 – 30	335	85
17,5 – 25	325	95
bij toepassing van gevelpannen is de minimale latafstand 295 mm		

Modelgebonden daksysteemcomponenten	
Euro-panhaak Sneldek, rekenwaarde	144 N

[1] De coating van deze dakpannen bevat een geringe hoeveelheid conserveringsmiddel met bestanddeel biocide THOR MKB3.

**In combinatie met het Monier VI90 PV-systeem is de variabele latafstand ter plaatse van het Monier VI90 PV-systeem + de daarbovenliggende pannenrij: 335 - 345 mm.*

De kleuren van de getoonde dakpannen benaderen zoveel mogelijk de werkelijke kleuren. Vraag voor de juiste kleurnuancering altijd monsters aan.

Kies voor zekerheid

Bij Monier testen we onze dakpannen uitgebreid, onder andere in de wind- en regentunnel.

TOPKWALITEIT VOOR LANGE TERMIJN

We bieden steeds de beste kwaliteit bij de keuze voor onze dakpannen en daksysteemcomponenten. Alle producten worden vervaardigd volgens de strengste kwaliteitsnormen. Zowel de grondstoffen als de eindproducten worden op zeer regelmatige basis uitvoerig getest en gecontroleerd. Klaar om een lange tijd optimaal te functioneren.

GETEST EN GOEDGEKEURD

Monier ontwerpt en produceert alle dakpannen en daksysteemcomponenten zelf. Op die manier worden alle onderdelen om tot een goed werkend dak te komen perfect op elkaar afgestemd. Alle onderdelen worden uitvoerig getest in eigen en onafhankelijke testcentra. Uniek in de dakenbranche is de eigen wind- en regentunnel die diverse weersomstandigheden nabootst en het effect ervan op de producten weergeeft.

30 JAAR PRODUCTGARANTIE

Monier-dakpannen hebben een garantieperiode van 30 jaar. Dit houdt in dat de pannen vorstbestendig, waterdicht en bestand tegen breuk zijn volgens de daarvoor geldende Europese normen. Monier-producten voldoen minimaal aan de geldende normen en voorschriften.

30 PRODUCT GARANTIE JAAR

15 JAAR DAKSYSTEEMGARANTIE

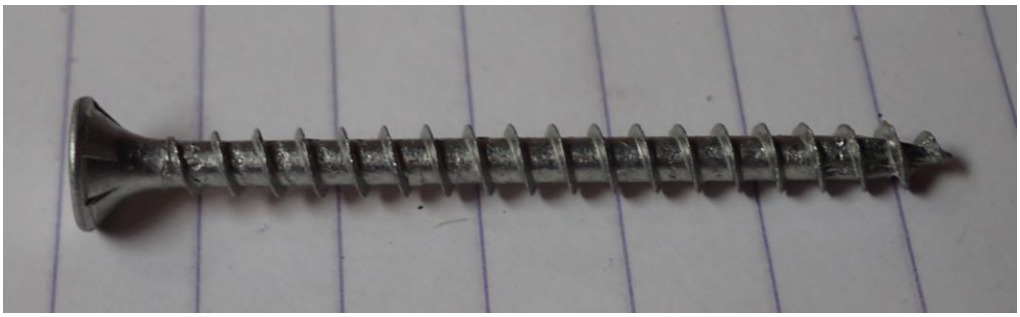
Behalve de productgarantie biedt Monier ook de voorwaardelijke Daksysteemgarantie aan. Deze garantie omvat een periode van 15 jaar en betreft de weerbestendigheid van de aangebrachte dakbedekking van Monier (dakpannen, hulpstukken en daksysteemcomponenten).

