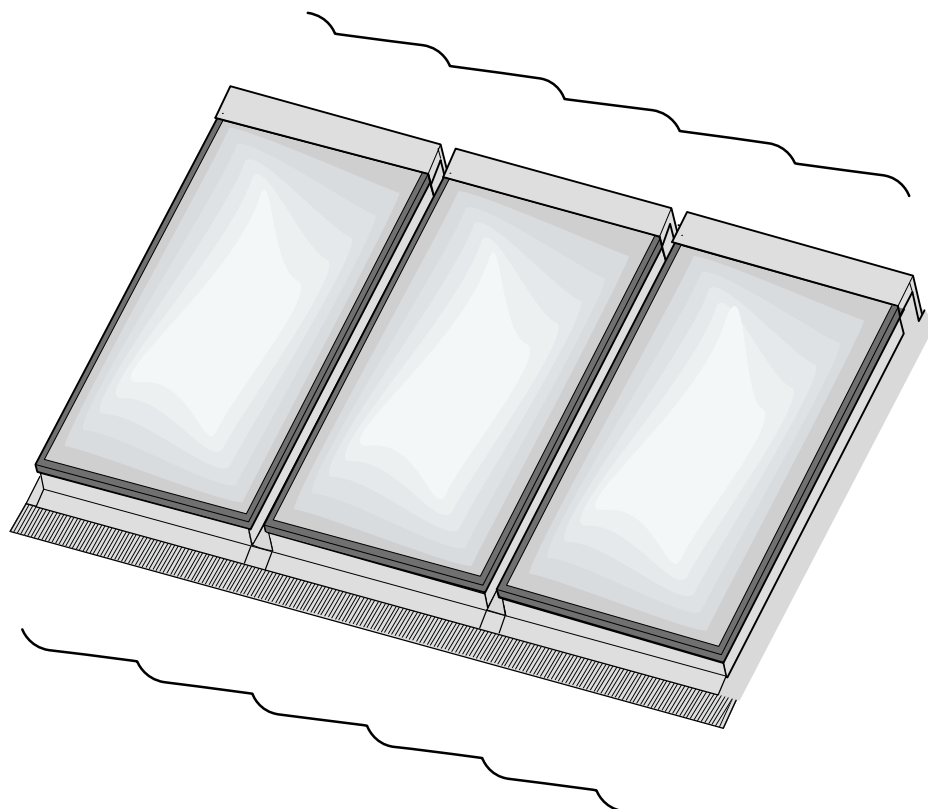




Regenerative Energie- und Montagesysteme GmbH



Solarthermal

Installation Manual In-roof
Collector RK 215

**Dear Customer,**

thank you for deciding to install a REM RK-215 collector on your roof.
Please read this installation manual carefully before installing the collector.
Please pay attention to the applicable technical regulations.

| | | |
|----------|--|-----------|
| 1 | Technical datas | 3 |
| 2 | Safety instructions..... | 3 |
| 3 | Required aids and tools..... | 3 |
| 4 | Installation | 4 |
| 4.1 | General Notes for the installing of the collectors | 4 |
| 4.2 | Possibilities of combination | 5 |
| 4.3 | Installation of collectors | 6 |
| 4.3.1 | Component overview | 11 |
| 4.3.2 | Fastening the flashing | 12 |
| 4.4 | Positioning of the sensor | 19 |
| 4.5 | Connection- and Linking-Set | 19 |
| 5 | Electrical Installation and Equipotential Bonding | 21 |
| 6 | Operational Notes | 21 |
| 7 | Troubleshooting..... | 23 |
| 8 | Acceptance Report | 26 |



1 Technical datas

gross collector Area : 2,15 m²
 aperture area : 1,9 m²
 dimensions (w x h x d) : 1070 x 2010 x 90 mm
 weight : 40 kg
 collector frame : aluminium silver anodized
 glas : highly transparent solar safety glas 4 mm
 connections : 2 x Cu 18 mm

2 Safety instructions

This manual ist written for professionals, who are familiar with the installation of solarthermal collectors.

.

- The accident prevention regulations for working on roofs must be followed..
- Where required a safety harness or safety scaffolding has to be used.
- The system must not be filled with liquid during a strong sunshine on the collector surface. If the filling is done during sunshine, the collectors have to be covered.
- If there ist he dange of freezing, the collectors may not be filled or pressure tested with water. In this case there has to be used the original REM heat transfer fluid.

3 Required aids and tools

To install the collectors, the following materials are required :

- piece of chalk, chalk line
- 2 ladders
- appropriate rope, ca. 8-10 m lonng, lashing straps
- water-level
- drillig maschine and drilling set
- drillset (Torx T25) für Torx-screws
- socket spanner with ratchet, sockets and extension (size 17 and 13 mm)
- open-end wrench (size 17 mm)
- adjustable open-end wrench (up to size 30 mm) or open-end wrench size 27 mm
- Screwdrivers (size 3 - 4)
- angle grinder with cutting disk for stone
- saw with blades for wood- and metal
- Hexagonal spanner 6 mm

4 Installation

The inroof mounting of the collectors is possible on roofs with an inclination of min. 20°. To be shure that everythin ist tight, th e mounting must be done by a professional.

4.1 General Notes for the installing of the collectors

- If the collectors have to be stored before installation, they have to be stored dry and protected from direct sunshine.
- In case of transporting a collector in vertical position, the collecto has to be secured against sliding out of the carton box.



- The perfect condition of the roof construction has to be checked before beginning of the installation (static loads).
- The collectors shoulbe faced to south if possible.

Possibilities of combination

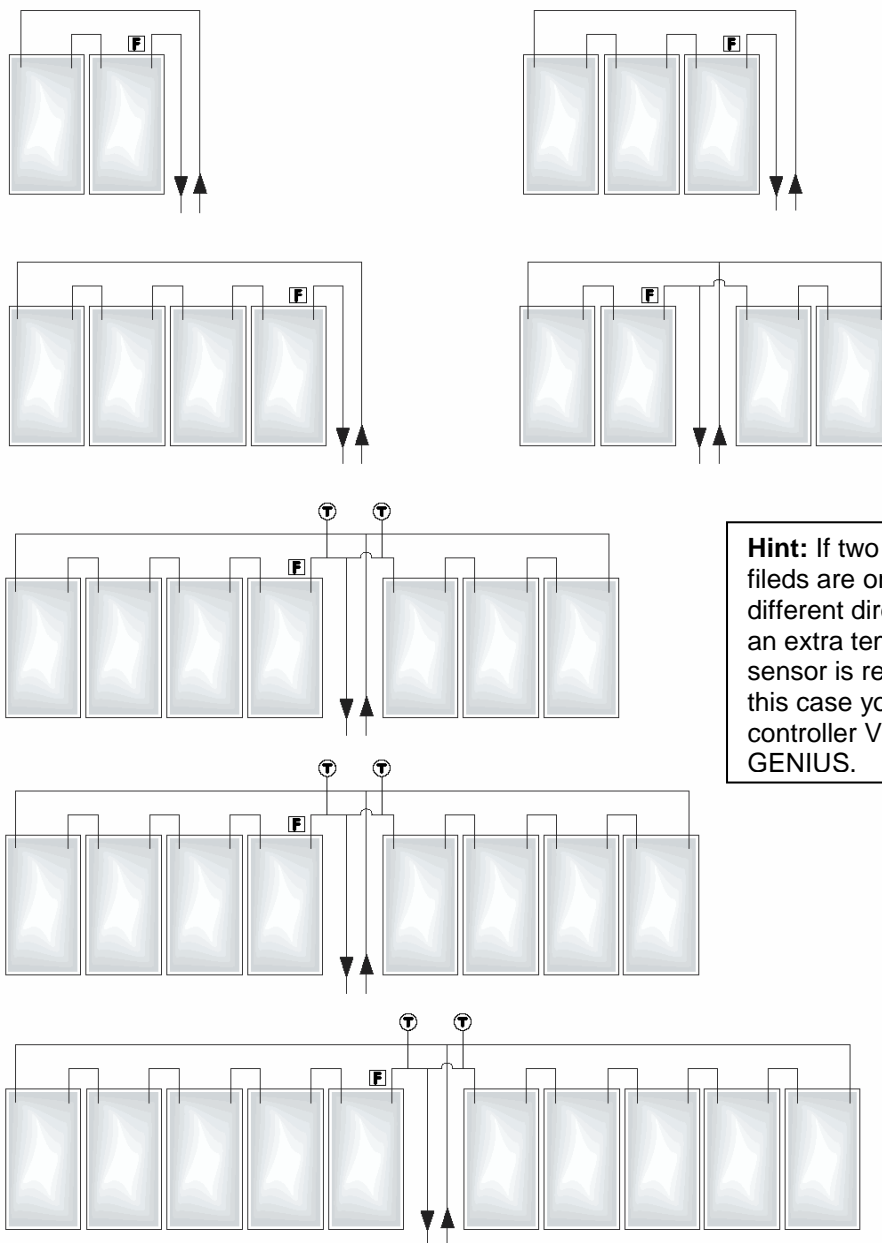


- 5 -

4.2 Possibilities of combination

In picture 1 are shown some possibilities of combination. 6 may be connected maximal in series. Multiple groups of serial connected collectors must be connected in parallel fields, according to the Tichelmann principle.

If collector groups with different numbers of collectors are connected, there must be used a temperature resistant string regulator (min up to 150°C) to adjust the pressure loss of the fields.



