

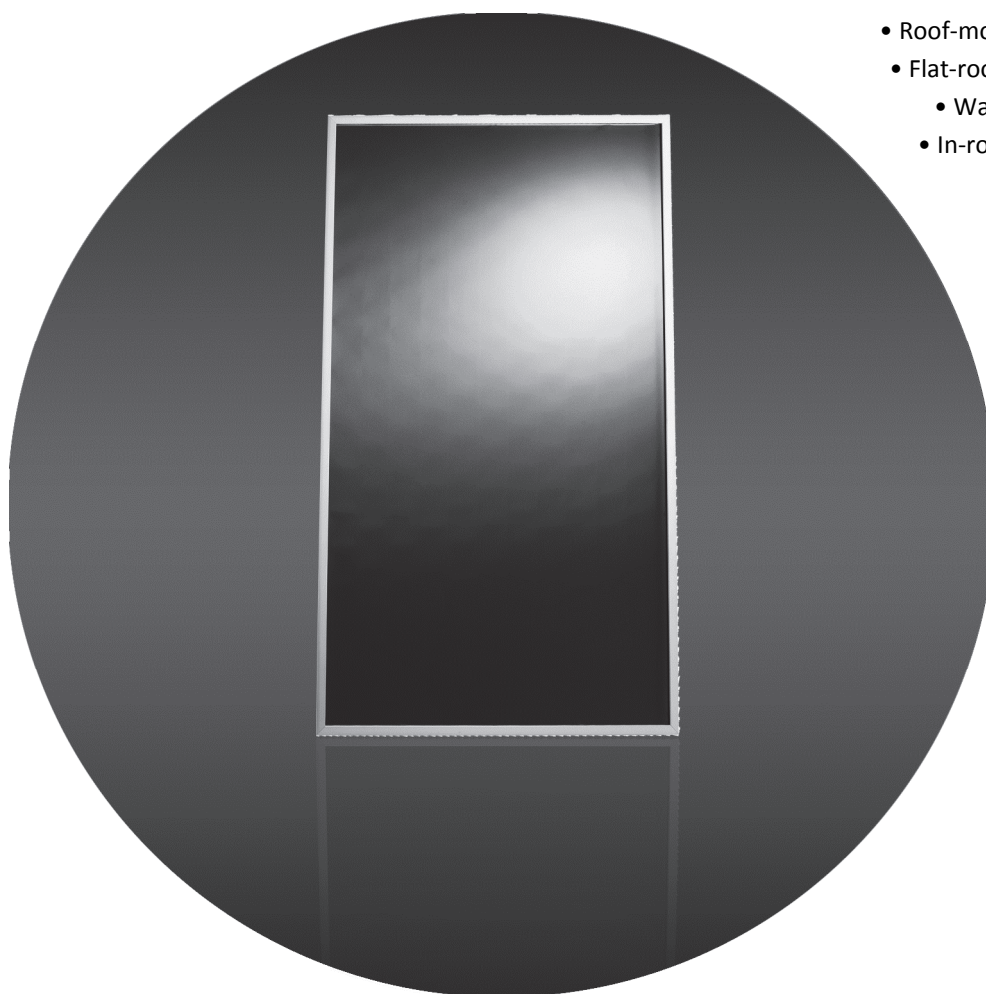
Installation

SolvisCala 254

The compact collectors C-254-AR and C-254-E

For the following types of installation:

- Roof-mount. (sl.: 20° – 60°)
- Flat-roof (slope: 30° – 60°)
 - Wall (slope: 45° – 90°)
- In-roof (from 22° slope)



1 Information About These Instructions

These instructions are intended for you as a technician from an installation company. You will find the specifications for installation, start-up and maintenance of the system here.

Please keep these instructions with the system so they can be referred to when necessary.

We recommend that you participate in a Solvis training course to ensure safe and proper installation.

As we are interested in improving our technical documentation, we appreciate feedback of any kind.

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A list of our international representatives is provided at www.solvis.com.

Please understand that the telephone numbers are reserved for use by our installers.

Interested system operators should contact their installer.

Symbols used



DANGER

Immediate danger, with serious health consequences and even death.



WARNING

Danger, with potentially serious health consequences.



CAUTION

Possible risk of moderate or light injury.



CAUTION

Risk of damage to unit or system.



Useful information, notes and work tips.



Change of document, referring to another document.



Energy-saving tip with suggestions on how to save energy. This reduces costs and helps protect the environment.

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2 Notes

2.1 Safety Notes



Observe the safety notes

This is for your own safety

- Make sure that you are familiar with the safety notes before beginning work.
- Observe and adhere to the relevant safety regulations and the accident prevention regulations.



CAUTION

Country-specific regulations

Regulations can differ depending on the country and the region.

- These are to be observed and adhered to in order to ensure safe and faultless operation.
- If certain laws and regulations do not apply in a particular country, they are to be replaced by the country's own specific laws and regulations.

2.1.1 General Information



DANGER

Note the following in the vicinity of live overhead electric cables:

Touching the overhead cables or a flashover may cause burns or cardiac arrest.

- When working in the vicinity of overhead electric cables, observe the safety clearances.
- Refer to the Employers' Liability Insurance Association (German: "Berufsgenossenschaft") guidelines for safety and health at work to find out the applicable safety clearances and further measures.



WARNING

Burn hazard when there is direct sunlight

Fluid that remains in the collector or steam released from the collector can cause scalding. Touching hot connections may cause burns.

- Perform work on the collectors only when the sun is not shining or when the collectors are covered.
- Remove the sun protection only after the (re-) commissioning of the solar plant.



CAUTION

Do not make any unauthorised modifications

Otherwise, there is no guarantee that the system will function correctly.

- You must not make any changes to the components of the unit.
- Only use original spare parts.



CAUTION

Lower side of the collector is hot

This may damage the components below the collector.

- Materials that come into contact with the rear side of the collector must be able to withstand temperatures up to 120 °C.
- Otherwise, they must be spatially and thermally separated from the rear side of the collector.



CAUTION

Observe instructions

Solvis is not liable for any damage resulting from non-observance of these instructions.

- Read the instructions carefully before operating or installing the system.
- Contact our Technical Sales department if you have any questions.



WARNING

Read before working on roof

Injury hazard

- Check the local conditions and construction requirements carefully before beginning the installation. Employ a structural engineer for advice if necessary.
- For roof-mounted installations, you must construct a collective non-personal fall prevention or fall arrest system in accordance with DIN 18338 (roofing and roof sealing work) and DIN 18451 (scaffolding work with safety nets).
- If, for technical reasons, a collective non-personal fall prevention system is not available, safety harnesses must be used.
- Use only tested and recommended safety harnesses: safety belts, lanyards or straps, shock absorbers, fall arresters. Attach safety harnesses only to load-bearing structures and/or fixing points.
- In addition to protecting those participating in the construction project, uninvolved third parties must also be protected from falling objects.
- The use of normal non-secured ladders can cause accidents if the ladder sinks in, slides or falls over. Do not use damaged ladders. Ensure that the ladder is at the correct angle; between 68 and 75°. Secure all ladders.
- Wear safety gloves, a helmet and safety boots during installation. Also wear protective goggles when drilling or grinding.
- Protect against moisture and dampness during electrical installation.



Work to be performed by qualified technicians

- Only trained specialist companies may install or maintain the system.
- Only qualified electricians may work on electrical equipment.

Intended use

The solar collectors are intended only for indirect heating of drinking water and for heating support and must be operated with appropriately sized heat exchangers between the closed solar circuit and heat consumer.

Operating these collectors for any other purpose is prohibited. Exceptions require express written approval or a statement from the manufacturer in advance.

The warranty is voided if:

- The components supplied are subject to improper use or modified without permission,
- The installation instructions are not properly observed during installation,
- The structural requirements regarding the snow and wind loads are not observed.

Disclaimer

The manufacturer accepts no liability for any damage that occurs as a result improper, incomplete or false information.

2.1.2 Regulations

Specifications, standards and guidelines must be applied as implemented in the country in question.

The following specifications and guidelines are to be observed:

Regulatory provisions

- Statutory specifications for preventing accidents
- Statutory specifications for environment protection
- Specifications of professional associations
- Federal German Energy Conservation Act for saving energy in buildings (EnEG)
- Federal German Renewable Energy Heat Act (EEWärmeG)

Standards and guidelines

- Safety regulations of the DIN, EN and VDE

Installation on roofs

- German Social Accident insurance (DGUV) 101-016 roofing work
- DIN 18338 Roofing work
- DIN 18339 Sheet metal roofing and wall covering work

- DIN 18451 Scaffolding works
- DIN 1052 Design of timber structures
- DIN EN 1991 Actions on structures

Steam boilers ordinance

- TRD 802 Technical Rules for Steam Boilers
- TRD 402 Technical Rules for Steam Boilers
- TRD 611 Technical Rules for Steam Boilers
- TRD 612 Technical Rules for Steam Boilers

Connection of solar thermal systems

- EN 12975 Thermal solar systems and components – Solar collectors
- EN 12976 Thermal solar systems and components – Factory made systems
- EN 12977 Thermal solar systems and components – Custom built systems
- EN ISO 9488 Thermal solar systems and components – Terminology
- VDI 6002 Solar drinking water heating
- DIN EN 1044 Brazing

General Conditions for Water Supply, DVGW worksheet

- W551, W552 Technical Measures for Preventing Growth of Legionella

German Energy Conservation Regulations

- German Energy Conservation Regulations (EnEv)

Installation and Equipment of Water Heaters

- DIN 18380 Heating of water for domestic and heating purposes – Leak testing
- DIN 18381 Gas, water and waste water installation work
- DIN 18421 Insulation of service installations
- DIN 1988 Codes of practice for drinking water installations
- EN 1717 Protection against pollution of potable water installations
- DIN 4753/EN 12897 Water heaters, water heating installations for drinking and service water; requirements, labelling, equipment and inspection

Electrical connection

- VDE 0100 Selection and erection of electrical equipment – Earthing arrangements and protective conductors
- VDE 0185 General notes on erection of lightning protection systems
- DIN EN 62305 Lightning protection of physical structures – Part 1: General principles
- VDE 0100-540 Main potential equalisation of electrical systems

2.2 Preventing Damage

2.2.1 Collector in general

Transporting the collectors

The collector connections must not be subjected to load. Always use the Solvis collector installation grip to transport the collectors properly. Observe the instruction sheet for the installation grip.

Collector storage

If stored temporarily after delivery, the collector must be protected from moisture and frost. Either store it in a sheltered space or outside at a minimum slope of 15°.



CAUTION

The SolvisCala must not be stored horizontally outdoors

Moisture can otherwise penetrate the collector and cause damage

- Storage angle: > 15°.

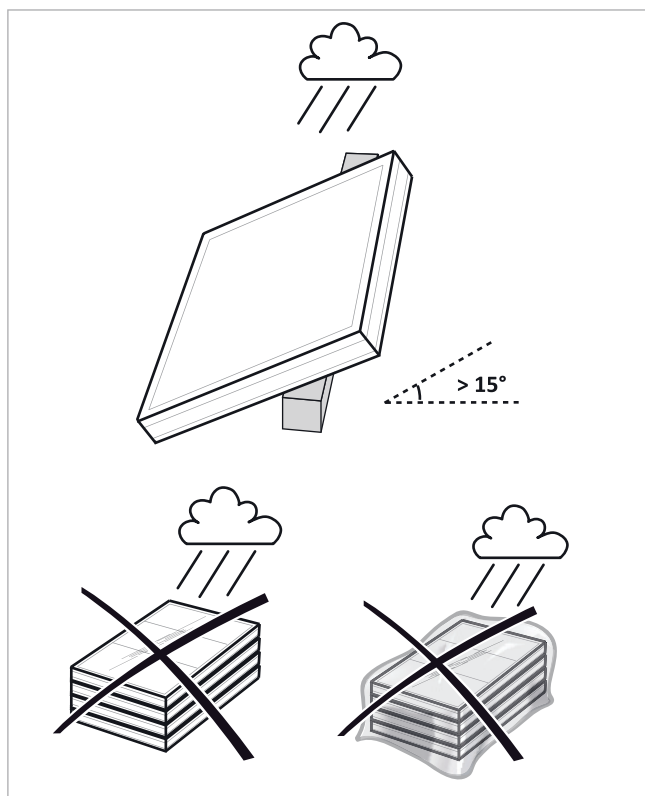


Fig. 1: Storing the SolvisCala outdoors



CAUTION

Risk of corrosion

- Do not install the solar system on copper roofs or underneath copper components.



CAUTION

Risk of deposits

- Once the collector has been previously filled with solar liquid, it may not be exposed to sunlight when empty.



CAUTION

When filling the solar circuit:

- Use only original Solvis Tyfocor LS-rot ready-mixed heat transfer medium to fill and flush the solar circuit.
- Using other types of heat transfer fluid in this system is prohibited and may damage the solar circuit components.

2.2.2 Solar glass pane (anti-reflective glass)



CAUTION

Observe with regard to anti-reflective glass

Otherwise damage may result

- Handle with care Anti-reflective glass is treated with a special, delicate surface coating that increases its transparency.
- Leave minor soiling untreated. You have no influence on the effectiveness of the collector. Otherwise the pollutant may be ground into the surface or damage the surface coating.

Notes on handling

- Avoid leaving fingerprints. Handle the sheets only with clean, soft (cotton) gloves (no leather gloves)
- Handle anti-reflective glass sheets only around the edges
- Do not set glass panes down on the sharp edge
- Do not expose the glass panes to uneven pressure
- Preferably use glass lifters
- Prevent soiling: keep clean all objects and surfaces that come in contact with the sheets (such as storage areas, glass lifters, tools)
- Avoid contact with substances such as silicone, oil and other lubricants as well as other mineral substances such as cement and mortar
- Avoid letting rain from façades (especially with mineral coatings) run off onto the collector
- Store sheets in a dry place protected from rain and from freezing

Notes on cleaning

- Clean anti-reflective glass sheets carefully and without pressing using only a microfibre cloth
- Use only glass cleaner or isopropyl alcohol for cleaning
- Do not use aggressive, scouring or chemical cleaning substances
- No mechanical cleaning: do not use abrasive sponges, steel wool, or scrapers

2.3 Overvoltage Protection

Lightning protection

Clarify if a lightning arrester is required according to building legislation. In addition, the planner or insurance company may require that lightning protection be installed. Take this into account accordingly.



CAUTION
Observe the following for lightning protection devices

- The layout and installation of lightning protection devices should be carried out by suitably qualified technicians only, in accordance with the recognised technical regulations.
- Observe the general principles of the DIN EN 62305 lightning protection standard.

External lightning protection

External lightning protection comprises interception devices, conductors and ground electrodes.

If a lightning protection system is in place, the planner checks if and how (separation distance) the planned solar system can be positioned within the interception devices.

This applies in particular:

- If an external lightning protection system is required
- If additional lightning protection is required for solar systems which are elevated in an exposed location on public buildings (e.g. if the building becomes significantly taller as a result).

Internal lightning protection

The internal lightning protection comprises equipotential bonding and overvoltage protection for electrical devices.

There must always be a connection between the equipotential bonding of the house and the solar circuit piping (solar flow and solar return); the cross section of the connection must be a minimum of 6 mm².



Even if no lightning protection is needed, you should at least install a lightning protection box (as close to the sensor as possible) to protect the collector sensor against overvoltage.



CAUTION
Please note the following with regard to lightning protection

Note that even a lightning protection system that fulfils all standards cannot guarantee complete protection against damage caused by lightning.

2.4 Dimensions

The collector spacing must be observed when connecting the collector connectors. Measurements are performed on the base (foot) of the collector.

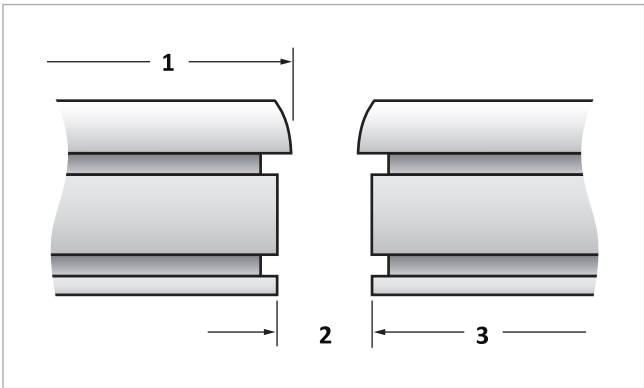


Fig. 2: The horizontal and vertical mounting clearance for collectors is measured at the base (foot) of the collector.

- 1 Head measurement (length and width at the top)
- 2 Clearance (horizontal and vertical at the bottom)
- 3 Foot measurement (length and width at the bottom)

Collector dimensions and clearances

Designation	C-254-AR	C-254-E
Length (Head measurement)	2176	2168
Length (Foot measurement)	2168	
Width (Head measurement)	1176	1168
Width (Foot measurement)	1168	
Horizontal clearance	30*	30
Vertical clearance (horizontal mounting)	30*	30
Vertical clearance (vertical mounting)	180*	180

All dimensions in [mm]
* (Foot measurement)

2.5 Orientation



CAUTION

Avoid excessively high temperature loads.

Otherwise, there may be damage to the solar system.

- The lower edge of the collector field **must not** be below the upper edge of the SolvisMax!

A solar system generates a maximum yield when it is facing due south. The recommended slope angle α of the collector in relation to horizontal depends on the type of installation, and is between:

- **Roof-mounted** 20° to 60°
- **Flat-roof** 30° to 60°
- **Wall** 45° to 90°. With additional cover on-site when 60° or more. Only 3 m above ground level when 75° or more.
- **in-roof** from 22°



In-roof installation possible only for C-254-AR



CAUTION

avoid slope angles smaller than 20° vermeiden

Otherwise losses in the solar yield or damage caused by condensation in the collector are possible.

- Slope angles should always be greater than 20°.
- For small slope angles (20° to 30°), an increased amount of condensate in the collector must be expected

Mounting orientation

The mounting orientation of SolvisCala collectors can, depending on your needs, be vertical or horizontal for roof-mounted installation or installation on flat roof holders. The collectors can only be mounted vertically (upright) for in-roof installation (possible only for C-254-AR).

2.6 Tile Heights for In-Roof Installation

In order to guarantee a sufficient slope for the lower connection to the roofing, the → table "Permitted tile

heights" lists the maximum tile height depending on the roof slope.

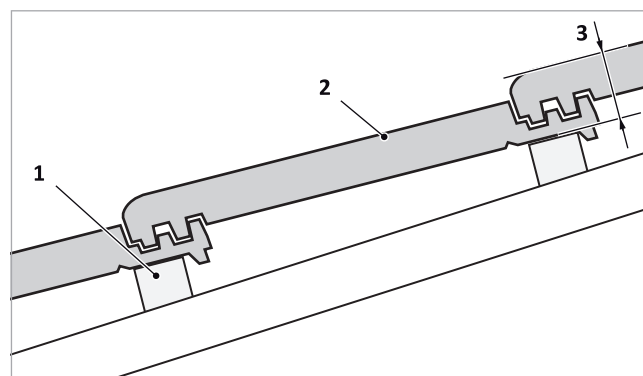


Fig. 3: Measuring the tile height

- 1 Batten
- 2 Tile
- 3 Tile height



Measure the height of the roofing tile at the upper bearing point of the tile from the upper edge of the batten to the upper edge of the tile.



Contact our Technical Sales department if you have any questions.

Permitted tile heights

Roof slope		Tile height
[°]	[%]	[mm]
22	40	Up to 20
24	45	Up to 25
26	49	Up to 30
28	53	Up to 35
32	62	Up to 40
36	73	Up to 45
38	78	Up to 50
42	90	Up to 55
44	97	Up to 60
48	111	Up to 65
52	128	Up to 70
54	138	Up to 75
58	160	Up to 80

2.7 Roof-Mounted, Flat-Roof and Wall-Mounted Installation

2.7.1 Installing the Holding Rails

Collectors are mounted on holding rails for roof-mounted, flat-roof, or wall-mounted installation. There are different combinations of pairs of holding rails available depending on the number of collectors connected in succession (see figure). They are screwed together on-site and mounted to the roof-mount frames or flat roof holders.

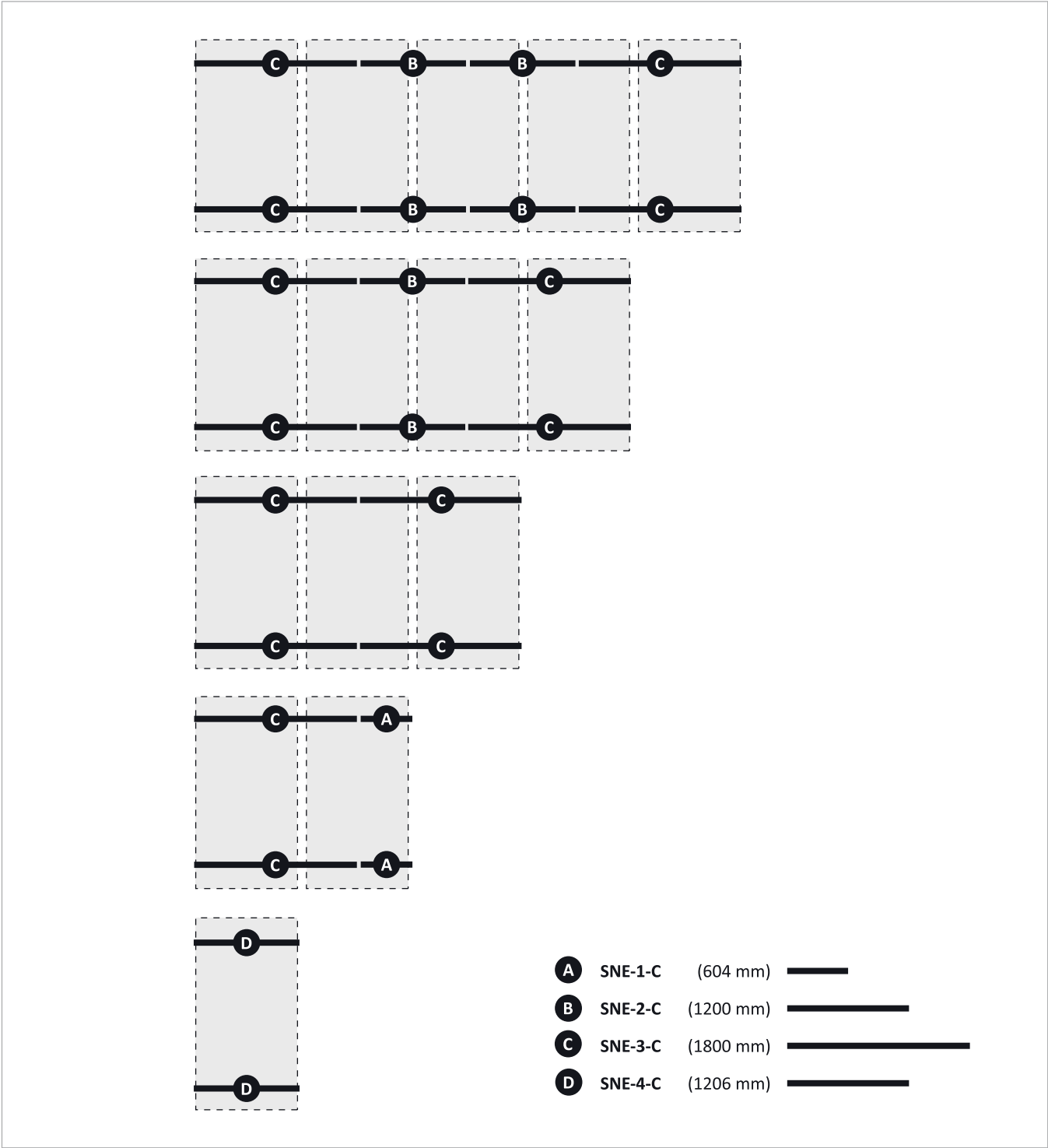


Fig. 4: Combination of pairs of holding rails

Holding rail assembly

Assemble the holding rails at ground level before mounting the collectors on the roof.

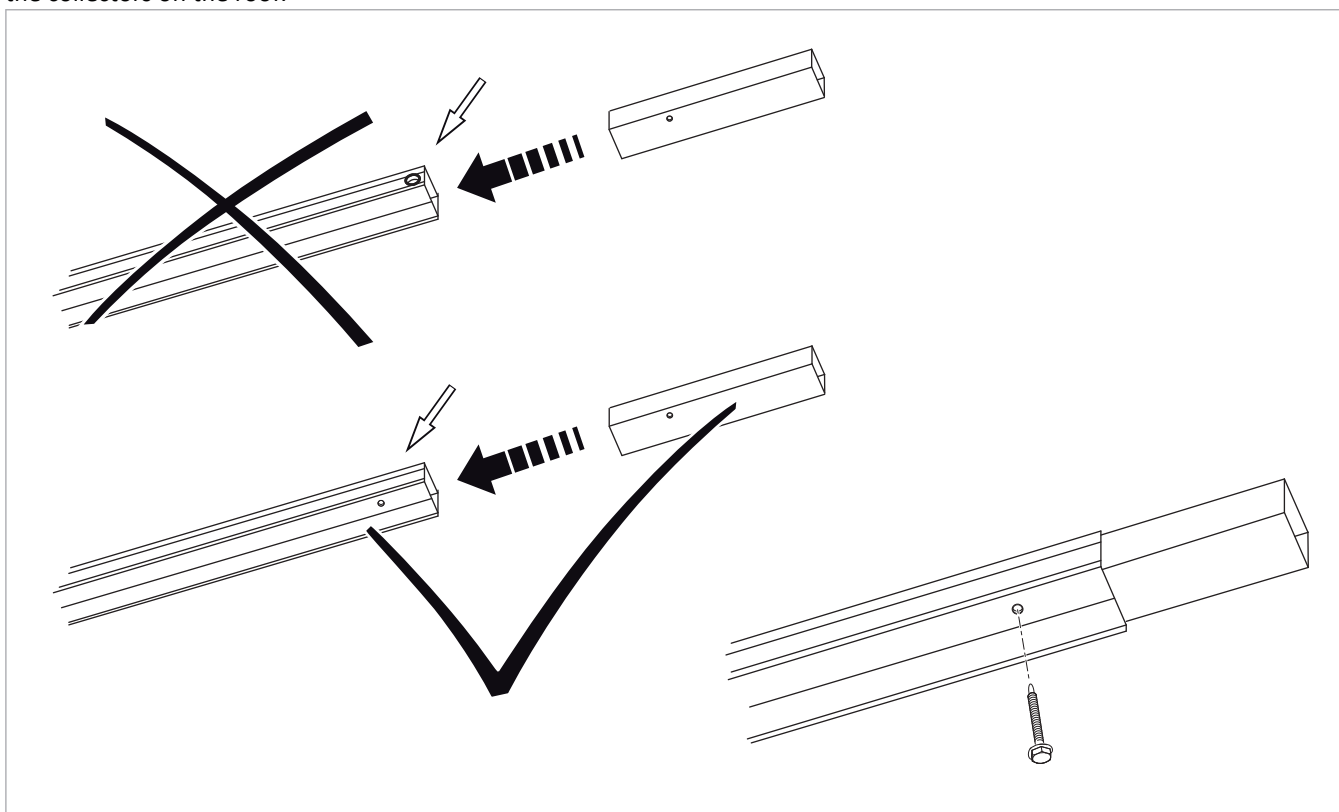


Fig. 5: Installing a connector

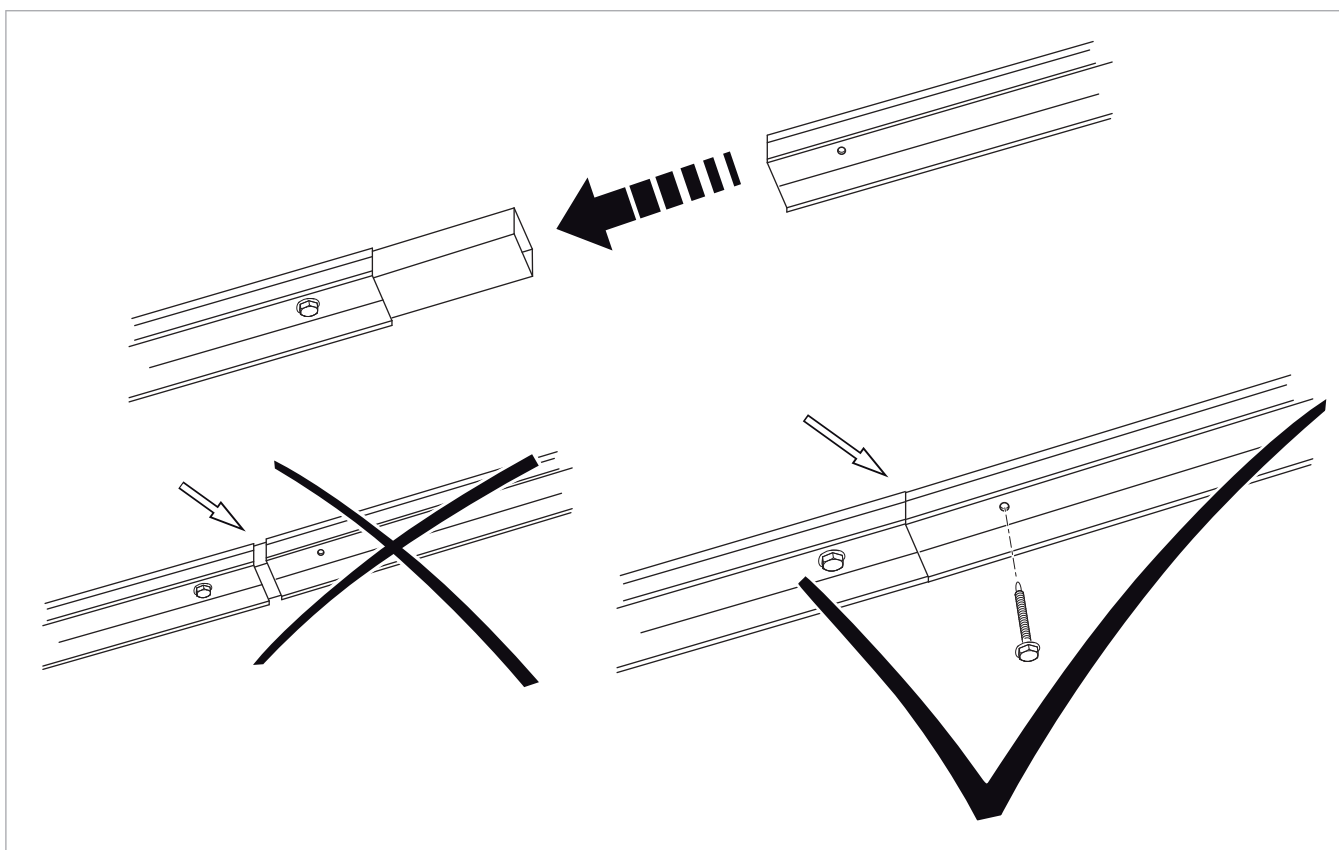


Fig. 6: Installing additional holding rails

2.7.2 Effects of Shadowing on Flat-Roof or Wall-Mounted Installations

Shadowing

Any shadow on the collector surface area reduces the solar yield and should be avoided whenever possible.

