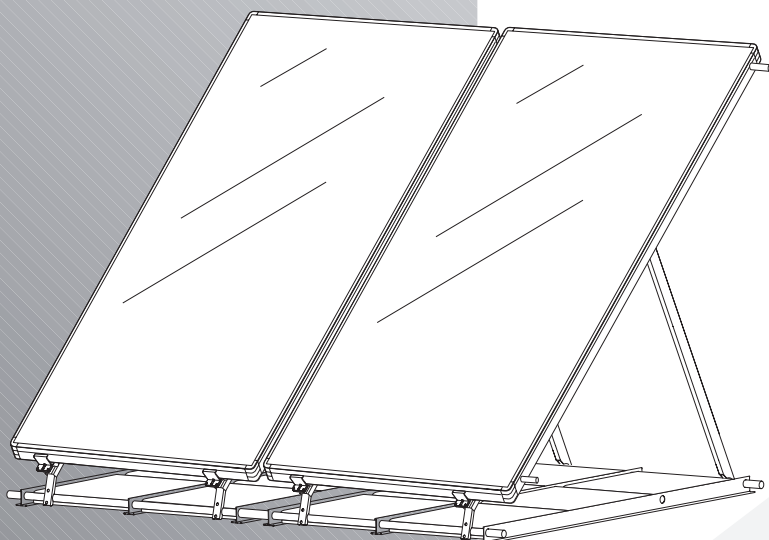


FK240 FLAT SOLAR COLLECTORS

FLAT ROOF SURFACE INSTALLATION



GB

INSTALLATION INSTRUCTIONS

About this manual

This installation manual contains important information for the safe and appropriate installation of solar panels and associated accessories on flat roofs.

These technical documents should be retained in a safe place. These may also be inspected at the manufacturer's premises.

The activities described in the installation manual assume expertise based on completed vocational training in gas or water-related installation. Only carry out these installation steps, if you possess these skills.

- ▶ Hand these installation instructions to the customer.
- ▶ Explain to the customer the function and operation of the related devices.



RECYCLING

At the end of their service life, collectors may be returned to the manufacturer. Materials will be recycled in an environmentally appropriate manner.

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1 General information

This chapter details which technical rules and regulations apply to this installation.



USER NOTE

Observe all standards and guidelines applicable to the installation and operation of this system in your country.

UK		
Installation work on roofs	Connection of thermal solar heating systems	Installation and equipment of DHW cylinders
The Health and Safety at Work etc Act 1974. The Management of Health and Safety at Work Regulations 1999. The Construction (Health Safety and Welfare) Regulations 1996. The Construction (Design and Management) Regulations 1994. The Lifting Operations and Lifting Equipment Regulations 1998.	EN 12976: Thermal solar heating system and their components (pre-fabricated systems). ENV 12977: Thermal solar heating system and their components (bespoke systems). BS 5918: Latest version: Solar heating systems for domestic hot water.	BS5546: 2000 Specification for installation of hot water supplies for domestic purposes, using gas-fired appliances of rated input not exceeding 70 kW. BS6700: 1997 Specification for design, installation, testing and maintenance, of servicing supplying water for domestic use within buildings and their curtilages.

Tab. 1 Technical rules for the installation of thermal solar heating systems (selection) in UK

- 1 VOB: Contract procedures for construction work, part C: General technical conditions of contract for construction services (ATV).
- 2 Terms of invitations to tender for construction services giving special consideration to the construction of living accommodation.

Lightning protection

If the solar heating equipment protrudes above the roof ridge or the building height (installation height) of 20 m, and there is no lightning conductor installed, ask your local electrical contractor to connect the components on the roof which conduct electricity with an electrical earth cable of at least 16 mm² to the earth bonding.

Special measures regarding lightning protection are not required for building heights (installation heights) of less than 20 m.

Where there is a lightning conductor system installed, ask your local electrical contractor to check the inclusion of the solar heating system into the lightning protection system.



USER NOTE

The installation of the Worcester Solar System must be carried out in accordance with the relevant requirements for safety, current IEE wiring regulations, local building regulations, building standards (Scotland) (Consolidation) regulations and by-laws of the local water company and health and safety document No 635 (Electricity at Work Regulations 1989).
BS 5918: Latest version

2 Specifications

FK240	
Length	2115 mm
Width	1135 mm
Height	112 mm
Clearance between collectors	40 mm
Absorber liquid content	1.15 l
Gross absorber surface area	2.4 m ²
Net absorber surface area	2.1 m ²
Net weight	approx. 43 kg
Permissible collector operating pressure	3 bar
Type approval code	08-228-762

Tab. 2 FK240 Specifications

3 Safety

This chapter details how the notes for the installation and maintenance instructions, as well as the general safety instructions, necessary for a safe and trouble-free operation, are arranged in this manual.

You will find the safety and user notes, which specifically refer to the installation, in the installation manual immediately following the individual installation steps.

Carefully read the safety instructions before commencing the installation of the flat roof frames and the collectors.

Severe injury, as well as material losses and environmental damage, may follow if you ignore safety instructions.

3.1 Correct use

The flat roof installation kit is used to hold thermal solar collectors for mounting on flat roofs.

The permissible standard snow load for the flat roof frames is 2.24 kN/m².

Individual tests should be performed, if conditions prevail, which lead you to expect higher wind load stresses. Such conditions may be caused by an exposed building location, by specific roof geometries within the immediate vicinity of the flat roof or through adjacent building structures (forming a wind tunnel). These may lead to localised increases in wind velocity, which should be considered.

The building height (installation height) should be taken into consideration as well as any auxiliary equipment which may be required (Table 7, page 28).

Application conditions for flat roof supports

Install components only on roofs with sufficient strength. Please take the additional roof load per flat roof support, including solar collector, into consideration. If necessary, ask a structural engineer for assistance.

Only install this system on flat roofs or roofs with a shallow inclination ($\leq 25^\circ$).

If there is a risk that larger quantities of snow might collect behind the collectors (towards the roof ridge), prevent such accumulations by fitting a suitable protective grille.

Secure the system on tiled roofs with a shallow inclination to the roof on site.

The "Roof connection – corrugated sheet steel roof" installation set can be used on roofs with corrugated or other sheet steel roofs.

3.2 Notes structure

Two levels are identified by signal terms:



WARNING!

RISK TO LIFE

Identifies possible dangers, which might lead to serious injury or death if appropriate care is not taken.



CAUTION!

RISK OF INJURY/ SYSTEM DAMAGE

Identifies potentially dangerous situations, which might lead to mild or slight injuries or to material losses.

Further symbols identifying dangers and user notes:



WARNING!

RISK TO LIFE

from electric shock.



USER NOTE

Tip for the optimum utilisation and setting of the products plus other useful information.

3.3 Please observe these safety instructions



WARNING!

RISK TO LIFE

through a fall or falling parts.

- ▶ Ensure you have the correct equipment for working on roofs.
- ▶ Take appropriate action to prevent accidents when working on roofs.
- ▶ Whilst working on the roof, take all necessary precautions against a possible fall.
- ▶ Always wear your personal protective clothing and safety equipment.
- ▶ After completing the installation, always check the secure positioning of the installed set and that of the collectors.



CAUTION!

RISK OF INJURY

Injury and operating faults can result from making changes to the system construction.

- ▶ Never change the system construction.



CAUTION!

RISK OF INJURY

Some parts may cause burns, if the collector and installation materials are exposed to solar radiation for longer periods of time.

- ▶ Always wear your personal protective clothing and safety equipment.
- ▶ Cover the collector (e.g. with a sheet) and the installation material during the installation as protection against high temperatures resulting from solar irradiation.

4 Before the installation

4.1 General notes

Make yourself familiar with the on-site conditions and local regulations before commencing the installation.

Check

- ▶ the delivery for completeness and perfect condition.
- ▶ the roof structure for sufficient strength and possible damage (e.g. leaks).
- ▶ the building height and determine the type of fixings required for the flat roof supports (see Chapter 5.3 "Stabilising the flat roof supports", page 25).
- ▶ the optimum arrangement of the solar collectors. Take the solar irradiation into consideration (angle of inclination, southerly orientation). Avoid the shade of high trees or structures and locate the collectors according to the shape of the building (e.g. aligned with windows, doors, etc.).
- ▶ the stability of the support surface. Remove gravel or similar material.



USER NOTE

Only use OEM components and replace any damaged or faulty parts immediately.



USER NOTE

Let a professional roofer carry out all difficult roof repairs, particularly weather-proofing of bitumen layers.

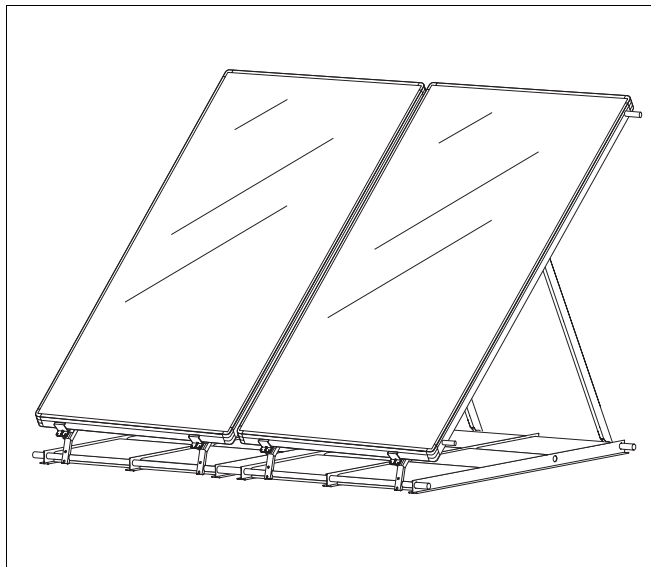


Fig. 1 General arrangement of flat roof supports

4.2 Component description



USER NOTE

You need a basic pipe set for each collector array.

You require a flat roof installation set (Fig. 2) for each collector.



USER NOTE

An auxiliary support (accessories) must be installed between the standard collector supports at a building height (installation height) of 20 – 100 m.

4.2.1 Flat roof installation set (per collector) – Fig. 2

Item 1:	Collector clips, incl. spacers	4 ×
Item 2:	Pre-assembled collector braces	2 ×
Item 3:	U-bolts	4 ×
Item 4:	Round pipes – long	2 ×
Item 5:	Spacer pipes between two base frames	2 ×
Item 6:	Tee-section	3 ×
Other:	Various small components	

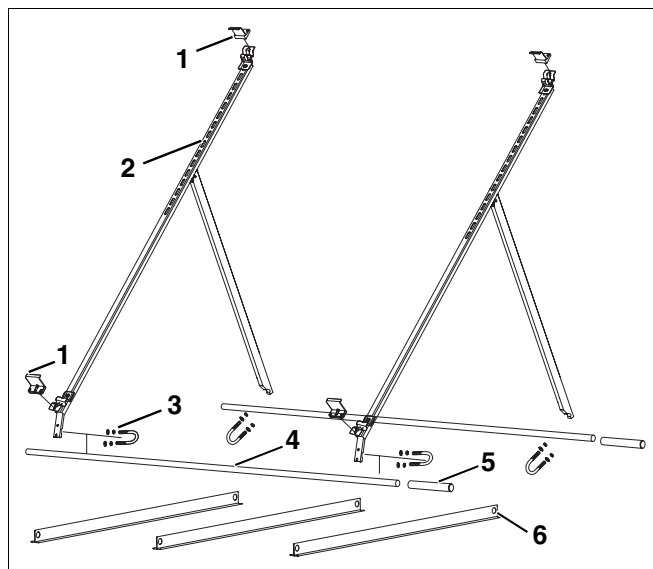


Fig. 2 Flat roof installation set

4.2.2 Auxiliary holder (accessory) – Fig. 3



USER NOTE

The auxiliary holder (accessory) for the flat roof installation set is required for building heights (installation height) of 8 – 20 m.