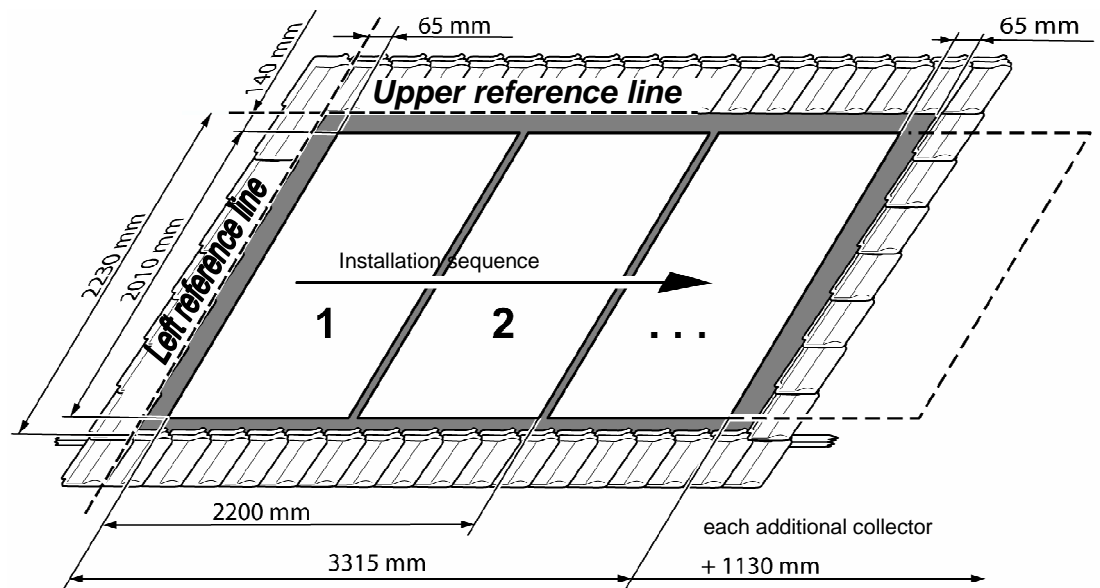
Hint: If two collector fields are oriented in different directions, then an extra temperature sensor is required. In this case you need the controller VISION or GENIUS.

F: collector-sensor
T: string regulator



4.3 Installation of collectors

1 Mark the position of the collectors using the drawings below



Pic 2

Left reference line = next tile edges in the left of the collectors.

Upper reference line = next tile edges over the collectors.

The alignment of collectors has to be done according to these 2 reference lines.

2 Remove tiles according to the area of the collector-field.

- Uncover the roof surface in accordance with the collector field plus working area. Remove at least one additional row of roofing plates each at the top, at the bottom, on the left and on the right.



Mounting

- 7 -

Dimensions

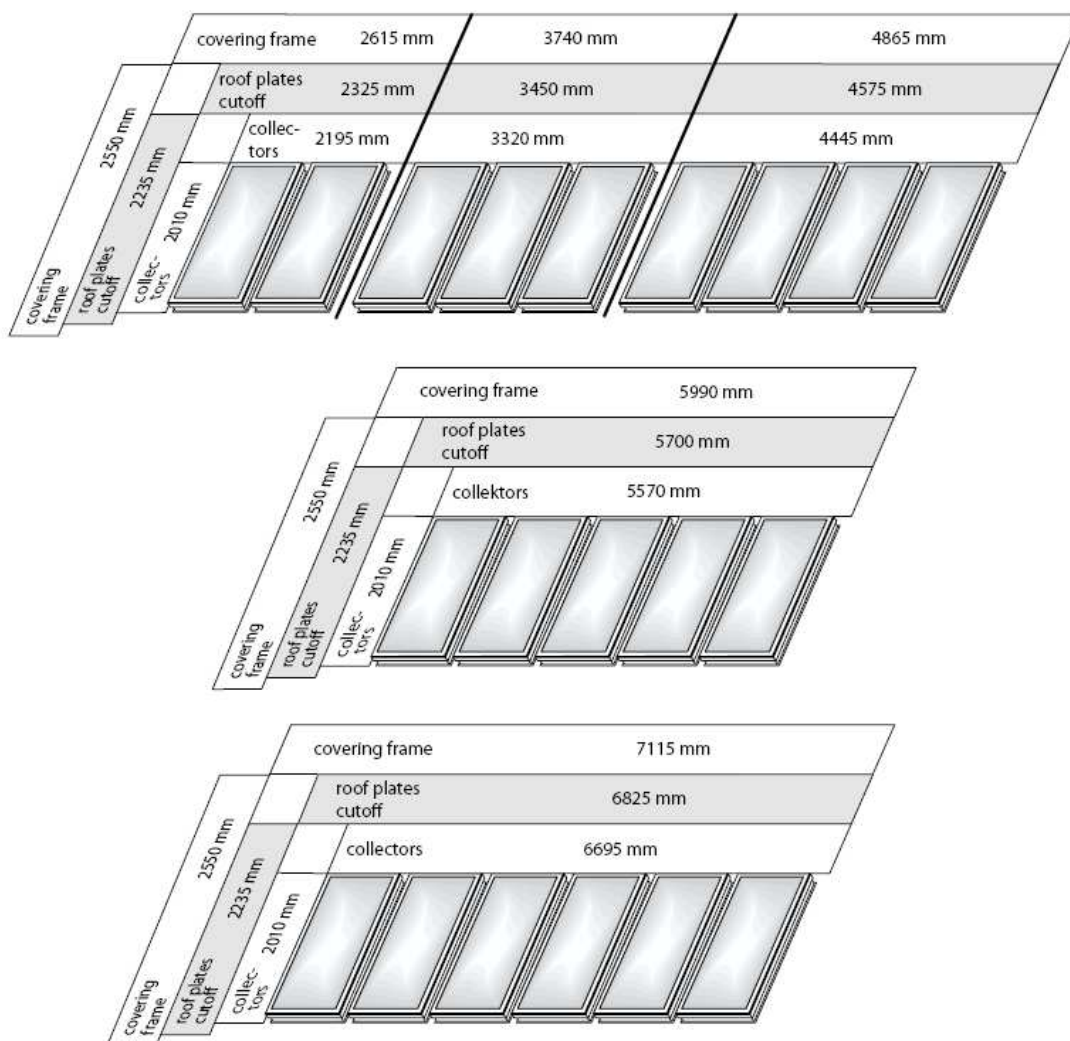
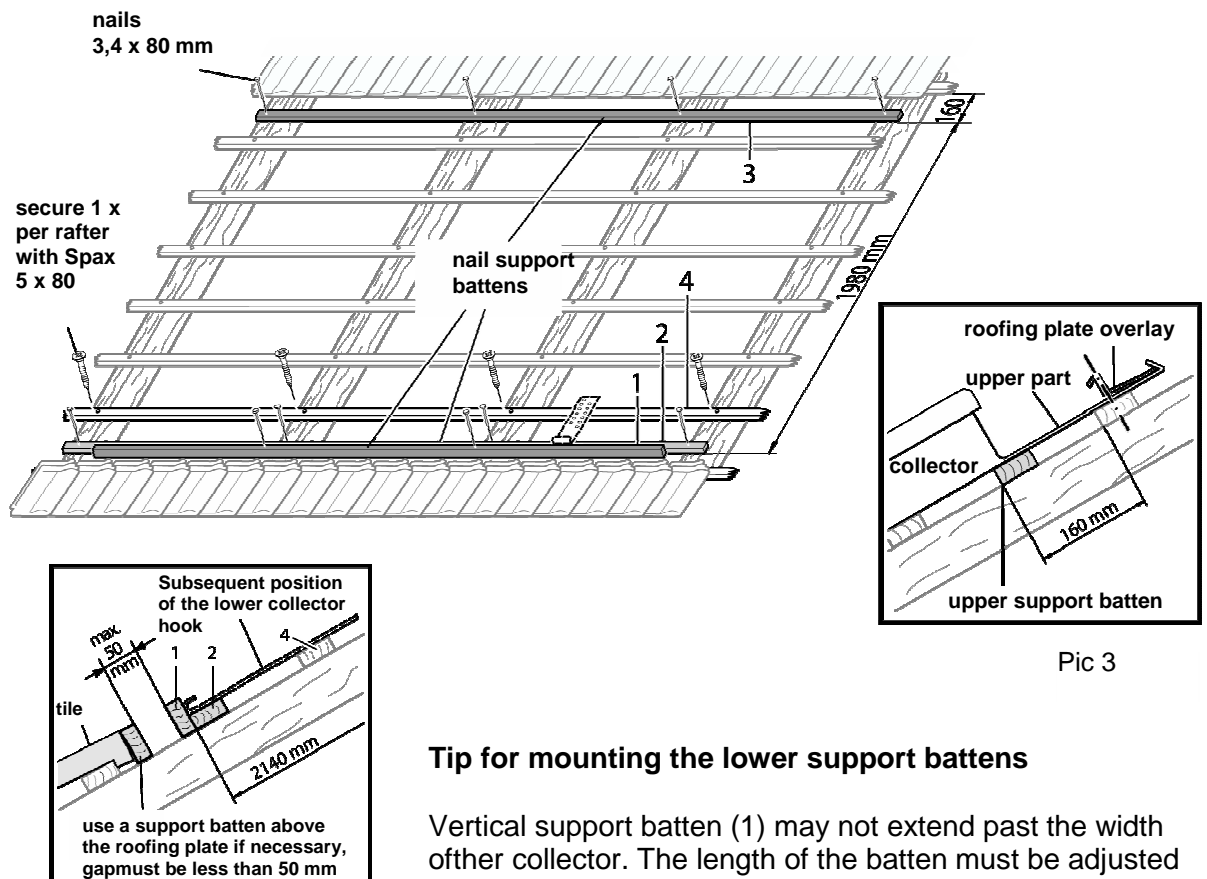


Tabelle 1

3 Fit support battens (1) to (3) to fasten the collectors as shown in picture 3.

These support battens have to be sufficiently nailed in place. The first roof batten (4) above the two lower support battens (1) and (2) must also be secured with 5 x 80 mm spaxscrews.