Shadows may also be cast by tall buildings, chimneys, dormer windows, tall trees, etc.

With flat-roof installation, it is also important to maintain sufficient spacing to prevent the adjacent collectors from casting shadows on one another.

Using the figures and the tables, you can calculate the spacing between the flat roof holders when taking shadowing into account:

- You can find the latitude of your location using → Fig. 7.
- The table shows the correct spacing given the latitude and the slope angle.

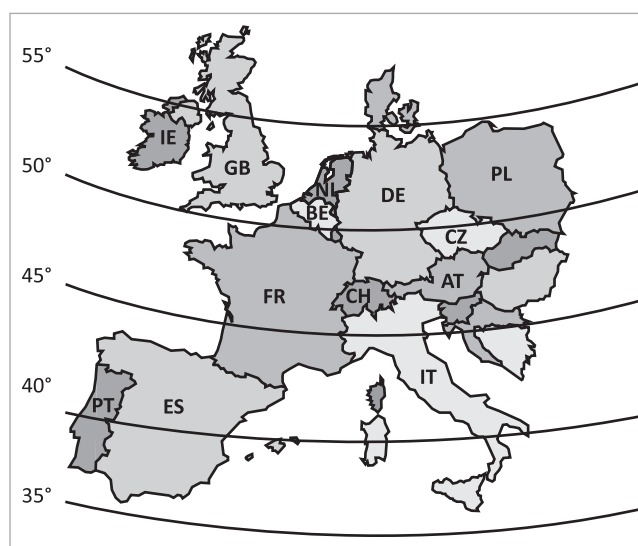


Fig. 7: Latitudes in Europe

Spacing depending on latitude (vertical installation)

Latitude	Flat roof mounted installation						Wall-mounted installation			
	Spacing in [m] for the slope angle						Spacing in [m] for the slope angle			
	30°		45°		60°		45°		60°	
	Measurement a	Measurement b	Measurement a	Measurement b	Measurement a	Measurement b	Measurement c	Measurement d	Measurement c	Measurement d
55	5.34	9.12	7.56	10.64	9.25	11.43	2.51	5.59	1.77	5.53
54	4.90	8.68	6.93	10.01	8.49	10.67	2.61	5.69	1.85	5.61
52	4.20	7.98	5.94	9.02	7.28	9.46	2.83	5.91	2.00	5.76
50	3.67	7.45	5.19	8.27	6.36	8.54	3.08	6.16	2.18	5.94
48	3.25	7.03	4.58	7.64	5.63	7.81	3.37	6.45	2.39	6.15
46	2.91	6.69	4.11	7.19	5.04	7.22	3.71	6.79	2.62	6.38
44	2.62	6.40	3.71	6.79	4.54	6.72	4.11	7.19	2.91	6.67
42	2.38	6.16	3.37	6.45	4.12	6.30	4.59	7.67	3.25	7.01
40	2.18	5.96	3.08	6.16	3.78	5.96	5.19	8.27	3.67	7.43
38	2.00	5.78	2.83	5.91	3.47	5.65	5.94	9.02	4.20	7.96
36	1.84	5.62	2.61	5.69	3.20	5.38	6.93	10.01	4.90	8.66

Spacing depending on latitude (horizontal installation)

Latitude	Flat roof mounted installation						Wall-mounted installation			
	Spacing in [m] for the slope angle						Spacing in [m] for the slope angle			
	30°		45°		60°		45°		60°	
	Measurement a	Measurement b	Measurement a	Measurement b	Measurement a	Measurement b	Measurement c	Measurement d	Measurement c	Measurement d
55	2.89	4.92	4.08	5.74	5.00	6.17	1.35	2.52	0.96	2.13
54	2.65	4.68	3.74	5.40	4.59	5.76	1.41	2.58	1.00	2.17
52	2.27	4.30	3.21	4.87	3.93	5.10	1.53	2.70	1.08	2.25
50	1.98	4.01	2.80	4.46	3.43	4.60	1.67	2.84	1.18	2.35
48	1.75	3.78	2.48	4.14	3.04	4.21	1.82	2.99	1.29	2.46
46	1.57	3.60	2.22	3.88	2.72	3.89	2.00	3.17	1.42	2.59
44	1.42	3.45	2.00	3.66	2.45	3.62	2.22	3.39	1.57	2.74
42	1.29	3.32	1.82	3.48	2.23	3.40	2.48	3.65	1.75	2.92
40	2.03	4.06	1.67	3.33	2.04	3.21	2.80	3.97	1.98	3.15
38	1.18	3.21	1.53	3.19	1.87	3.04	3.21	4.38	2.27	3.44
36	1.08	3.11	1.41	3.07	1.73	2.90	3.74	4.91	2.65	3.82

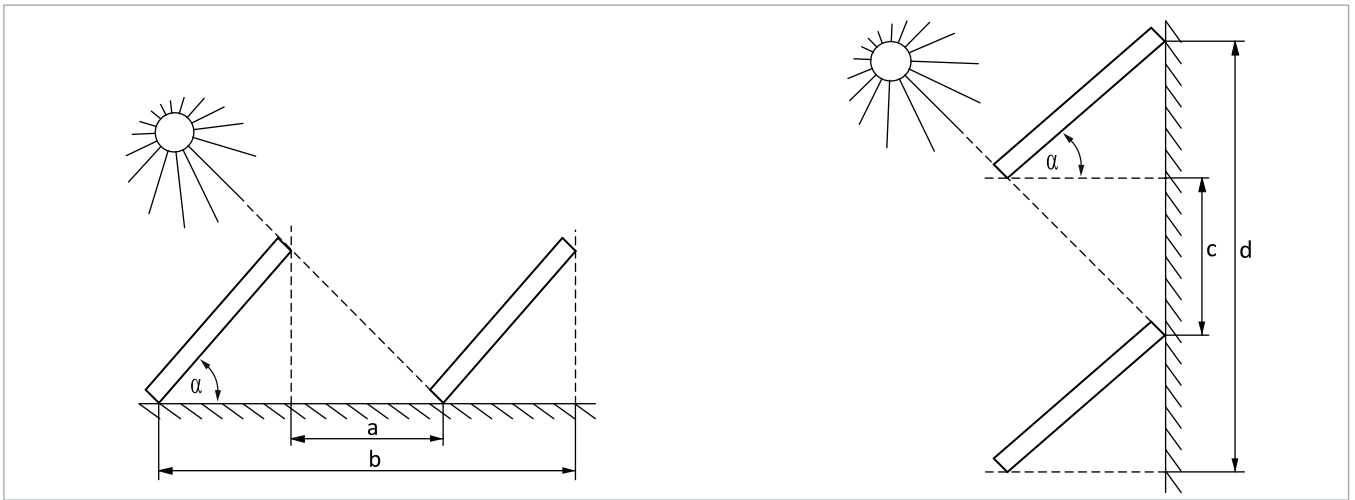


Fig. 8: Spacing and angles determined by shadowing

3 Hydraulics

Collectors of the type SolvisCala have the following properties:

- No bleeder necessary
- Minimal work required for piping
- Can be installed horizontally or vertically
- Can be turned through 180°.

The collector sensor must be ordered separately and is mounted directly on the collector output at the flow.



CAUTION

Longitudinal thermal expansion

Leaks may arise due to material expansion/contraction.

- Install only flexible connection lines in the collector field.
- Recommendation: Use the connection sets and connectors offered.

3.1 SolvisCala 254 AR

The optimised absorber hydraulics with double meander allows up to six collectors to be connected in series. The SolvisCala 254 AR can be combined with three pipe diameters (12, 15 and 18 mm). This allows optimum degrees of efficiency to be achieved for each system.

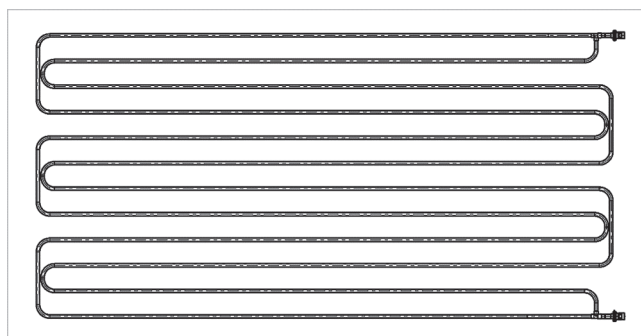


Fig. 9: Hydraulic diagram for SolvisCala 254 AR

Required pipe diameters

Depending on the size of the solar circuit, quick-fit duct SMR-12 or SMR-15 or, in certain cases, 18-mm copper tubing may be suitable. Please direct any questions to our technical sales team. In third-party systems, we recommend using bleeders at suitable points.

Required components for series connection

For wiring of 5 collectors:

- 5 x collectors (C-254-AR) and an installation kit, depending on the installation type
- 4 x collector connector VB-C-N-12
- 1 x flexible connection pipe set, e.g. ROS-12-FLX
- 1 x T-piece set TST-SEN-12-C/F
- 1 x BLS-SEN lightning protection box

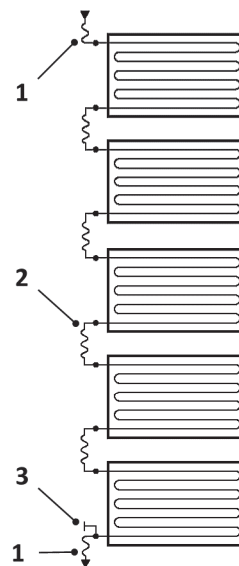
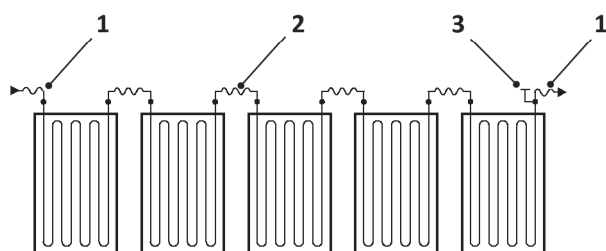


Fig. 10: SolvisCala 254 AR, horizontal and vertical series connection

- 1 ROS-12-FLX
- 2 VB-C-N-12
- 3 TST-SEN-12-C/F with BLS-SEN

3.2 SolvisCala 254 Eco

The single meander of the SolvisCala 254 Eco allows series connection of up to four collectors, depending on the solar pump and size of the solar circuit. Up to 3 SolvisCala Eco units may be connected in series with the SÜS 5.5. If more collector surface area is desired (systems with SÜS-Max), parallel connection of 2x3 collectors is possible.

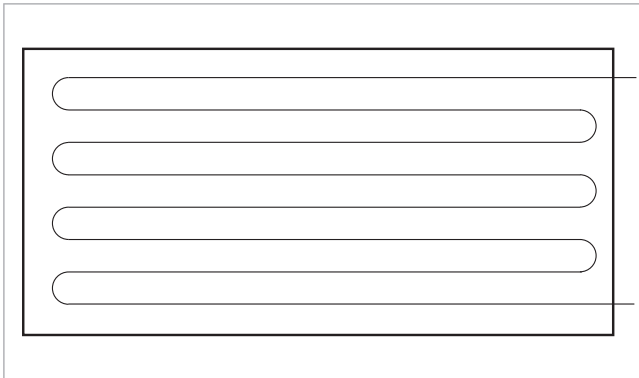


Fig. 11: Hydraulic diagram for SolvisCala 254 Eco

Required components for series connection

For wiring of 3 collectors:

- 3 x collectors (C-254-E) and an installation kit, depending on the installation type
- 2 x VB-CE collector connectors
- 1 x flexible connection pipe set, e.g. ROS-12-FLX
- 1 x T-piece set TST-SEN-12-CE
- 1 x BLS-SEN lightning protection box

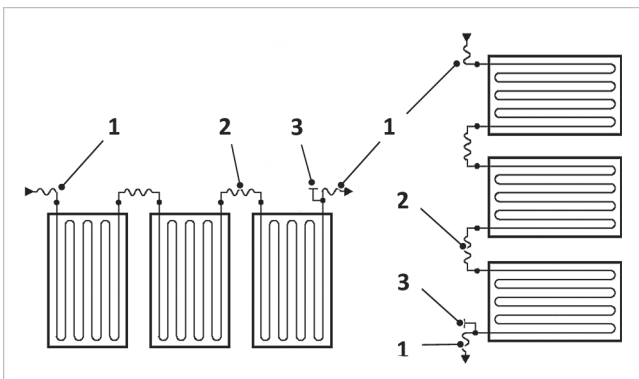


Fig. 12: SolvisCala 254 Eco, horizontal and vertical series connection

- 1 ROS-12-FLX
- 2 VB-CE
- 3 TST-SEN-12-CE with BLS-SEN

Required components for series connection

For wiring of 4 collectors:

- 4 x collectors (C-254-E) and an installation kit, depending on the installation type
- 3 x VB-CE collector connectors
- 1 x flexible connection pipe set, e.g. ROS-12-FLX
- 1 x T-piece set TST-SEN-12-CE
- 1 x BLS-SEN lightning protection box

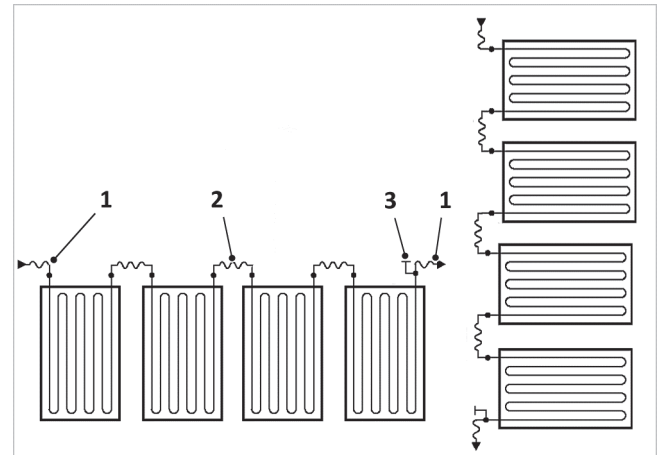


Fig. 13: SolvisCala 254 Eco, horizontal and vertical series connection

- 1 ROS-12-FLX
- 2 VB-CE
- 3 TST-SEN-12-CE with BLS-SEN

Required components for parallel connection

For wiring of 6 collectors:

- 6 x collectors (C-254-E) and an installation kit, depending on the installation type
- and as follows for horizontal and vertical installation:

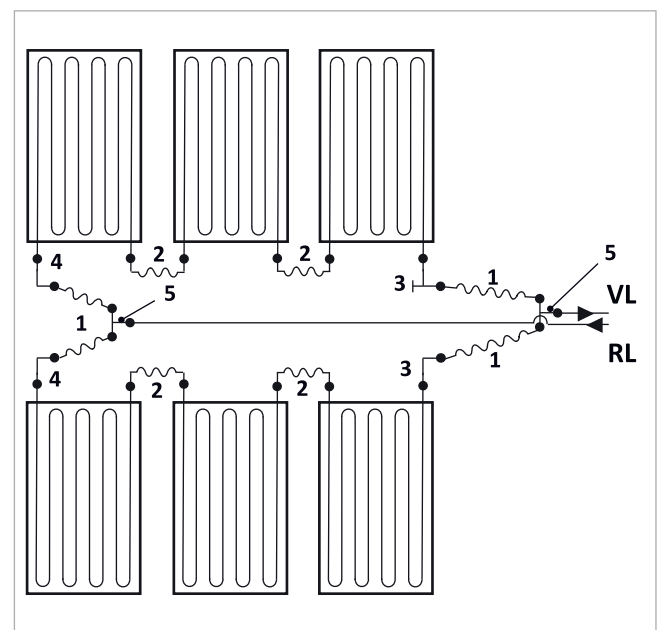


Fig. 14: SolvisCala 254 Eco, parallel connection for vertical installation

- 1 flexible connection pipe set ROS-12-FLX (2 pieces)
- 2 Collector connector VB-CE (4 pieces)
- 3 T-piece set TST-SEN-12-CE with lightning protection box BLS-SEN
- 4 Connection angle set ASS-CE
- 5 Parallel connection kit VB-SMR-12-P

Required pipe diameters

Depending on the size of the solar circuit, quick-fit duct SMR-12 or SMR-15 or, in certain cases, 18-mm copper tubing may be suitable. Please direct any questions to our technical sales team. In third-party systems, we recommend using bleeders at suitable points.

4 Roof-Mounted Installation

4.1 Scope of Delivery

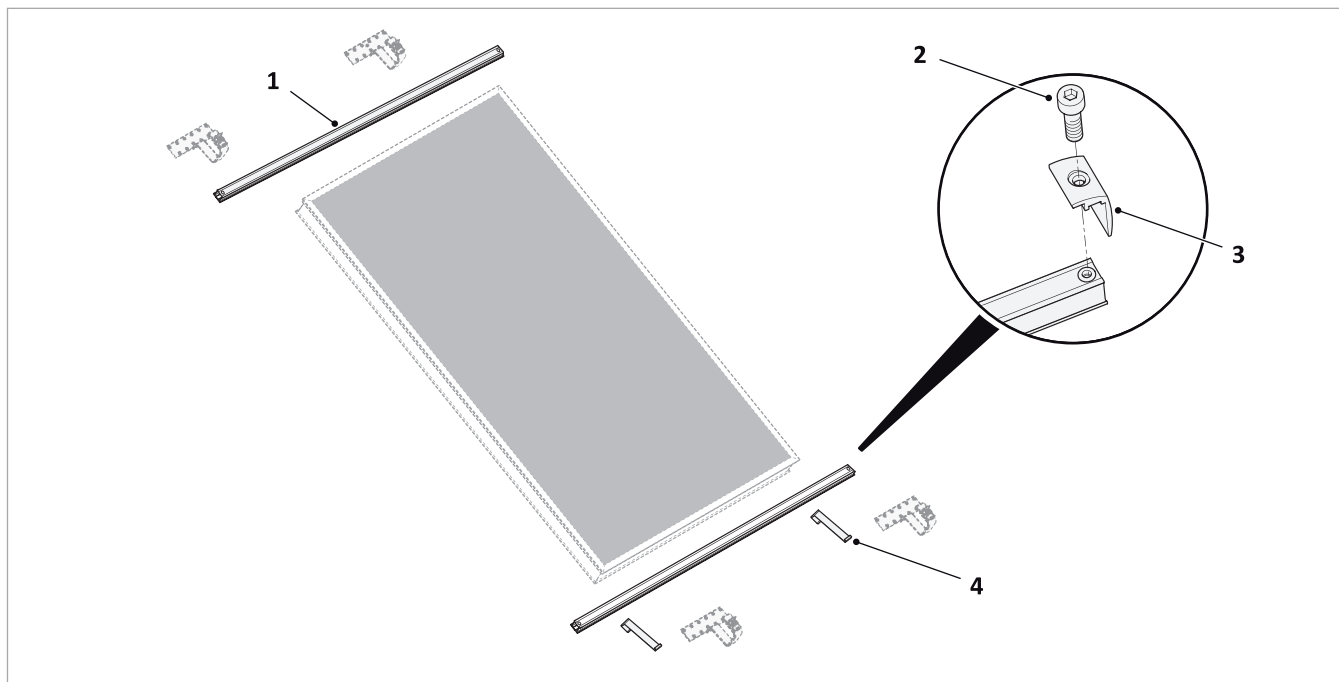


Fig. 15: Roof-mounted rail set (collector and roof-mount frame are not included in the scope of delivery)

- | | | | |
|---|-------------------------|---|------------------------|
| 1 | Holding rail | 3 | Edge clamp |
| 2 | Allen screw, M8 x 15 A2 | 4 | Fall protection device |

List of tools

- Allen key size 6, extended by at least 10 cm
- Ratchet with extension, 17 mm socket
- Wrenches: size 12, 13, 14, 15, 17 (2 x), 19, 21, 27
- Adjustable wrench, pipe wrench
- Pencil, felt tip pen or chalk
- Folding metre ruler, 10 m measuring tape
- Measuring cord, spirit level
- Rubber mallet, hammer
- Cable drum, protective goggles
- Cordless screwdriver and/or drill

The side edge area (**e**) applies for installation without elevation with a slope greater than or equal to 20°.

For roofs with a slope less than 30°, maintain a lower and upper edge area as well (**e'**).

Side edge area (**e**):

$$e = b \cdot 0,1$$

$$e = h \cdot 0,2$$

Lower/upper edge area (**e'**), if necessary:

$$e' = l \cdot 0,1$$

$$e' = h \cdot 0,2$$

When calculating the edge areas, the **smaller value** is to be used as the minimum size of the edge area (e and possibly e').

4.2 Structural Requirements

4.2.1 Edge and Corner Areas

Increased static loads occur at the edge area of the roof.



CAUTION

Danger of overloading the brackets

- Due to increased static load, the solar systems that do not fulfil special measures may not be extended out to the edge areas of the roof (EN 1991).
- If the solar system extends into the edge area, suitable measures for stabilising the system should be taken on-site.

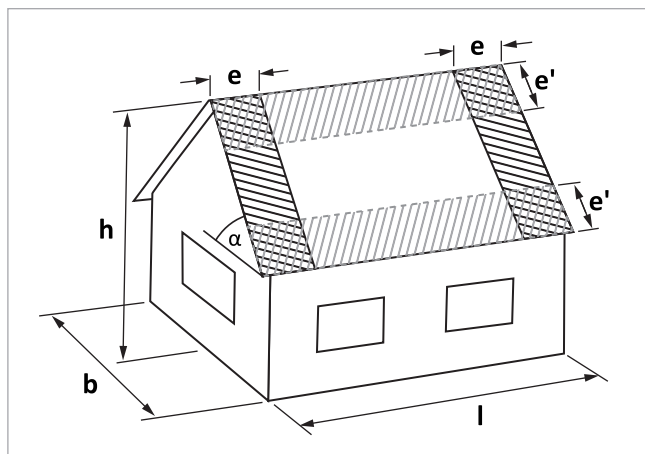


Fig. 16: Edge areas of the roof

- α Roof slope
- b Building width
- h Building height
- l Building length
- e Side edge area
- e' Lower/upper edge area

4.2.2 Structural Design

Maximum roof bracket spacings

Collector type	Designation	Maximum spacings $e_{\max}$ in [mm] for load class				
		A	B	C	D	E
1 x C-254	Number of roof brackets (pair)	2	2	2	3	3
	Roof bracket spacing	1168	1168	1168	584	584
2 x C254	Number of roof brackets (pair)	3	3	4	5	6
	Roof bracket spacing	1183	1183	789	592	473
3 x C-254	Number of roof brackets (pair)	4	5	6	7	9
	Roof bracket spacing	1188	891	713	594	446
4 x C-254	Number of roof brackets (pair)	5	6	8	9	11
	Roof bracket spacing	1190	952	680	595	476
5 x C254	Number of roof brackets (pair)	6	7	10	11	14
	Roof bracket spacing	1192	993	662	596	458

Additional holding rail



CAUTION

Do not exceed roof bracket spacing.

- An additional holding rail is necessary if the maximum roof bracket spacing is exceeded.
- If the required number of roof brackets cannot be divided onto rafters, you must use an additional holding rail.
- Mount the additional holding rail to the bottom third of the collectors.

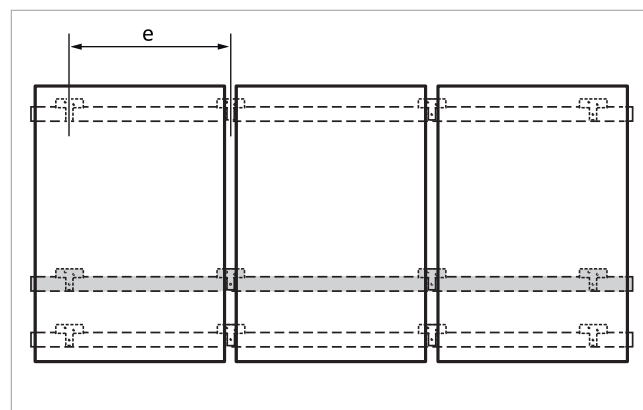


Fig. 17: Additional holding rail (horizontal installation)



Contact our Technical Sales department if you have any questions.