Auxiliary holder for the 1st collector in each row (accessory) – Fig. 3

Item 1	Pan-head screws M8 × 16	4 ×
Item 2	Plain collector clips, incl. spacers	2 ×
Item 3	Collector holders	2 ×
Item 4	Pan-head screws M8 × 50 incl. nuts and washers	2 ×
Item 5	Threaded plates	2 ×
Item 6	Auxiliary strap	1 ×

Auxiliary holder for each additional collector (accessory) – Fig. 3

Item 1	Pan-head screws M8 × 16	3 ×
Item 4	Pan-head screws M8 × 50 incl. nuts and washers	2 ×
Item 5	Threaded plates	2 ×
Item 6	Auxiliary strap	1 ×
Item 7	Double clip incl. protective cap	1 ×
Item 8	Collector holder link, incl. spacers	1 ×

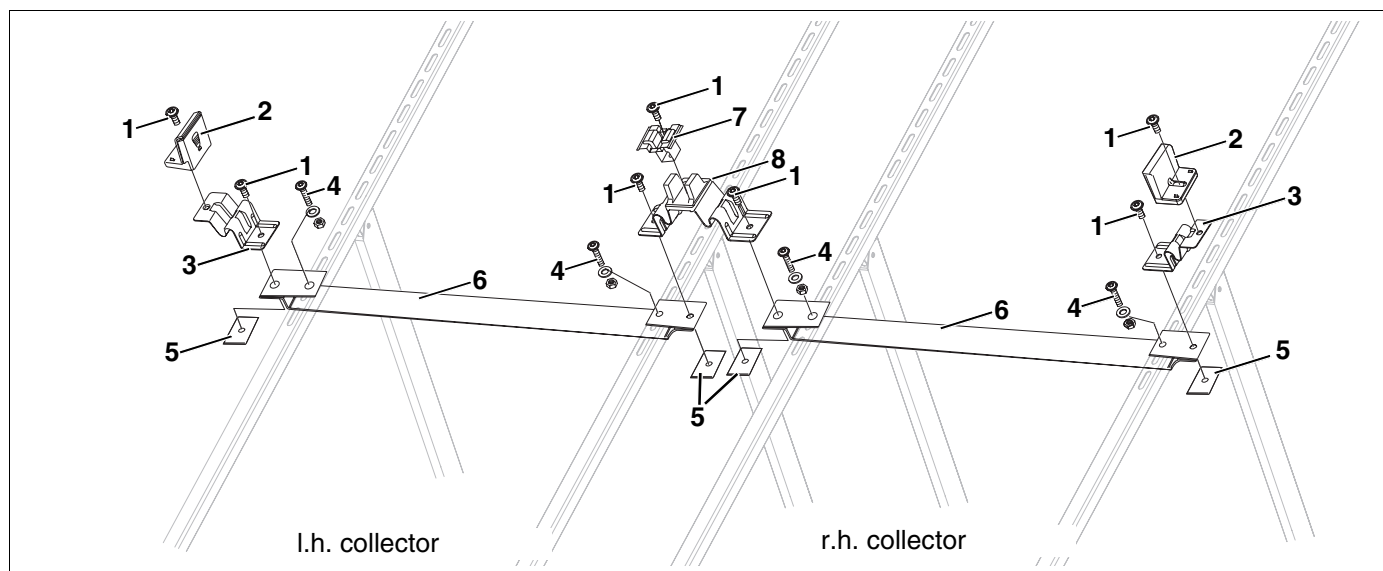


Fig. 3 Collector array for two collectors

4.2.3 Basic pipe set (per collector row) – Fig. 4

Item 1:	Cable clamp for collector sensor	1 x
Item 2:	Allen key SW 5	1 x
Item 3:	Hose couplings	2 x
Item 4:	Solar hoses, 1000 mm long (only one solar hose is required)	2 x
Item 5:	Dummy plug	2 x
Item 6:	Solar hoses, 60 mm long (including 1 x replacement)	2 x
Item 7:	Spring clips (including 1 x replacement)	7 x
Others:	Various small components	

4.2.4 Additional material requirements

- Spanner SW 13 and 27
- Spirit level
- Vacuum pump (recommended)
- Safety harness with safety line (recommended)
- Pipe insulation
- Scaffolding (recommended)
- Walk-way plates
- Hammer
- Building protection mats



USER NOTE

To protect the roof skin, lay commercially available building protection mats, onto which you can position the tee-sections of the supports. The sealing membrane must not be damaged.

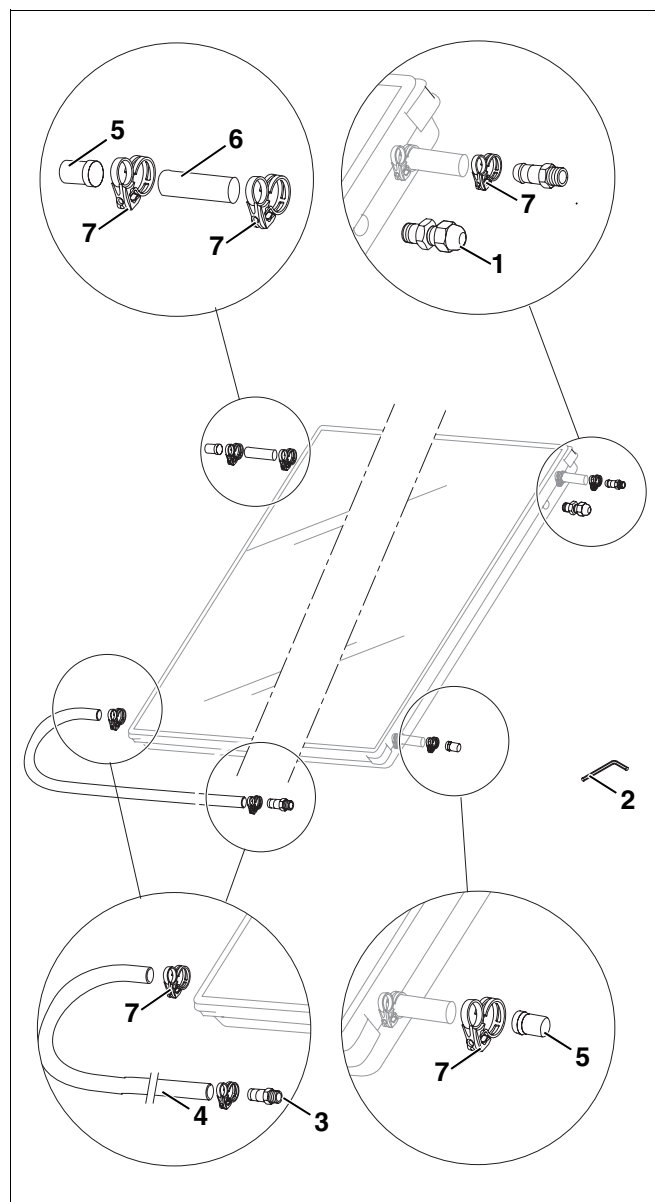


Fig. 4 Basic pipe set per collector row

4.3 Determine the collector installation angle – flat roof mounting set

Depending on the area of application of the solar heating system, determine the angle of incidence towards the horizontal plane (Fig. 5).

The angle of incidence results from the roof inclination and the collector angle of inclination. You should correlate these values.



USER NOTE

The collector support is set up in the factory for installation on a "level" flat roof. The angle of incidence to the horizontal plane is 45°.

If you require a different angle of incidence to the horizontal plane, re-calculate the hole positions of the collector braces and take the roof inclination into consideration.



CAUTION!

SYSTEM DAMAGE

through non-approved collector angle of inclination.

- Please ensure that the angle between the brace and the collector back (Fig. 5, **angle A**) and that between the brace and the tee-section (Fig. 5, **angle B**) is not greater than 90°.
- In general, observe the approved angles of inclination.

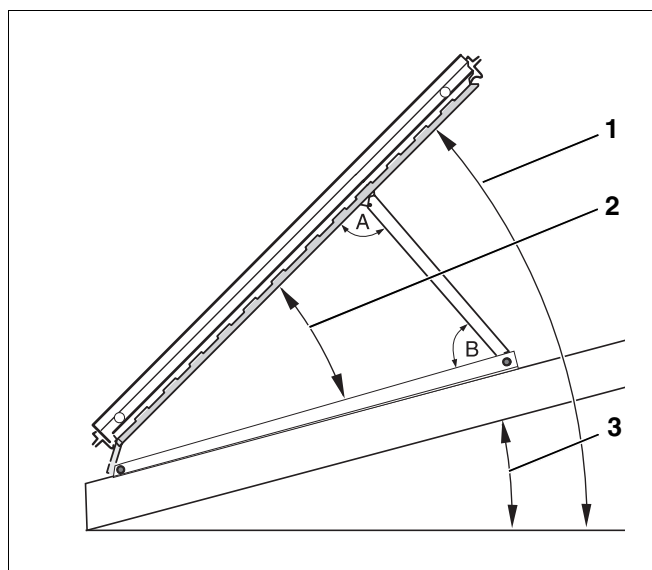


Fig. 5 Angle of inclination, angle of incidence, roof inclination

Item 1: Angle of incidence (absolute angle to the horizontal plane)

Item 2: Collector angle of inclination

Item 3: Roof inclination

A: Angle – brace to collector back

B: Angle – brace to tee-section

4.3.1 Determination of the area of application

The different areas of application of solar heating systems provide angles of incidence, which ensure an optimum solar yield for every season.

Applications	Angle of incidence Range
DHW	30 – 45°
Domestic hot water + central heating	45 – 60°
Domestic hot water + swimming pool	30 – 45°
Domestic hot water + central heating + swimming pool	45 – 60°

Tab. 3 Area of application, area of angle of incidence



USER NOTE

Observe the maximum angle of incidence for collectors. Otherwise there is a danger that the collectors might topple over during strong wind or when loaded with snow. The max. permissible angle of incidence is 60°.