Pic 3

Tip for mounting the lower support battens

Vertical support batten (1) may not extend past the width of other collector. The length of the batten must be adjusted for the total width of the collector (Pic 2).

The upper edge of the vertical batten (1) must be the same height as the upper edge of the roofing plates.

The length of support batten (2) must be adjusted to match the substructure (distance between the rafters).

Conditional step :

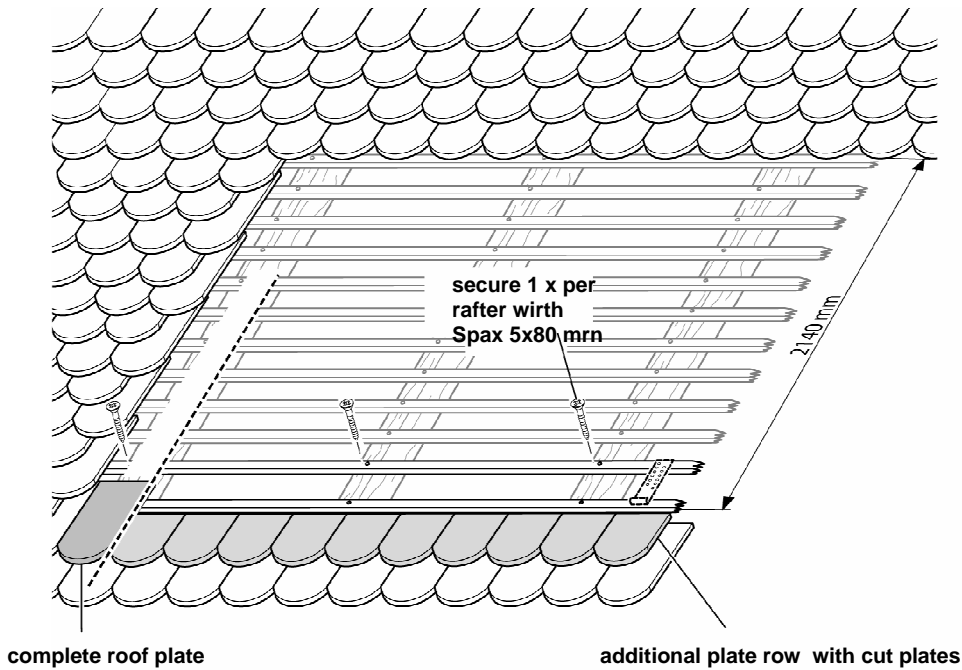
Depending on the type of roofing plate, it may be necessary to grind or knock off the plate folds at the upper plate edge of the lower roofing plate row. This may be necessary for a proper fixing of the lower part led sheets.

Mounting

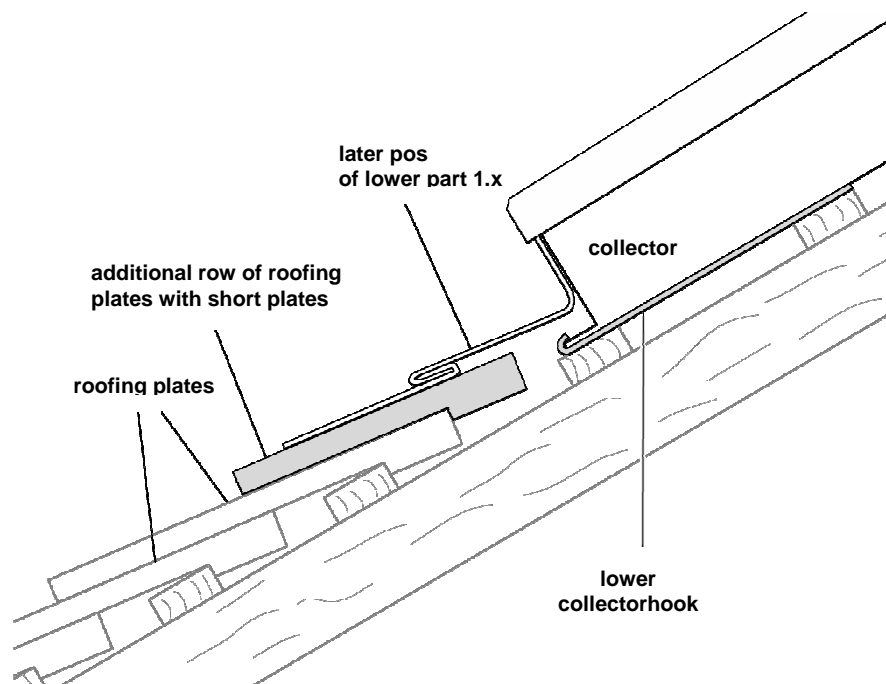
- 9 -

Tips for roofs with plain tiles

The support battens (1) to (3), as shown in Pic 3 are not required.
Mount an additional plate row on the lower side of the collector field as shown in Pic 4. Apart from that Pic 3 is valid.



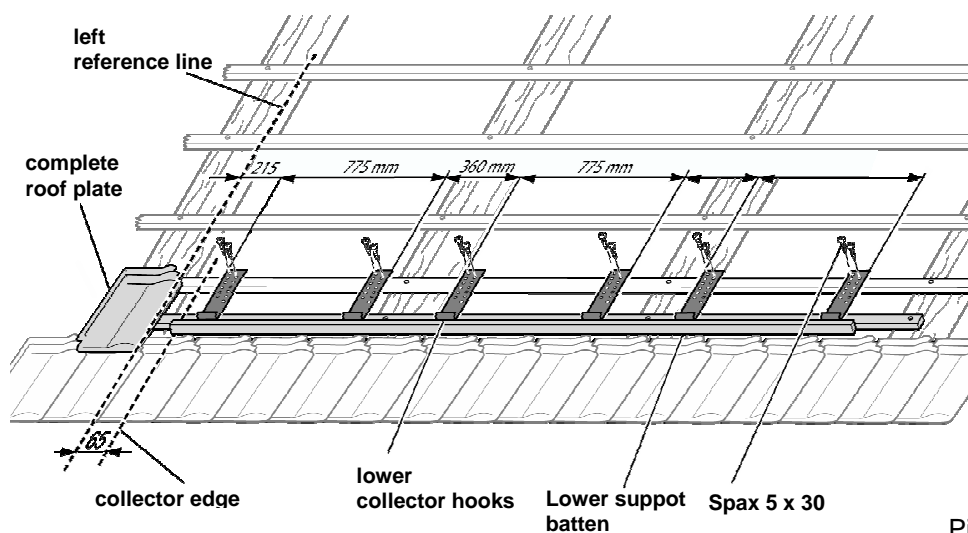
Pic 4



4 Transportation of collectors on the roof.

To avoid damages of the collector during the transport to the roof, unpack the collector not until it is on the roof.

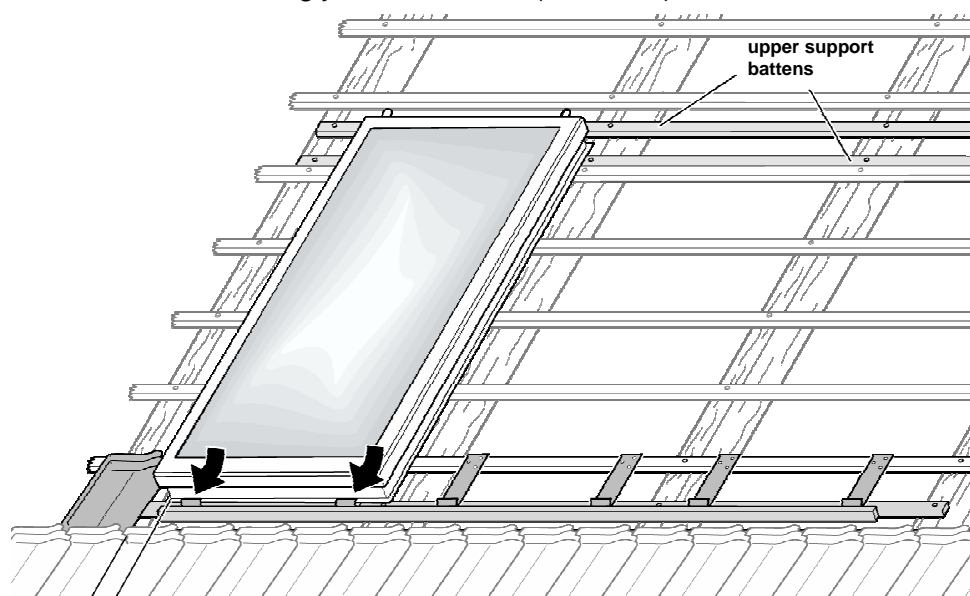
5 Mounting of the lower collector hooks.



Pic 5

6 Positioning of the first collector.

Put the first collector in position and fit it in the two left collector mounts. Align the collector accordingly, but don't fix it (see Pic 6).