15 DAKSYSTEEM GARANTIE JAAR

Monier B.V., Heeswijk 155, Postbus 29, 3417 ZG Montfoort
T 0348 - 47 65 00 **F** 0348 - 47 24 10 **E** infoNL@monier.com www.monier.nl

MONIER-SHELDEK/H-07-17

Fasteners for tile batten



Tile battens

Datasheet ClickFit EVO

CLICKFIT EVO'S 4 BASIC COMPONENTS

1. UNIVERSAL ROOF HOOK

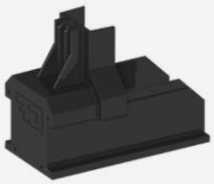
- 1 universal Magnelis® roof hook for all roofing tile/batten combinations
- Easy mounting from above
- Infinitely adjustable in height and width
- Better point load distribution, less chance of tiles cracking and leakage
- Self-aligning snap connection mechanism: easier and faster
- Can be used for both horizontal and vertical mounting
- Integrated cable management

2. MOUNTING RAIL

- 30% stronger
- 30% lighter
- Suitable for larger roof spans

3. UNIVERSAL MODULE CLAMP

- Universal module clamp: suitable for all framed solar panels
- Can be used as centre clamp or as end clamp in combination with end cap
- Standard assembly
- Including grounding for the solar panels
- Available in grey and black



4. END CAP

- Elongated end cap to allow for aesthetically pleasing finish
- Available in grey and black

www.esdec.com

CLICKFIT EVO

TILED ROOF

MOUNTING HAS NEVER BEEN EASIER

Solar panels are popular. The total solar panel capacity in the Netherlands has been increasing steadily, and will continue to do so in the coming years. As such, you are likely to have to start getting up on people's roofs to mount systems more often. If you do solar panel mounting work with any regularity, there is no greater benefit than having a universal mounting system at your disposal that will allow you to do the job easily and reliably.

ClickFit EVO: universal and fast

Esdec developed ClickFit EVO especially for professional solar panel installers. This mounting system consists of 4 components that will allow you to mount all commonly used types of solar panels on all types of tiled roofs. Thanks to its unique properties, this mounting system can be installed in half the usual time.

Flexible and easy mounting

When working with ClickFit EVO, one tool is all you need. Our revolutionary hook-and-snap technique eliminates the need for all other tools. Thanks to this innovative mounting system's smart design, panels can be mounted both horizontally and vertically.

Connecting with your clients

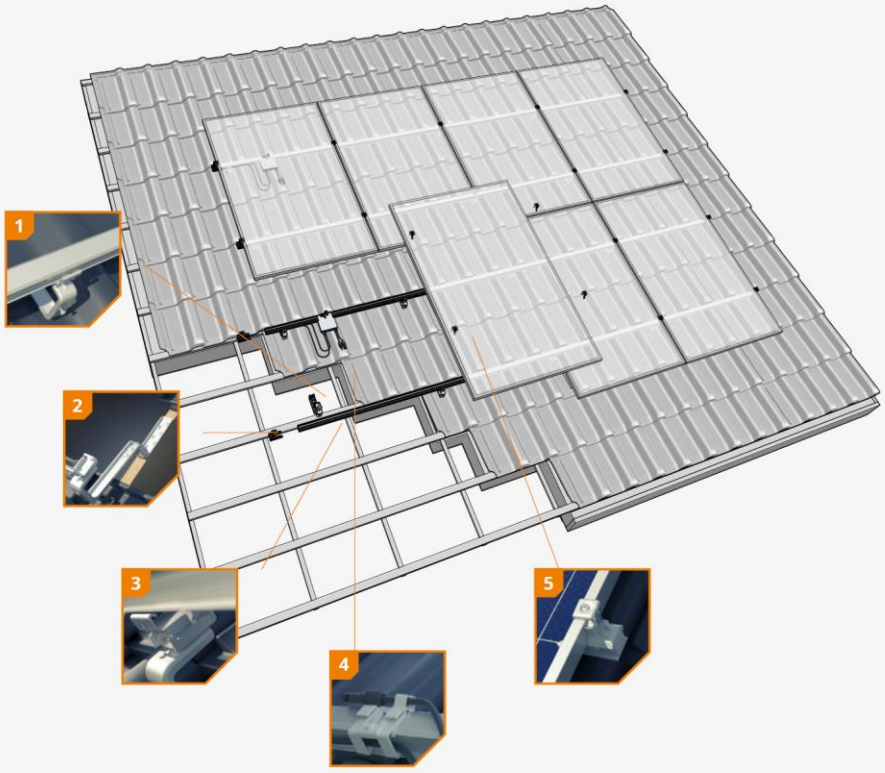
When using ClickFit EVO, the end user's roof structure remains entirely intact. There is no need for any drilling in the existing structure. The universally adjustable roof hook is suitable for use with all roof tile/batten combinations, and the clever water barrier in the system helps prevent leakage.