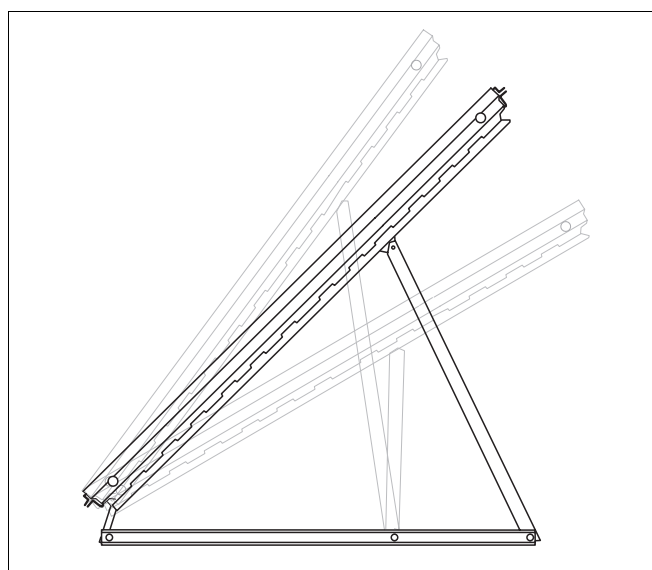


Fig. 6 Collector view – angle of inclination

4.3.2 Flat roofs

You can set the collector angle of inclination to different values (Fig. 7):

- above the fixing point (centre, rear),
- above the slot position,
- via the length of the brace (short – see Chapter 4.3.5 "Shortening the collector braces", page 17).



USER NOTE

Slots are counted from the top end of the channel rail.

The table 4 shows the various options.

- Depending on the required angle of inclination, obtain the fixing points, the length of the collector braces and the resulting slot positions from table 4.



SYSTEM DAMAGE

through unfavourable support points.

CAUTION!

- Only use the combinations stated in the tables. Other positions are not approved by the manufacturer.

Angle of inclination	Brace	Fixing point	Slot
25°	short	rear	14 ¹
30°	short	centre	16
35°	long	rear	4
40°	long	rear	7
45°	long	rear	14 ¹
50°	long	centre	12
55°	long	centre	14 ¹
60°	long	centre	17

Tab. 4 Angle of inclination

¹ Factory settings

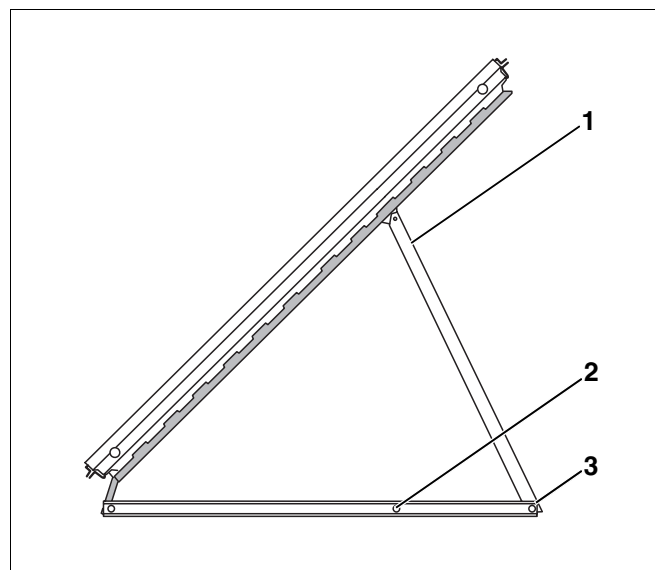


Fig. 7 Collector bracing and fixing points

Item 1: Collector braces (long)

Item 2: Central fixing point

Item 3: Rear fixing point

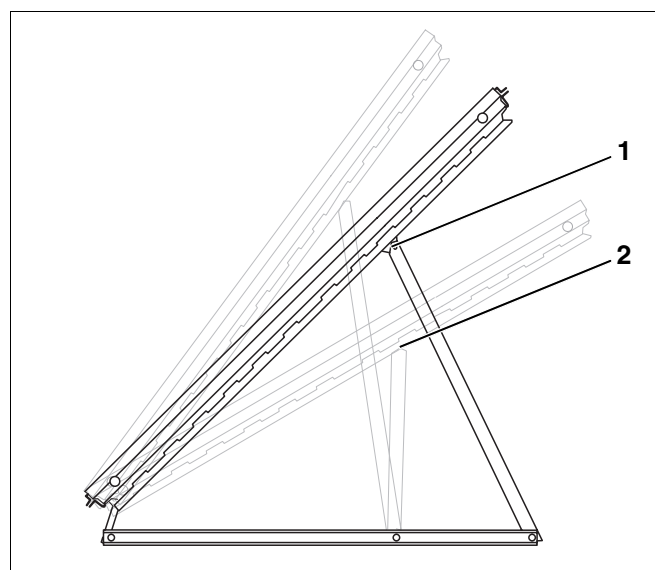


Fig. 8 Angle of inclination through different slot positions and braces

Item 1: Long brace, rear fixing point, slot position 12

Item 2: Short brace, central fixing point, slot position 16

4.3.3 Sloping flat roofs

For roofs, which slightly slope in a southerly direction, the roof slope angles are deducted from the angle of incidence. For roofs, which slightly slope in a northerly direction, the roof slope angles are added to the angle of incidence.



WARNING!

RISK TO LIFE

If there is a risk that larger quantities of snow might collect behind the collectors (towards the roof ridge), prevent such accumulations by fitting a suitable protective grille.



USER NOTE

Determine the respective slot position and the resulting angle of inclination of the collectors from Table 4.



CAUTION!

SYSTEM DAMAGE

through strong wind. On sloping flat roofs the flat roof supports must be secured on site.

- Ask a roofing contractor to carry out the installation on sloping flat roofs.

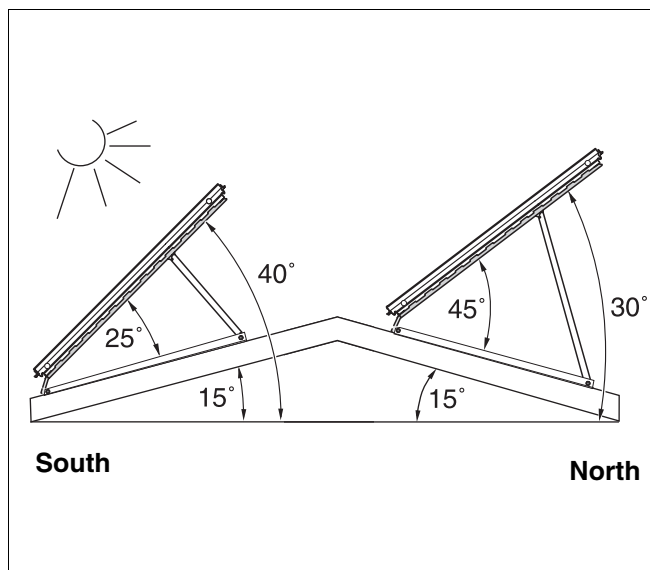


Fig. 9 View – collector bracing – angle of incidence

Example 1 – Fig. 10

A collector array (short collector braces – see Chapter 4.3.5 "Shortening the collector braces", page 17 – rear fixing point) is to be installed with an angle of incidence of 40° towards the sun on a **south** sloping roof (roof inclination = 15°).

Subtract the roof inclination from the angle of incidence.

Position the support at an angle of inclination of 25° to the roof surface.

- Install the short collector brace (see Chapter 4.3.5 "Shortening the collector braces", page 17) with its head into the 14th slot (factory setting) and fit the foot into the rear fixing point.

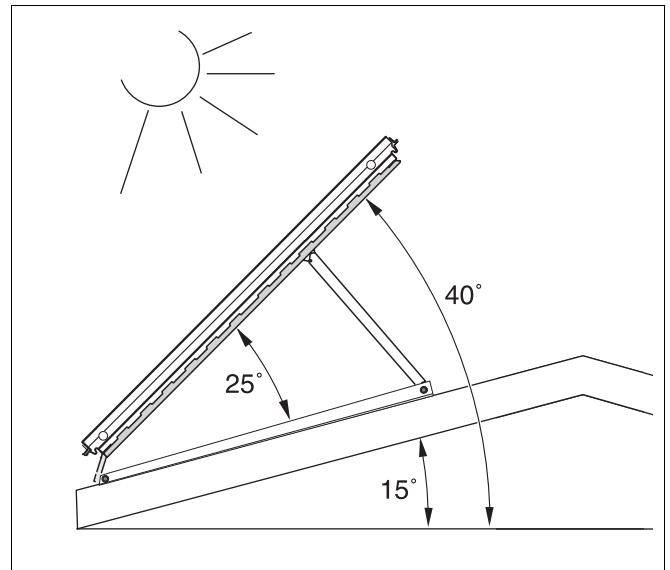


Fig. 10 Example 1: South sloping roof

Example 2 – Fig. 11

A collector array (long collector braces, rear fixing point) is to be installed with an angle of incidence of 30° towards the horizontal plane on a **north** sloping roof (roof inclination = 15°).

Add the roof inclination to the angle of incidence.

Position the flat roof support at an angle of inclination of 45° to the roof surface.

- Install the collector brace with its head into the 14th slot (factory setting) and fit the foot into the rear fixing point.

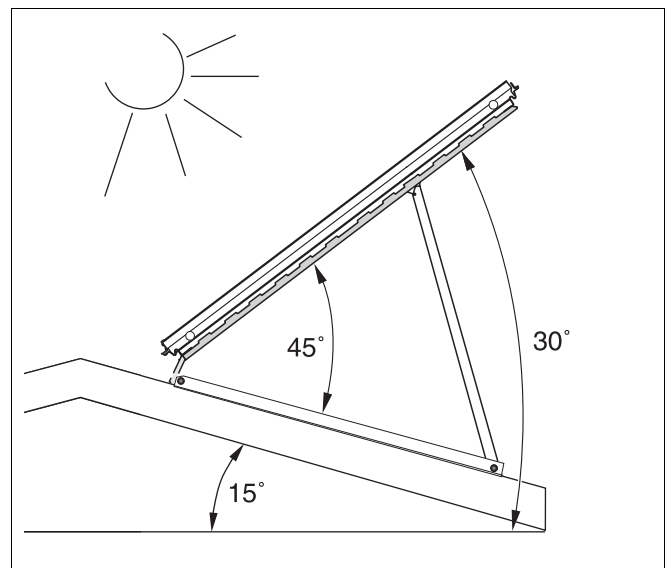


Fig. 11 Example 2: North sloping roof

4.3.4 Transferring the new angle of inclination to the collector braces

If the angle of inclination, which you have determined, differs from the factory setting (45°), transfer the new angle to the collector braces.

Setting the collector braces

- Remove the brace (Fig. 12, **Item 1**) with the head from the collector support (Fig. 13, **Item 2**) by unscrewing the pan-head screw.

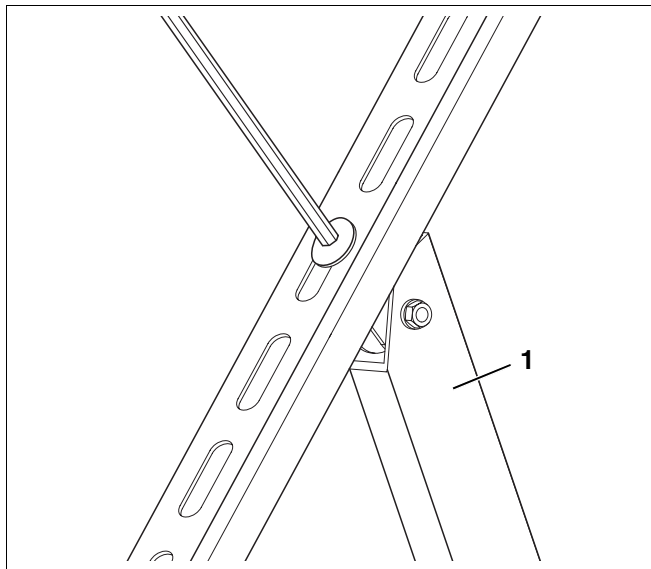


Fig. 12 Unscrewing the brace from the collector support

Item 1: Brace

- Position the brace (Fig. 13, **Item 1**) into the slot position you have determined.