7 fit all other collectors but don't secure them

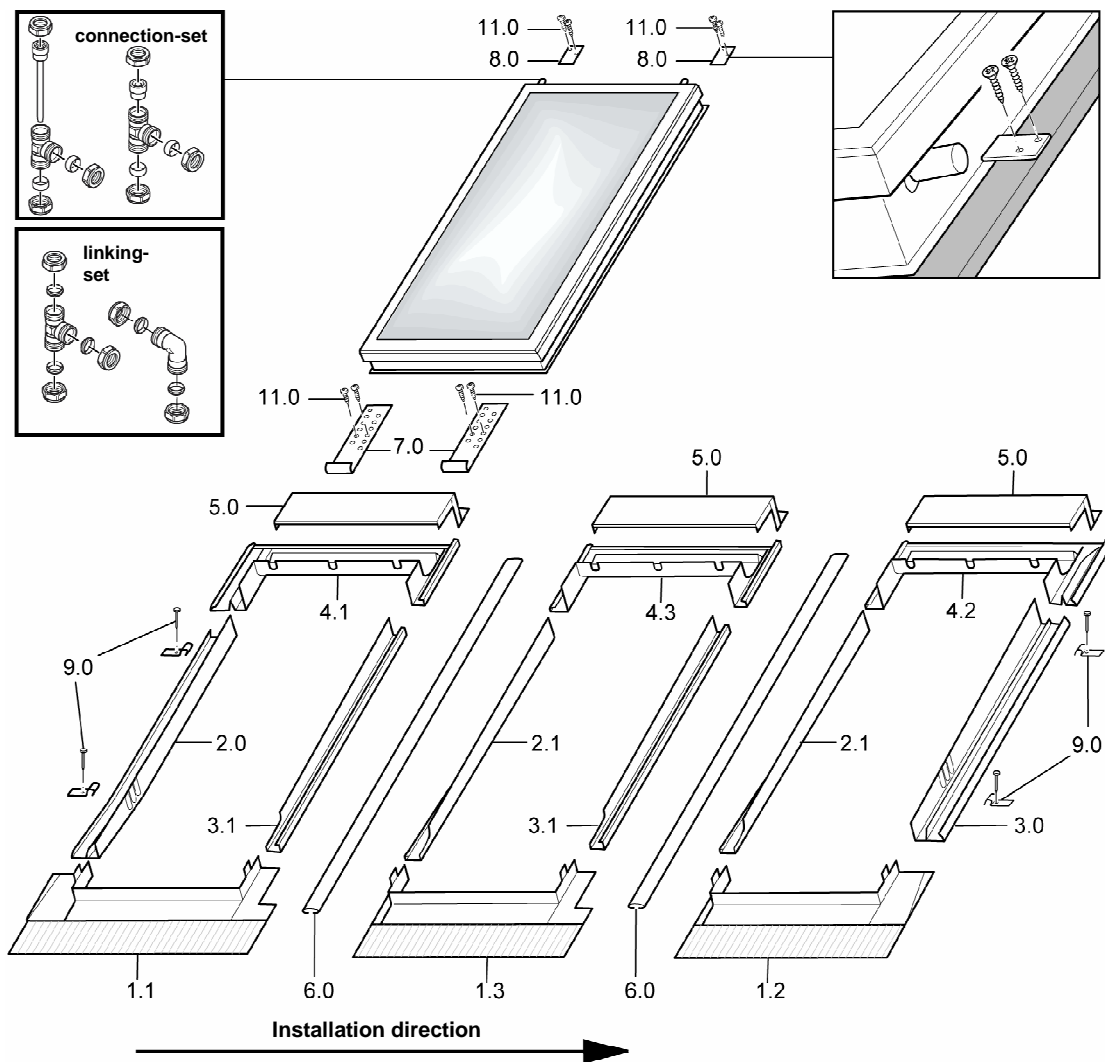
Pic 6



Mounting

- 11 -

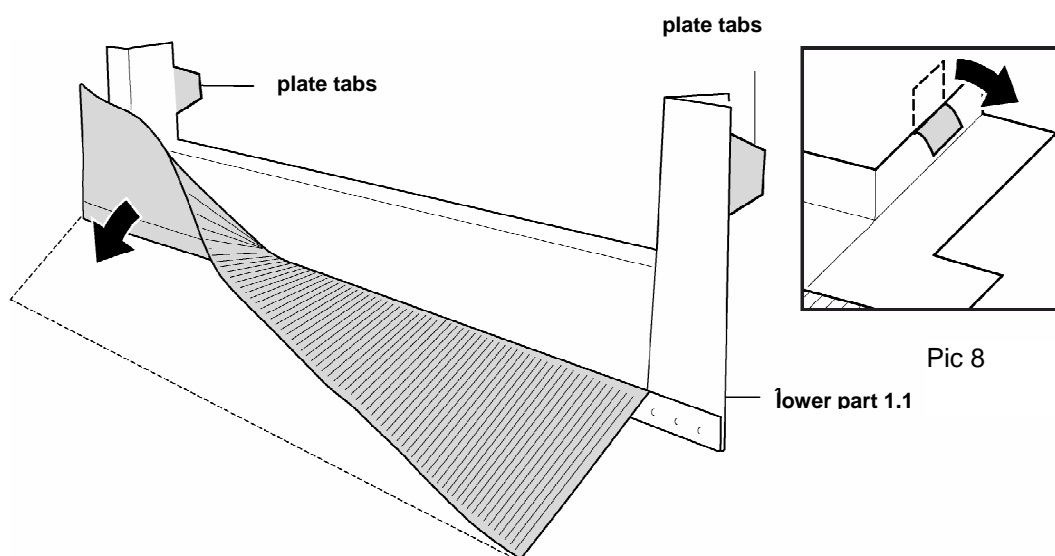
4.3.1 Component overview



4.3.2 Fastening the flashing

8 Prepare the lower parts 1.x for installation with the collectors.

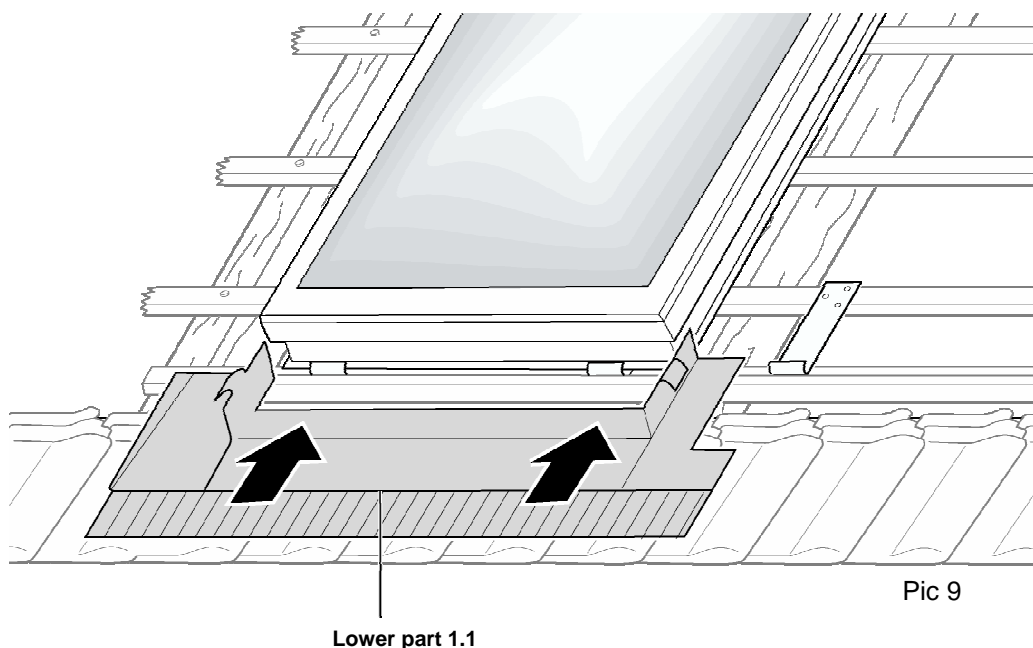
To do so, fold the corrugated lead plate open about 180°, bend the plate tabs over (see small illustration)



9 Attach all lower parts 1.x.

Tip : The left lower part must be attached first to ensure that the lower parts 1.x overlap. Then lay the next plate over it (to do so, lift the collector slightly).

The lead plate covering must overlay the lower tile by at least 100 mm.