4.3 Installing Roof Brackets and Rails

4.3.1 Horizontal Roof-Mounted Installation

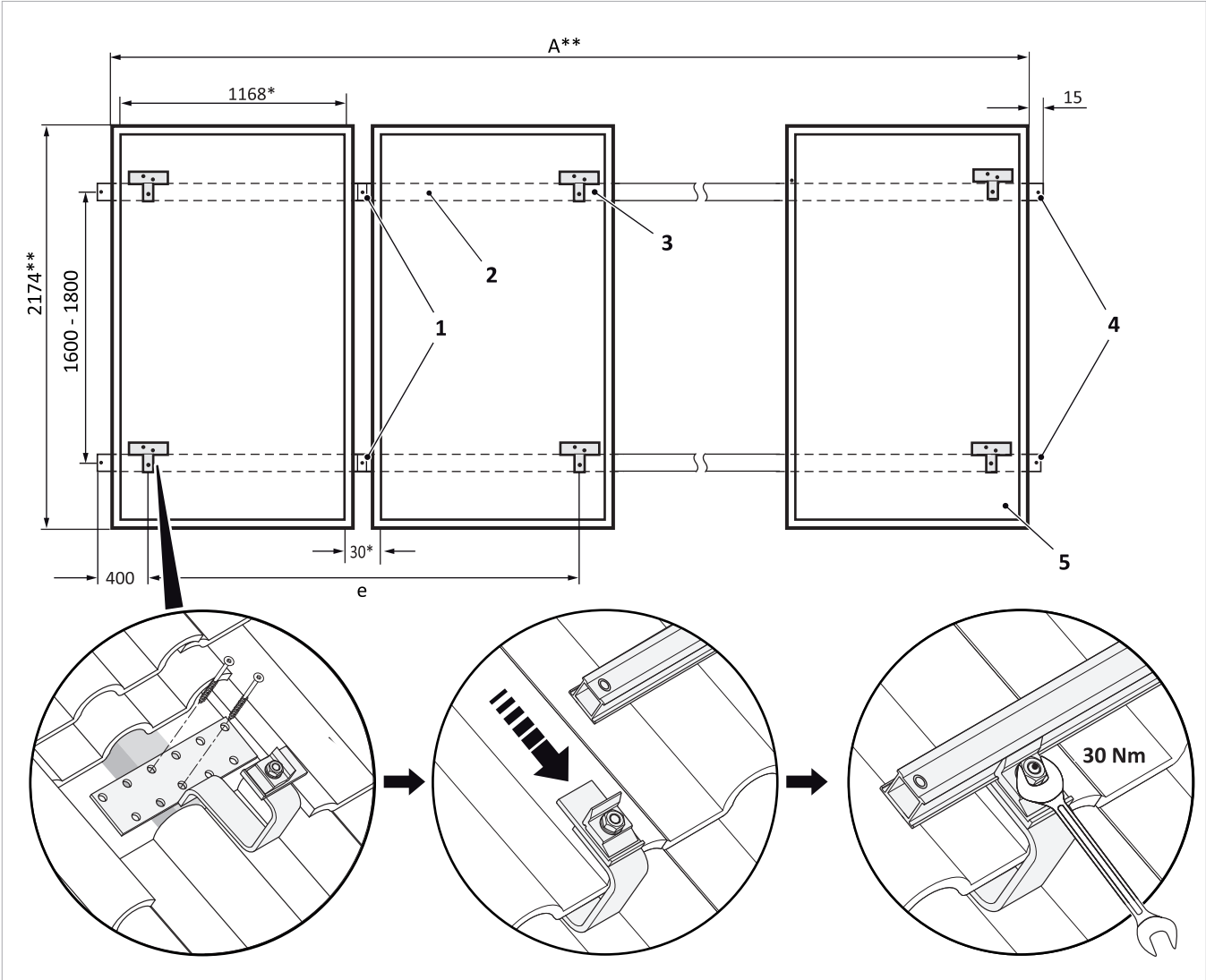


Fig. 18: Horizontal installation of the roof brackets and mounting rails.
The type of roof bracket varies depending on the roofing. Observe the installation instructions provided with the roof bracket.

- | | |
|--|----------------|
| * Dimension measured at the base (foot) of the collector | 3 Roof bracket |
| ** Dimension measured at the top (head) of the collector | 4 Edge clamp |
| 1 Central clamp | 5 collector |
| 2 Holding rail | |

Abbrevia- tion	Designation	Number of collectors				
		1	2	3	4	5
-	Total weight incl. holding rails	55 kg	95 kg	140 kg	185 kg	230 kg
A	Field width (head measurement)	1174	2378	3582	4786	5990
e	Roof bracket spacing					

All dimension specifications in mm

4.3.2 Vertical Roof-Mounted Installation

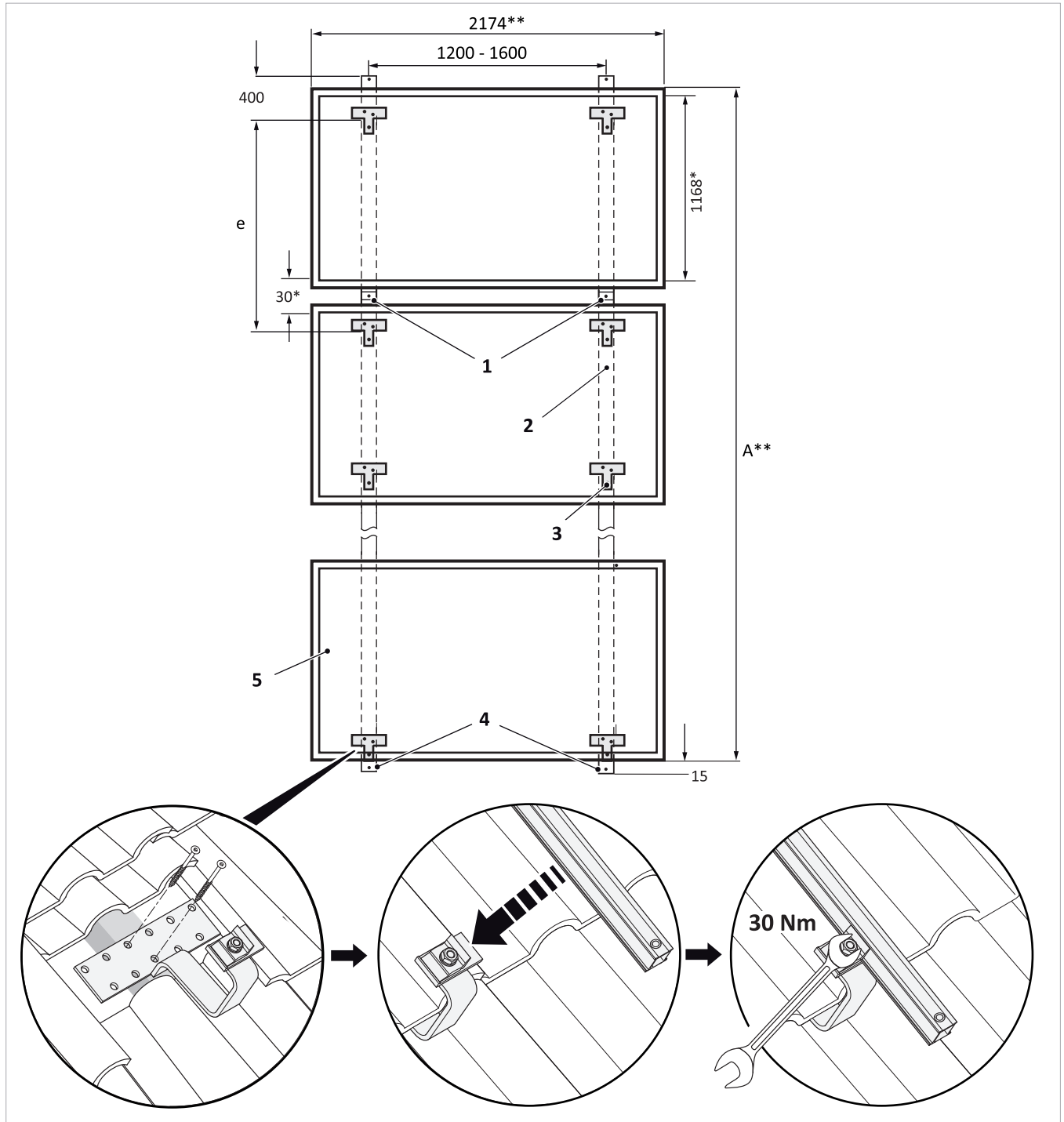


Fig. 19: Vertical installation of the roof brackets and mounting rails.
The type of roof bracket varies depending on the roofing. Observe the installation instructions provided with the roof bracket.

- | | | | |
|----|--|---|----------------------|
| * | Dimension measured at the base (foot) of the collector | 3 | Roof bracket |
| ** | Dimension measured at the top (head) of the collector | 4 | Edge clamp |
| 1 | Central clamp | 5 | SolvisCala collector |
| 2 | Holding rail | | |

Abbrevia- tion	Name	Number of collectors				
		1	2	3	4	5
–	Total weight incl. holding rails	55 kg	95 kg	140 kg	185 kg	230 kg
A	Field height (head measurement)	1174	2378	3582	4786	5990
e	Roof bracket spacing	see → Tab. "Maximum spacing between roof brackets", p. 17				

All dimension specifications in mm

4.4 Collector Installation



WARNING

Burn hazard when there is direct sunlight

Fluid that remains in the collector or steam released from the collector can cause scalding. Touching hot connections may cause burns.

- Perform work on the collectors only when the sun is not shining or when the collectors are covered.
- Remove the sun protection only after the (re-) commissioning of the solar plant.



DANGER

Collectors sliding during installation

Collectors could fall from the roof.

- Observe and adhere to the relevant safety requirements when performing roofing work.
- Secure off a large enough area below the roof so as to prevent persons from entering it.
- Secure the collectors from sliding off the roof during roof installation.



When carrying out vertical roof-mounted installation, use two fall protection devices per collector. They are included in the scope of delivery.

- A fall protection device is mounted to the holding rail on the outer edge of each collector, and is pushed in by about 200 mm.
- The fall protection device cannot be removed after the collectors are fastened and remains on the collector.



Fig. 20: Mounting the fall protection device (2 per collector)

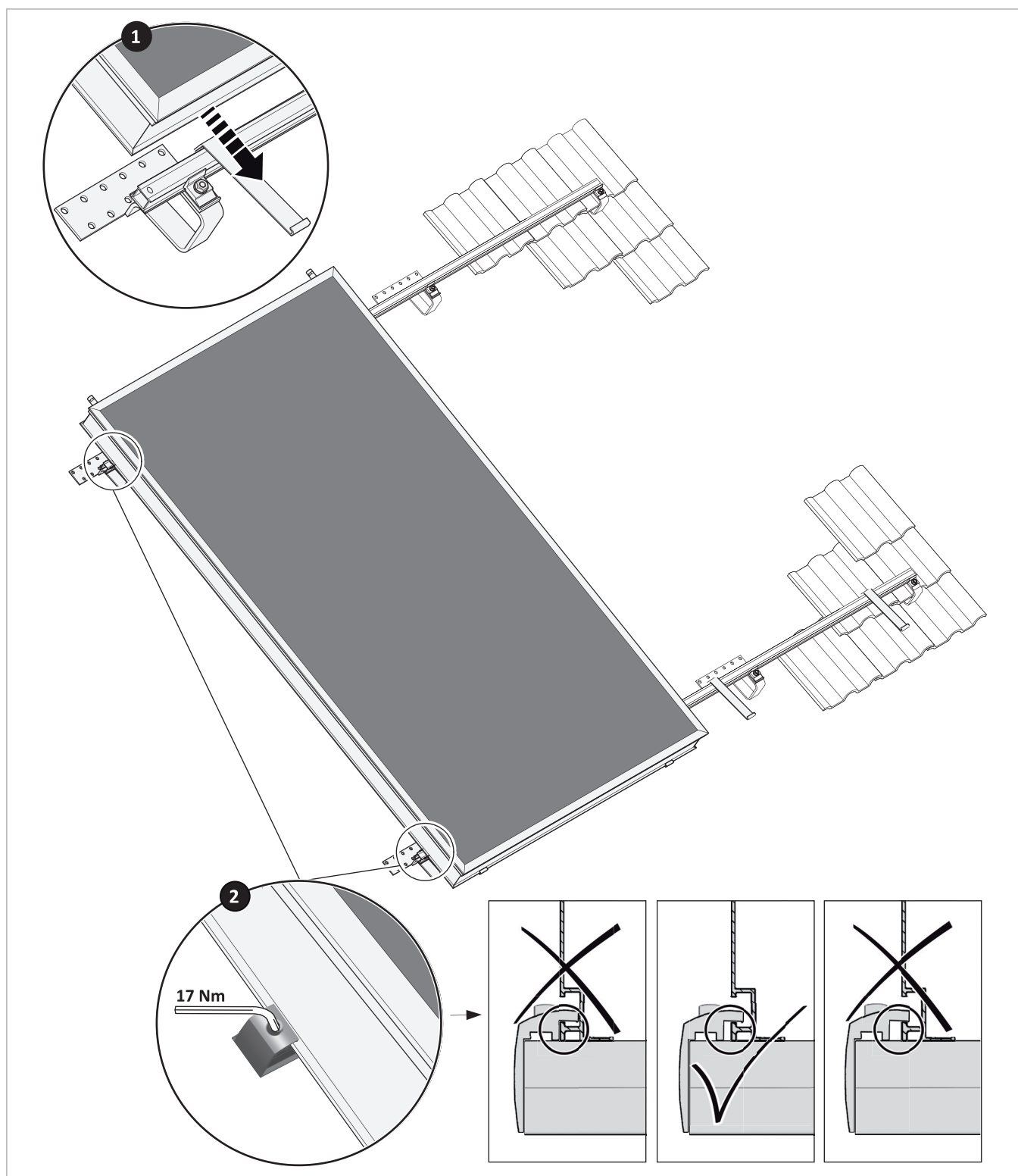


Fig. 21: Fastening a collector to the mounting rails

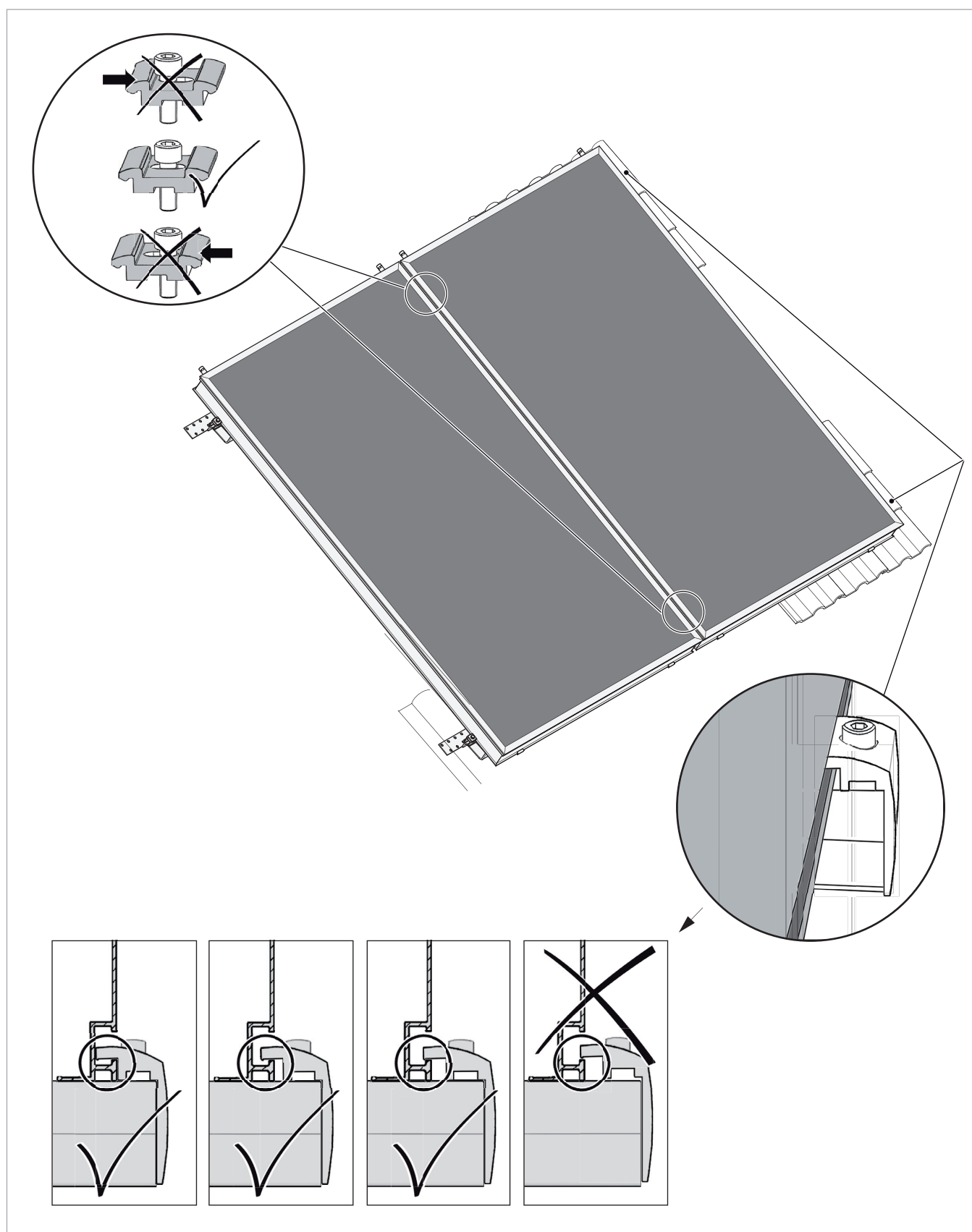


Fig. 22: Fastening the central and edge clamps

5 Flat-Roof or Wall-Mounted Installation

5.1 Scope of Delivery

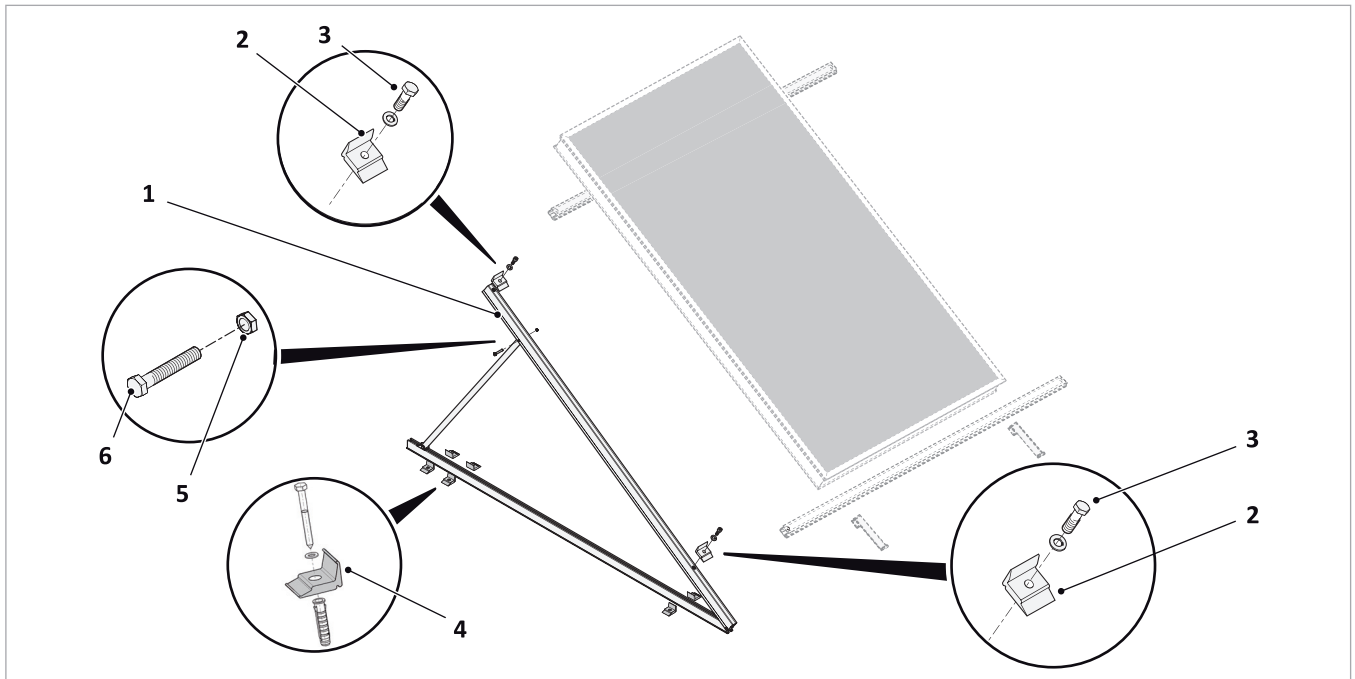


Fig. 23: Flat roof installation kit (collector and transverse rails are not included in the scope of delivery)

1	Flat roof holder	4	Clamping bracket (incl. concrete screw and wall plug)
2	Clamping bracket for holding rail	5	M8 nut with locking serration
3	Hexagon screw, M8 x 30 A2	6	Screw, M8 x 40 A2

List of tools

- Allen key size 6, extended by at least 10 cm
- Ratchet with extension, 17 mm socket
- Wrenches: size 12, 13, 14, 15, 17 (2 x), 19, 21, 27
- Adjustable wrench, pipe wrench, nipper pliers
- Pencil, felt tip pen or chalk
- Folding metre ruler, 10 m measuring tape
- Measuring cord, spirit level
- Rubber mallet, hammer
- Cable drum, protective goggles
- Cordless screwdriver and/or drill

5.2 Structural Requirements

5.2.1 Edge and Corner Areas

Increased static loads occur at the edge area of the roof.



CAUTION

Observe the minimum edge spacing

- On flat roofs, all superstructures should maintain a minimum spacing of 1 m to the edge of the roof.

5.2.2 Structural Design



Contact our Technical Sales department if you have any questions.

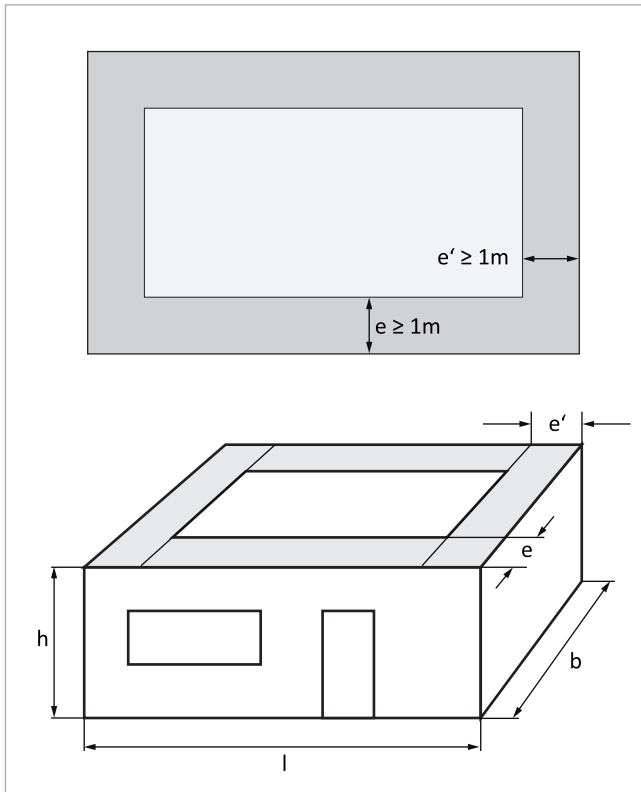


Fig. 24: Minimum spacing to edge of building

5.3 Installation with Weights

Load distribution

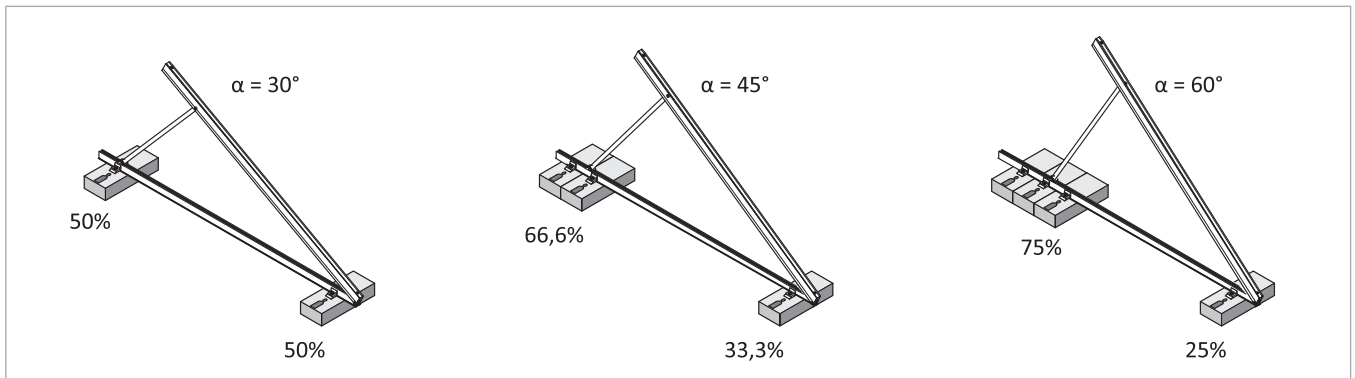


Fig. 25: Load distribution at slope angle $\alpha = 30^\circ / 45^\circ / 60^\circ$



CAUTION

Hazard due to overloading the building

- As the system (solar module + holder + weights) has a significant weight load, always check the structural calculations for the building bearing the load before beginning installation.

Loads

The loads can be made from any material. It is important that they remain resistant to any type of wind load that may occur for the duration of the collectors' lifespan. Higher loads are required for gravel loading. For more information please refer to the Technical Sales (tel. see → Kap. „Information About These Instructions“, p. 2).

Example for load distribution

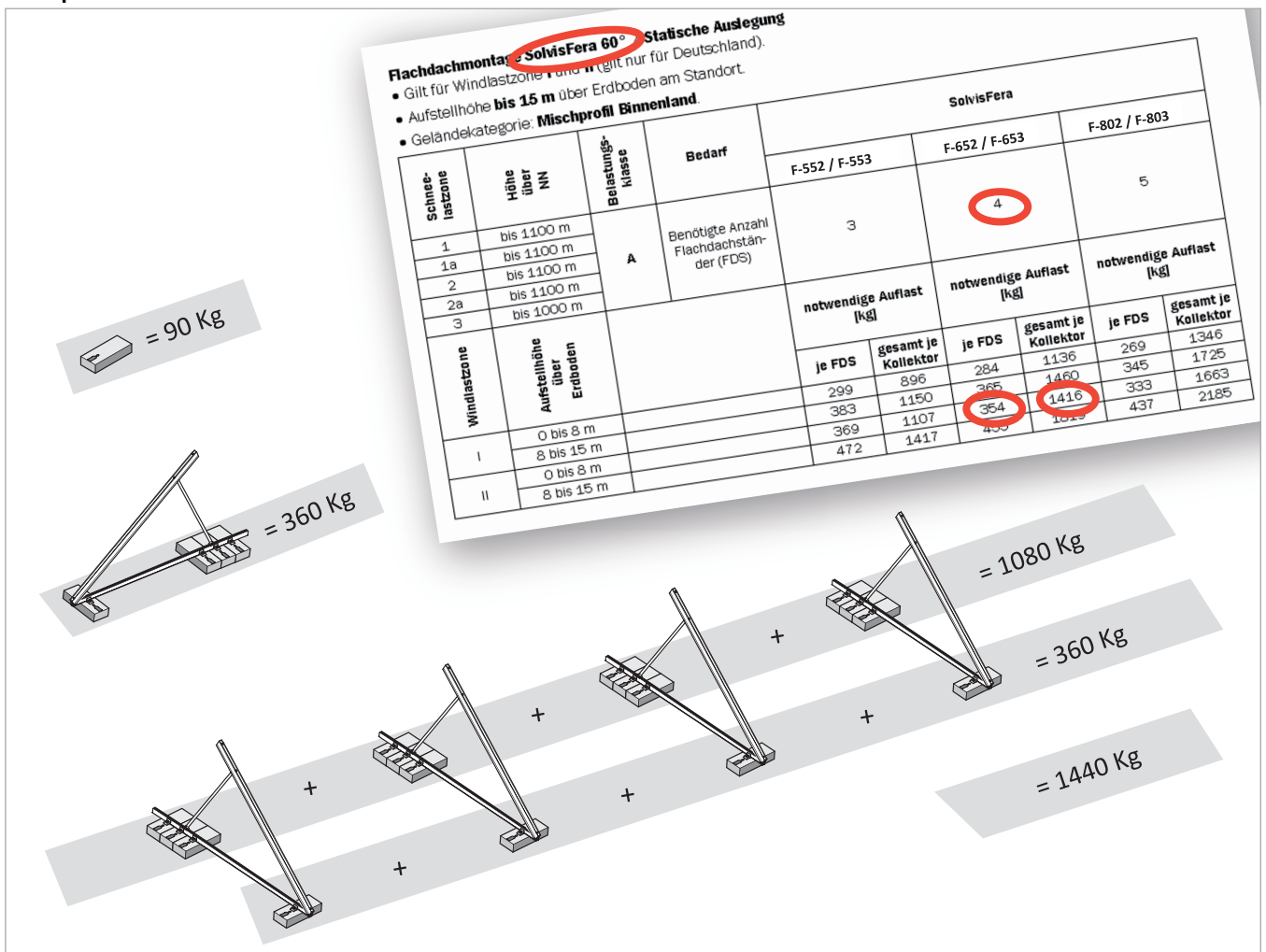


Fig. 26: Example for load distribution

5.4 Placement

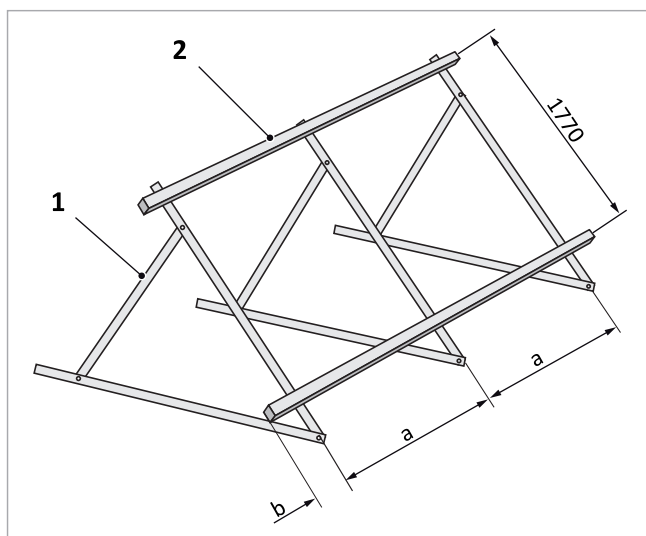


Fig. 27: Flat roof holder clearances

- 1 Flat roof holder
- 2 Holding rail
- a Holder spacing, see → Tab. „Abstand a zwischen den Flachdachständern (± 50 mm)“, S. 26
- b Collector overhang = $a/2$

Number of required flat roof holders and spacing

Designation	Number of collectors			
	2 x	3 x	4 x	5 x
Number of flat roof holders (load class A)	3	4	5	6
Holder spacing (a) ± 50 [mm]	799	899	958	998
Collector overhang (b) ± 50 [mm]	399	449	479	499

Number of flat roof holders (load class B)	3	5	6	8
Holder spacing (a) ± 50 [mm]	799	719	799	749
Collector overhang (b) ± 50 [mm]	399	359	399	374

Number of flat roof holders (load class C)	4	6	8	10
Holder spacing (a) ± 50 [mm]	599	599	599	599
Collector overhang (b) ± 50 [mm]	300	300	300	300

Determining the installation angle

Installation angle (= slope angle) α °	Installation angle setting	
	C in mm	Shortening size for S in mm ¹⁾
25	311	690
30	89	420
35	400	420
40	603	420
45	112	-
50	383	-
55	707	-
60	1075	-

¹⁾ At an installation angle smaller or equal than 40°, it is necessary to shorten the support rail S by the measurement specified.