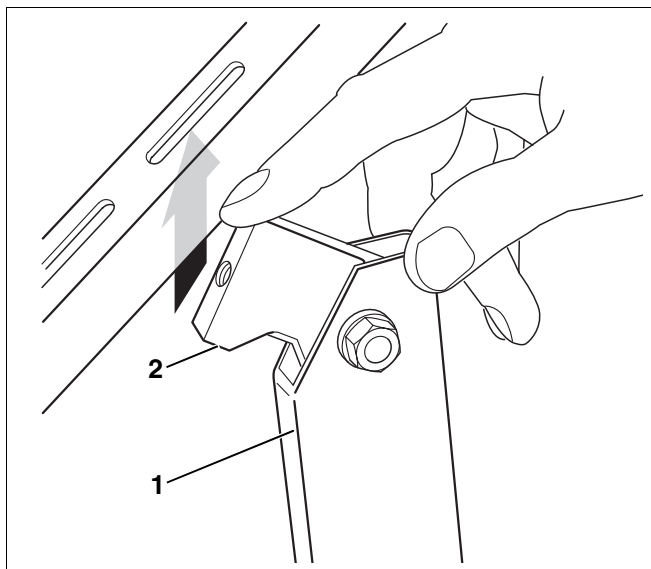


Fig. 13 Fitting the brace to the new slot position

Item 1: Brace

Item 2: Head

- Secure the brace (Fig. 14) in the upper end-stop of the slot using the pan-head screw.

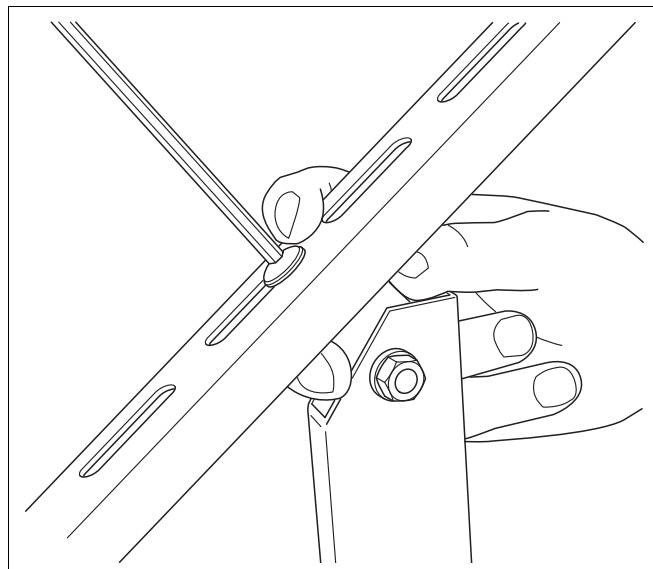


Fig. 14 Securing the brace on the collector support

4.3.5 Shortening the collector braces

If you require a shorter brace, you should shorten the collector support using the markings provided for this purpose on the braces (see detail Fig. 15).

- Cut the braces at the markings using a hacksaw (Fig. 15, **Item 1**).
- Then position the head into the drilled hole provided (Fig. 15, **Item 2**).

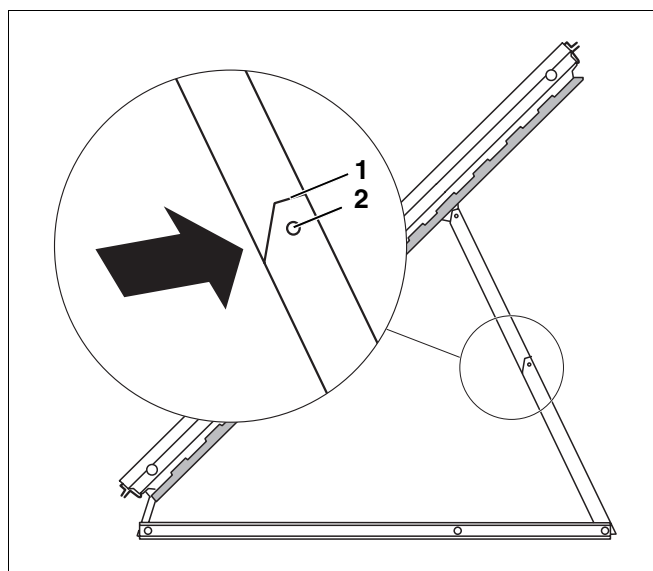


Fig. 15 Shortening the collector braces

Item 1: Marking

Item 2: Drilled hole

4.4 Taking measurements



USER NOTE

Carefully ascertain the location of the collector array on the roof, and note the correct collector orientation.

4.4.1 Ascertain the clearance between collector rows.

The minimum clearance between collector rows is subject to the angle of inclination (see adjacent table).



USER NOTE

For multi-row collector arrays, please ensure that the clearance *x* (Fig. 16) between individual rows is large enough to prevent shading.

Angle of inclination collector	clearance <i>x</i>
30°	3,50 m
35°	4,00 m
40°	4,50 m
45°	4,90 m
50°	5,30 m
55°	5,70 m
60°	6,00 m

Tab. 5 Dependency of the clearance from the angle of incidence and the angle of the sun (17°)

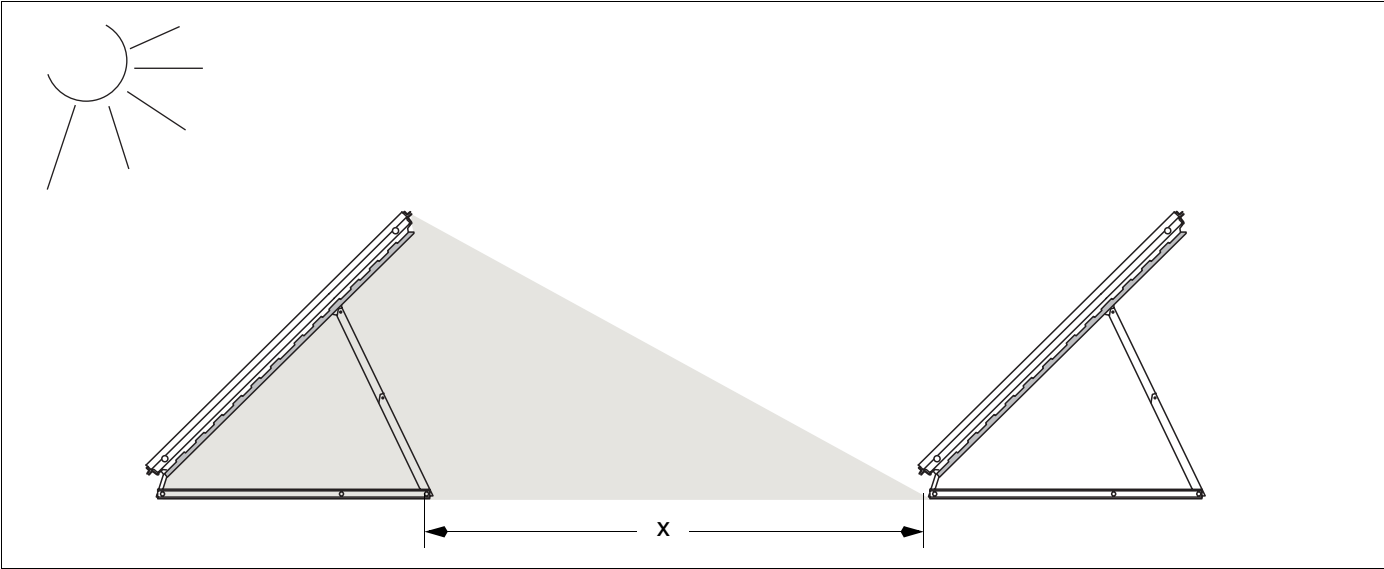


Fig. 16 Illustration of shading – clearance *x*

4.4.2 Estimate your space requirements

Plan sufficient installation area.

These dimensions relate to the roof surface area, which must be available.

The dimensions stated relating to space requirements are simply the width of the collector array. In addition, allow at least 0.5 m on either side of the collector array for pipework (Fig. 17).



CAUTION!

SYSTEM DAMAGE

through wind eddies and pressure peaks at the flat roof perimeter.

- Before commencing the installation, ensure that at least one metre is allowed between the flat roof supports and the roof perimeter.

Number Collectors	Dimension A	Dim. B
2	2,34 m	1,55 m
3	3,51 m	1,55 m
4	4,68 m	1,55 m
5	5,85 m	1,55 m
6	7,02 m	1,55 m
7	8,19 m	1,55 m
8	9,36 m	1,55 m
9	10,53 m	1,55 m

Tab. 6 Space requirement

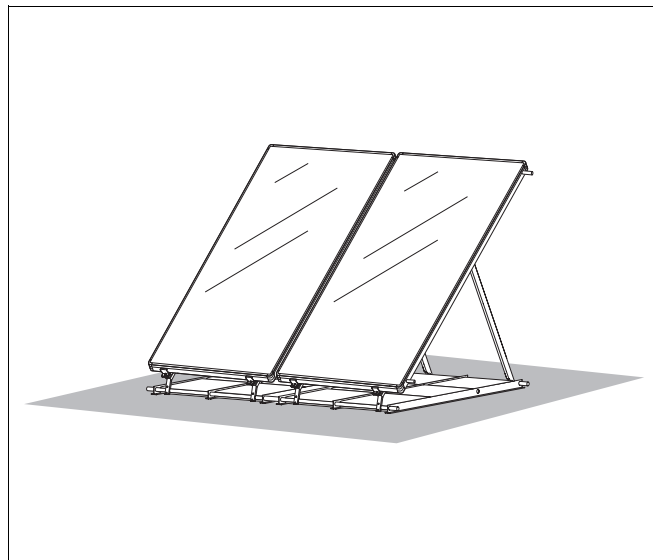


Fig. 17 Additional space required

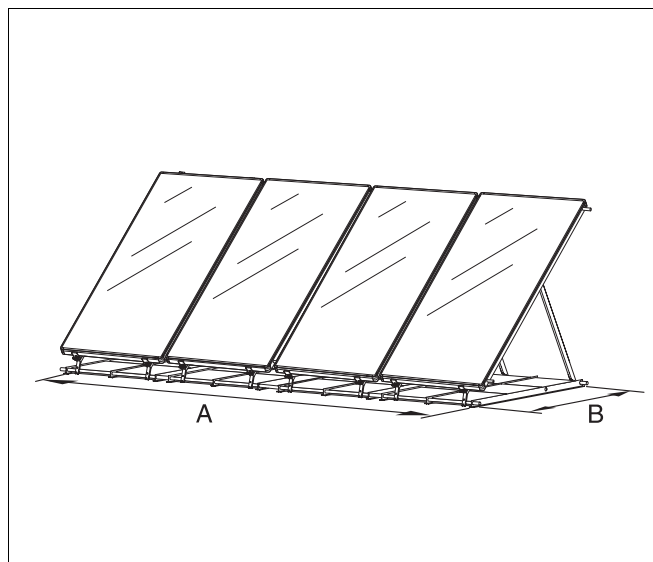


Fig. 18 Space required for collector array

5 Installing flat roof supports



WARNING!