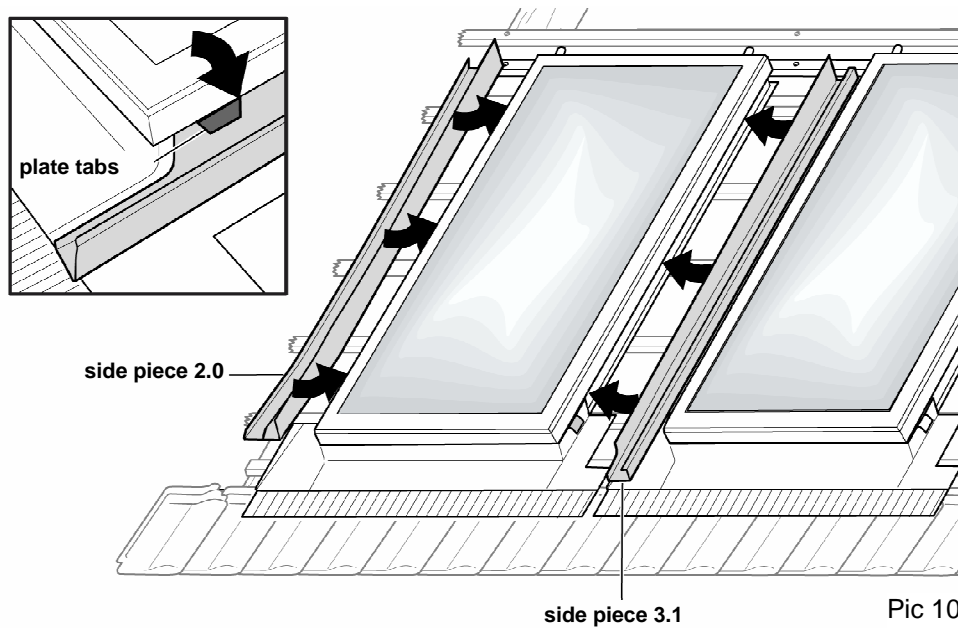


Mounting

- 13 -

10 Put side pieces 2.0 and 3.1 in position.

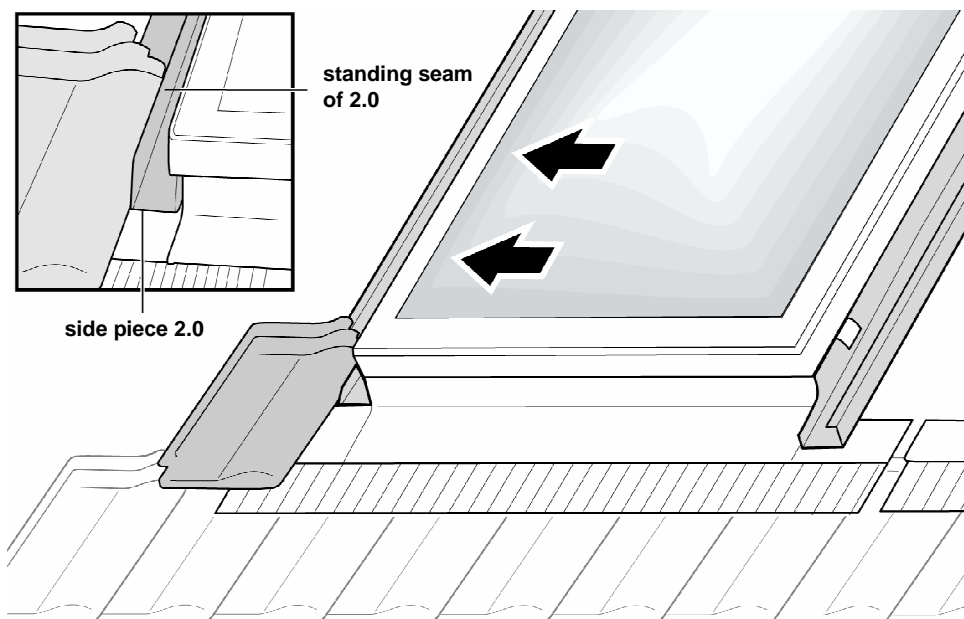
clamp them in place using the plate tabs of lower part 1.1, Pic 10.



Pic 10

11 Position a test roofing plate to the left of the first collector.

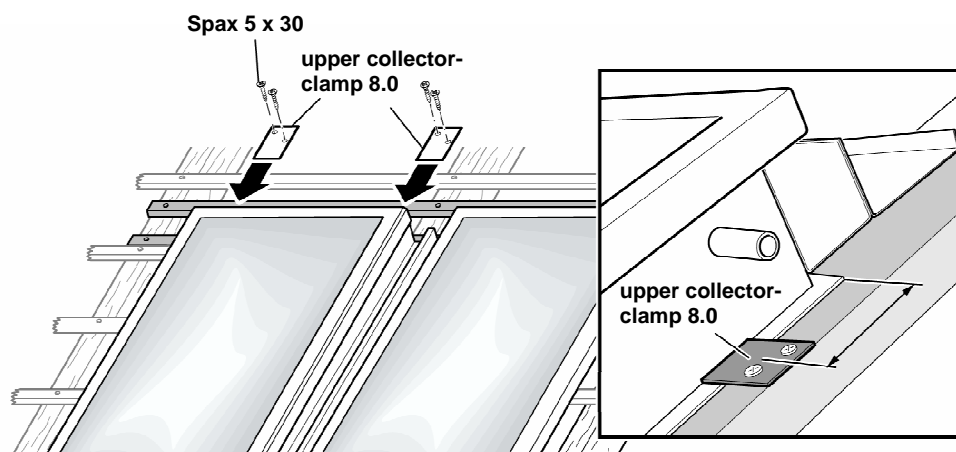
Place the collector with the left side piece 2.0 flush against the roofing plate and align it correctly.



Pic 11

12 Fixing the left collector.

Install the left collector first using upper collector clamp 8.0 (Pic 12). The other collectors are mounted later after all side pieces are inserted

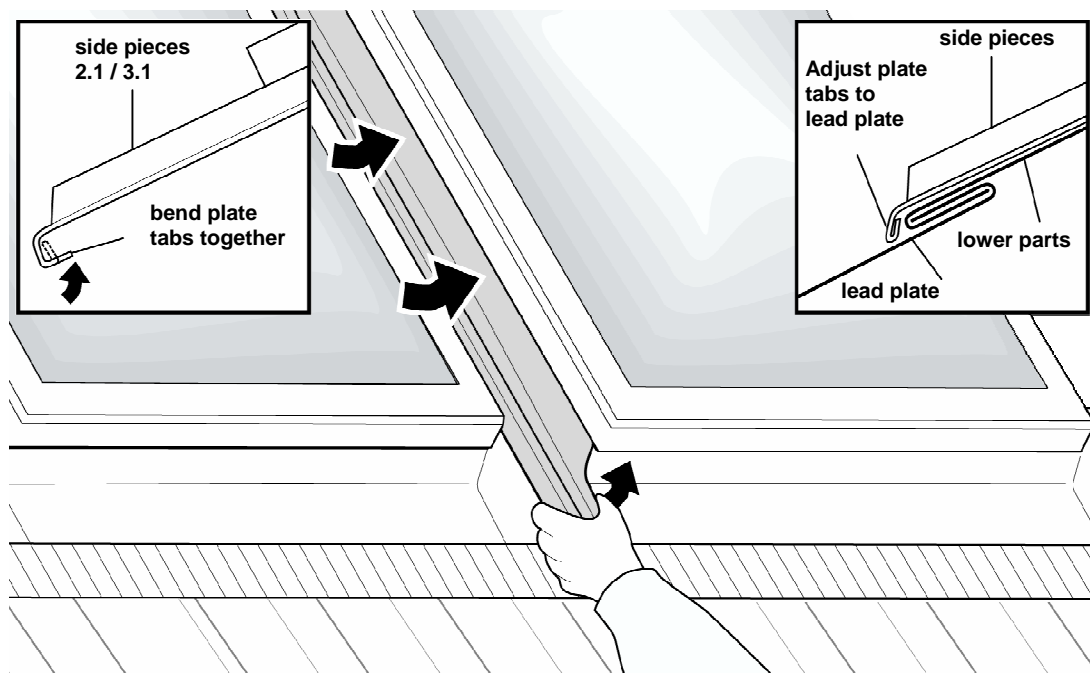


Pic 12

13 Insert the remaining side pieces 1.1/3.1/3.0.

Bend all platetabs together and match them to the corresponding lowerparts 1.x, (see Pic 13).

Push the collectors until the edges meet



Pic 13

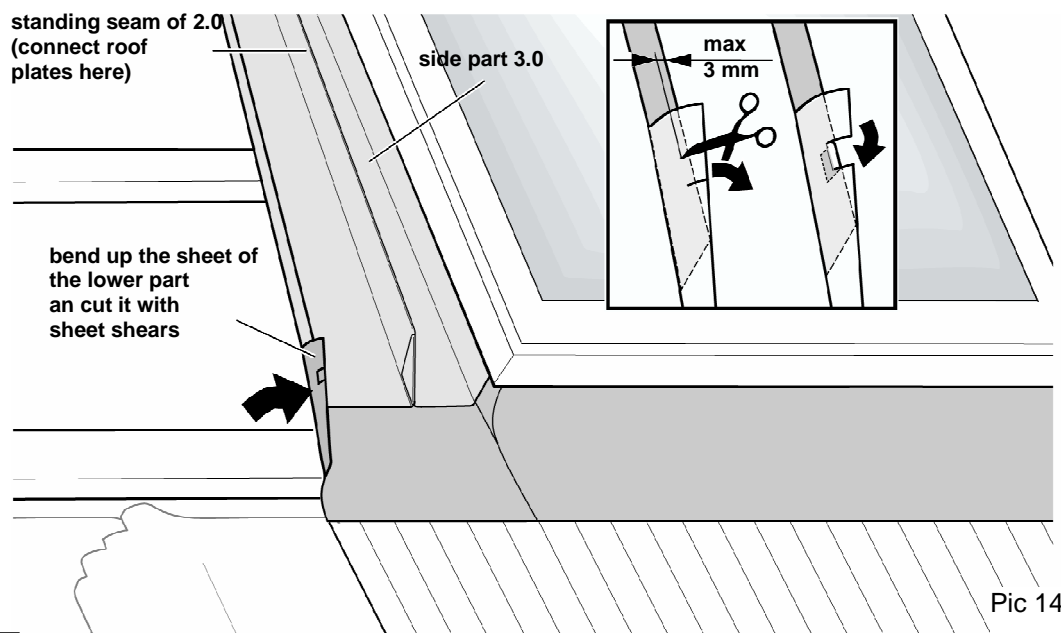
Mounting

- 15 -

- 14** Bend the edge folds of lower parts 1.1 (left) and 1.2(right) around side pieces 2.0 (left) and 3.0 (right).

That is important for a watertight transition to the roofing plates.