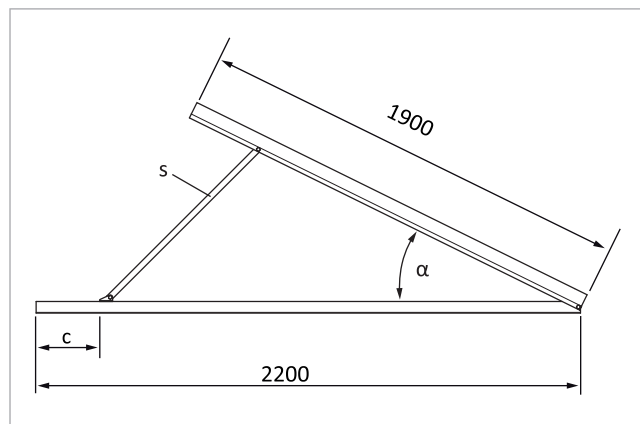


Fig. 28: Flat roof holder, dimensions and installation angle

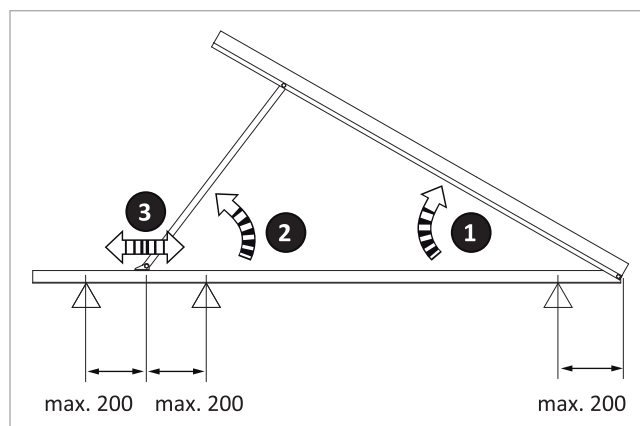


Fig. 29: Setting up the flat roof holder

5.4.1 Low Slope Surfaces

Low slope surfaces present special cases in terms of setting up flat roof holders.



Contact our Technical Sales department if you have any questions.

If the collectors are to be installed on low slope surfaces (roof slope angle in relation to horizontal = γ) using flat roof holders, a flat roof holder installation angle (= β) of a maximum of 20° is permitted. The overall slope of the collector α in relation to horizontal may not exceed 60°.

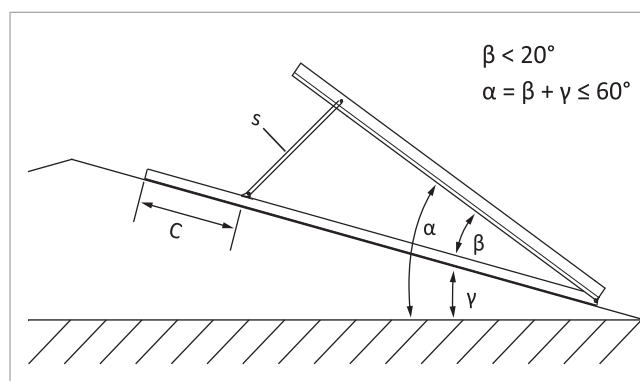


Fig. 30: Angle on low slope surfaces

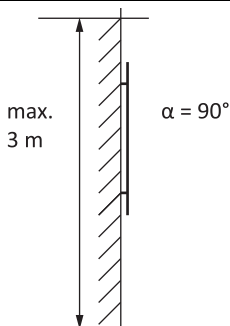
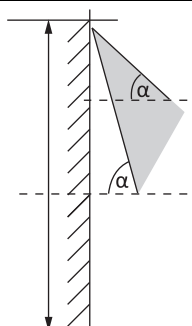
Determining the installation angle - special case

Installation angle β°	Installation angle setting	
	C in mm	Shortening size for S in mm ¹⁾
10	9	900
15	158	900
20	46	690

¹⁾ At an installation angle smaller or equal than 20°, it is necessary to shorten the support rail S by the measurement specified. After shortening the support rail, drill an 8 mm hole in the support rail (in the same position as the original hole).

5.5 Wall-Mounted Installation

Installation variants

Solvis collectors	
Wall-mounted	
For heights up to 3 m $\alpha = 90^\circ$	All heights $75^\circ > \alpha > 45^\circ$
	

For wall-mounted installation up to a slope angle of 74°, flat roof holders are screwed on to customer-provided substructures or are fastened directly to the wall with wall plugs (provided the wall has sufficient load-bearing capacity). For this, holes are drilled in the centre of the bottom rail.

For thermally insulated façades, make sure that the foundation has sufficient compressive strength. Appropriate fixing materials can be purchased from producers of thermal insulation systems.

The fixing material you choose (wall plugs, etc.) must meet static requirements and be suitable for the on-site brick-work.

Minimum pull-out loads of the wall plugs

Applies for directly fastening the flat roof holders to the wall:

- 2 kN for buildings up to 8 m tall
- 3 kN for buildings between 8 and 20 m tall

If these values cannot be reached, then more attachment points must be sought. For example, a customer-provided substructure of horizontal rails to which the flat roof holders are screw-fastened.



The construction party is responsible for providing on-site support structures.

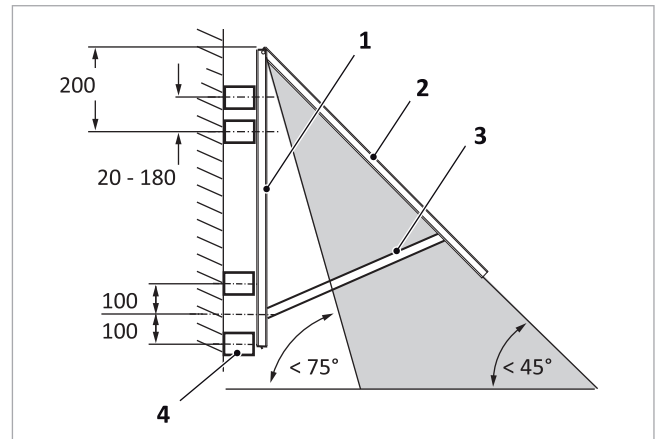


Fig. 31: Assembly of the holders on the wall

- α Slope angle
- 1 Bottom rail
- 2 Bearing rail
- 3 Support rail
- 4 On-site connection according to construction and static specifications (installation example)

Where possible, install the collector at an angle to the wall. Use the holders described in the installation instructions for this.

For angles larger than 60° (e.g. vertical installation on the wall), fit the top of the collectors on-site with a cover plate. During heavy rainfall, water could otherwise get into the collector via the ventilation holes. Metal flashing should also be secured against effects of the wind.

An additional cover plate is not necessary if the roof offers sufficient protection.

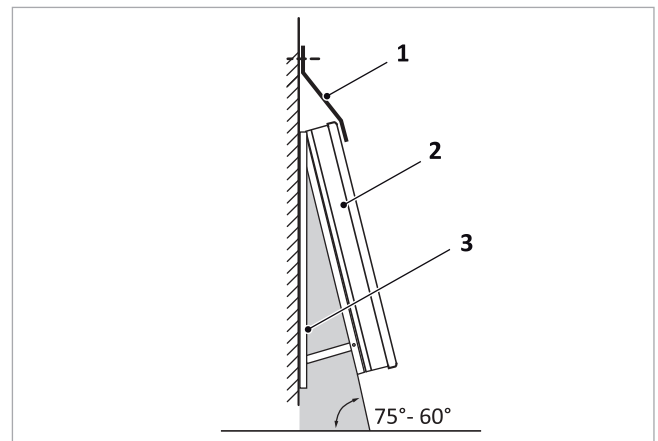


Fig. 32: Collector with cover plate

- 1 Cover plate (on-site)
- 2 Collector
- 3 Flat roof holder

5.6 Flat Roof Holder Installation

5.6.1 Steel Girders

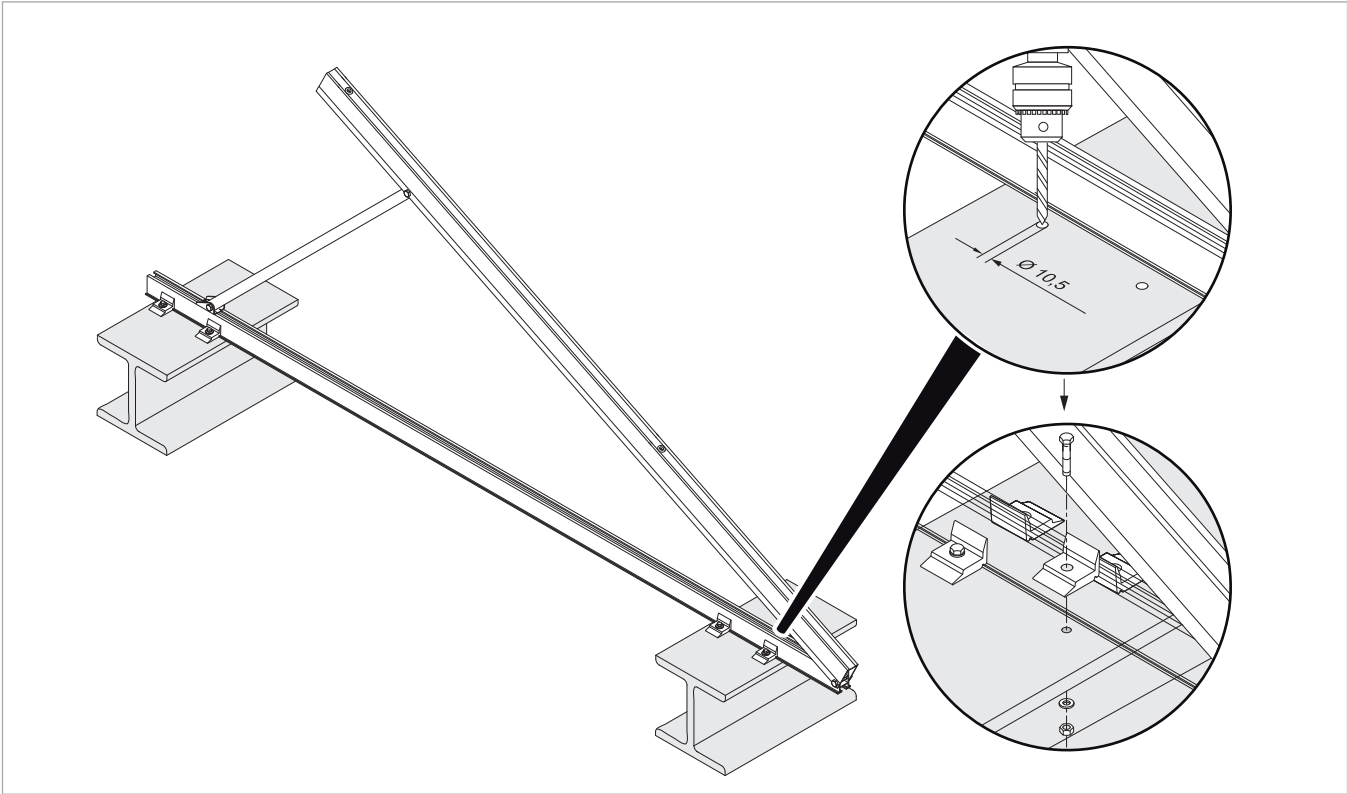


Fig. 33: Flat roof holder installation on steel girders

5.6.2 Steel girder (self-tapping)

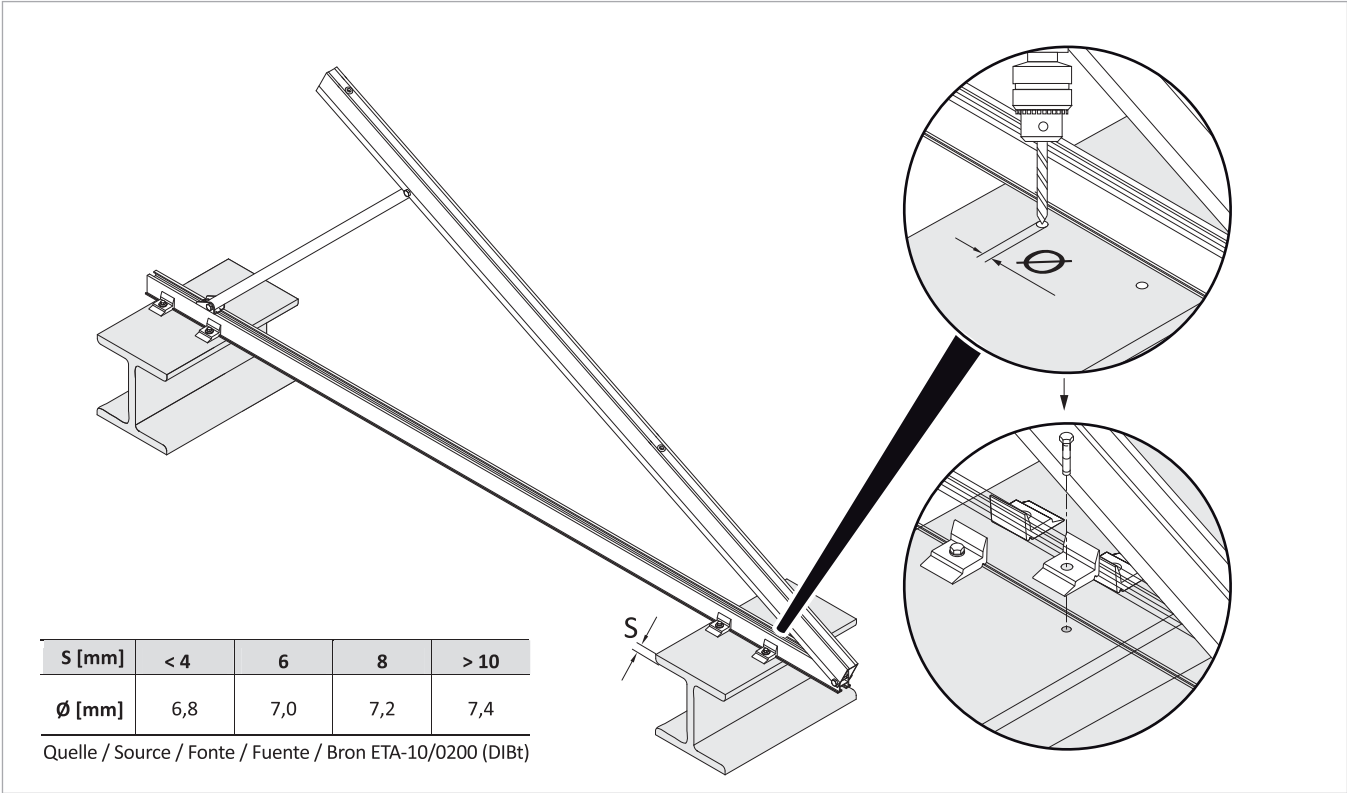


Fig. 34: Installation of the flat roof holder on a steel girder with self-tapping screws (flat roof holder set MUK)