RISK TO LIFE

Whilst working on the roof, take all necessary precautions against a possible fall.



USER NOTE

Please observe all national and local accident prevention regulations, as well as the safety instructions in this manual when working on roofs.



USER NOTE

To protect the roof skin, it may be advisable to lay commercially available building protection mats, onto which you can position the tee-sections of the supports. The sealing membrane must not be damaged.

Ensure sufficient stability at the installation surface, and remove gravel and similar material from the installation location.

5.1 Assembling the base frame

- ▶ Position the three tee-sections required for one collector at a distance of approx. 500 mm next to the first.
- ▶ Insert two round tubes through the respective holes in the tee-sections (fixing points from Table 4, "Angle of inclination", page 13).
- ▶ Align the tee-sections on the round tubes using the markings.



USER NOTE

The markings provide installation aids for tee-sections and collector braces.

The tee-section markings are 500 mm apart.

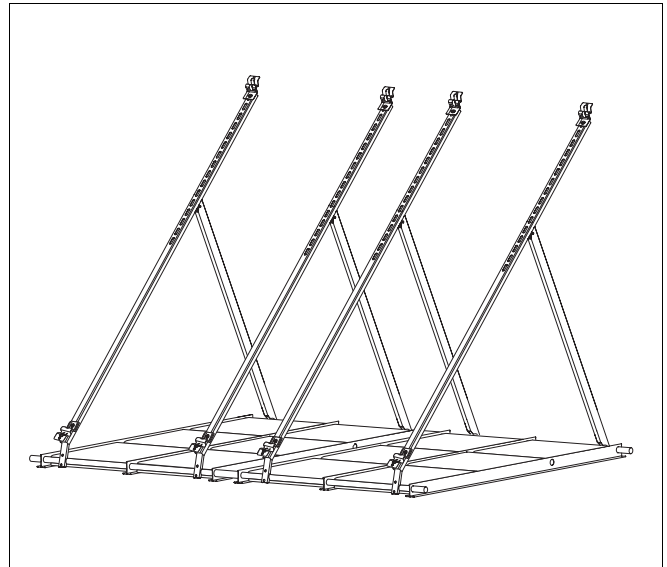


Fig. 19 General view of flat roof frames of two collectors

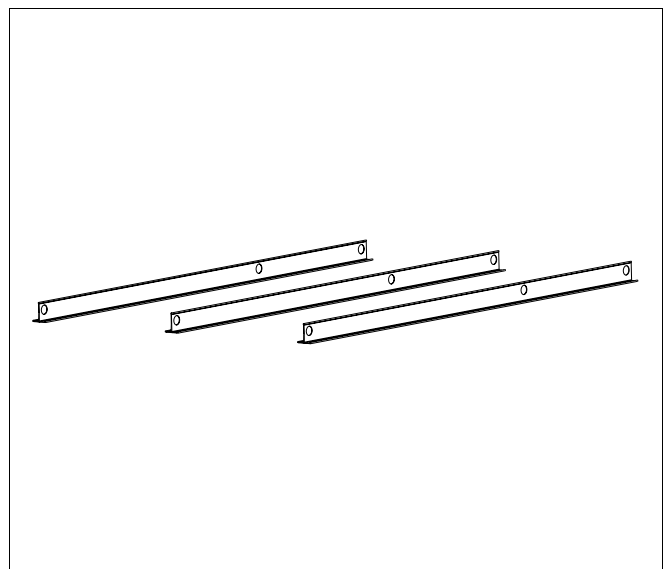


Fig. 20 Tee sections of the frame

- Align the first base frame in accordance with on-site conditions/requirements.



USER NOTE

At the beginning of the installation, position only one paving slab onto the tee-section. This enables an easier alignment of the assembled flat roof supports towards each other.

- Stabilise the base frame by positioning a conventional paving slab (Fig. 21) onto the tee-section legs. Locate the remaining paving slabs only after the flat roof supports have been fully assembled (see Chapter 5.3 "Stabilising the flat roof supports", page 25).

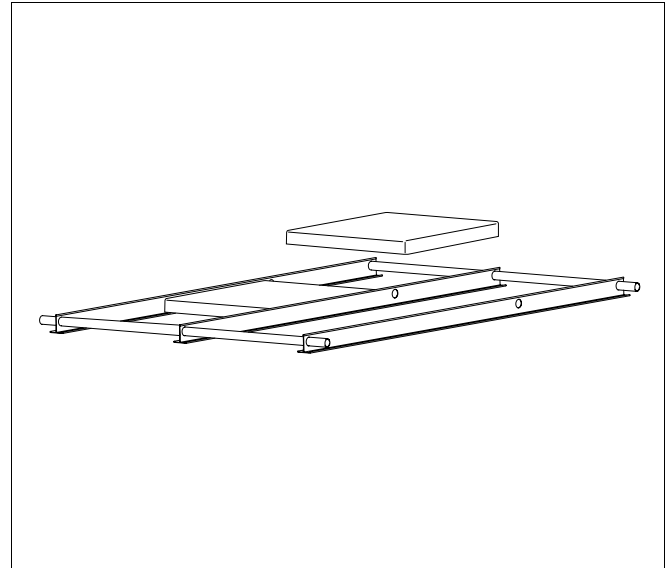


Fig. 21 Stabilising the base frame with walk-way plates

- Push both spacer pipes included (Fig. 22, **Item 1**) over the round tubes of the first base frame.



USER NOTE

Ensure that you push the round tubes respectively to the middle of the distance pipes (Fig. 22, **Item 2**).

- Now position the three tee-sections required for the second collector at a distance of approx. 500 mm next to the first. Please note the markings on the round tubes.

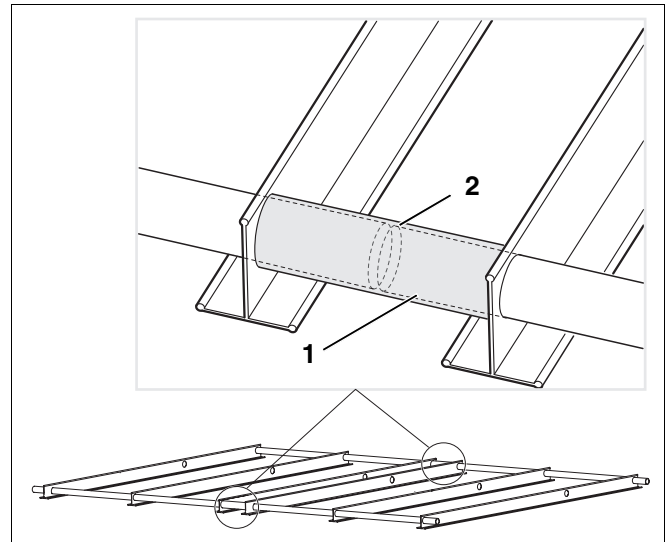


Fig. 22 Spacer pipes between two base frames

5.2 Installing the collector supports

- Position the collector braces (Fig. 23, **Item 1**) onto the round tubes.



USER NOTE

The distance (centre to centre) between the collector braces (U-bolt) should be approx. 920 mm. Please note the markings on the round tubes.

- Measure this distance at the foot of the braces (Fig. 24).
- Tighten the nuts on all U-bolts of the collector braces.
- Install the collector holder so that the edge of the collector holder is flush with the channel rail (Fig. 23). Under no circumstances must the collector holders protrude.
- Secure the collector holder using the tapped plates and the pan-head screws.

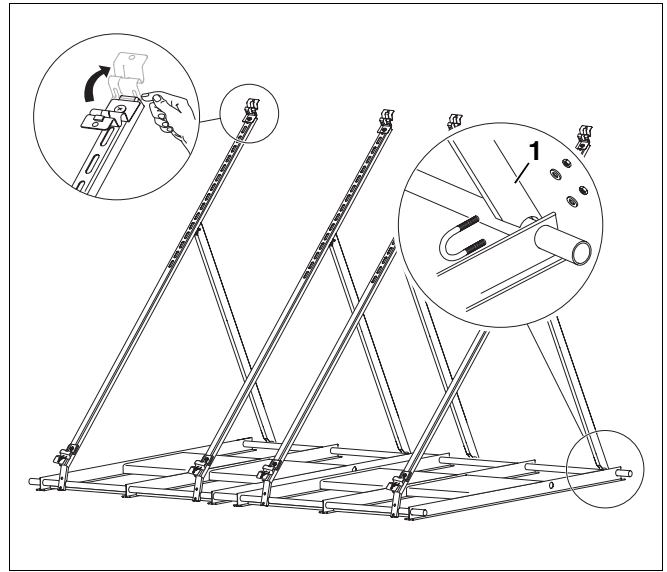


Fig. 23 Assembly of the collector supports

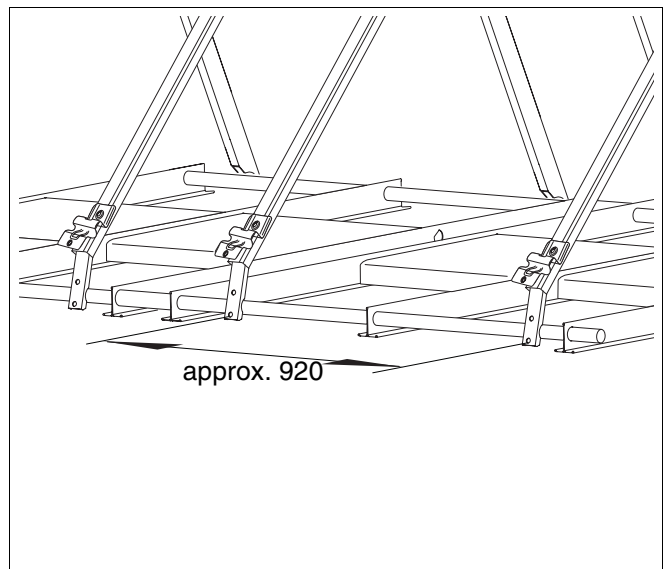


Fig. 24 Clearance between collector braces (dimension in mm)

- Position the next collector braces onto the round tubes.



USER NOTE

Ensure that the distance to the next collector brace is approx. 250 mm.

In total, a dimension of approx. 1 170 mm should be achieved.