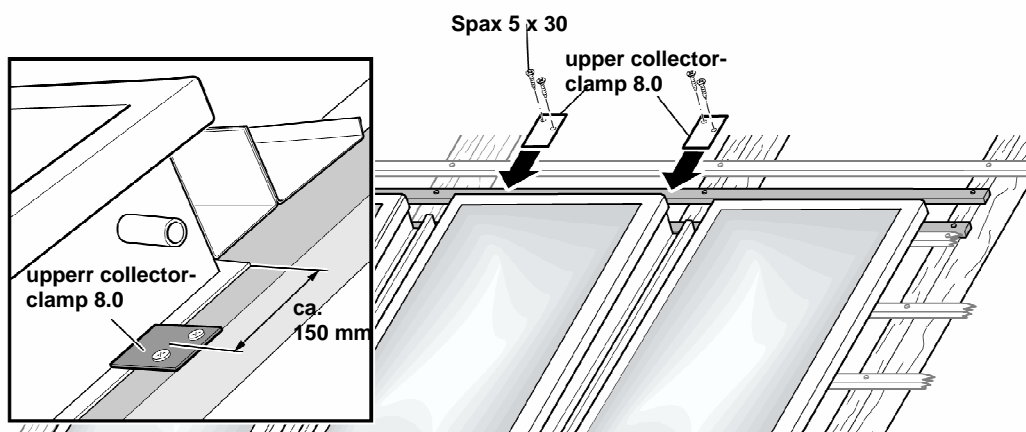
Tip : Cut into the edge fold twice with sheet shears. The edge of the side pieces may only be cut in 3 mm. Bend the resulting plate tab inwards. This additionally protects the lower part from sliding (see Pic 14).



Pic 14

- 15** Fixing of collectors

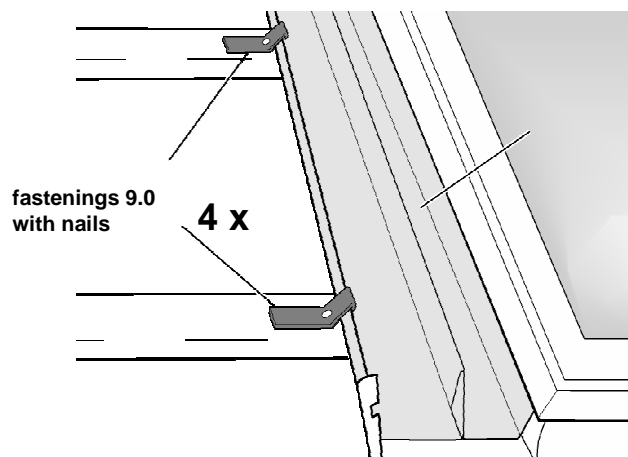
Now fix the remaining collectors with the upper collector clamps 8.0, (see Pic 15).



Pic 15

16 Fastenings 9.0 fixing.

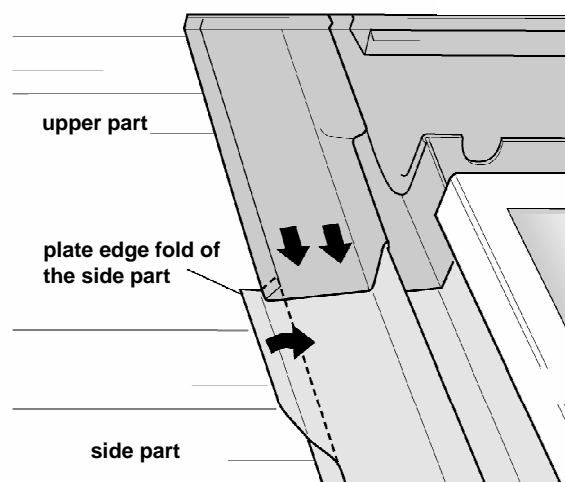
Attach the side fastenings.
Clamp the fastenings in
side pieces 2.0 and 3.0 and
secure the fastenings with the
nails 9.0 on the counter battens.



Pic 16

17 Slide up upper parts 4.x

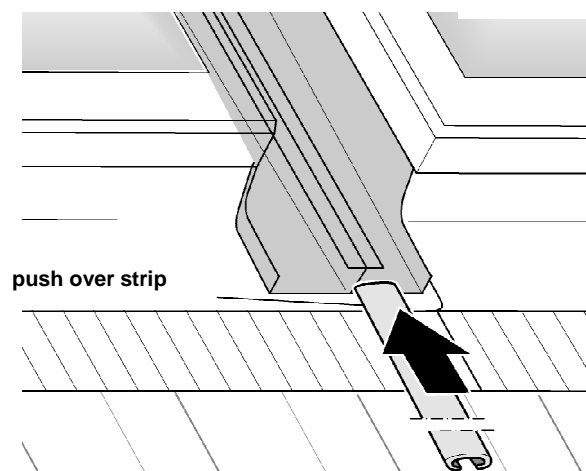
Blechrandfalz der Seitenteile 2.0
und 3.0 um die Oberteile
schließen, Bild 17



Pic 17

18 Fixing push over strips

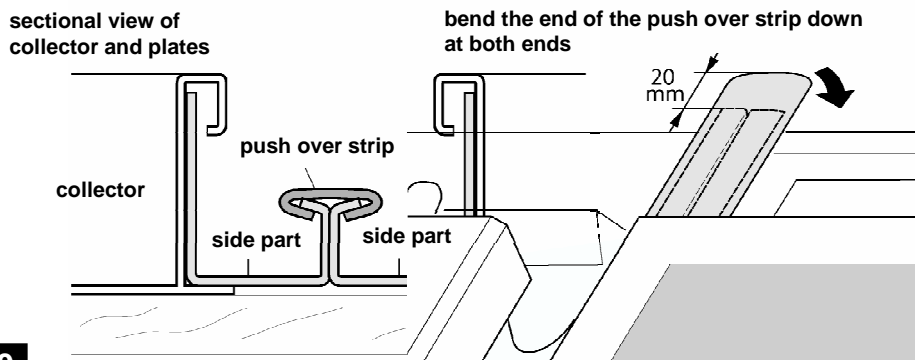
Attach the die push-over strips
and leave about 20 mm protruding
at the bottom



Pic 18

19 Überstand umbiegen.

bend the end of the push over strip down at both ends (see Pic 19).



Pic 19

20 Shaping the corrugated lead plate

Shape the corrugated lead plate from 1.1/1.3 or 1.2 to the contour of the roof tile. The best way to do this is by pressing against them with the ball of your hand. Do not use any pointed tools for this.

Recommendation :

Stick the long lead plate apron down using silicone to prevent it being lifted by wind.

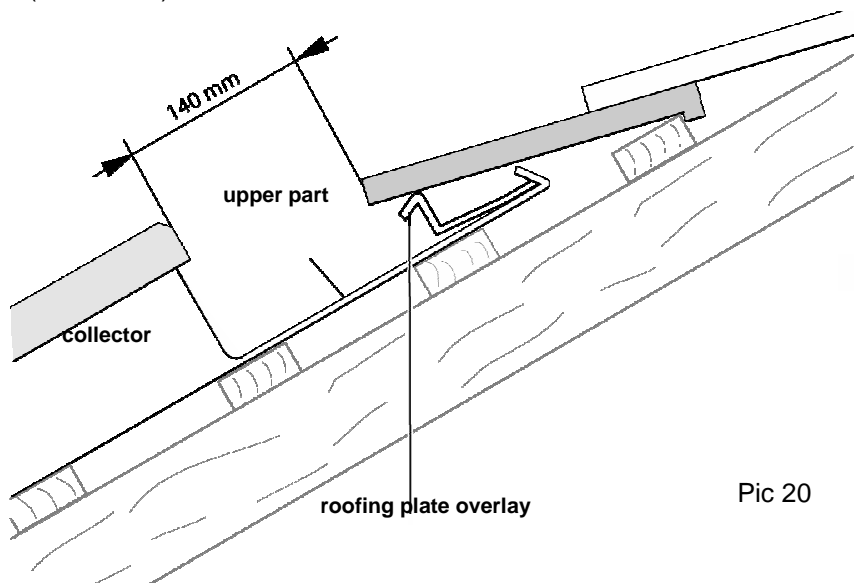
21 Closing the in-roof frame.

Cut the roofing plates to size if necessary (see Pic 21).

Adjusting of the roof plates on the right side has to be done on the roof.

According to type of roof plates it can be necessary, to mount additional lead plates (not included in the delivery contents).

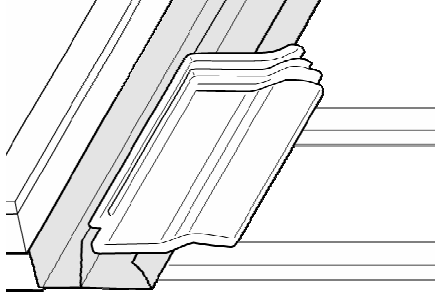
Important: The distance of the first row of roofing plates to the collector above the collectors must be 140mm. If the distance is smaller, there is a risk of blockage by leaves etc. (see Pic 20).