5.6.3 Concrete Blocks

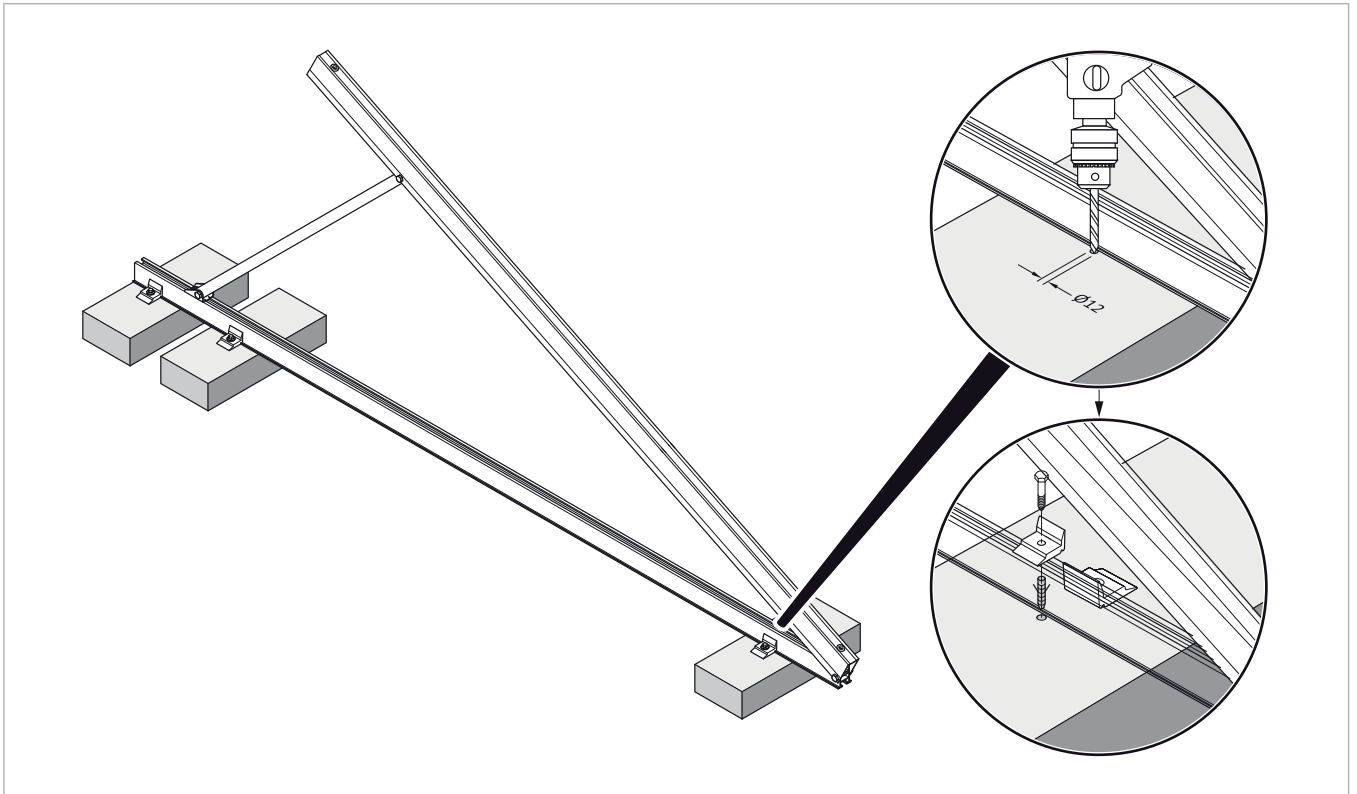


Fig. 35: Flat roof holder installation on concrete blocks

5.6.4 Roof-mount frame ADH-U

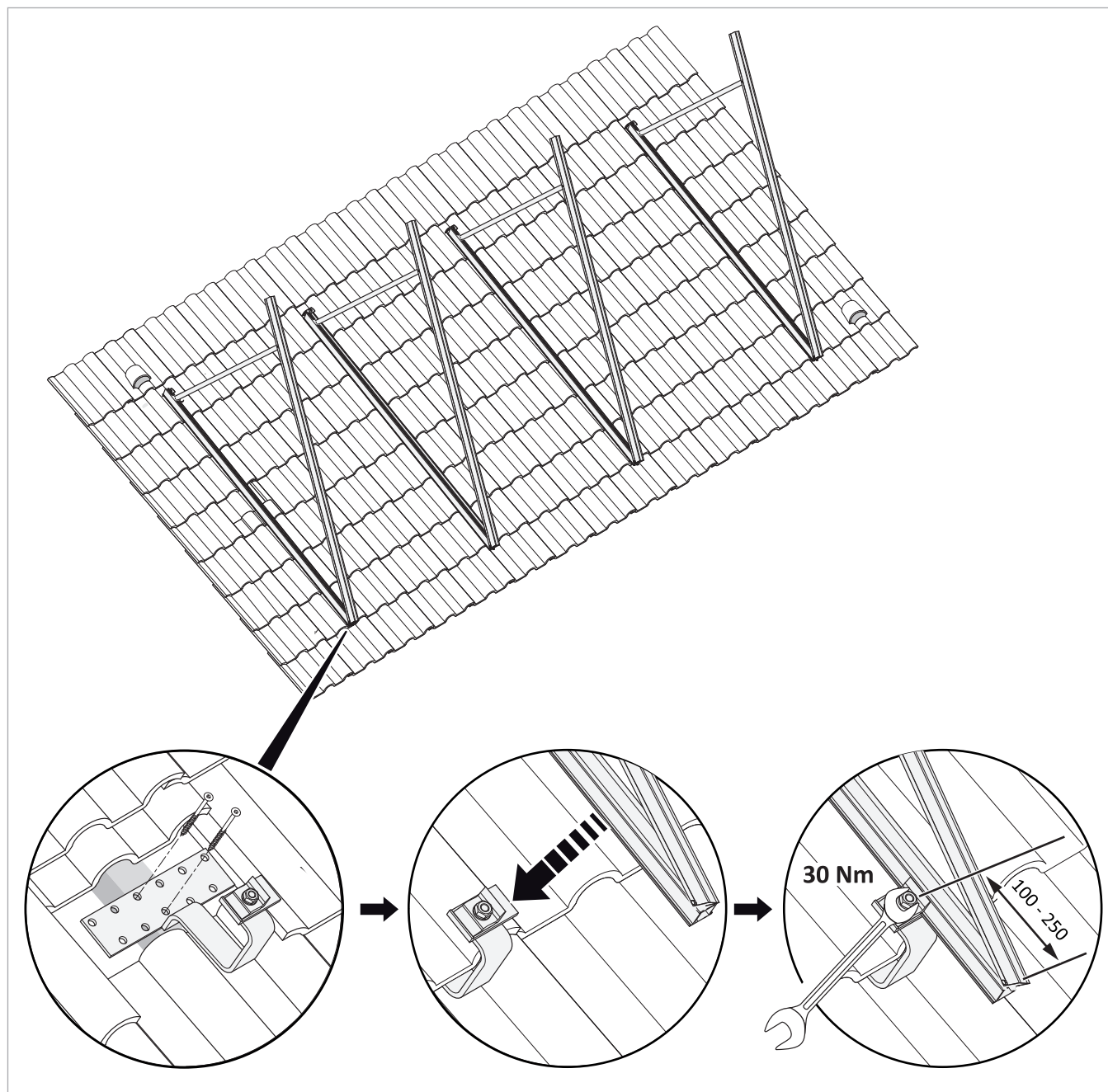


Fig. 36: Installation of the flat roof holder on a roof-mount frame ADH-U

5.6.5 Trapezoidal Sheet Metal

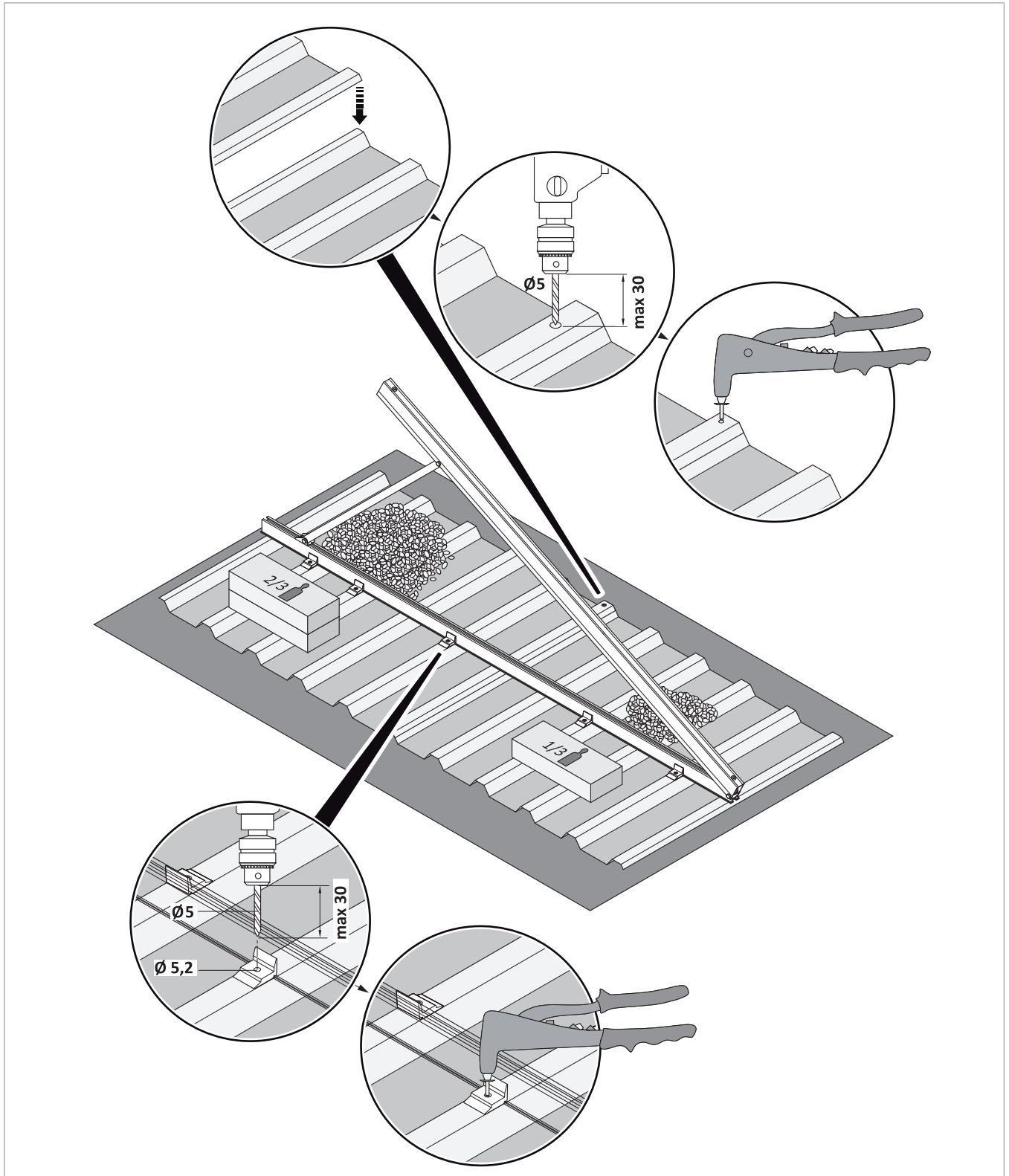


Fig. 37: Flat roof holder installation on trapezoidal sheet metal



CAUTION

Be careful when drilling the roofing
Possible building damage due to moisture

- Drill carefully
- Place a protective layer underneath

5.7 Collector Installation

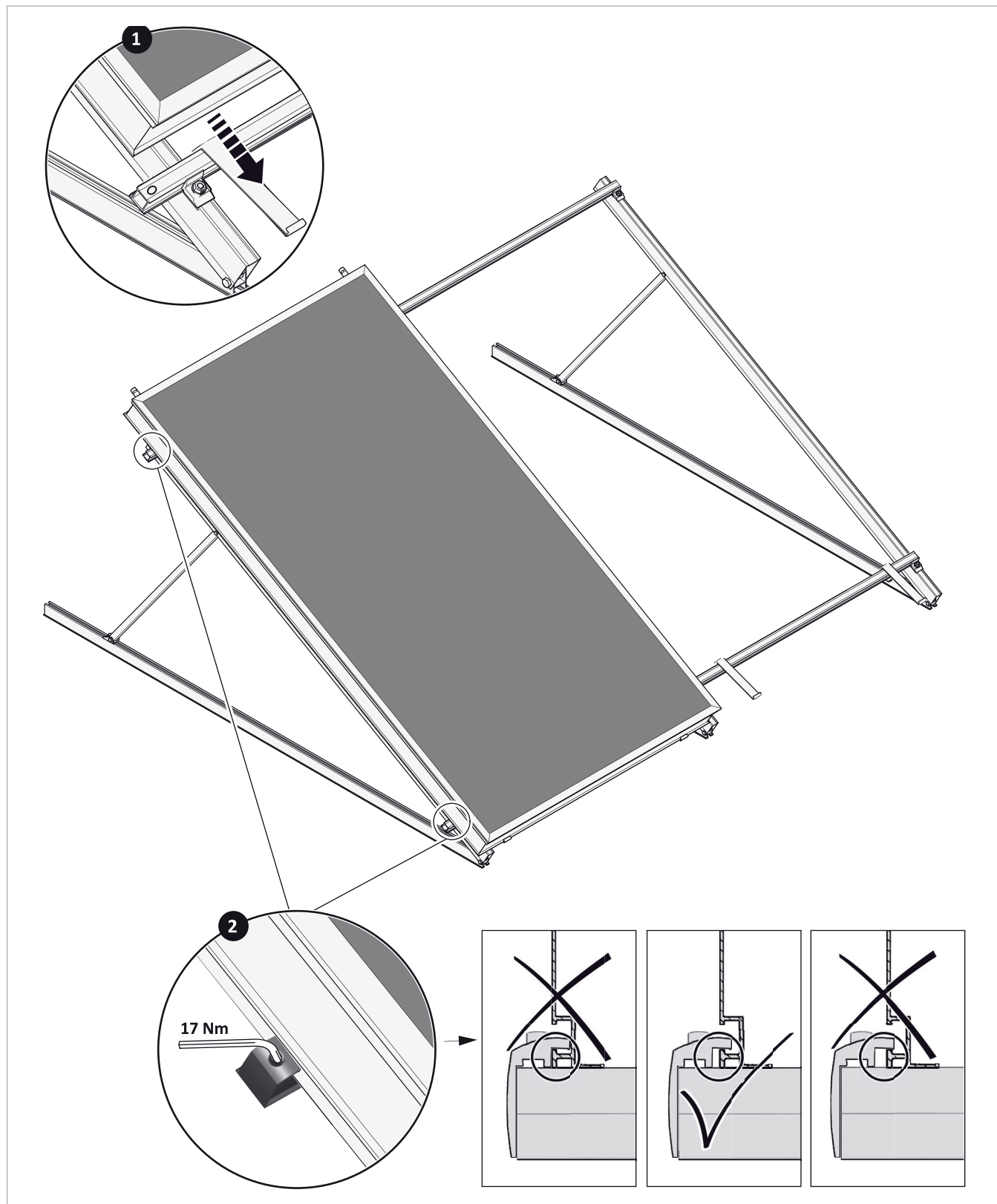


Fig. 38: Fastening a collector to flat roof holders

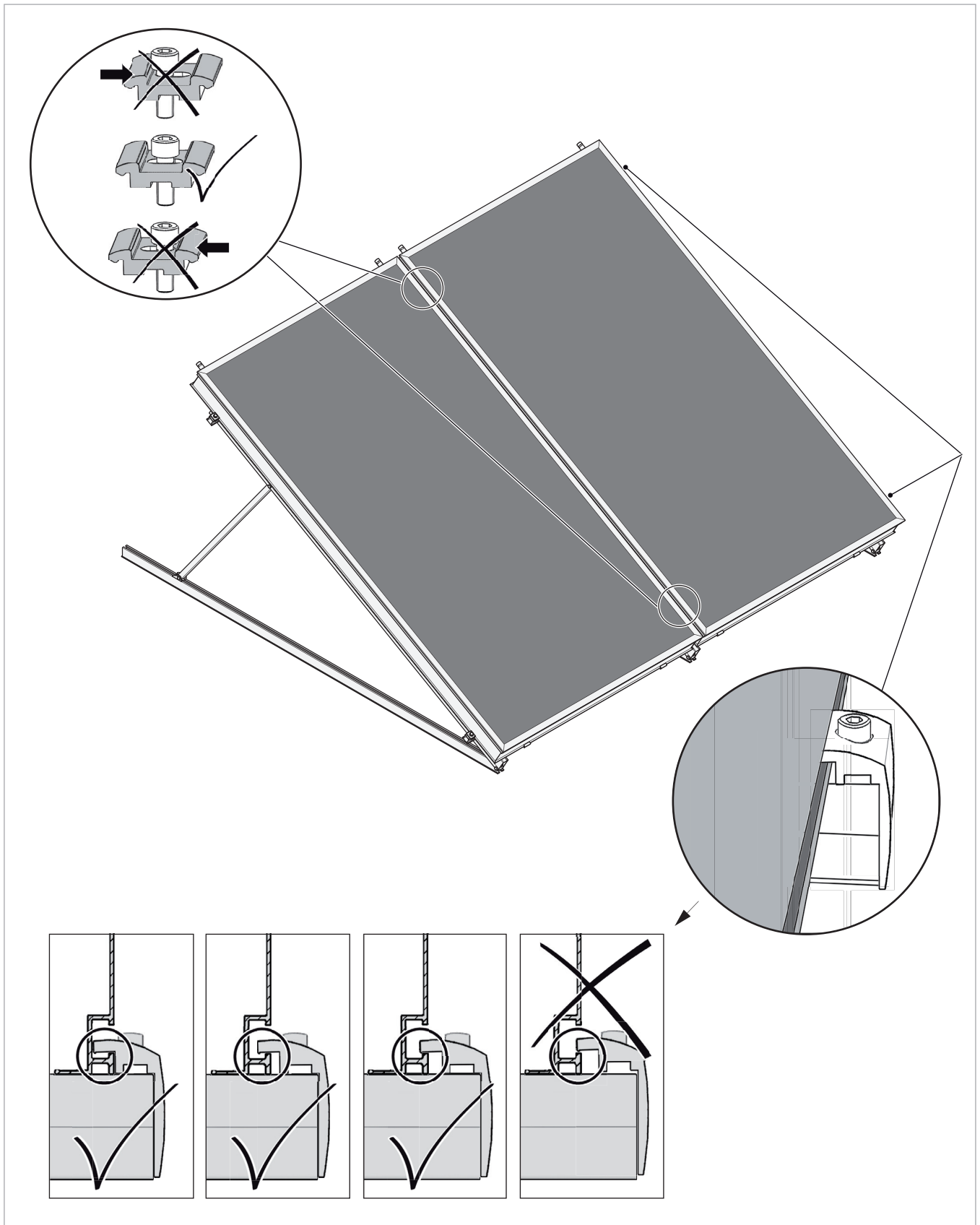


Fig. 39: Fastening the central and edge clamps

6 In-Roof Mounted Installation

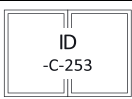
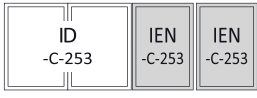
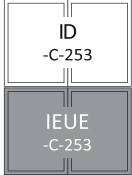
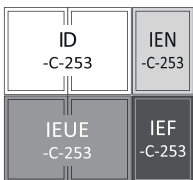
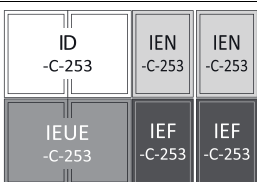
6.1 Scope of Delivery

For in-roof installation (possible only with C-254-AR), collectors are installed vertically (upright) in the roof using installation frames. A minimum of two collectors have to be installed horizontally. Installation is possible from roof slopes of 22°. The collector connections are to be positioned at the top for a single row or in the middle for two rows.

Various installation kits are required depending on the number and the position of the collectors:

- In-roof installation kit for two collectors (MS-ID-C-253)
- expansion kits depending on the collector field (MS-IEN-C-253, MS-IEUE-C-253, MS-IEF-C-253)

In-roof installation kits required for standard contour tiles

Description	Number and position	ID	IEN	IEUE	IEF
2 collectors, horizontal installation		1	–	–	–
3 collectors, horizontal installation		1	1	–	–
4 collectors, horizontal installation		1	2	–	–
5 collectors, horizontal installation		1	3	–	–
2 collectors, horizontal installation and 2 collectors, vertical installation		1	–	1	–
3 collectors, horizontal installation and 2 collectors, vertical installation		1	1	1	1
4 collectors, horizontal installation and 2 collectors, vertical installation		1	2	1	2

List of tools

- Wrenches: size 12, 14, 15, 17, 19, 20, 21, 24, 27
- Adjustable wrench, pipe wrench
- Pencil, felt tip pen or chalk
- Folding metre ruler, 10 m measuring tape
- Measuring cord, spirit level
- Rubber mallet, hammer
- Cable drum, protective goggles
- Cordless screwdriver and/or drill

- Angle grinder with stone disk (dry cut diamond), if you need to cut tiles
- Bit Torx 25 and 3 mm diam. metal drill
- Tenon saw for wood
- Cutter
- Tool box (bin/bucket) with roof hook

6.2 Structural Requirements

6.2.1 Roof Construction

The In-roof mounting kit, designed for roof tiles, is suitable for roof slopes greater than 22°.

Requirements for the roof

- Materials underneath the collector (sarking membrane and/or insulation) must be able to withstand temperatures up to 120°C.
- The roof must be equipped with a sarking membrane. It must be spatially (min. 10 mm) and thermally separated from the rear of the collector.
- If the area of the roof on which the collectors are to be installed is uneven, this area (batten height) must be evened out using wedges (or additional battens with Jamo screws), so that the plates can be installed flat without any abrupt vertical or horizontal offset.

6.2.2 Edge and Corner Areas

Increased static loads occur at the edge area of the roof.



CAUTION

Danger of overloading the brackets

- Due to increased static load, the solar systems that do not fulfil special measures may not be extended out to the edge areas of the roof (EN 1991).
- If the solar system extends into the edge area, suitable measures for stabilising the system should be taken on-site.

The side edge area (e) applies for installation without elevation with a slope greater than or equal to 20°.

For roofs with a slope less than 30°, maintain a lower and upper edge area as well (e').

Side edge area (e):

$$e = b \cdot 0,1$$

$$e = h \cdot 0,2$$

Lower/upper edge area (e'), if necessary:

$$e' = l \cdot 0,1$$

$$e' = h \cdot 0,2$$

When calculating the edge areas, the **smaller value** is to be used as the minimum size of the edge area (e and possibly e').

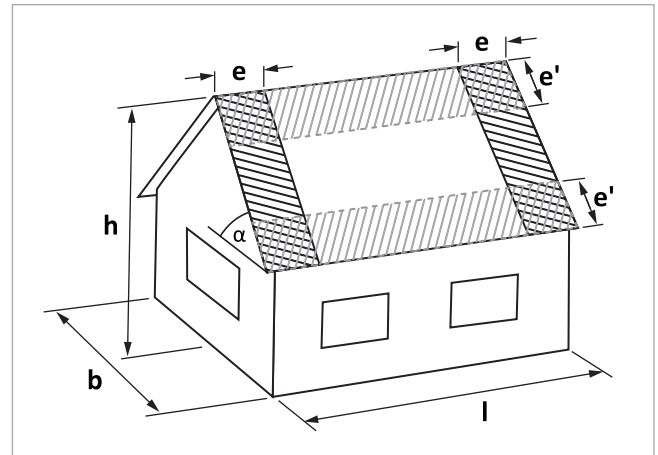


Fig. 40: Edge areas of the roof

α	Roof slope
b	Building width
h	Building height
l	Building length
e	Side edge area
e'	Lower/upper edge area

6.2.3 Snow and Wind Loads

Prerequisites

The following specifications apply to an overall load of snow and wind. Maintain the following conditions:

- Collectors may be installed on buildings no taller than 20 m.
- At the installation site the wind speeds must be lower than 130 km/h.
- The roof slope must conform to the values listed in the table → "Minimum roof slope".
- The roof substructure (statics) must be in perfect condition.
- Snow can slide off the roof unhindered (no snow guards, dormer windows or similar fixtures underneath the collectors).
- The roof surface does not have any height differences greater than 0.3 m.
- The roof surface must not be shaped in a way that allows piling up of snow.

Solvis cannot guarantee the product if any of the specified requirements are not fulfilled. Contact our Technical Sales department to determine if special measures can enable installation.

The snow load zone must first be identified to determine the design specifications, see → section "Snow and Wind Load Zones", p. 59.

Minimum roof slope depending on snow load zone and terrain height

The table shows the minimum roof slope according to the applicable standard DIN EN 1991.

6 In-Roof Mounted Installation

Ground elevation above sea level [m]	Minimum roof slope in [°] for snow load zone				
	1	1a	2	2a	3
< 300	> 22	> 22	> 22	> 22	> 22
< 400	> 22	> 22	> 22	> 22	> 35
< 500	> 22	> 22	> 22	> 38	> 42
< 600	> 22	> 22	> 40	> 44	> 47
< 700	> 22	> 22	> 44	> 48	> 51
< 800	> 22	> 39	> 48	> 51	> 53
< 900	> 38	> 43	> 51	> 53	> 55
< 1000	> 42	> 46	> 52	> 55	> 56
< 1100	> 45	> 49	> 54	> 56	> 57
< 1200	> 47	> 51	> 56	> 57	> 58
< 1300	> 50	> 52	> 57	> 58	> 59
> 1300	On request				

In-roof installation is permissible in the shaded zones only if the installation frame is additionally reinforced (technical sales, telephone number see ➔ section "Information About These Instructions", p. 2).

6.2.4 Dimensions and weight

Preparing installation

1. Measure the space needed for the entire system on the roof and mark the corners with chalk. Make sure to take the edge areas of the roof into account.

Dimensions and weight

Designation	Head measurement	Foot measurement
Collector length	2176	2168
Collector width	1176	1168
Collector weight	38 kg	
Field width	$n \times 1168 + (n-1) \times 30 + 240$	
Field height	$n \times 2168 + (n-1) \times 180 + 660$	

n = Number of collectors over width and height

• Vertical alignment

The position of the collector field is determined by the lower lead apron plates. These plates must be carefully aligned and positioned. The position of the individual collectors is determined by the components.

• Horizontal alignment

If possible, the collector system should be positioned so

that it can be connected to the tiles on the sides without having to adjust the tiles themselves.



For systems with multiple rows of collectors, vertically mounted collectors must be aligned in a single vertical line. For this reason, the first collector in each new row must be aligned carefully.



CAUTION

Always pay attention to the gradient

Otherwise, risk of building damage due to moisture.

- Top flashings and lead apron plates must always have an incline (in relation to horizontal)
- So that rain water cannot flow under the roofing and into the collectors

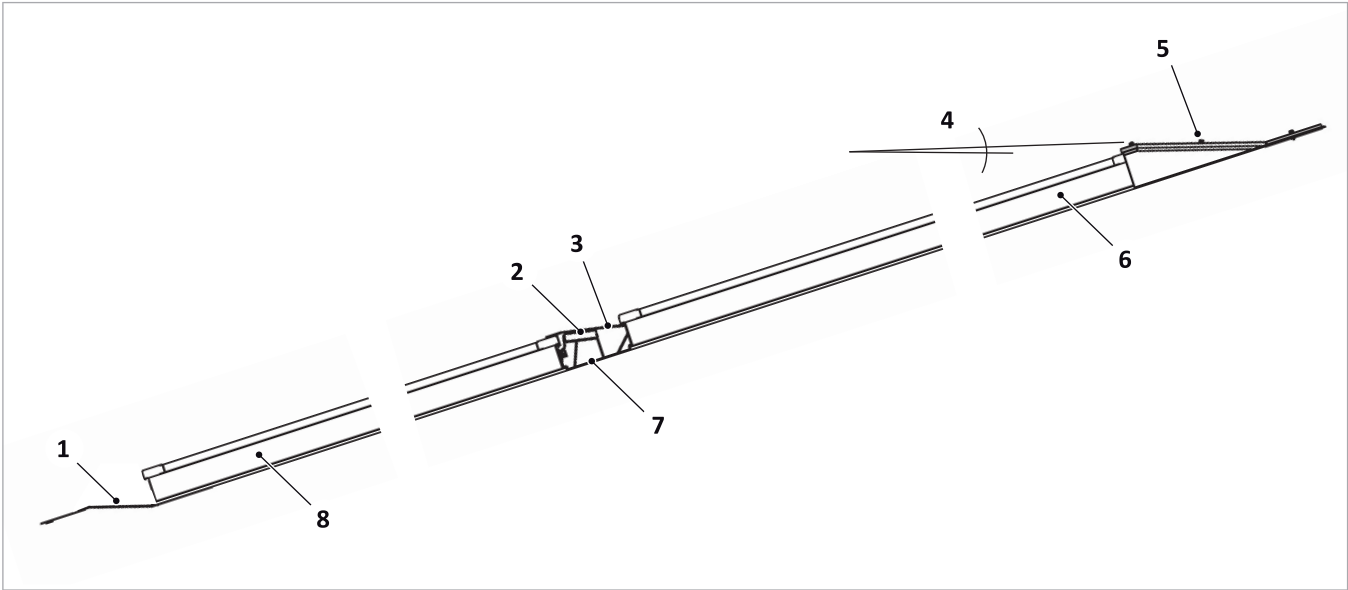


Fig. 41: Cross section of collector field with two rows

- | | | | |
|---|-------------------------------|---|------------------|
| 1 | Lead apron | 5 | Top flashing |
| 2 | Intermediate flashing support | 6 | Upper collector |
| 3 | Intermediate flashing | 7 | Collector spacer |
| 4 | Incline to collector | 8 | Lower collector |

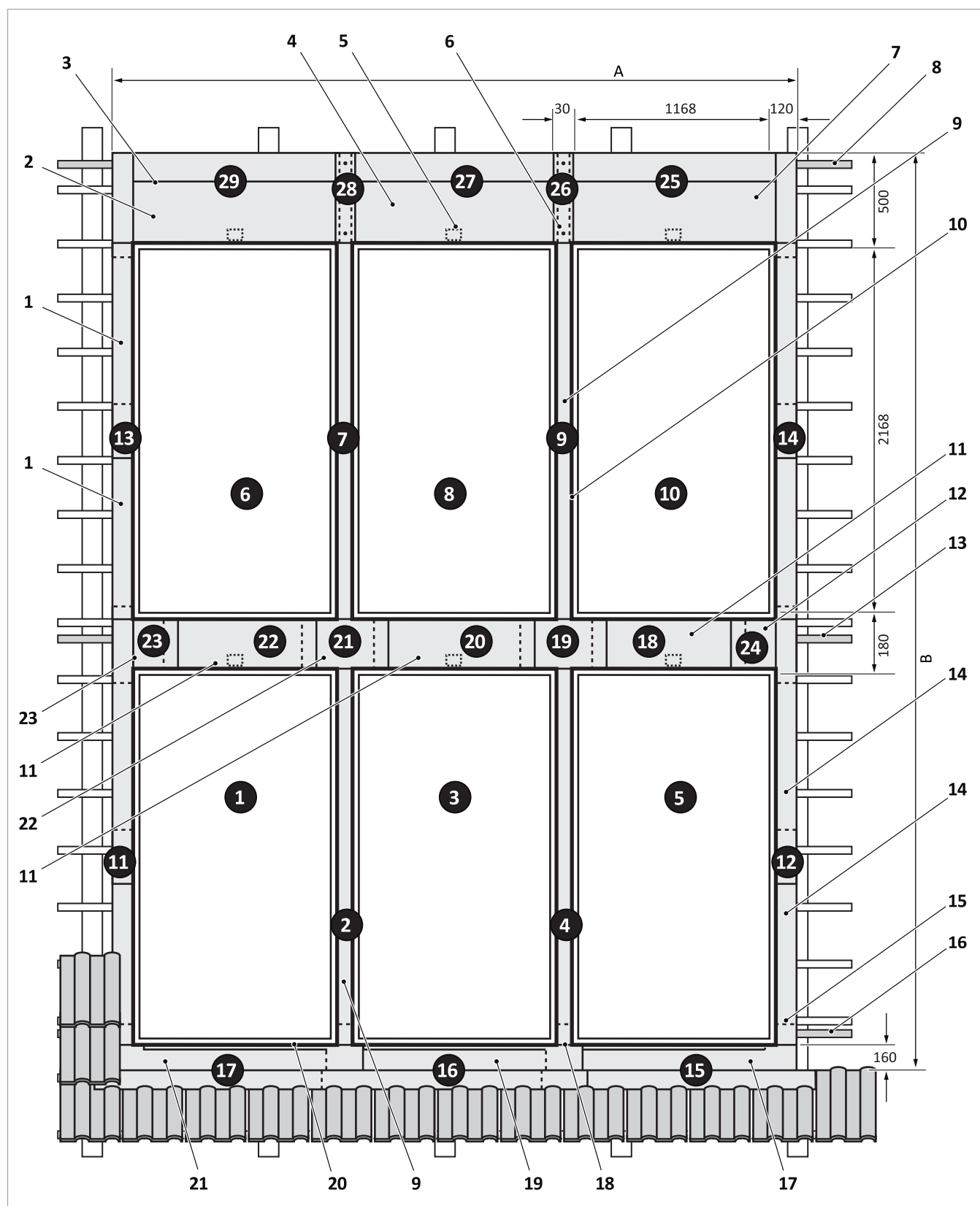


Fig. 42: Dimensions of an in-roof collector field with six SolvisCala collectors (dimensions in mm, collector dimensions are measured at the base (foot))

1 – 29 Installation sequence

- 1 Left side part
- 2 Left top flashing with corner
- 3 Bend in top flashing
- 4 Central top flashing
- 5 Mounting bracket
- 6 Top flashing connector
- 7 Right top flashing with corner
- 8 If necessary, additional battens ³⁾
- 9 Vertical central part
- 10 Collector frame
- 11 Intermediate flashing
- 12 Right intermediate flashing corner
- 13 If necessary, additional battens ²⁾
- 14 Right side part
- 15 Alignment line*
- 16 If necessary, additional battens ¹⁾
- 17 Right lead apron
- 18 Cover plate connector
- 19 Central lead apron
- 20 Cover plate

- 21 Left lead apron
- 22 Intermediate flashing junction
- 23 Left intermediate flashing corner

* The alignment line for the upper edge of the lead apron plates is at a distance of 340 mm (measured from the upper edge of the lower row of tiles).

To support the cover plate, there must be battens in the following positions (install additional battens if necessary):

- ¹⁾ In the area between 180 and 320 mm, measured from the upper edge of the lower row of tiles
- ²⁾ At a distance of 145 mm (central line of batten), measured from the collector foot of the lower collectors
- ³⁾ In the area between 480 and 550 mm, measured from the collector foot of the upper collectors.

6.3 Collector Installation



CAUTION

Risk of corrosion

- Do not install the solar system on copper roofs or underneath copper components.



WARNING

Burn hazard when there is direct sunlight

Fluid that remains in the collector or steam released from the collector can cause scalding. Touching hot connections may cause burns.

- Perform work on the collectors only when the sun is not shining or when the collectors are covered.
- Remove the sun protection only after the (re-) commissioning of the solar plant.

6.3.1 Preparations

Preparing the roof surface

- Measure out the collector surface on the roof.
- Cover the roofing amply, but also in such a way that you can access the collectors from every side.

Bending the lead aprons

Bend the lead aprons onto the lower end plates as follows:

- First, bend the lead apron by 90°.
- Readjust at the right angle bracket using the rubber mallet.
- Then bend the lead aprons completely around and hammer them flat using the rubber mallet.

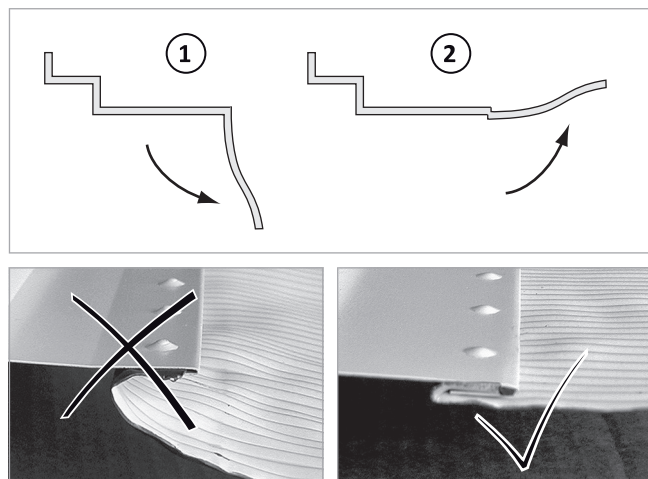


Fig. 43: Incorrect (left), correct (right)

Preparing for installation

- Check the position of the bottom batten: it must be located in the area between 180 and 320 mm (measured from the upper edge of the lower row of tiles).
- If there are **no** battens located in this area, an additional batten must be installed in the corresponding position.

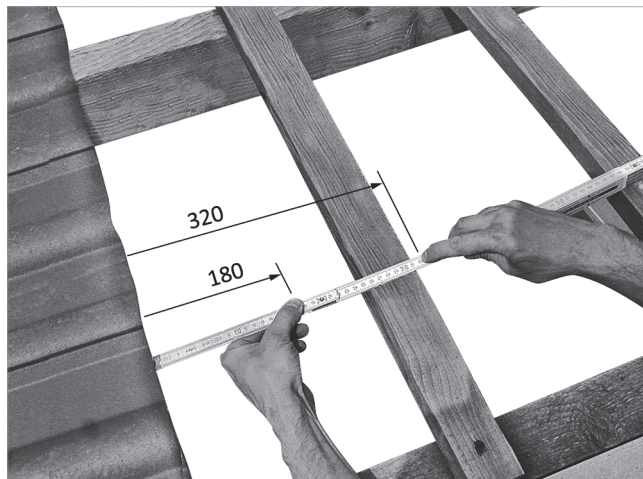


Fig. 44: Checking the position of the bottom batten

- Establish the position of the collector system in terms of width (including cover plates): if possible, the collector system should be positioned so that it can be connected to the tiles on the sides without having to adjust the tiles themselves.
- Mark the starting and ending points.



See also → "Dimensions" section, p. 8.

Positioning the lead aprons

The number of lead apron plates depends on the number of collectors in the row (1 plate per collector). An additional retaining plate supports the collectors using an angle profile.

The plates must be aligned as precisely as possible along a horizontal line.

- Measure 340 mm from the upper edge of the lower row of tiles. Measure the alignment line (e.g. using measuring cord).