THE ADVANTAGES FOR YOU

- Up to 40% quicker mounting
- Only 4 components
- Light and durable
- Only 1 tool necessary
- Up to 25 years' warranty

THE ADVANTAGES FOR YOUR CLIENTS

- Rock solid basis for solar panels
- The roof stays intact
- Reliable
- Up to 25 years' warranty



1 Universally adjustable

Our universal Magnelis® roof hook is infinitely adjustable in height and width, and can thus be used for all roof tile/batten combinations.

2 Including screwing option

The universal roof hook is also equipped with a screwing option, which allows you to fasten the hook onto the roof with screws instead, if desired.

3 Fully renewed snap connection mechanism

The universal roof hook is equipped with a self-aligning snap connection mechanism, meaning that the mounting rail can always be easily installed from above.

4 Integrated cable management

Cables and plugs can be neatly and safely stored away in both the roof hook and the cable clip. The optimiser can also easily be snapped onto the cable clip.

5 Always the right size

The universal module clamp is suitable for all types of framed solar panels and can be used both as a centre clamp and – in combination with the end cap – as an end clamp.

ROOF HOOK

ClickFit Evo Roof hook Universal
1008040

MOUNTING RAIL

ClickFit Evo Mounting rail

ClickFit Evo Mounting rail 1060mm	1008001
ClickFit Evo Mounting rail 2065mm	1008002
ClickFit Evo Mounting rail 3065mm	1008003
ClickFit Evo Mounting rail 4065mm	1008004
ClickFit Evo Mounting rail 5070mm	1008005
ClickFit Evo Mounting rail 6070mm	1008006
ClickFit Evo Mounting rail 3500mm	1008007

MODULECLAMP & END CAP

ClickFit Evo Module Clamp Universal grey
1008020

ClickFit Evo Module Clamp Universal black
1008020-B

ClickFit Evo Mounting rail End cap grey
1008060

ClickFit Evo Mounting rail End cap black
1008060-B

ACCESSORIES

ClickFit Evo Mounting rail Coupler
1008061

ClickFit Evo Mounting rail Cable clip optimizer ready
1008062

ClickFit Evo Roof hook Spacer
1008063

ClickFit Evo Auxilliry set
1008064

Calculator

The new ClickFit EVO calculator is easy and quick to use. The clear, organised dashboard makes it easy for you to find saved and/or completed projects. If the roof situation is known, the calculator will automatically generate proposals based on that situation and the most commonly used solar panels. The calculator has also been optimised for Google Maps.

- Easy and quick to use
- Shows all of your projects in one clear overview
- Automatically generates proposals based on the roof situation at hand and the most commonly used solar panel
- Including auto-fill option
- Optimised for Google Maps

Warranty

ClickFit EVO meets all of the requirements and standards that currently apply. ClickFit EVO comes with a unique 25-year warranty, thus ensuring the system's quality

- Use of premium high tech materials
- Extensively tested
- BDA/KIWA certification
- 25 years' warranty

www.esdec.com


QUICK
RELIABLE
INNOVATIVE
MAKE THE CONNECTION WITH ESDEC
Esdec has been developing, producing, and supplying professional roof-mounting systems for solar panels since 2004. ClickFit and FlatFix are inspired by all installers who regularly install solar panels. Easy, fast, reliable installation using innovative, high-quality, durable mounting systems: Esdec makes it possible.
Esdec
Londenstraat 16
7418 EE Deventer
The Netherlands
+31 850 702 000
info@esdec.com
www.esdec.com