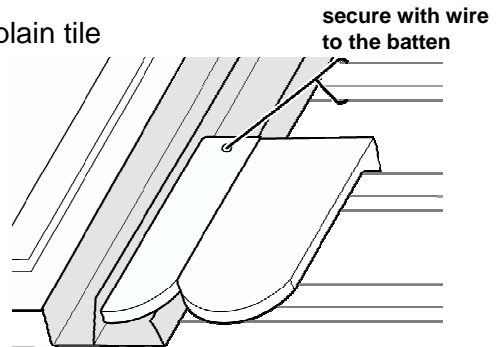
Pic 20

Examples :

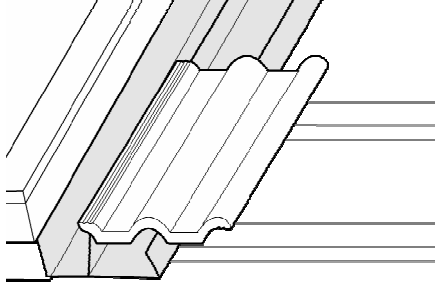
grooved tile cladding



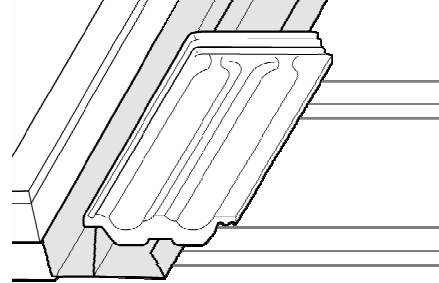
plain tile



double roman tile



flat roof tile



Pic 21

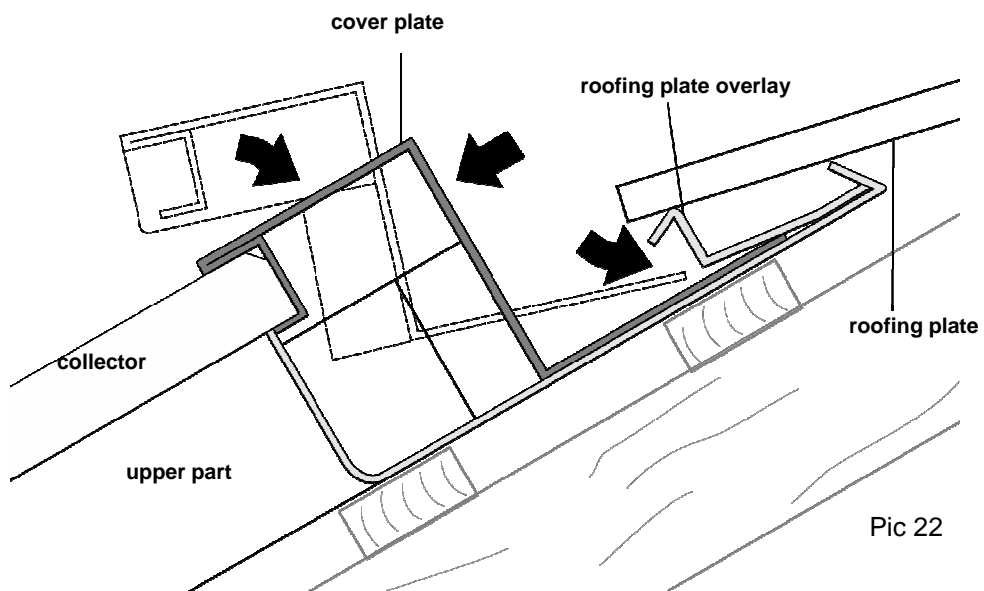
22 Piping of collectors

at this position follows the piping of the collectors, Hints see chapter 4.6

23 Installing the cover plates 5.0

After installing the piping, initialfilling and bleeding, insert cover plates 5.0 below the upper parts 4.1, 4.3 and 4.2.

To do so, insert the sheetlugs of cover plate 5.0 under the roofing plate overlay and press downwards over the collector frame.



Pic 22

Sensor / Solar circle connection

- 19 -

4.4 Positioning of the sensor

- In row installations, the sensor must be located in the last collector in the direction of flow.
- The collector with the sensor must not be shaded.
- Cut ca. 5 mm of the rubber-grommet, stick the cylinder of the sensor until the fence and pull the rubber-grommet over the sensor pocket.
- The sensor cable should be laid inside a protection pipe on the roof.

4.5 Connection- and Linking-Set

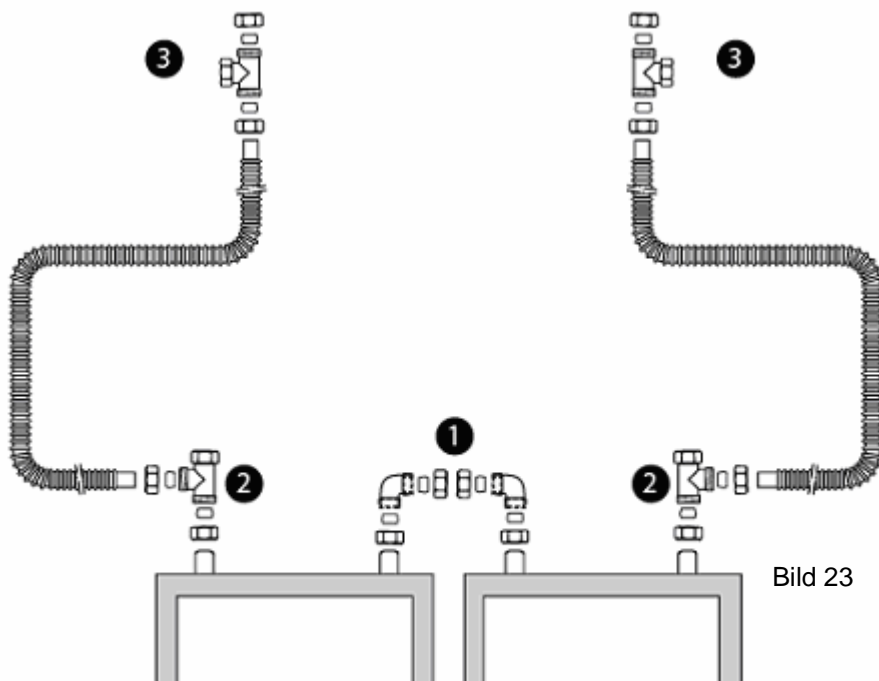


Bild 23

- 1: Connection-Set
(1 T-piece has a sensor pocket inside)
- 2: Linking Set
- 3: Linking-Set for stainless steel flexhose set

Installation instructions for the connection- and linking-set

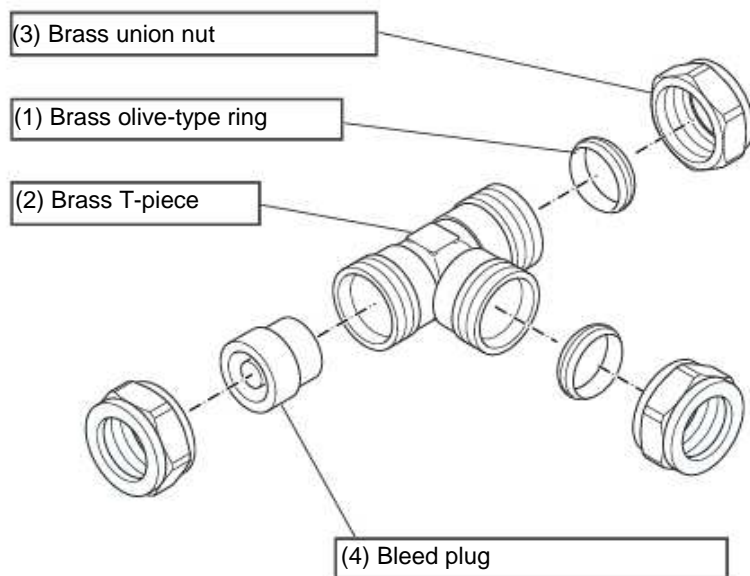
These sets are suitable for copper pipes according to DIN EN 1057 or DIN 1754 with 1 mm walls..

The following simple rules must be observed to ensure rapid and safe connection :

1. Cut the pipe at right angles to its axis using a rotating pipe cutter. The pipe end must be round (correct if necessary) and cleanly deburred.
2. Loosen the union nut and check that the olive-type ring sits properly in the fitting.
3. Now slide the pipe fully into the fitting. The pipe must sit in the fitting without any lateral tension.
4. Now hand-tighten the union nut and then tighten it one turn further using an appropriate open-end spanner.
5. Fill the system with REM heat transfer fluid and perform a leak-test.

The bleed plug (4) can also be mounted on the stub of the T-piece: Loosen the union nut (3) and swap the olive-type ring (1) with the bleed plug. Now hand-tighten the union nut and then tighten it one turn further using an appropriate open-end spanner.

Note : Original REM components must always be used, also when replacing parts. Otherwise all guarantees are null and void.



Pic 24



Electrical Installation / Operational Notes

- 21 -

Table of flow rates depending of the size of the collector field (RK 215 in a system with a solar-storage) :

| Number of collectors | 2 | 3 | 4 | 5 | 6 |
|----------------------|-----|-----|-----|-----|-----|
| Flow rate [l/min] | 2,0 | 3,0 | 4,0 | 5,0 | 6,0 |

5 Electrical Installation and Equipotential Bonding

Regarding general protection against accidental electrical contact

The collectors must be electrically connected to each other and the solar piping (supply and return) must be connected with the building equipotential bonding by the shortest possible route. Metal parts with a large surface area must always be connected to the existing building lightning conductor. Please be sure to observe the local regulations and follow the installation instructions relating to the solar controller. The work may only be performed by qualified, authorised personnel..

6 Operational Notes

Depending on the system configuration, collector overheating (e.g. through standstill) can cause solar heating fluid to escape through the pressure-relief valve. This should not be channelled into the sewers, but rather collected for refilling and, where possible, fed back into the system. The heat transfer fluid is not poisonous.