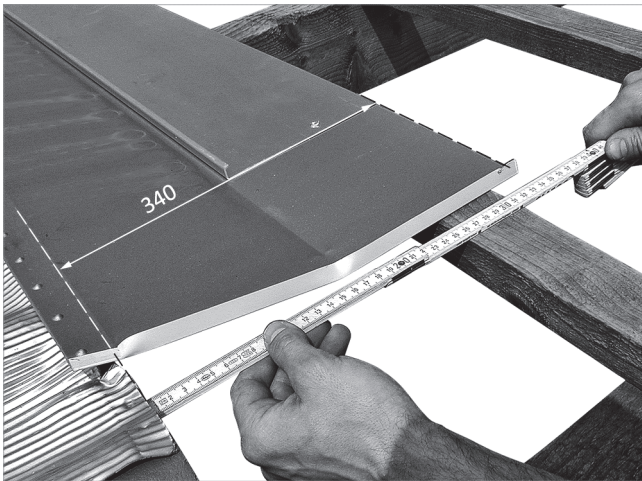


Fig. 45: Establishing the position of the lead apron plates

2. Position the right-hand lead apron on the right side. The upper edge must lie on the alignment line.
3. Screw on the plate in the area of the retaining plate.
 - Screw (5 x 80) at the height of a rafter
 - 4 additional screws (5 x 30), distributed over the entire width



Fig. 46: Positioning the first plate on the right and screwing it on

4. Remove the protective strips from the joint sealing strip on the top of the plate.
- Depending on the number of collectors, you may need to install additional plates:
5. Position the next plate (central or left-hand lead apron) from the left. It must make contact with the retaining plate of the previous plate.

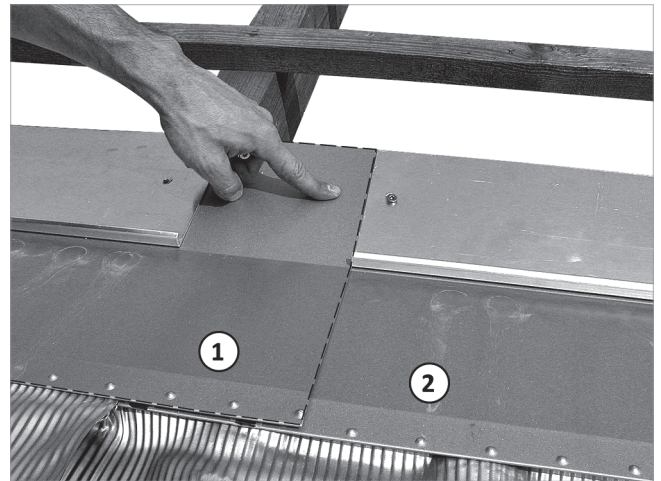


Fig. 47: Positioning the next plate from the left, adjusting it and screwing it on

6. Adjust the plate and screw it on. Then remove the protective strips from the joint sealing strip.



The outermost left lead apron plate has no joint sealing strip.

7. Finally, remove the protective strips from the joint sealing strip on the underside of the lead aprons and press the lead aprons onto the roofing tile.



Fig. 48: Removing the protective strips and pressing on the lead aprons

6.3.2 Lower Row of Collectors

Installing the first collector

The collectors are installed from left to right. The foot of the collector is pushed onto the retaining plate located on the lead apron plates.

1. Place the first collector on the left-hand side and push it onto the retaining plate.
2. Position the collector: the horizontal distance between the outer edge of the lead apron plate and the collector foot must be 120 mm.

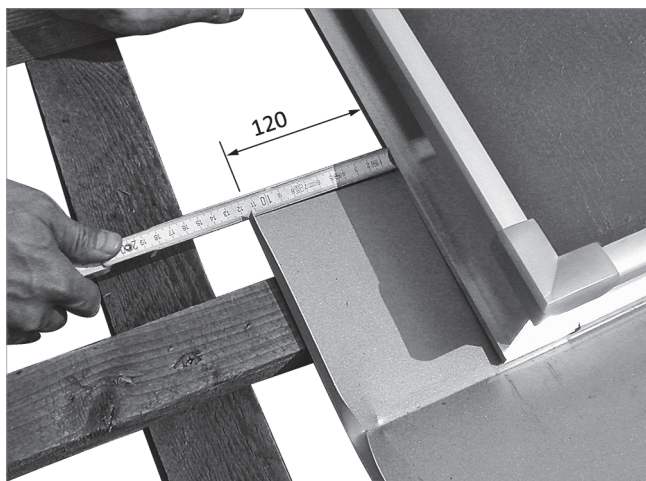


Fig. 49: Positioning the first collector on the left and establishing the horizontal spacing

3. Fasten the collector on the front at the top: attach the mounting bracket to a rafter using 3 Spax screws (5.0 x 80). Screw the collector onto the collector frame using 1 sheet metal screw (4.8 x 19, stainless steel).



Fig. 50: Fastening the collector to the rafter on the front at the top

Installing the vertical central plate

The vertical central plate is a connecting plate installed lengthwise between two collectors. The collars on both sides of the plate must lock into the slot under the clip profile.

1. Insert the connecting plate diagonally and place the metal collar onto the slot.
2. Rotate the metal collar to turn it into the slot and attach the connecting plate to the collector.

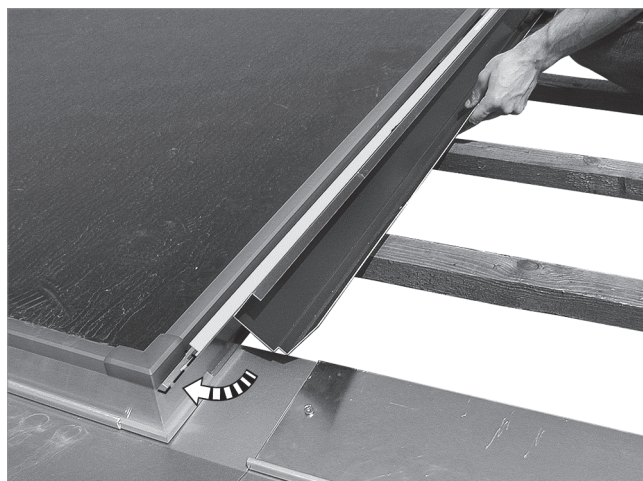


Fig. 51: Turning the connecting plate in

3. Push the connecting plate down until it locks into place and screw it onto the battens using Spax screws (5.0 x 30).



Fig. 52: Pushing the connecting plate down until it locks into the place and screwing it onto the battens

Installing additional collector(s)

1. Insert the next collector from the right.
2. Hold the collector approx. 20 mm above the adjacent collector. The slot in the clip profile of the collector must be held above the metal collar of the connecting plate.



Fig. 53: Setting down the next collector and pushing it down against the retaining plate

3. Set down the collector and push it down against the retaining plate.
4. Fasten the collector at the top using mounting brackets.

i If you plan to install another collector in the row, repeat the previous step outlined in “Installing the vertical central part”. Otherwise proceed to the next step, “Installing the side flashings on the left”.

Installing the side flashings on the left

The side flashings on each side consist of two identical individual parts.

1. Slide the upper part of the side flashing over the lower part of the side flashing.

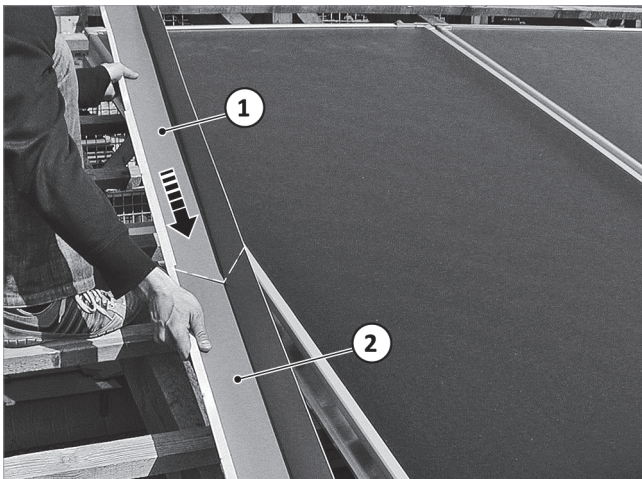


Fig. 54: Slide the upper part of the side flashing over the lower part of the side flashing.

- 1 Upper part of side flashing
- 2 Lower part of side flashing

2. Insert the entire flashing diagonally and position it next to the slot under the clip profile.
3. Use a turning motion to turn the flashing into the slot and attach the flashing to the collector.

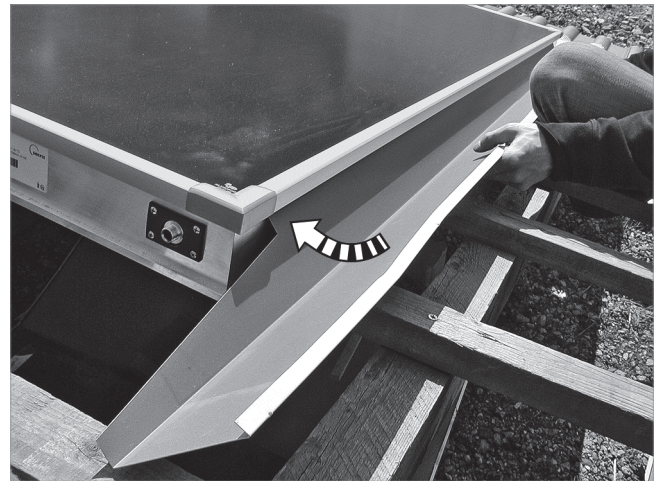


Fig. 55: Positioning the flashing next to the slot under the clip profile, then attaching it to the collector

4. Slide the upper part of the side flashing up until it reaches the stop

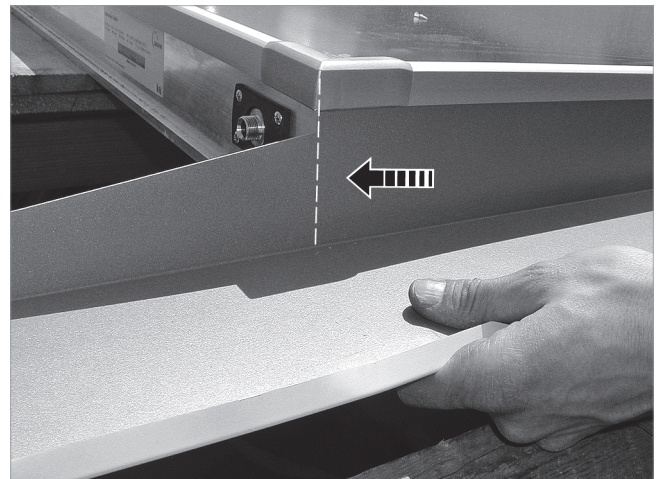


Fig. 56: Sliding the upper part of the side flashing up until it reaches the stop

5. Slide the lower part of the side flashing down until it reaches the bend in the lead apron plate.

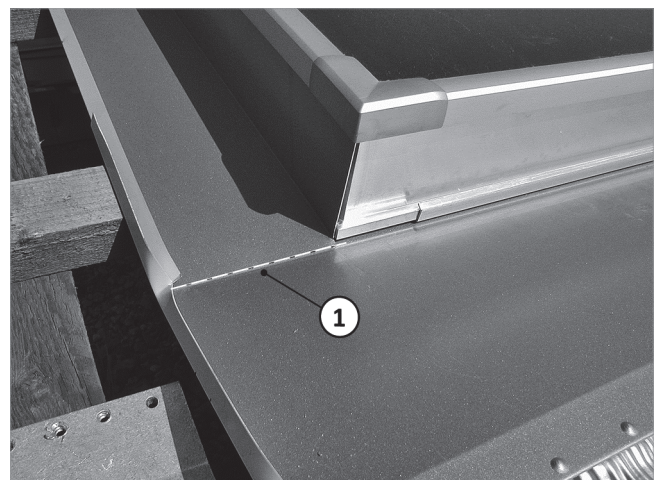


Fig. 57: Sliding the lower side flashing down until it reaches the bend

- 1 Bend

6. Fasten the flashing to the battens using metal retainers.

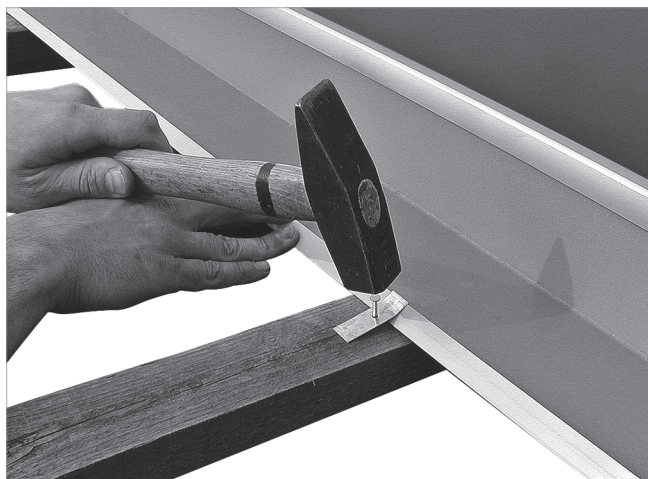


Fig. 58: Fastening the flashings to the battens using metal retainers

Installing the side flashings on the right

Proceed as described in the step "Installing the side flashings on the left." Reverse the procedure left to right.

- i** The following steps describe the installation of the next (upper) row of collectors.
If the collector system consists of a single row only, continue with → section "Top Flashings", p. 48.

6.3.3 Upper Row of Collectors

Installing the collector spacers

In order to install the next row of collectors, collector spacers must be installed between the rows. The screw position is located at the top of installed collectors at a distance of 145 mm from the collector foot.

1. If the collector spacers cannot be installed in this area because there are no battens available, additional sheeting must be installed.
2. If necessary, support the sheeting so that it is flush with the battens.



Fig. 59: For additional rows of collectors, install additional sheeting above the collector if necessary.

Install a spacer on the left and right of each collector (distance from the centre of the spacer to the outer edge of the collector is 240 mm).

3. Position the collector spacers and screw them down onto the battens beneath.

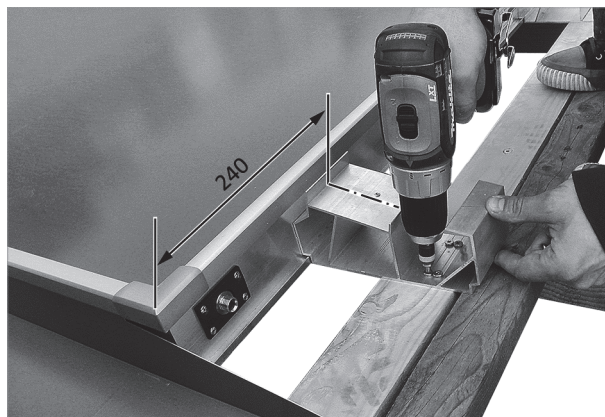


Fig. 60: Screwing on collector spacers at a distance to the left and right of the outer edge of the collector

Installing collectors

Installation of the upper row of collectors is similar to the installation of the lower row:

1. Place the first collector on the left-hand side and allow it to make contact with the collector spacers.



CAUTION

Ensure a positive fit

The bracket may otherwise fail.

- The spacers must form a positive fit on both sides of the collector foot.
- Wedge plastic beneath the spacers if necessary.

2. Position the outer edge of the collector so that it is aligned with the lower collector.

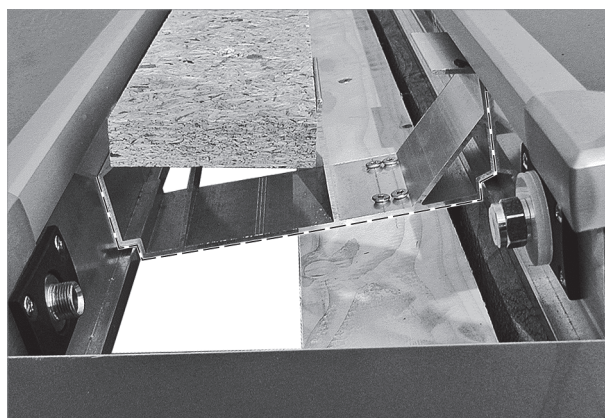


Fig. 61: Position of the collector spacers in relation to the collectors

3. Fasten the collector on the front at the top using a mounting bracket.
4. Install the vertical central part (connecting plate).
5. Install additional collectors and connecting plates until the outermost collector is on the right side.

i See also → section "Lower Row of Collectors", p. 41:

- Installing the first collector
- Installing the vertical central part
- Installing additional collector(s).

Installing the side flashings on the left

The side flashings are identical for each row of collectors. They have two identical individual parts on each side. Installation of the upper row of collectors is similar to the installation of the lower row:

1. Slide the upper part of the side flashing over the lower part of the side flashing.

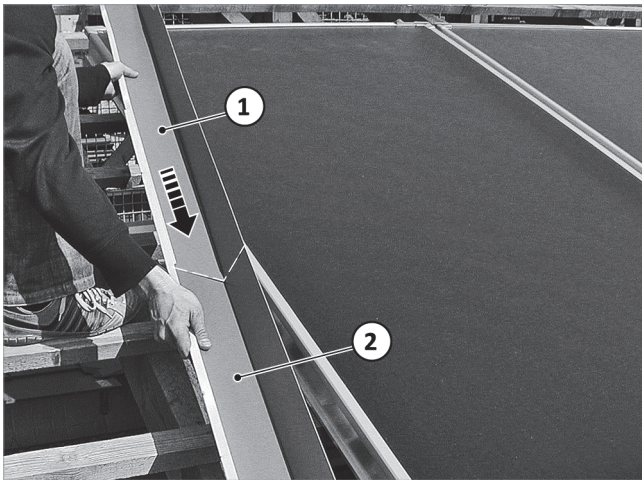


Fig. 62: Sliding the upper side flashing over the lower part

- 1 Upper part of side flashing
- 2 Lower part of side flashing

2. Insert the entire flashing diagonally and position it next to the slot under the clip profile.
3. Use a turning motion to turn the flashing into the slot and attach the flashing to the collector.

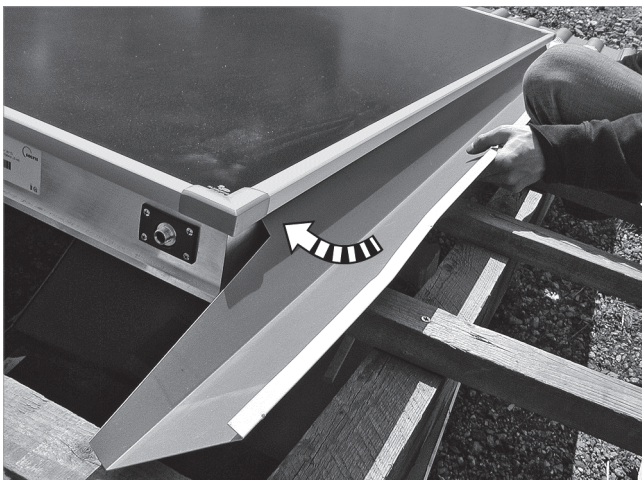


Fig. 63: Positioning the flashing next to the slot under the clip profile, then attaching it to the collector

4. Slide the upper part of the side flashing up until it reaches the stop

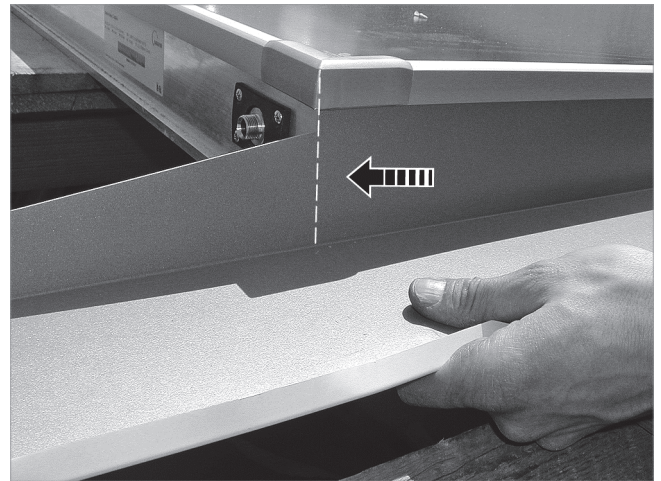


Fig. 64: Sliding the upper part of the side flashing up until it reaches the stop

5. Slide the lower part of the side flashing down until it reaches the lower edge of the collector frame. **Do not slide it past the lower edge.**

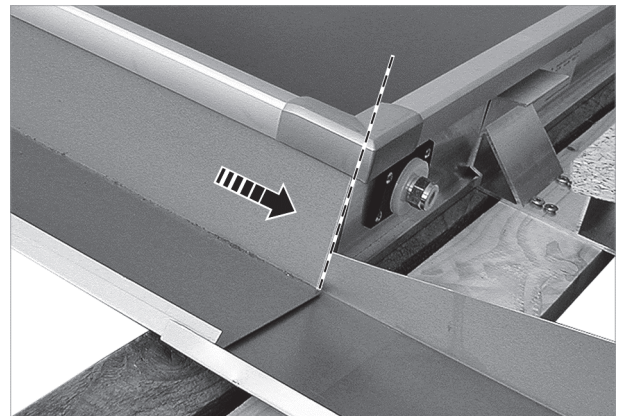


Fig. 65: Sliding the lower side flashing until it reaches the lower edge of the collector frame

6. Fasten the flashing to the battens using metal retainers.

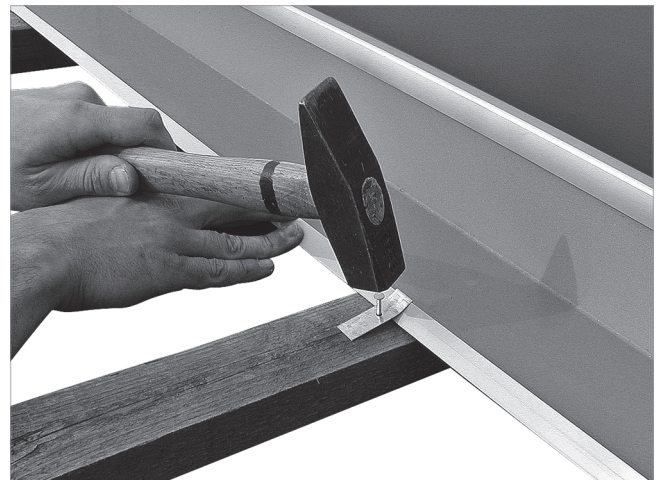


Fig. 66: Fastening the flashings to the battens using metal retainers

Installing the side flashings on the right

Proceed as described in the step "Installing the side flashings on the left." Reverse the procedure left to right.

6.4 Installing the Flashings

6.4.1 Preparations

i You must perform the following work before proceeding with the installation (for further information see → section “Installing the Sensor”, p. 52:

- Mounting the collector sensor
- Connecting collectors to the solar circuit
- Filling and pressure test.

Installing the intermediate flashing supports

To increase the stability of the plates between the collector rows, screw intermediate flashing supports onto the collector spacers.

1. Place the intermediate flashing supports onto the spacers.
2. Align them and then fasten them using Spax screws (5.0 x 30).



Fig. 67: Screwing intermediate flashing supports onto collector spacers

6.4.2 Intermediate Flashing Pieces

The space between the collector rows is covered using:

- One long piece of intermediate flashing per collector over the area of the intermediate flashing supports
- One or more junction plates
- One piece of intermediate flashing with corner on the outer left and right.

See also → Fig. 42, p. 38.

Installing the first piece of intermediate flashing

1. Stick the joint sealing strip around the upper edge of the lower row of collectors: begin on the side flashing and proceed along the entire width of the profile.



Fig. 68: Sticking joint sealing strip on the upper edge along the entire width

2. Position the first piece of intermediate flashing to the far right. Attach the metal collar to the slot under the clip profile.
3. Rotate the metal collar to turn it into the slot and attach the plate.
4. Press on the plate until it locks into position with the lower collector.

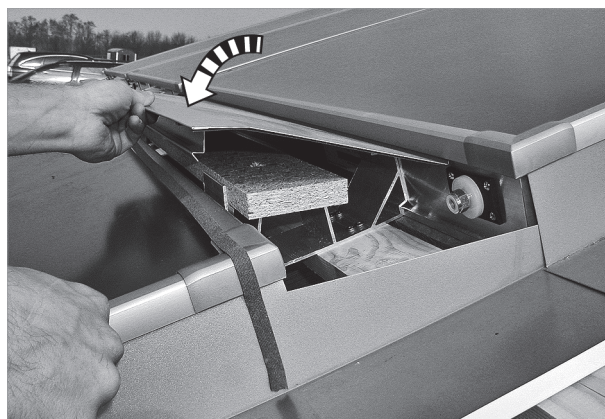


Fig. 69: Turning the first piece of intermediate flashing into the slot, positioning it and pressing it in

5. Position the plate: the distance from the right edge of the plate to the outer edge of the collector (head measurement) is 120 mm.

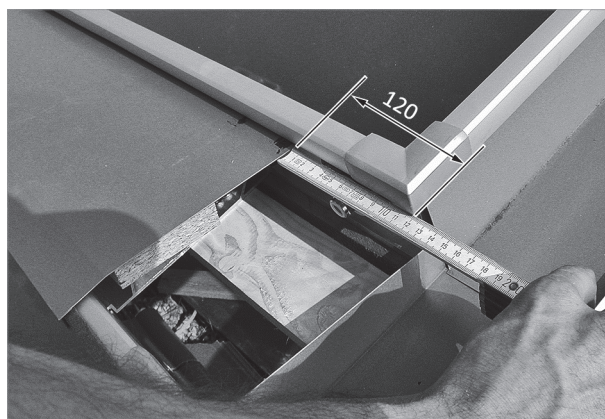


Fig. 70: Positioning the plate at the correct distance from the outer edge

6. Fasten the plate on the left side: screw it onto the intermediate flashing support, maintaining a minimum distance (10 mm) to the outer edge.

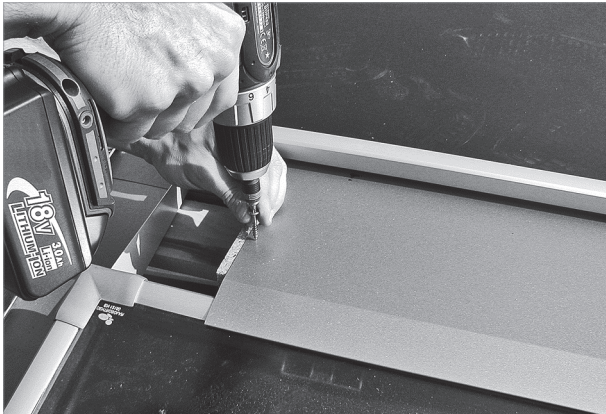


Fig. 71: Screwing on the intermediate flashing at least 10 mm from the outer left edge

Installing the first junction plate

The first junction plate is installed at the cross joint of the collectors (on the left next to the first intermediate flashing piece):

1. Position the junction plate: push the nose of the plate forward under the vertical connecting plate.
2. Attach the metal collar to the slot under the clip profile.
3. Remove the protective strips from the joint sealing strip on the underside of the junction plate.

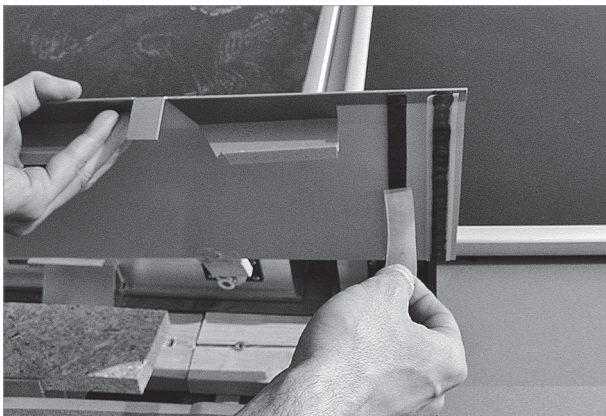


Fig. 72: Removing the protective strips on the underside of the junction plate

4. Rotate the metal collar to turn it into the slot and attach the plate.
5. Press on the plate until it locks into position with the lower collector.