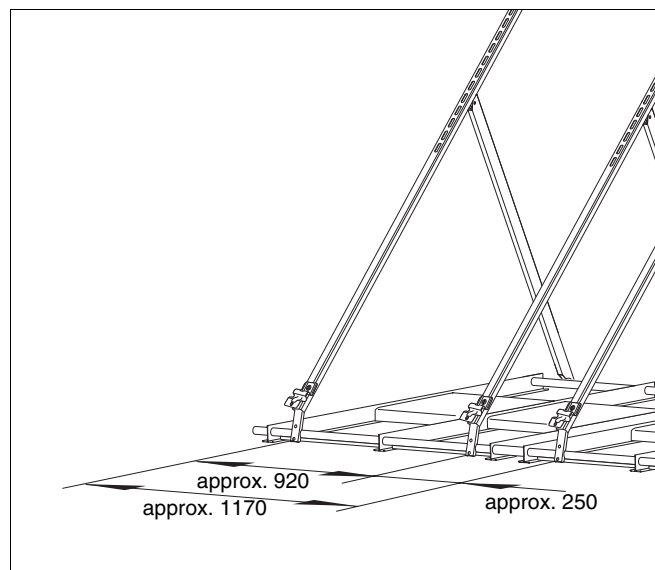


Fig. 25 Clearance between collector braces (dimensions in mm)

Installing auxiliary holders (accessory)

If higher wind loads are expected (see Table 7, page 28), fit auxiliary holders, threaded plates and collector holder links.

- Slide the auxiliary strap (Fig. 26, **Item 1**) between the collector braces (Fig. 26, **Item 2**).
- Secure the auxiliary strap in the 17th slot from the top (if occupied, in the 16th slot from the top) with pan-head screws M8 × 50 (Fig. 26, **Item 3**) using nuts (Fig. 26, **Item 5**) and washers (Fig. 26, **Item 4**).

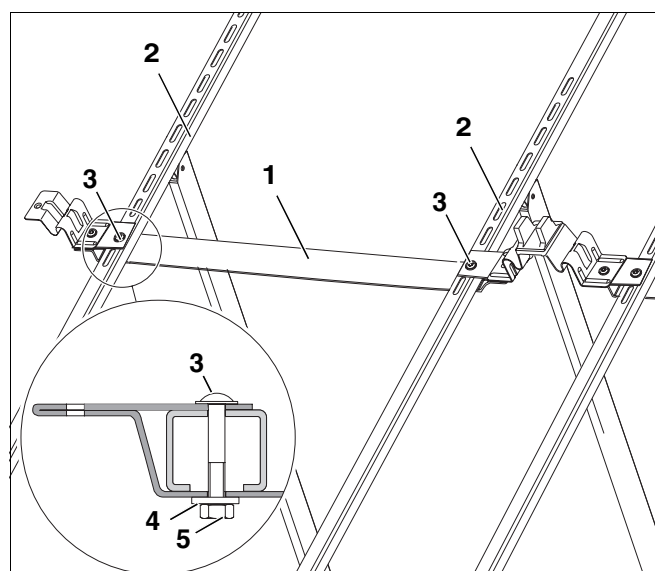


Fig. 26 Installing auxiliary holders

Item 1: Auxiliary strap

Item 2: Collector braces

Item 3: Pan-head screws M8 × 50

Item 4: Washer

Item 5: Nut

- Locate the collector holder link centrally (Fig. 27) onto the ends of the auxiliary straps.
- Secure the collector holder links (Fig. 27, **Item 3**) to the auxiliary straps (Fig. 27, **Item 4**) using the threaded plates (Fig. 27, **Item 5**) and pan-head screws M8 × 16 (Fig. 27, **Item 2**).

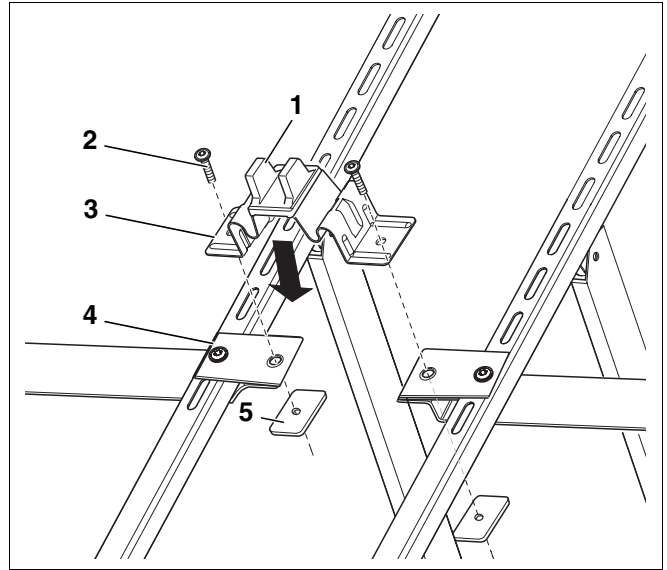


Fig. 27 Installation of the collector holder bridge

Item 1: Spacer block

Item 2: Pan-head screws M8 × 16

Item 3: Collector holder link

Item 4: Auxiliary straps

Item 5: Threaded plates



USER NOTE

Please ensure, that the high webs of the rotating spacer block (Fig. 27, **Item 1**) for supporting the frame (Fig. 28, **Item 2**) are positioned parallel to the profile rails of the collector supports.

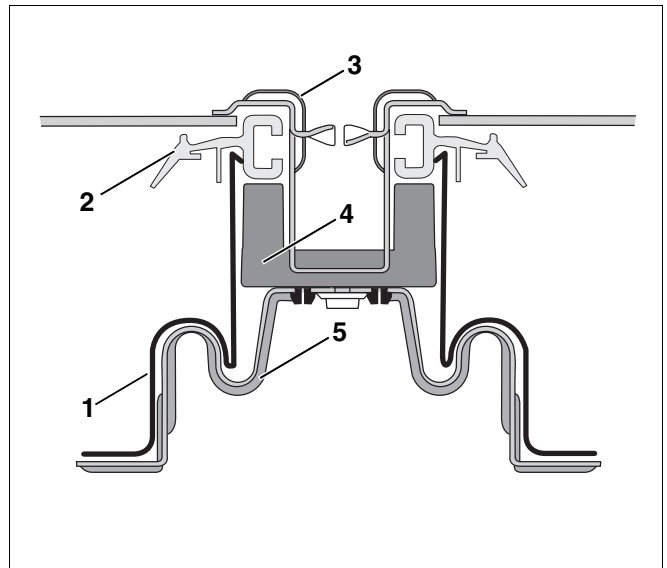


Fig. 28 Diagram of inserted collector clips with double clips

Item 1: Collector trough

Item 2: Collector frame

Item 3: Double clip incl. protective cap

Item 4: Spacer block link

Item 5: Collector holder link

The lateral collector holders act as stops or limits for the collector array.

- Secure the lateral collector holder (Fig. 29, **Item 2**) and the auxiliary straps (Fig. 29, **Item 3**) using the threaded plates (Fig. 29, **Item 4**).

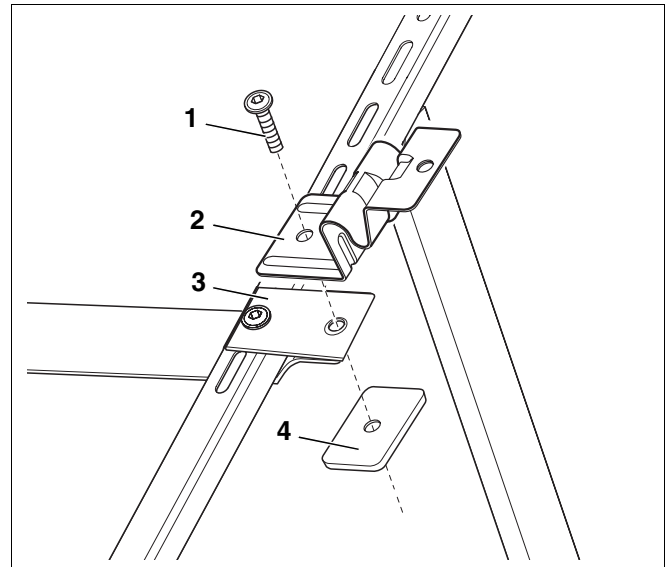


Fig. 29 Securing the collector holder flush with the profile rails

Item 1: Pan-head screws M8 × 16

Item 2: Collector holder (lateral)

Item 3: Auxiliary strap

Item 4: Threaded plate

5.3 Stabilising the flat roof supports

The following details refer to a single flat roof support.

Individual flat roof supports may be secured in the following three ways to prevent slippage or tipping of the structure as a result of wind influence:

- weighting flat roof supports with paving slabs,
- securing flat roof supports with anchor bolts,
- weighting flat roof supports with paving slabs and additional ropes.

For all methods, please consider the structural integrity of the roof.

5.3.1 Weighting flat roof supports with paving slabs

Flat roof supports on buildings up to a height of 8 m can be weighted with paving slabs (see Table 7, page 28).

Take greater wind forces into consideration on buildings higher than 8 m. Provide additional weighting to the flat roof supports.



USER NOTE

As the roof structure is frequently not designed for this additional load, we would recommend the use of anchor bolts or a combination of paving slabs and ropes to secure the installation, as alternative, for buildings higher than 8 m.

5.3.2 Securing flat roof supports with anchor bolts

You can secure the flat roof support on girders.

Design the substructure so that the collectors can withstand the wind forces affecting them.

In addition, a means of fixing should be provided on site, which stabilises the structure and prevents damage to the roof.

Secure each flat roof support (Fig. 30) with at least four U-bolts (to be provided on site) (1", M8/8.8).



SYSTEM DAMAGE

through design modifications.

CAUTION!

- For example, never drill the flat roof support tee-sections.

- Drill two holes for the U-bolts approx. 50 mm away from the collector brace into the girders.
- Position the U-bolts on the round tubes and push the threaded ends through the drilled holes in the girder.
- Pack the space between the round tube and the girder.
- Secure the U-bolts with the girder (see detail Fig. 30).

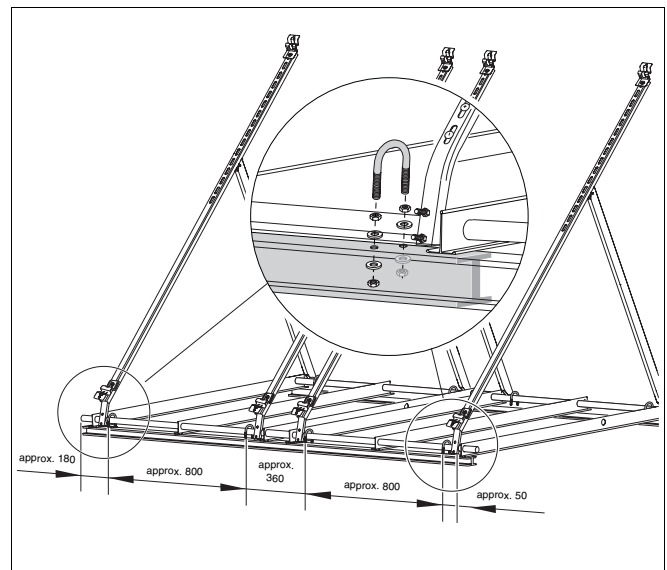


Fig. 30 Fix flat roof stands to girders with U-bolts (dimensions in mm)