Safety-valve, expansion vessel and heat transfer fluid have to be checked regularly

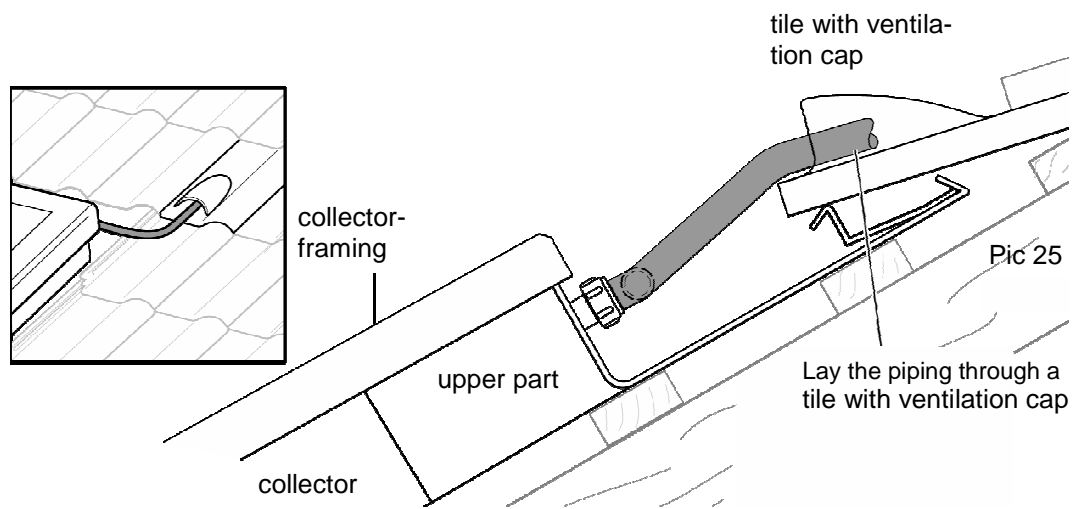
The heat transfer fluid must be tested for frost resistance using a special frost resistance tester, when first installed and at regular intervals thereafter. A frost resistance of $-27^{\circ}\text{C} \pm 3^{\circ}\text{C}$ must be tested and documented.

In the case of brown colouration, cloudiness or odour creation, the fluid must be replaced.

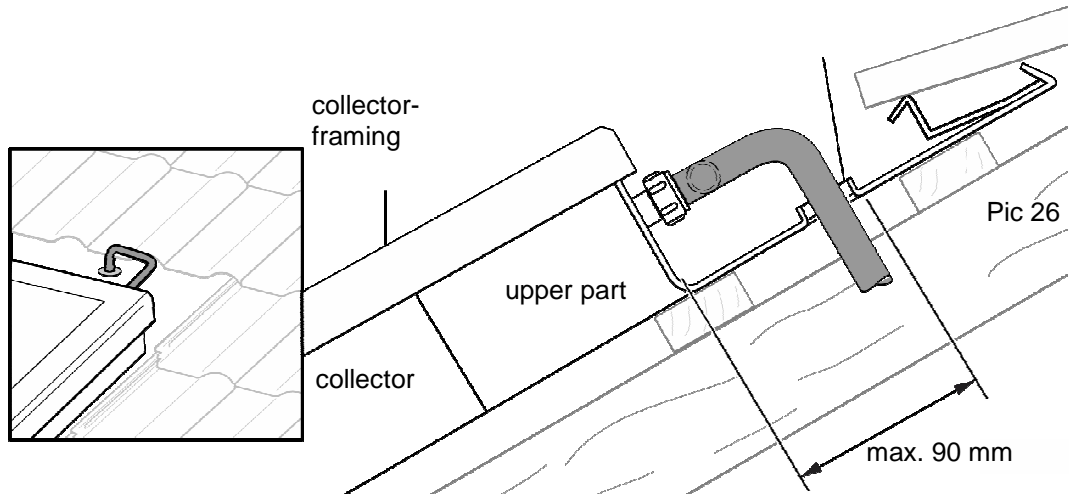
Damage caused by overheating or frost damage is not covered by the manufacturer warranty.

Warning: Overdimensioning and system standstill during periods of high solar irradiation can lead to overheating and creation of steam in the system.

To avoid system overheating, appropriate protection measures, such as recooling or cooling using heat dissipation devices, must be considered.



Make opening (flanging)
on-site and seal it





Troubleshooting

- 23 -

7 Troubleshooting

| Symptom | Description | Explanation | Solution |
|--|---|---|--|
| System delivers no output | Controller settings incorrect | | Check controller settings |
| | Controller has no function | Lightning strike/Malfunction | Please contact qualified personnel |
| | Air in the system | There is no deaerator at the highest point in the system Bleeding process not | Set hand-bleeding system. Empty and flush the system according to installation |
| | No flow through the system | Sufficiently connected/Faulty controller | Check manual operation of the solar controller's |
| | | Pump is blocked | Open the pump and move it mechanically |
| System delivers too little output | Flow rate of the solar system too high or too low | | Set the correct flow rate according to the pump assembly installation instructions |
| | Heat transfer fluid damaged | Large system idle time | Check heat transfer fluid and change if necessary |
| | The solar system has only short operating times | Storage tank sensor set too high, storage tank sensor put in T-piece connection | Position sensor in the lowest part of the storage tank possible Position sensor directly on the storage tank if possible |
| | Circulation pump has long operating times | Resulting in strong and permanent mixture and circulation losses | Reduce operating time to a minimum, either by timer or sensor |
| | Supply and return mistakenly interchanged | | Checking all connections |
| | Mount collector with sensor facing down | | Always position the sensor on top |
| | The heat cannot be transferred | | Storage tank maintenance, Carefully empty and flush the system |
| | Low solar irradiance | | No error has occurred |
| System frequently switches itself on and off | Position of the collector sensor incorrect | | Position sensor according to the installation instructions |
| | Gravity circulation | Gravity brakes out of service | Check position of the gravity brakes |
| Solar piping heats | Gravity circulation | | Check all pipes for |



| Symptom | Description | Explanation | Solution |
|---|---|--|---|
| up during standstill | | | gravity circulation |
| Storage tank cool in the morning | Pipes poorly insulated | Gravity circulation | Check isolation of all pipes and of the gravity brakes |
| | Unexpected decrease of performance (e. g. heating boiler) | | Check all pipes for gravity circulation |
| | Storage tank insulation damaged | | Check storage tank insulation |
| Automatic deaerator not tight | Automatic deaerator faulty | Seals not temperature-resistant | Exchange with hand-bleeding systems and do not use any automatic deaerators |
| The temperature of the tapped drinking water is too high | No domestic hot water mixer installed | | Install domestic hot water mixer |
| Storage tank heats up too much | Overdimensioning of the system | | During the night, the amount of heat generated is dissipated over the system or by using heat dissipation |
| | Consumption on the consumer side insufficient | | Make sure to have adequate heat dissipation |
| Screw connections become untight | Screw connections tightened when hot | | Retighten all screw connections when cold |
| Storage tank corrosive in a short time | Missing anode maintenance | | Change anodes |
| | Highly aggressive water | | Use adequate anodes |
| The collector shows condensation | Temporary condensation | Formation of dew because of excessive humidity | As long as the condensation disappears when the sun is shining on the system no measures need to be taken |
| | Permanent condensation | Accumulation of humidity | Please contact qualified personnel |
| The system has become untight during the winter | Frost damage | Frost protection insufficient | Check heat transfer fluid, conduct pressure tests on collector/system |
| | | The heat transfer fluid was diluted with water | Check heat transfer fluid, conduct pressure tests on collector/system |
| When switched off, pressure drop occurs at minimum pressure | System filled when there was solar irradiation System has lost fluid | | Fill system when switched off or when the collectors are covered |
| | No initial pressure on membrane expansion tank (membrane expansion tank faulty) | | Change tank |
| Empty system | Expansion tank faulty | | Change tank |
| | Expansion tank out of service | | Check tank |
| | Capacity of expansion tank insufficient | | Change tank or add another membrane |

Troubleshooting



- 25 -

| Symptom | Description | Explanation | Solution |
|---------|--|--|---|
| | | | expansion tank |
| | Amount of heat transfer fluid in the system too high | When heated up to the maximum temperature for the first time, the surplus fluid is pressed out | No further steps are necessary if this has only occurred once |



8 Acceptance Report

Date: _____

Building project : _____

Address : _____

Company performing the work _____ Installer: _____

Solar energy system configuration (pieces): RK 215 _____

Collector manufacturer number : _____

Installation type: ☐ On-roof ☐ Roof-integrated ☐ FreestandingCollector orientation: ☐ West ☐ Southwest ☐ South
☐ Southeast ☐ East

Roof slope:(°) _____

Collectors are shaded (%): ☐ yes _____ ☐ no

Storage tank type/make: _____ Contents (l): _____

Storage tank installed on : _____ Company : _____

Simple pipe length from collector to storage tank (m) : _____

Pipe type : _____ Ø : _____

Electrical connections according to VDE regulations

Specialist company performing the work: _____

Date

Stamp/Signatur

Solar controller : _____ Type : _____

Controller settings adjusted according to instructions

☐ yes ☐ no ΔT : _____ K T_{max} : _____ °C

Controller placed in operation according to the operating instructions on _____

Acceptance Report



- 27 -

Corrosion protection anode installed in storage tank:

- ☐ yes ☐ no
☐ Magnesium anode ☐ Permanent anode with external power source
☐ Permanent anode with external power source connected and tested

Domestic hot water mixer installed : ☐ yes ☐ noDrinking water storage tank filled and bled : ☐ yes ☐ noStorage tank cut-off device open: ☐ yes ☐ no

Drinking water safety valve installed _____ bar

Safety valve blow-off pipe mounted on exit funnel : _____

Solar circuit pressurised to 10 bar on a cold system ☐ yes ☐ noLeak test of screwed and soldered connections, as well as cut-off devices : ☐ yes ☐ noSystem pressure (cold) _____ (bar) provided : ☐ yes ☐ noSystem filled with heat transfer fluid and free of air : ☐ yes ☐ no

Pumping set to level : _____

Piping insulated : ☐ yes ☐ no

Insulation material make : _____ Insulation thickness : _____ mm

Setting of the flow (target value): _____ (l/h)

Frost protection _____ °C checked : ☐ yes ☐ no

Note: The system (controller) must not be switched off.

Location / Date:_____
Stamp / Sign



01/2008

Technische Änderungen vorbehalten

REM GmbH – Benzstraße 1 – D-84056 Rottenburg
Tel. +49 (0)8781-201567 Fax +49 (0)8781-201569 e-mail info@rem-gmbh.com