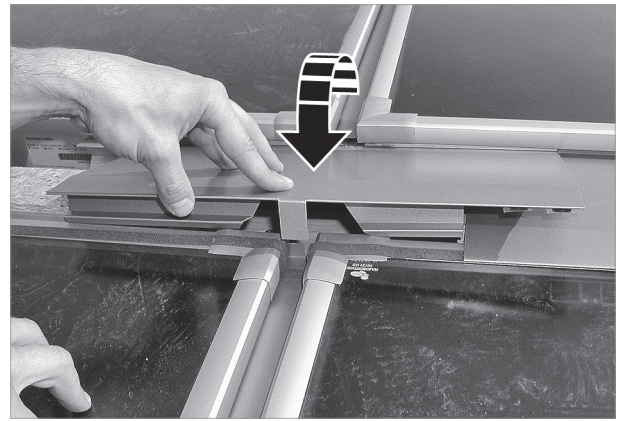


Fig. 73: Inserting the junction plate into the slot, positioning it and pressing it in



The junction plates do **not** need to be screwed into place.

Installing additional plates

1. Depending on the number of collectors, you may need to alternate between intermediate flashing pieces and junction plates. Before positioning the plates, remove the protective strips on the underside of the plate.



Fig. 74: Installing additional plates: removing the protective strips before positioning

Installing the intermediate flashing corners

1. Position the intermediate flashing corner on the right side. Attach the metal collar to the slot under the clip profile.

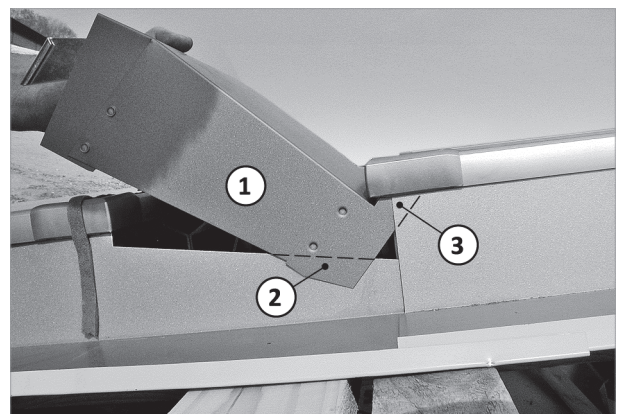


Fig. 75: Inserting the first intermediate flashing corner into the slot, positioning it and pressing it in



CAUTION

Check that the intermediate flashing corners are positioned correctly.

There is otherwise a risk of damage to the intermediate flashing.

The right side of the intermediate flashing corner (1) must:

- Cover the lower part of the side flashing (2)
- Be covered by the upper part of the side flashing (3).

2. Remove the protective strips from the joint sealing strip on the underside of the plate.
3. Rotate the metal collar to insert it into the slot and attach the plate.
4. Press on the plate until it locks into position with the lower collector.

6.4.3 Disassembling the Intermediate Flashing

Disassemble the intermediate flashing corners as needed

If you need to access the outer collector connections at a later time, proceed as follows to open the intermediate flashing corner:

1. Loosen the connection of the joint sealing strip: slide a cutter underneath the intermediate flashing corner and carefully cut along the lower plate.

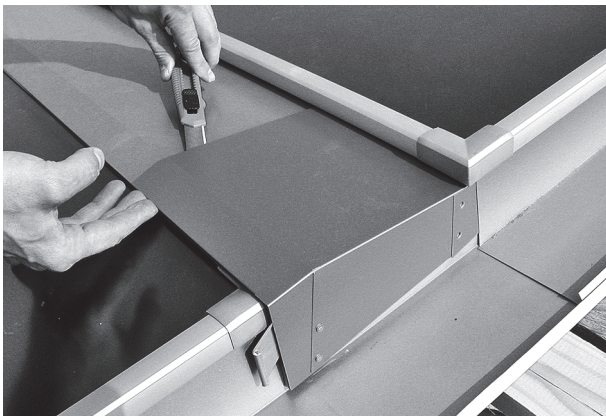


Fig. 76: For access at a later time: loosening the connection between the plates ...

2. Press against the side and use leverage to flip up the plate.

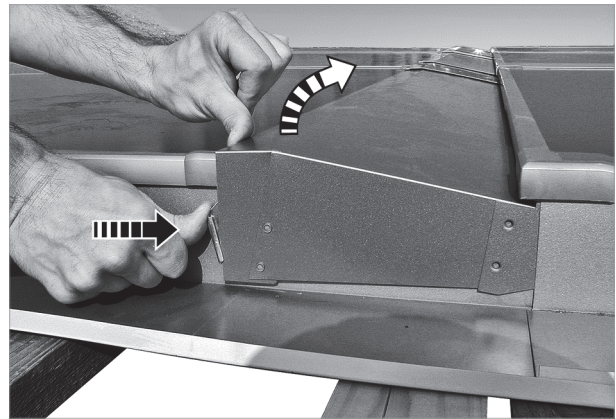


Fig. 77: ... pressing against the side and using leverage to flip up the intermediate flashing



On the underside of each intermediate flashing, there is a plate bracket that attaches to the clip profile when the plate is locked into place.

When a plate is removed at a later time, the plate bracket loses its tension. For this reason, make sure to bend it back before locking the plate back into place.

6.4.4 Top Flashings

The space above the collector is covered using:

- One top flashing (with corner) above the two outermost collectors
- Top flashings for the central collectors (for more than two collectors in a row)
- Connector(s) with upper and lower plate.

See also → Fig. 42, p. 38.

Installing the top flashing

1. Stick the joint sealing strip around the upper edge of the row of collectors: begin on the side flashing and proceed along the entire width of the profile.



Fig. 78: Sticking the joint sealing strip on the upper edge along the entire width of the profile

2. Check the position of the top batten: it must be located in the area between 480 and 550 mm (measured from the collector foot).

**CAUTION****Install a batten if necessary.**

It may otherwise not be possible to stably fasten the top flashings.

- An additional batten must be installed if a batten is not located in the area between 480 and 550 mm (measured from the collector foot).

3. Install the corresponding top flashing (with corner) over the two outermost collectors.
4. Place the top flashing on the side flashing and press it against the collector.

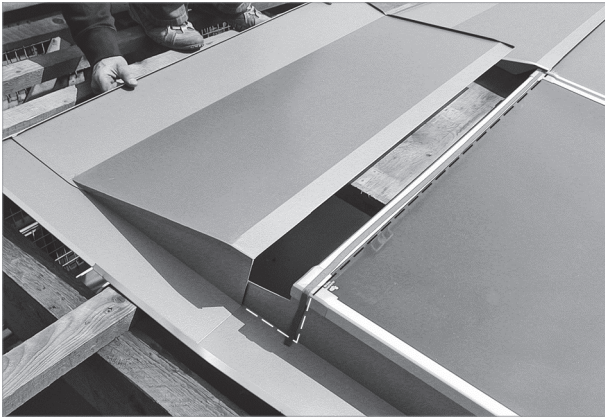


Fig. 79: Placing the top flashing on the side flashing and pressing it against the collector



The top flashings are positioned correctly when they are attached to the clip profile of the collector and completely cover the clip.

5. For more than two collectors in a row: press the top flashings (without corner) onto the central collectors.
6. At the butt joint of the top flashing: first push the **lower** plate of the connector until it is aligned under the top flashing.



Fig. 80: Pushing the lower plate of the connector under the top flashing

7. Position the **top** flashing of the connector to the butt joint.
8. Position holes in the **top** flashing so that they cover the thread adapters in the **lower** plate.

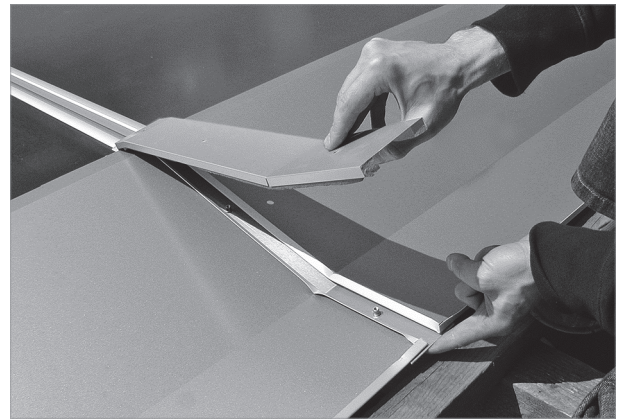


Fig. 81: Positioning the upper plate of the connector to cover the lower plate

9. Screw on the **upper** and **lower** plate using the screws and washers (included).

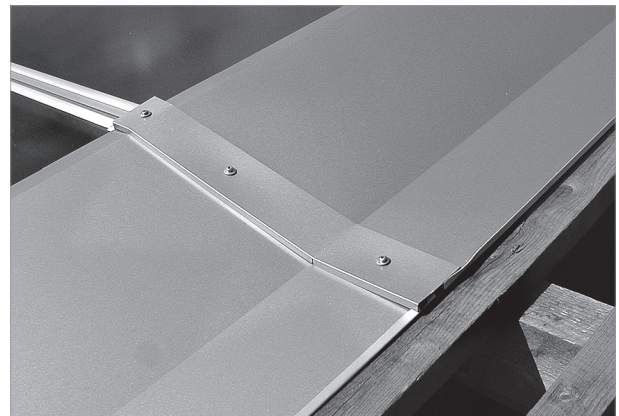


Fig. 82: Screwing the upper plate to the lower plate

10. Fasten the plates to the battens using metal retainers.

Installing the tile elevator (optional)

If the tiles hinge down too far when positioned, you can install tile elevators across the whole width of the top flashing.

1. Carefully position the roofing tiles.
2. If the tiles hinge down too far, install the tile elevators as shown in the figure, and bend the metal strips around the next batten.

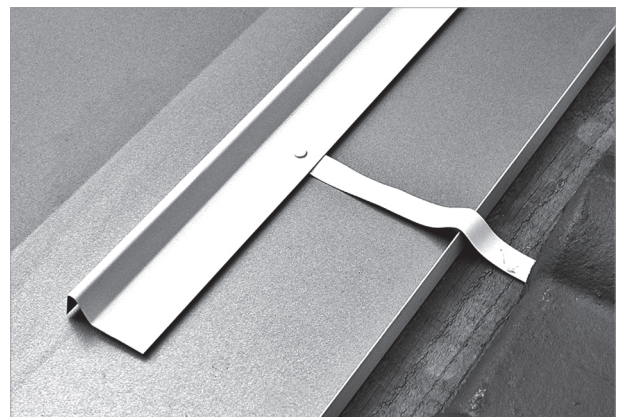


Fig. 83: Installing the tile elevator and bending the metal strips

- i** The row of tiles directly above the collector may extend only into the area between the bend of the top flashing and 50 mm above the bend.

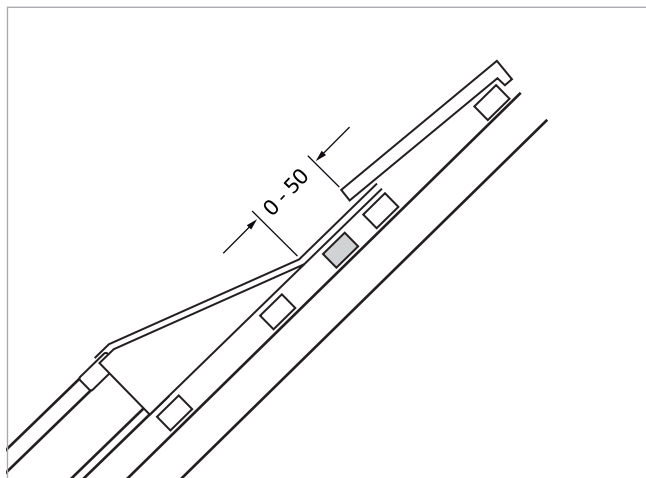


Fig. 84: Covering at the top (side view)

Installing the driving snow wedges

The driving snow wedges must be attached along the top and side flashings. The surfaces must be clean and dry for the adhesive to hold.

1. Remove the protective strips and attach the wedges with the diagonal side facing outwards (see arrow). Distance to the outer edge is approx. 30 mm.

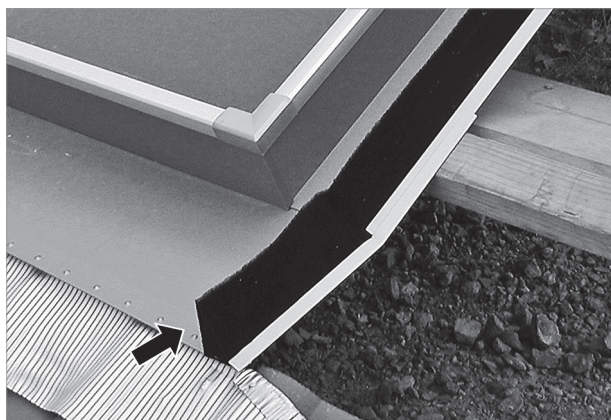


Fig. 85: Driving snow wedge attached

6.4.5 Final Tasks

Tiling the roof

1. Position tiles around the collectors.
In order to avoid storm damage, you must observe the following measures:
2. **For the side flashings:** For tiles that do **not** fit exactly against the side flashing, remove the stoppers with a hammer and fasten the tiles.



Fig. 86: Removing stoppers as necessary

3. **Near the top flashings:** Secure every third tile. Drill through the tiles using a 6 mm bit and fasten using Spax screws (alternatively, you can use storm safety devices).



Fig. 87: Fastening the tile next to the side flashing

Installing the cover plate

You will now install cover plates on the bottom front of the first (lower) row of collectors:

1. **Insert a small plate:** Push the nose of the plate forward under the vertical connecting plate. Then position the plate so that it is tight.

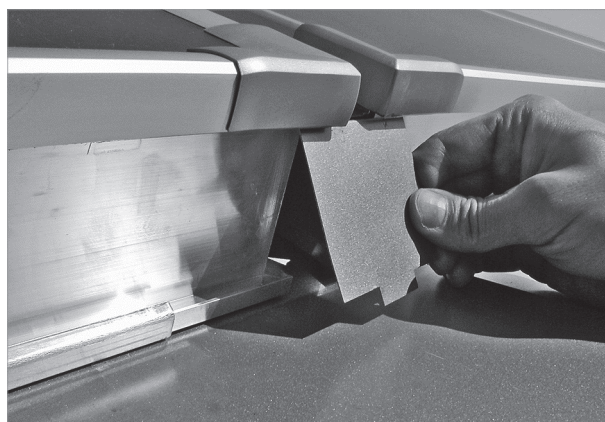


Fig. 88: Positioning the small plates in front of the gaps between the collectors

2. **Insert a long casing plate:** Place the wire springs of the plate on the slot of the clip profile and the plate against the collector frame with a rotating motion.
3. Next, press the plate upwards and against the collector at the same time. When you set the plate down, it locks into position.

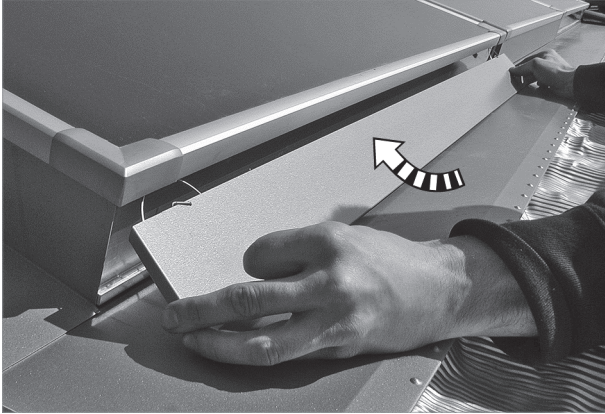


Fig. 89: Positioning the long casing plates on the front of the collectors

6.4.6 Disassembling the Casing Plate

- i** In order to remove the plate, slide a flat plastic object (e.g. ice scraper) underneath the plate and press it upwards. Then turn it to remove the plate.

7 Installing the Sensor

i In order for the system to function properly, it is important that the sensor is positioned correctly.

- Always attach the sensor on the side of the collector where the solar flow is located. See → section “Hydraulics”, p. 14.

Preparing installation

1. Push the PG screw fitting parts onto the collector sensor.

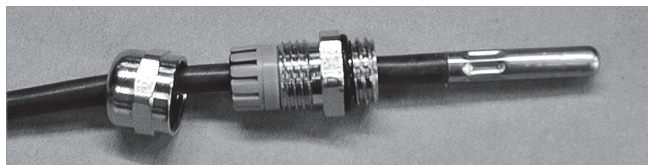


Fig. 90: Pushing the PG screw fitting onto the collector sensor

i The collector sensor is always installed at the output of the solar flow.

Installing the Sensor

1. Set clamp ring screw connection with T-piece on the collector connection (flow) and tighten by hand.
2. Tighten the clamp ring screw connection that has been tightened by hand with the open-end wrench (maximum of one rotation, hold in place).
3. Push the sensor into the sensor sleeve as far as it can go.
4. Screw in the front part of the PG screw fitting to the connection.
5. Tighten the union nut.



Fig. 91: Install sensor (solar flow)

i The sensor must be activated by the control using the **collector start** function.

Installing the lightning protection box

1. To protect the control from overvoltage, place a lightning protection box as close as possible to the collector (beneath the roof, for example).
2. Then extend the sensor cable over the lightning protection box connection to the control.



CAUTION

Pay attention to the sensor line when extending.

- The line you use must at least meet the requirements for temperature and UV radiation in the installation location.
- Use only shielded lines.
- Use a protective conduit to prevent damage by animals or mechanical strain.
- For extension up to 50 m: (2-wire, 0.75 mm²)
- For extension over 50 m: (2-wire, 1.5 mm²)

Final Tasks



CAUTION

Note the following for wall-mounted installation with slope angles greater than 60°

Possible reduction in solar yields or collector damage due to moisture.

- Fit the top of the collectors on-site with a suitable cover plate.
- See → section “Wall-Mounted Installation”, p. 27.

8 Hydraulic Connection



CAUTION

Longitudinal thermal expansion

Leaks may arise due to material expansion/contraction.

- Install only flexible connection lines in the collector field.
- Recommendation: Use the connection sets and connectors offered.

Outlet turret

Vent tiles that are made for most roofing are particularly well suited for the outlet turret of the solar lines. The flexible connection set ROS-12-FLX facilitates outlet turrets.

Connecting collectors to the solar circuit

1. Push the flexible pipe (e.g. ROS-12-FLX) onto the return connection. For SolvisCala Eco, use connection angle from TST-SEN-CE or ASS-CE and do not forget the support sleeve on the collector.
2. Tighten the clamp ring screw connection that has been tightened by hand with the open-end wrench (maximum of one rotation, hold in place).
3. Push the other end of the flexible pipe onto the solar circuit connection and tighten as described in step 2. Do not forget the support sleeves.



Fig. 92: Connect return

4. Repeat the process on the solar flow T-piece on the last collector. For SolvisCala Eco, do not forget the support sleeve on the collector.



Fig. 93: Connect flow

5. Insulate the pipe lines and the T-piece with sensor in accordance to the German Energy Conservation regulations (EnEv).

Connecting the collectors

Proceed as follows for collectors connected in series:

1. Put the collector connectors, e.g. VB-C-12-N, on the horizontally mounted collector connections and tighten the clamp ring screw connection by hand. For SolvisCala Eco, do not forget the support sleeve on the collector.
2. Tighten the clamp ring screw connection that has been tightened by hand with the open-end wrench (maximum of one rotation, hold in place).

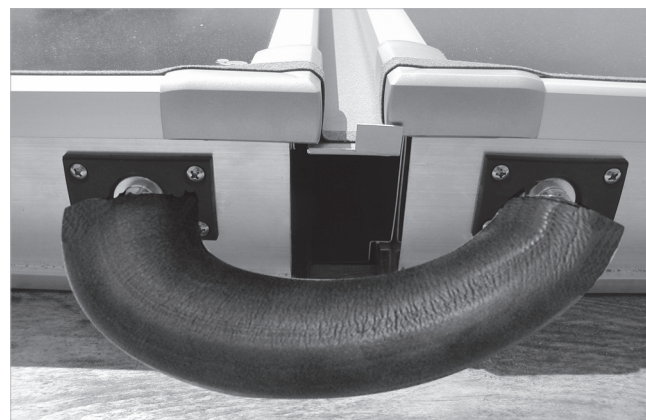


Fig. 94: Connecting the horizontally mounted SolvisCala collectors



Before start-up, a pressure test must be performed; see → section "Starting up the solar circuit" in the installation instructions for the solar storage tank.

Heat transfer fluid

Solvis can only guarantee correct performance with the Tyfocor LS-rot heat transfer fluid, which has been designed especially for use in Solvis systems and collectors. The corresponding safety data sheet according to 91/155/EWG, see → section "Safety data sheet antifreeze agents", p.61.



CAUTION

When filling the solar circuit:

- Use only original Solvis Tyfocor LS-rot ready-mixed heat transfer medium to fill and flush the solar circuit.
- Using other types of heat transfer fluid in this system is prohibited and may damage the solar circuit components.

9 Start-Up



WARNING

Risk of hot steam escaping when working on the solar system

Scalding of hands and face possible.

- Carry out work on the solar system only when there is no direct sunlight or when the collectors are covered.



CAUTION

When filling the solar circuit:

- Use only original Solvis Tyfocor LS-rot ready-mixed heat transfer medium to fill and flush the solar circuit.
- Using other types of heat transfer fluid in this system is prohibited and may damage the solar circuit components.

Setting the solar operating pressure

1. Set the solar operating pressure approx. 0.3 bar higher than the admission pressure of the solar expansion vessel (e.g. admission pressure 1.6 bar, solar operation pressure 1.9 bar).
2. When the solar operating pressure has been reached, close the flushing valve.

The collector can be operated with an operating pressure of up to 4 bar. The higher the pressure, the quicker damage can be done to the heat transfer fluid. It remains in liquid form at higher temperatures.



There is a calculation program for designing the expansion vessel and the primary tank (if present) as well as for determining the admission pressure and system filling pressure under the business partner section on the SOLVIS homepage (<http://www.solvis.de>) under "Auslegungsprogramme" (Design Programs), or contact our Technical Sales department.



Fill, pressure test and start up system as per → *'Start-Up' chapter of installation instructions for relevant system.*

10 Maintenance

You must perform an annual check of the pH value of the heat transfer fluid using suitable testing equipment.



Maintain the system according to → section *“Maintenance and Care”* in the installation instructions and the maintenance reports for the respective system.

11 Decommissioning

The system must be drained if it is taken out of operation for long periods or if it is taken out of operation completely. Collect solar liquid and dispose of it correctly.

If taking out of service for extended periods and simultaneously draining the system, we recommend that you make sure, as far as is possible, that no solar liquid residue remains in the collectors.



CAUTION

Risk of deposits

- Once the collector has been previously filled with solar liquid, it may not be exposed to sunlight when empty.

Observe the safety notes when disassembling the system, see ➔ *section "Safety Notes", p. 5.*



WARNUNG

Burn hazard when there is direct sunlight

Fluid that remains in the collector or steam released from the collector can cause scalding. Touching hot connections may cause burns.

- Perform work on the collectors only when the sun is not shining or when the collectors are covered.
- Remove the sun protection only after the (re-) commissioning of the solar plant.

Environmentally-sound reuse

Old Solvis collectors may be returned to the factory free of charge and then recycled in an environmentally sound manner.

12 Technical Data

12.1 General Specifications

Collector parameters for SolvisCala

Name	Unit	C-254-AR	C-254-E
Dimension (gross surface area)	mm (m ²)	2176 x 1176 x 98 (2.56)	2168 x 1168 x 93 (2.53)
Opening surface area*	m ²	2.40	2.4
Absorber surface area	m ²	2.38	2.38
Total weight	kg	38	39
CE mark of conformity	–	✓	–
Anti-reflective glass	–	✓	–
Glass transmission	%	> 96	> 91
Absorber type	–	Aluminium with mirotherm® coating (95% absorption, 5% emission)	
Solar Keymark registration no.	–	011-7S567 F	011-7S2768 F
Solar Keymark certificate	–	see → http://www.dincertco.com	

* Effective surface area according to EN 12975

12.2 Connection Dimensions

Centre-to-centre distances for the connectors

For more information on the position of the connectors, see → section “Hydraulics”, page 14.

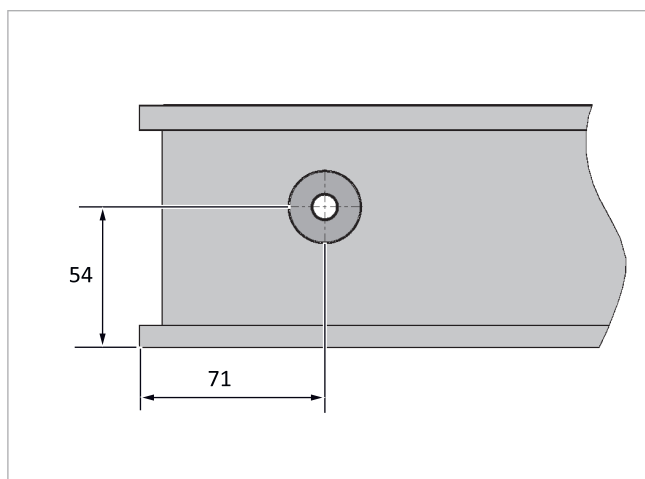


Fig. 95: Position of connection on SolvisCala C-254-E

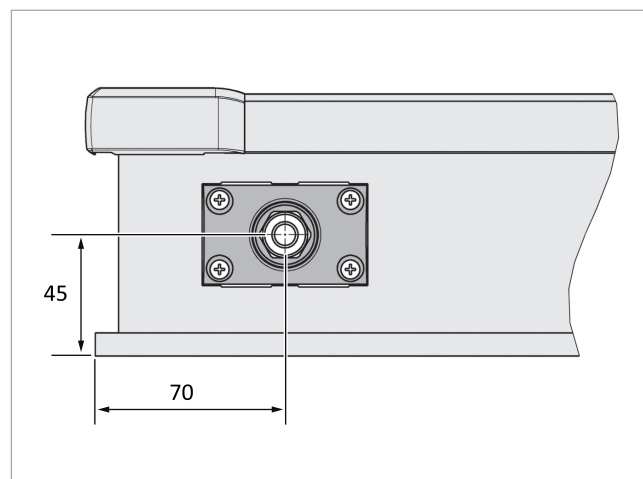


Abb. 96: Position of connection on SolvisCala C-254-AR

12.3 Hydraulic Specifications

SolvisCala hydraulics

Name	Unit	C-254-AR	C-254-E
Heat transfer fluid content	l	2.5	2.1
Hydraulics	–	2 x 6 pipes, serial flow	1 x 10 pipes, serial flow
Rated flow	l/(h m ²)	15 to 40	15 to 40
Connection	mm	18 (clamp ring)*	12 (clamp ring)
Pipe diameter in the meander	mm	12 x 0.5	12 x 0.4
Operating pressure	bar	4	4

* Reductions to 12 and 15 mm enclosed

12.4 Pressure Loss

SolvisCala C-254-AR

Under the following conditions

- 2 x 6 pipes with serial flowthrough
- Solar liquid 40% Tyfocor/60% water
- Average collector temperature 40 °C

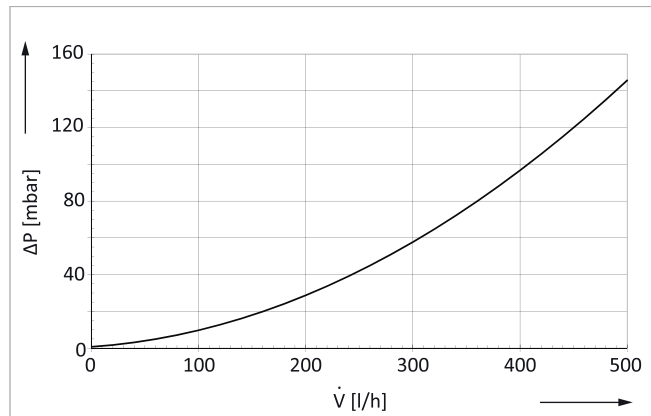


Fig. 97: SolvisCala C-254-AR pressure loss curve

$\dot{V}$ Volume flow [l/h]

Δp Pressure loss in [mbar]

SolvisCala C-254-E

Under the following conditions

- 1 x 10 pipes, serial flow
- Solar liquid 40% Tyfocor/60% water
- Average collector temperature 40 °C

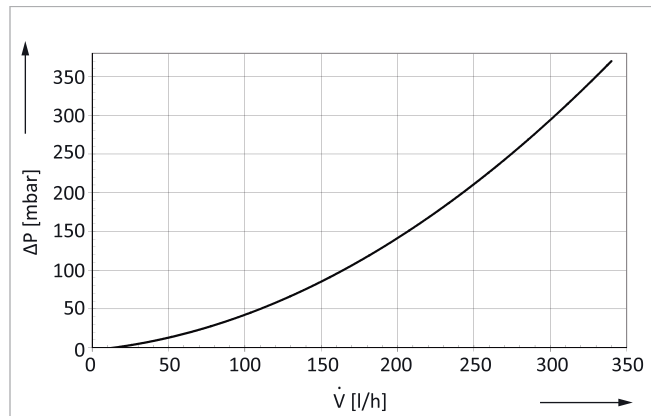


Fig. 98: Pressure loss curve SolvisCala C-254-E

$\dot{V}$ Volume flow [l/h]

Δp Pressure loss in [mbar]

13 Appendix

13.1 Snow and Wind Load Zones

For the structural design of the support structure, it is necessary to know and observe the additional snow and wind load in your region. These loads can be determined using the information from snow and wind load zones.