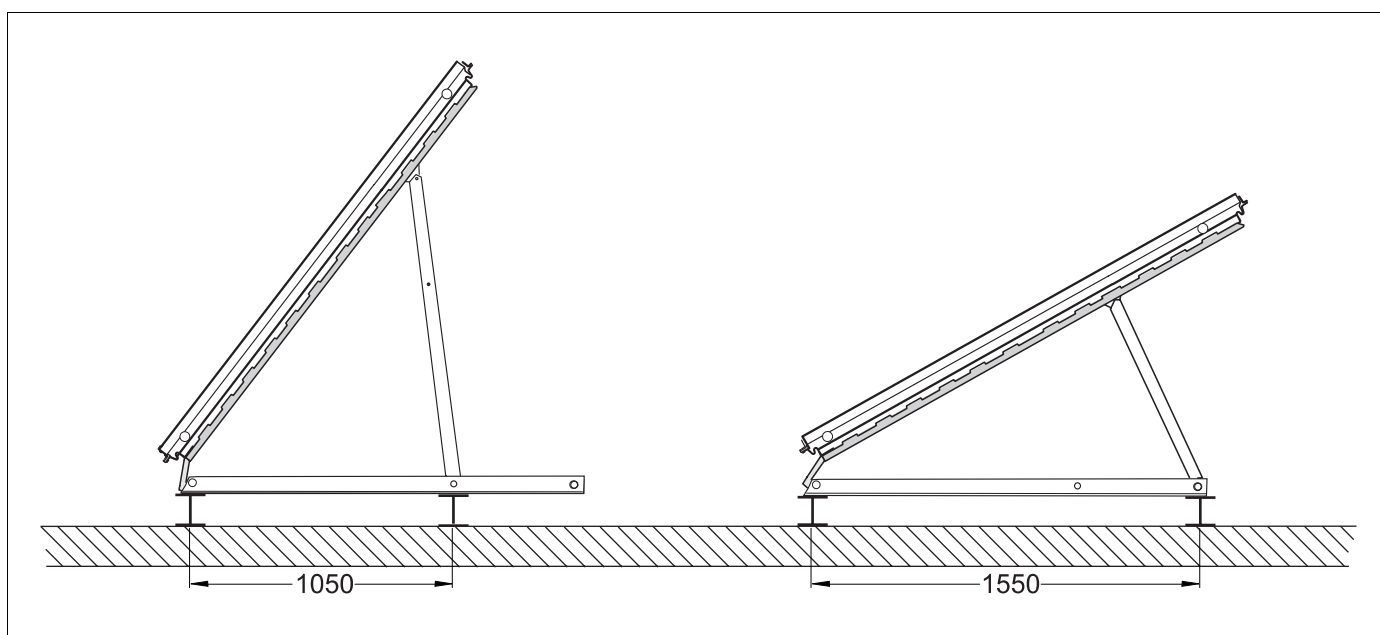


Fig. 31 Flat roof stands mounted on girders and also fastened with U-bolts (dimensions in mm)

5.3.3 Flat roof supports, weighted with paving slabs and additionally secured with ropes

You may also additionally secure the weighted flat roof support with ropes.

To do this, secure each flat roof support on site with at least two wire ropes at the bottom of the brace at the inside of the collector support and at a suitable point on the roof.

Select the rope depending on the weighting applied (see Table 7).

This ensures that the structure will not lean or topple over.

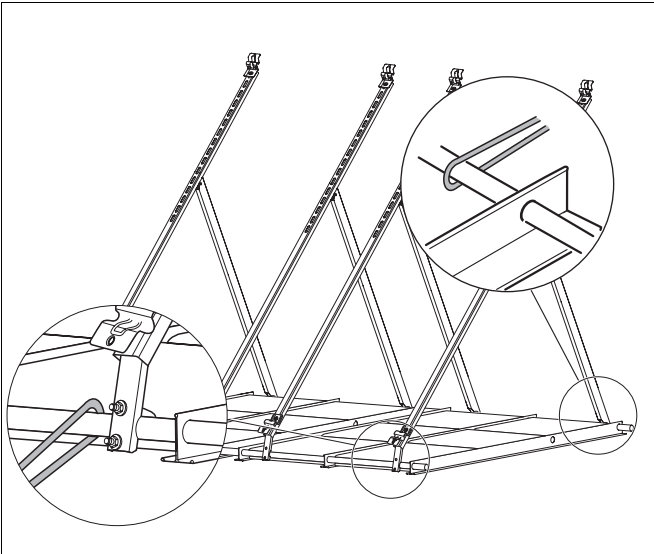


Fig. 32 Additional fixings for flat roof supports

Flat roof support					
Height of building	Wind velocity	Weighting	Base anchor	Rope ties	
		Number of paving slabs ¹ (500 × 500 × 50 mm) /weight	Number and type of bolts ² (e.g. U-bolts)	Securing against tipping Number of paving slabs ¹ (500 × 500 × 50 mm) /weight	Securing against slippage Maximum rope tension
0 m to 8 m	102 km/h	9/270 kg	4 × M8/8.8	6/180 kg	1,6 kN
above 8 m up to 20 m ³	129 km/h	15/450 kg	4 × M8/8.8	10/300 kg	2,5 kN

Tab. 7 Fixing values for a single flat roof support

- 1 These details apply to paving slabs with individual weights of 30 kg.
- 2 To evenly distribute forces, at least four bolts (1", M8/8.8) are required per flat roof support.
- 3 For flat roof installations you need the auxiliary holder, which is available as accessory.

6 Collector installation

Observe the following safety and user instructions when commencing the collector installation.



RISK TO LIFE

through a fall or falling parts.

WARNING!

- ▶ Take appropriate action to prevent accidents when working on roofs.
- ▶ Whilst working on the roof, take all necessary precautions against a possible fall.
- ▶ Always wear your personal protective clothing and safety equipment.
- ▶ After completing the installation, always check the secure positioning of the installed set and that of the collectors.
- ▶ Ensure that the correct equipment is used for working on roofs.



RISK OF INJURY

through interruption of work.

CAUTION!

- ▶ Secure the collectors against falling.
- ▶ Stabilise the collector array.



USER NOTE

Use lifting equipment as used by roofing contractors or sufficient suction handles for the installation.



USER NOTE

Unsecured collectors may fall during handling and installation.

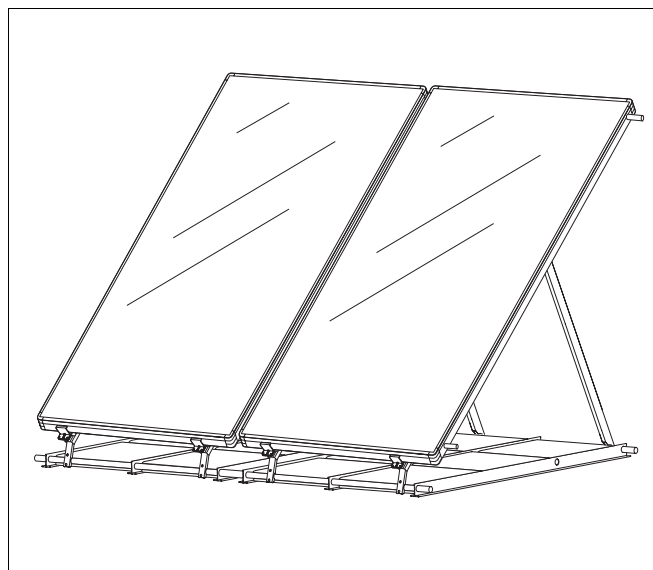


Fig. 33 Finished collector installation – flat roof stands,

6.1 Placing and interconnecting collectors in the collector holders



RISK OF INJURY

Install collectors with at least one assistant.

CAUTION!

- ▶ Always commence with the right hand collector.
- ▶ Position the first collector (Fig. 34) centrally into the pre-assembled collector holders.

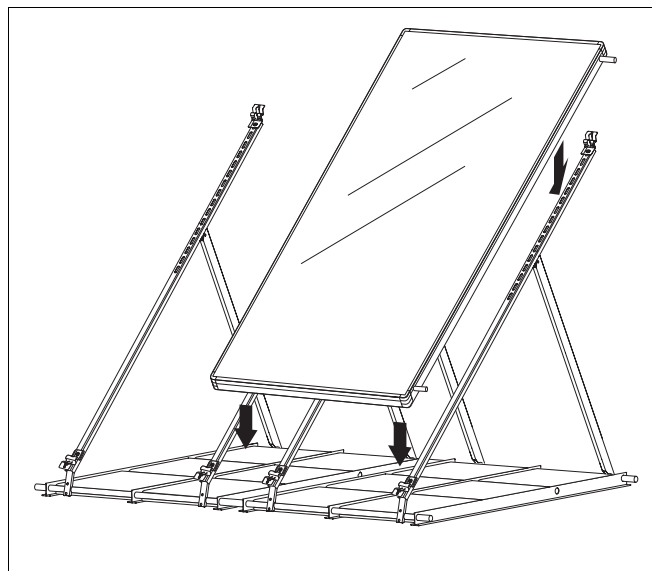


Fig. 34 Inserting the first collector

As standard, the hose clip is fitted (Fig. 35, **Item 2**) to the solar hose (Fig. 35, **Item 1**).

- ▶ Before inserting the next collectors, push the hose clips (Fig. 35, **Item 2**) over the pre-assembled solar hoses (Fig. 35, **Item 1**).



USER NOTE

Ensure that the second hose clip (Fig. 35, **Item 2**) is located on the solar hose.

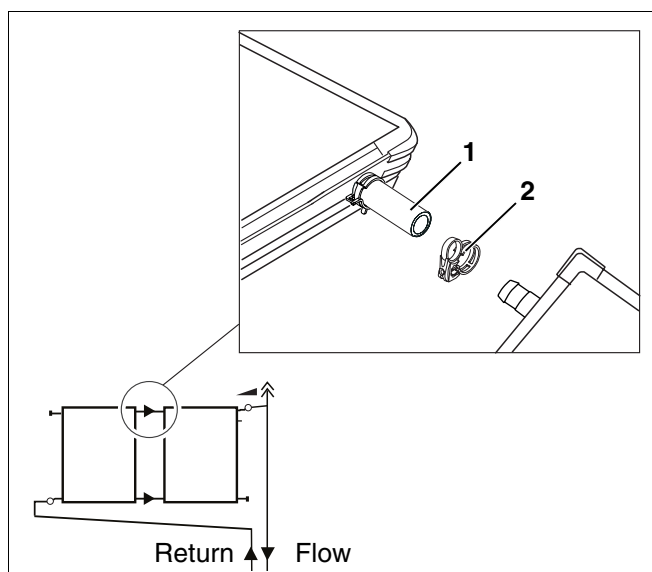


Fig. 35 Pull the hose clip over the solar hose.

Item 1: Pre-assembled solar hose

Item 2: Hose clip

- ▶ Whilst inserting the next collector, push the pre-assembled solar hoses onto the connections of the previously installed collector (Fig. 36).
- ▶ Then place the collector into the collector holders.



CAUTION!

SYSTEM DAMAGE

It is only possible to adjust the location of the hose clip with the blue clamping ring still in place and the clip in the open state. The clip should not be slackened with pliers, to avoid damage to the corrosion resistant coating on the hose clip.



CAUTION!

RISK OF INJURY

Only pull the blue ring from the clip when the solar hose is in the correctly installed position.

The clamping ring must be removed from the hose clip to close or secure the solar hose.

- ▶ Pull the serrated washers of the hose clips.