This is the only way to ensure safe installation of the solar system.

The illustrated map provides an overview of the distribution of snow and wind load zones.

Contact the local authorities for the classifications of the standard snow load for the region.

 Contact Solvis if the standard snow load at the installation location is greater than the specifications in EN 1991 according to the local authorities responsible (examples: Reit im Winkl/elevations of the Fichtelgebirge mountain range, etc.)



Fig. 99: Distribution of snow and wind load zones in Great Britain

A Snow load zones

B Wind load zones

13.2 Product Fiche



Product fiche collector

Scheda di prodotto di Collettore / Ficha del producto de colector / Ficha de produto de coletor / Fiche de produit de capteur / Productkaart voor de zonnecollector

Solvis GmbH
Grotian-Steinweg-Str. 12
38112 Braunschweig - Germany

Information according to regulation / Informazioni secondo la normativa / Información según reglamento / Informação de acordo com regulamento / Information conforme à la règlement / Informatie volgens verordening:

→ installation instructions / istruzioni per il montaggio / instrucciones de montaje / instruções de montagem / instructions de montage / montage-instructies

Authorized signatory / Firmatario autorizado / Signatario autorizado / Signatário Autorizado / Signataire autorisé / Geautoriseerde ondertekenaar

ppa. Claas Rühling

1 Information in accordance with Annex IV

Informazioni in conformità all'Allegato IV / Información de acuerdo con el Anexo IV / Informações em conformidade com o anexo IV / Informations conformément à l'annexe IV / Informatie overeenkomstig bijlage IV

1	2		3		4		5		6		7	
	A _{sol} in m ²		η _{col} in %		η ₀ in %		α ₁ in W/(m ² K)		α ₂ in W/(m ² K)		IAM in –	
	A	B	A	B	A	B	A	B	A	B	A	B
SolvisCala C-254-AR	2,39	2,56	67	62	0,833	0,778	3,57	3,33	0,015	0,014	0,93	0,93
SolvisCala C-254-E	2,39	2,53	62	58	0,791	0,748	3,46	3,28	0,023	0,021	0,94	0,94
SolvisLuna LU-304	2,57	2,87	61	54	0,644	0,577	0,75	0,67	0,005	0,004	1,00	1,00
SolvisFera F-553-S(D)	5,16	5,61	66	60	0,831	0,756	3,52	3,20	0,017	0,015	0,93	0,93
SolvisFera F-653-S(D)	6,45	7,01	66	60	0,831	0,756	3,52	3,20	0,017	0,015	0,93	0,93
SolvisFera F-803-S(D)	7,74	8,40	66	60	0,831	0,756	3,52	3,20	0,017	0,015	0,93	0,93
SolvisFera F-553-I-AR	5,16	5,61	68	63	0,843	0,776	3,32	3,05	0,016	0,016	0,94	0,94
SolvisFera F-653-I-AR	6,45	7,01	68	63	0,843	0,776	3,32	3,05	0,016	0,016	0,94	0,94
SolvisFera F-803-I-AR	7,74	8,40	68	63	0,843	0,776	3,32	3,05	0,016	0,016	0,94	0,94

A = For collector aperture area / Per area di apertura del collettore / Para área de apertura del colector / Para área de abertura do coletor / Pour la surface d'entrée du capteur / Voor apertuuroppervlak van de collector

B = For collector gross area / Per l'area lorda del collettore / Para área bruta del colector / Para área Bruta do Coletor / Pour la surface brute du collecteur / Voor collector bruto oppervlakte

- 1 solar collector / collettore solare / colector solar / coletor solar / capteur solaire / zonnecollector
- 2 Reference surface / Superficie di riferimento / Superficie de referencia / Superficie de referência / Surface de référence / Referentieoppervlak
- 3 Collector efficiency / Efficienza del collettore / Eficiência do coletor / Rendement du capteur / Collectorefficiëntie
- 4 Optical efficiency / Efficienza ottica / Eficiência óptica / Efficacité optique / Optische efficiëntie
- 5 Linear heat transfer coefficient / Coefficiente di trasmissione termica lineare / Coeficiente de transferencia de calor lineal / Coeficiente de transferência de calor linear / Coefficient de transfert de chaleur linéaire / Lineaire warmteoverdrachtscoëfficiënt
- 6 Square heat transfer coefficient / Coefficiente di trasmissione termica quadrato / Coeficiente de transferencia de calor cuadrado / Coeficiente de transferência de calor quadrado / Coefficient de transfert de chaleur carré / vierkante warmteoverdrachtscoëfficiënt
- 7 Incident angle modifier / Modificatore dell'angolo di incidenza / Modificador ángulo de incidencia / Modificador de ângulo de incidência / Agent de modification de l'angle d'incidence / Invalshoek modifier

Abb. 100: Product fiche

13.3 Safety data sheet antifreeze agents



SAFETY DATA SHEET

according to Regulation (EC) No. 1907/2006

Revision date 01.07.2017

Version: 1.0, ID-No.: 2610-01_GB-GB

Page 1/7

SECTION 1: Identification of the substance/mixture and of the company

- 1.1. Product identifier:** TYFOCOR® LS® rot
ready mixed, frost protection -25 °C
- 1.2. Relevant identified uses of the substance or mixture and uses advised against**
Relevant identified uses: Heat transfer fluid for solar thermal systems
- 1.3. Details of the supplier of the safety data sheet**
Company: TYFOROP Chemie GmbH, Anton-Rée-Weg 7, D-20537 Hamburg
Telephone/Telefax: Tel.: +49 (0)40 20 94 97 0, Fax: +49 (0)40 20 94 97 20
E-Mail: msds@tyfo.de (E-Mail adress of person responsible for SDS)
- 1.4. Emergency telephone number:** Tel.: +49 (0)551-19240 GIZ-Nord Poison Center

SECTION 2: Hazards identification

- 2.1. Classification of the substance or mixture**
Classification according to Regulation (EC) No. 1272/2008 [CLP]
The product is not subject to classification.
- 2.2. Label elements**
Labelling according to Regulation (EC) No. 1272/2008 [CLP]
The product is not subject to labelling.
- 2.3. Other hazards:** None known.

SECTION 3: Composition/information on ingredients

- 3.2. Mixtures**
Chemical nature: Aqueous solution of Propane-1,2-diol (propylene glycol) with inhibitors.
Hazardous components

Substance / REACH registration number	Content	CAS number	EC number	INDEX number	Classification acc. CLP
1,1'-Iminobis-2-propanol 01-2119475444-34	> 1 % - < 3 %	110-97-4	203-820-9	603-083-00-7	Eye Irrit. 2, H319

The full text of the abbreviations is listed in section 16.

SECTION 4: First aid measures

- 4.1. Description of first aid measures**
Protection of first-aiders: No special precautions are necessary for first aid responders.
If inhaled: If inhaled, remove to fresh air. Get medical attention if symptoms occur.
On skin contact: Wash thoroughly with soap and water. Get medical attention if symptoms occur.
On contact with eyes: Wash affected eyes for at least 15 minutes under running water with eye-lids held open. Get medical attention if irritation develops and persists.
On ingestion: Rinse mouth thoroughly with water. Get medical attention. DO NOT induce vomiting. Get medical attention if symptoms occur.
- 4.2. Most important symptoms and effects, both acute and delayed**
None known.
- 4.3. Indication of any immediate medical attention and special treatment needed**
Treatment: Symptomatic treatment (decontamination, vital functions), no known specific antidote.

Fig. 101: Tyfocor LS-rot manufacturer's safety data sheet – page 1/7

TYFOROP Safety Data Sheet Product TYFOCOR® LS® rot		Version 1 0, ID-No 2610-01_GB-GB	Revision date 01 07 2017 Page 2/7
SECTION 5: Firefighting measures			
5.1. Extinguishing media			
Suitable extinguishing media:		Water spray Alcohol-resistant foam Dry powder Carbon dioxide (CO ₂)	
Unsuitable extinguishing media:		None known	
5.2. Special hazards arising from the substance or mixture			
Specific hazards during firefighting:		Exposure to combustion products may be a hazard to health	
Hazardous combustion products:		Carbon oxides Nitrogen oxides (NO _x)	
5.3. Advice for fire-fighters			
Special protective equipment:		In the event of fire, wear self-contained breathing apparatus Use personal protective equipment	
Specific extinguishing methods:		Use extinguishing measures that are appropriate to local circumstances and the surrounding environment Use water spray to cool unopened containers Remove undamaged containers from fire area if it is safe to do so	
SECTION 6: Accidental release measures			
6.1. Personal precautions, protective equipment and emergency procedures			
Personal precautions:		Use personal protective equipment Follow safe handling advice and personal protective equipment recommendations	
6.2. Environmental precautions			
Discharge into the environment must be avoided Prevent further leakage or spillage if safe to do so Prevent spreading over a wide area (e.g. by containment or oil barriers) Retain and dispose of contaminated wash water Local authorities should be advised if significant spillages cannot be contained			
6.3. Methods and material for containment and cleaning up			
Methods for cleaning up:		Soak up with inert absorbent material For large spills, provide dyking or other appropriate containment to keep material from spreading If dyked material can be pumped, store recovered material in appropriate container Clean up remaining materials from spill with suitable absorbent Local or national regulations may apply to releases and disposal of this material, as well as those materials and items employed in the cleanup of releases You will need to determine which regulations are applicable Sections 13 and 15 provide information regarding certain local or national requirements	
6.4. Reference to other sections:		See sections 7, 8, 11, 12 and 13	
SECTION 7: Handling and storage			
7.1. Precautions for safe handling			
Technical measures:		See Engineering measures in section 8	
Local/total ventilation:		Use only with adequate ventilation	
Advice on safe handling:		Handle in accordance with good industrial hygiene and safety practice Take care to prevent spills, waste and minimize release to the environment	
Advice on protection against fire and explosion:		Observe the general rules of industrial fire protection	
Hygiene measures:		When using do not eat, drink or smoke Wash contaminated clothing before re-use	
7.2. Conditions for safe storage, including any incompatibilities			
Requirements for storage areas and containers:		Store containers tightly sealed in a cool, dry and well ventilated place Store in accordance with the particular national regulations	
Advice on common storage:		Do not store with strong oxidizing agents Keep away from food, beverages and animal feedstuffs	
7.3. Specific end uses			
For the relevant identified uses listed in section 1 the advice mentioned in this section 7 is to be observed			

Fig. 102: Tyfocor LS-rot manufacturer's safety data sheet – page 2/7

SECTION 8: Exposure control/personal protection

8.1. Control parameters

Components with occupational exposure limits

Information on component Propane-1,2-diol

Legal basis	Value type	Control parameters	Further information
GB EH40	TWA (Particles) TWA (Total vapour and particles)	10 mg/m ³ 10 mg/m ³ 474 mg/m ³ , 150 ppm	Where no specific short-term exposure limit is listed, a figure three times the long-term exposure should be used

DNEL values - information on component Propane-1,2-diol

End use	Exposure routes	Potential health effects	Value
Workers	Inhalation	Long-term local effects	10 mg/m ³
Workers	Inhalation	Long-term systemic effects	168 mg/m ³
Consumers	Inhalation	Long-term local effects	10 mg/m ³
Consumers	Inhalation	Long-term systemic effects	50 mg/m ³

DNEL values - information on component 1,1'-Iminobis-2-propanol

End use	Exposure routes	Potential health effects	Value
Workers	Inhalation	Long-term systemic effects	16 mg/m ³
Workers	Skin contact	Long-term systemic effects	12.5 mg/kg body weight/day
Consumers	Inhalation	Long-term systemic effects	3.9 mg/m ³
Consumers	Skin contact	Long-term systemic effects	6.3 mg/kg body weight/day
Consumers	Ingestion	Long-term systemic effects	1.3 mg/kg body weight/day

PNEC values - information on component Propane-1,2-diol

Fresh water	Marine water	Water (intermittent release)	Fresh water sediment	Marine water sediment	Soil	Sewage treatment plant
260 mg/l	26 mg/l	183 mg/l	572 mg/kg	57.2 mg/kg	50 mg/kg	20000 mg/l

PNEC values - information on component 1,1'-Iminobis-2-propanol

Fresh water	Marine water	Water (intermittent release)	Fresh water sediment	Marine water sediment	Soil	Sewage treatment plant
0.2777 mg/l	0.02777 mg/l	2.777 mg/l	2.19 mg/kg	0.219 mg/kg	0.275 mg/kg	15000 mg/l

8.2. Exposure controls

Engineering measures:

Ensure adequate ventilation, especially in confined areas. Minimize workplace exposure concentrations.

Personal protective equipment

Eye protection:

Safety glasses with side-shields (frame goggles, e.g. EN 166)

Hand protection:

Chemical resistant protective gloves (EN 374). Material: butyl rubber. Protective index 2. Break through time >30 minutes. Glove thickness 0.7 mm. Material: nitrile rubber. Protective index 2. Break through time >30 minutes. Glove thickness 0.4 mm. Remarks: Choose gloves to protect hands against chemicals depending on the concentration and quantity of the hazardous substance and specific to place of work. For special applications, we recommend clarifying the resistance to chemicals of the aforementioned protective gloves with the manufacturer. Wash hands before breaks and at the end of workday.

Skin and body protection:

Wash skin thoroughly after contact.

Respiratory protection:

Use respiratory protection unless adequate local exhaust ventilation is provided or exposure assessment demonstrates that exposures are within recommended exposure guidelines. Filter type: Particulate type (P).

Fig. 103: Tyfocor LS-rot manufacturer's safety data sheet – page 3/7

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SECTION 9: Physical and chemical properties			
9.1. Information on basic physical and chemical properties			
Appearance:	liquid		
Colour:	pale pink		
Odour:	faint		
Odour threshold:	No data available		
pH value (20 °C):	9 0 - 10 5		(ASTM D 1287)
Freezing point:	ca -22 °C		(ASTM D 1177)
Frost protection:	ca -25 °C		(calculated)
Solidification temperature:	ca -28 °C		(DIN ISO 3016)
Initial boiling point/boiling range:	>100 °C		(ASTM D 1120)
Flash point:	not applicable		(DIN EN 22719, ISO 2719)
Evaporation rate:	No data available		
Flammability (solid, gas):	not applicable		
Upper explosion limit:	12 6 % vol		(Inform on Propylene glycol)
Lower explosion limit:	2 6 % vol		(Inform on Propylene glycol)
Vapour pressure (20 °C):	ca 20 hPa		(calculated)
Vapour density:	No data available		
Density (20 °C):	ca 1 032 g/cm³		(DIN 51757)
Solubility:	Water solubility soluble		
Partition coefficient n-octanol/H₂O:	log P _{ow} (20 5 °C) -1 07		(Inform on Propylene glycol)
Auto-ignition temperature:	No data available		
Decomposition temperature:	No data available		
Viscosity (kinematic, 20 °C):	ca 4 5 mm²/s		(DIN 51562)
Explosive properties:	not explosive		
Oxidizing properties:	not oxidizing		
9.2. Other Information:	No other information		
SECTION 10: Stability and reactivity			
10.1. Reactivity:	No hazardous reactions if stored and handled as prescribed/indicated Corrosion to metals No corrosive effect on metals		
10.2. Chemical stability:	The product is stable if stored and handled as prescribed/indicated		
10.3. Possibility of hazardous reactions:	No hazardous reactions if stored and handled as prescribed/indicated		
10.4. Conditions to avoid:	No conditions to avoid anticipated		
10.5. Incompatible materials:	Substances to avoid strong oxidising agents		
10.6. Hazardous decomposition products:	No hazardous decomposition products if stored and handled as prescribed/indicated		
SECTION 11: Toxicological information			
11.1. Information on toxicological effects			
Information on likely routes of exposure:	Inhalation Skin contact Ingestion Eye contact		
Acute toxicity:	Not classified based on available information Information on component 1,1'-Iminobis-2-propanol Acute oral toxicity LD50 (Rat) >2000 mg/kg, method OECD test guideline 401 Acute inhalation toxicity LC0 (Mouse) >2069 mg/m³, exposure time 3 hours, test atmosphere dust, mist Acute dermal toxicity LD50 (Rabbit) 8000 mg/kg		
Skin corrosion/irritation:	Not classified based on available information Information on component 1,1'-Iminobis-2-propanol No skin irritation (Rabbit), method OECD test guideline 404		
Serious eye damage/eye irritation:	Not classified based on available information Information on component 1,1'-Iminobis-2-propanol Irritation to eyes, reversing within 21 days (Rabbit), method OECD test guideline 405		
Respiratory or skin sensitisation:	Skin sensitisation Not classified based on available information Respiratory sensitisation Not classified based on available information		

Fig. 104: Tyfocor LS-rot manufacturer's safety data sheet – page 4/7

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SECTION 11: Toxicological information - Continuation

Germ cell mutagenicity:	Information on component 1,1'-Iminobis-2-propanol Skin contact not sensitising (Guinea pig, Buehler Test), method OECD test guideline 406 Not classified based on available information
Carcinogenicity:	Information on component 1,1'-Iminobis-2-propanol Genotoxicity in vitro not mutagenic Tests 1 Bacteria, AMES Test, method OECD test guideline 471, 2 Chromosome aberration test in vitro, method OECD test guideline 473, 3 In vitro mammalian cell gene mutation test, method OECD test guideline 476 Not classified based on available information
Reproductive toxicity:	Information on component 1,1'-Iminobis-2-propanol Not carcinogenic (Rat), application route ingestion, exposure time 94 weeks Not classified based on available information
Specific target organ toxicity (single exposure):	Information on component 1,1'-Iminobis-2-propanol Effects on fertility negative (Rat, One-generation reproduction study, application route ingestion Effects on foetal development negative (Rat, embryo-foetal development), appl route ingestion, method OECD test guideline 414 Not classified based on available information
Specific target organ toxicity (repeated exposure):	Not classified based on available information
Aspiration toxicity:	Not classified based on available information

SECTION 12: Ecological information

12.1. Toxicity
 Information on component 1,1'-Iminobis-2-propanol

Toxicity to	Value / exposure time	Species
fish	LC50 1466 mg/l / 96 h	Brachydanio rerio (Zebra fish) Method OECD test guideline 203
daphnia and other aquatic invertebrates	EC50 277.7 mg/l / 48 h	Daphnia magna (Water flea)
algae	EC50 339 mg/l / 72 h NOEC 125 mg/l / 72 h	Desmodesmus subspicatus (Green algae)

12.2. Persistence and degradability:	Information on component 1,1'-Iminobis-2-propanol Biodegradability Biodegradation 94 % (28 d), method OECD test guideline 301 Result readily biodegradable
12.3. Bioaccumulative potential:	Information on component 1,1'-Iminobis-2-propanol Partition coefficient n-octanol/H ₂ O log P _{ow} -0.88
12.4. Mobility in soil:	No data available
12.5-Results of PBT and vPvB assessment:	The product does not contain a substance fulfilling the PBT criteria (persistent/bioaccumulative/toxic) or the vPvB criteria (very persistent/very bioaccumulative)
12.6. Other adverse effects:	No data available
12.7. Further information:	No further information

SECTION 13: Disposal considerations

13.1. Waste treatment methods
Product: Dispose of in accordance with local regulations
 According to the European Waste Catalogue (EWC), waste codes are not product specific, but application specific Waste codes should be assigned by the user, preferably in discussion with the waste disposal authorities

Fig. 105: Tyfocor LS-rot manufacturer's safety data sheet – page 5/7

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SECTION 13: Disposal considerations - Continuation				
Contaminated packaging: Dispose of as the product Empty containers should be taken to an approved waste handling site for recycling or disposal				
SECTION 14: Transport information				
	ADR/ RID	ADN	IMDG	IATA/ ICAO
	Not classified as a dangerous good under transport regulations			
14.1 UN number	-	-	-	-
14.2 UN proper shipping name	-	-	-	-
14.3 Transport hazard classes	-	-	-	-
14.4 Packing group	-	-	-	-
14.5 Environmental hazards	-	-	-	-
14.6 Special precautions for user	-	-	-	-
14.7. Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not evaluated				
SECTION 15: Regulatory information				
15.1. Safety, health and environmental regulations/legislation specific for the substance/mixture				
Legal basis		Remark / Evaluation		
Regulation (EC) No 649/2012 of the European Parliament and the Council concerning the export and import		Not applicable		
REACH - Candidate List of Substances of Very High Concern for Authorisation (Article 59)		Not applicable		
Regulation (EC) No 1005/2009 on substances that deplete the ozone layer		Not applicable		
Regulation (EC) No 850/2004 on persistent organic pollutants		Not applicable		
Seveso III - Directive 2012/18/EU of the European Parliament and of the Council on the control of major-accident hazards involving dangerous substances		Not applicable		
Other regulations No further information				
15.2. Chemical Safety Assessment A Chemical Safety Assessment was not carried out for the product				
SECTION 16: Other information				
Full text of the abbreviations of classifications and H-Statements used in sections 2 and 3				
Eye Irrit 2	Eye irritation, Category 2			
H319	Causes serious eye irritation			
Other abbreviations used in this safety data sheet in alphabetical order				
ADN	European agreement concerning the international carriage of dangerous goods by inland waterways			
ADR	European agreement concerning the international carriage of dangerous goods by road			
ASTM	American Society for Testing and Materials			
CAS number	Chemical Abstracts Service number			
CLP	Regulation (EC) No 1272/2008 on classification, labeling and packaging of chemical substances and mixtures			
DIN	German Institute for Standardisation/German Industrial Standard			
DNEL	Derived No Effect Level			
EC50	Median Effective Concentration			

Fig. 106: Tyfocor LS-rot manufacturer's safety data sheet – page 6/7

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SECTION 16: Other information - Continuation			
EC number	EINECS number (European Inventory of Existing Substances) or ELINCS number (European List of Notified Chemical Substances)		
GB EH40	UK EH40 WEL - Workplace Exposure Limits		
GB EH40 TWA	Long-term exposure limit (8-hour TWA reference period)		
IATA	International Air Transport Association		
IBC	International Bulk Chemicals		
ICAO	International Civil Aviation Organization		
IMDG	International Maritime Dangerous Goods Code		
INDEX number	Identification code for hazardous substances, Annex VI of Regulation (EC) No 1272/2008		
ISO	International Organisation for Standardisation/International Standard		
LC0	Threshold concentration without harmful effect		
LC50	Median Lethal Concentration		
LD50	Median Lethal Dose		
MARPOL	International Convention for the Prevention of Marine Pollution from Ships		
NOEC	No Observed Effect Concentration		
OECD	Organisation for Economic Cooperation and Development		
PNEC	Predicted No Effect Concentration		
REACH	Regulation (EC) No 1907/2006 on Registration, Evaluation, Authorisation and Restriction of Chemicals		
RID	Regulation concerning the international carriage of dangerous goods by rail		
Further information			
Sources of key data used to compile the safety data sheet Internal technical data, data from component SDS, OECD eChem Portal search results and European Chemicals Agency [ECHA]			
Revision date	01 07 2017		
Date of previous version	-		
Vertical lines in the left hand margin indicate an amendment from the previous version			
The information provided in this safety data sheet (SDS) is correct to the best of our knowledge, information and belief at the date of its publication. The information is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and shall not be considered a warranty or quality specification of any type. The information provided relates only to the specific product identified at the top of this SDS and may not be valid when the SDS product is used in combination with any other materials or in any process, unless specified in the text. Product users should review the information and recommendations in the specific context of their intended manner of handling, use, processing and storage, including an assessment of the appropriateness of the SDS product in the user's end product, if applicable.			

Fig. 107: Tyfocor LS-rot manufacturer's safety data sheet – page 7/7

13.4 Solar Keymark certificate

The Solar Keymark certificate and the corresponding data sheet can be viewed at <http://www.dincertco.com>.

13.5 Accessories

All accessories are listed in the Solvis price list.

13.6 Nameplate

Each unit has a product-specific nameplate that indicates the most important parameters. The contents are explained using this example.

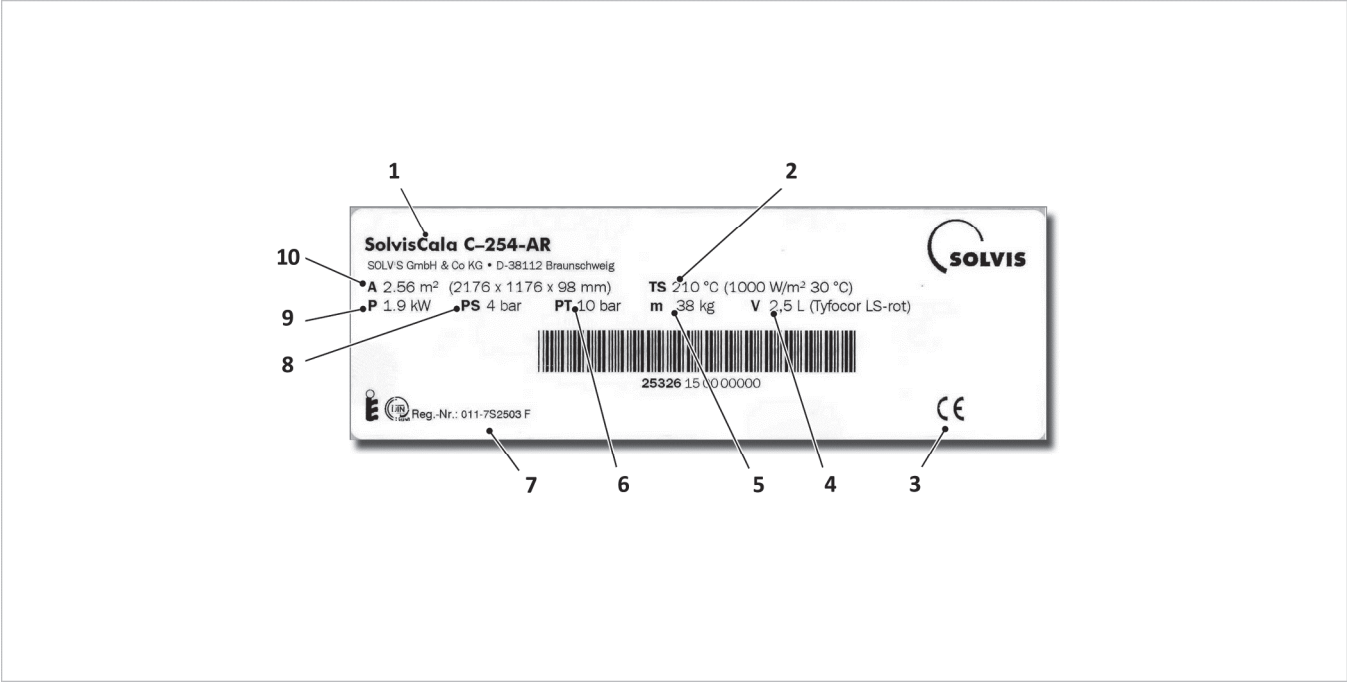


Fig. 108: SolvisCala sample nameplate

- | | | | | | |
|---|-----------------------------------|---|------------------------------|----|---|
| 1 | Type designation and manufacturer | 5 | Weight | 9 | Max. performance |
| 2 | Idle temperature | 6 | Test pressure | 10 | Gross surface area and collector dimensions |
| 3 | Conformity marking | 7 | Keymark registration | | |
| 4 | Heat transfer fluid volume | 8 | Permitted operating pressure | | |

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Notes



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