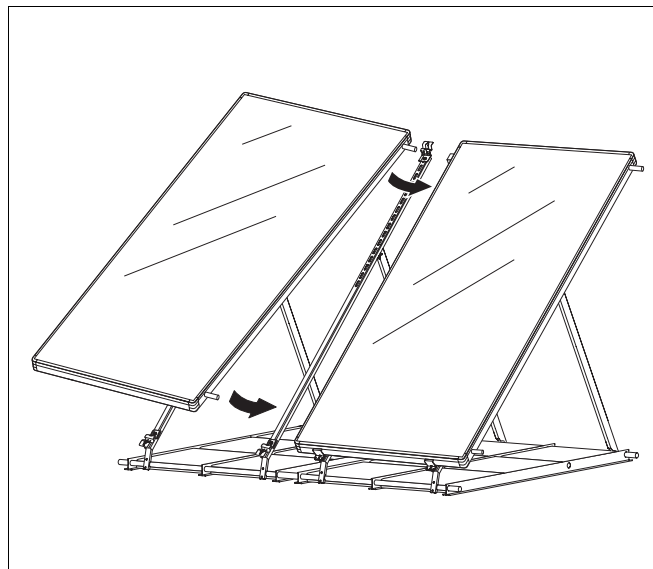


Fig. 36 Inserting the second collector and tightening the hose clip

6.2 Securing collectors

Secure the collectors with the collector clamps supplied.



USER NOTE

Ensure that the plastic top parts of the two-part spacer blocks are located on the plastic bottom parts see Fig. 37, page 32.

The plastic top parts support the collector frame.

- ▶ Tip the collector clips slightly forward and insert them into the groove in the collector frame (Fig. 38).
- ▶ Secure the collector clips with the collector holders using the pan-head screws supplied.

Collectors need to be additionally fitted with a double clip (Fig. 39, **Item 1**), if an auxiliary holder (accessory) is fitted.

- ▶ Position the edge of the double clamp onto the glass panes of the collectors (Fig. 39).



USER NOTE

Hold the collector clip tightly when securing to ensure proper alignment.

Ensure that the protective caps of the double clamps are present.

- ▶ Secure the double clamps on the collector holders using the pan-head screws supplied.



USER NOTE

Use the Allen key SW5 to secure the collector clamps.

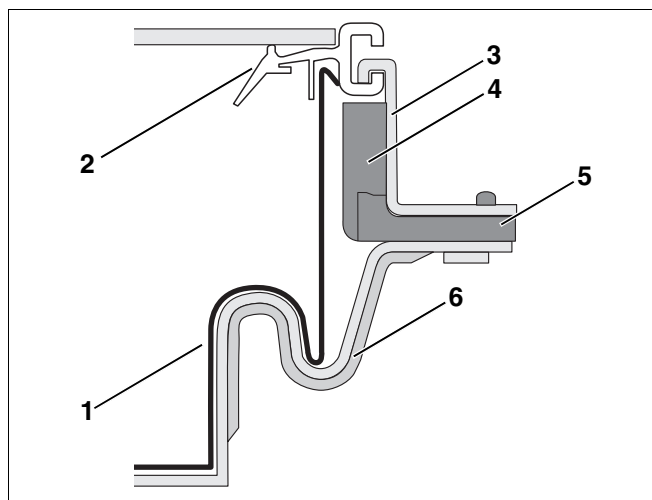


Fig. 37 Diagram of inserted collector clips

Item 1: Collector trough

Item 2: Collector frame

Item 3: Collector clips

Item 4: Top spacer plastic

Item 5: Bottom spacer plastic

Item 6: Collector holder

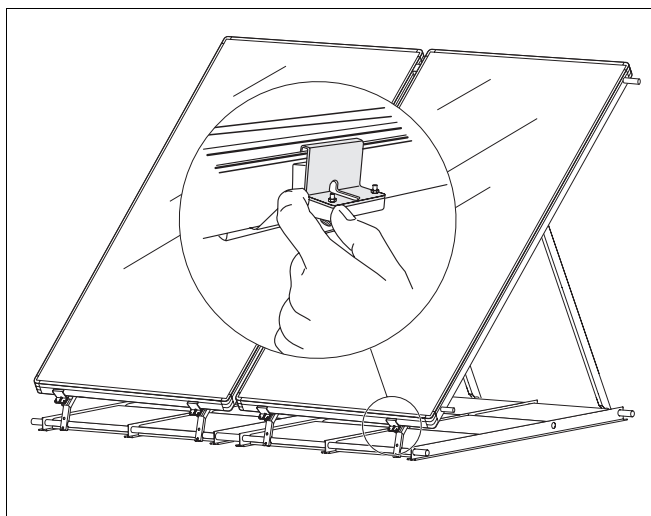


Fig. 38 Securing collectors

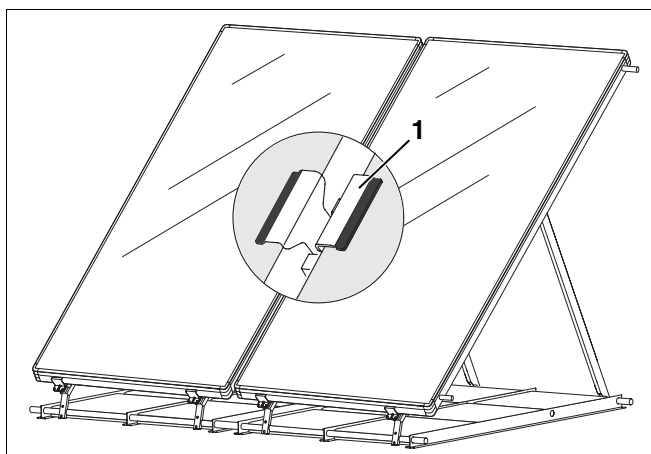


Fig. 39 Secure collectors centrally with auxiliary holders

Item 1: Double clip

6.3 Securing the tee-piece through re-shaping

- Re-shape the outer tee-profiles of one collector array (Fig. 40) with a hammer blow to the upper edge, until the round tubes are secured inside the tee-profiles.



USER NOTE

Do not re-shape the round tubes, otherwise spacer pipes cannot be pushed onto the tubes, if the system is to be extended at a later date.

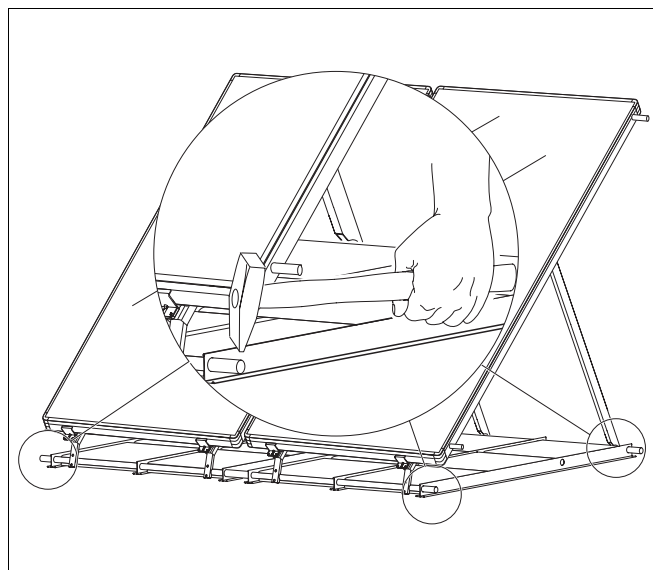


Fig. 40 Stabilising the flat roof supports

7 Header connection

7.1 Water connection acc. to the Tichelmann principle

Generally, connect the collectors in accordance with the Tichelmann principle (Fig. 41). Install the pipework so that the same volume flow is channelled to each collector.

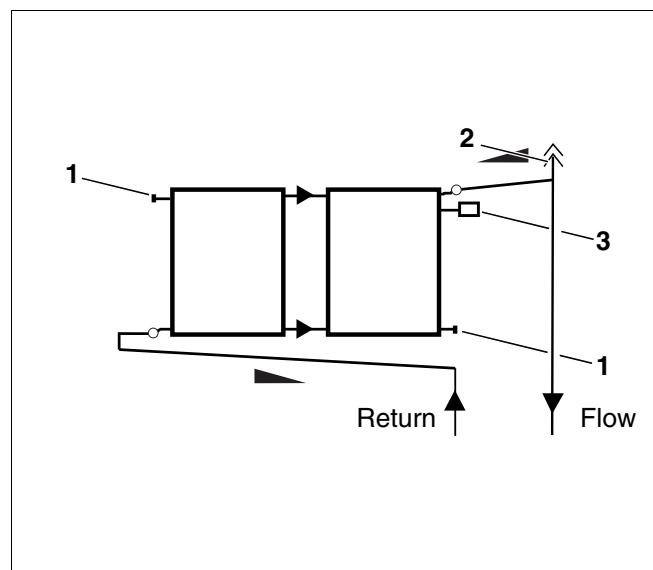


Fig. 41 Water connection acc. to the Tichelmann principle

Item 1: Dummy plug

Item 2: Automatic air-vent valve (accessory)

Item 3: Temperature sensor

7.2 Always ensure the system is properly vented

If you intend venting a solar heating system with automatic air-vent valves (Fig. 42, accessory) at the highest point of the system, run your pipework rising to the air-vent valve.

Avoid frequent changes in direction.



USER NOTE

For each change of direction downwards and each new rise, provide an additional air trap with air vent.

If you cannot provide an automatic air-vent valve due to space restrictions, install a manual air-vent valve.



USER NOTE

For solar heating systems always use all-metal air vents. Automatic air-vent valves with plastic floats will be destroyed, as the liquid and steam temperatures can be higher than 110 °C. Plastic pipes (e.g. those made from polyethylene) are also unsuitable for solar heating systems.

Function of the shut-off screw and the weather protection cap

The solar heating system is vented through the opened shut-off screw (Fig. 42, **Item 1**). The weather protection cap must always be positioned over the shut-off screw to prevent moisture entering through the opened shut-off screw into the solar heating system (Fig. 42, **Item 2**).

- Open the air-vent valve by unscrewing the shut-off screw one full revolution.

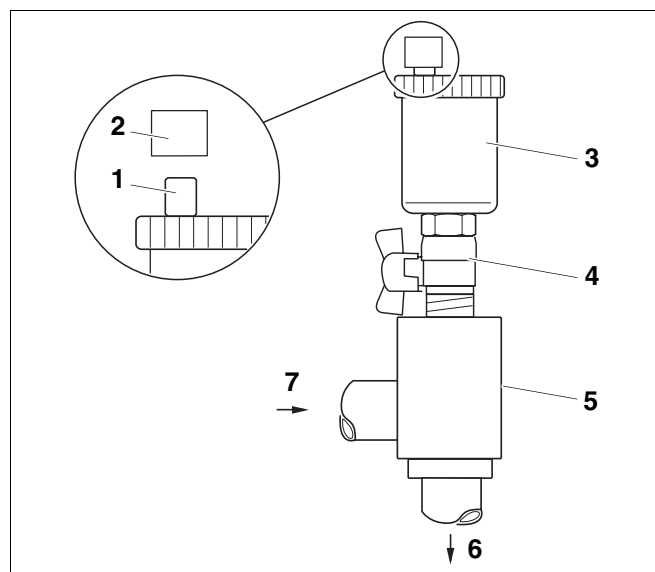


Fig. 42 View – air trap with vent valve for flow connection (accessory)

Item 1: Shut-off valve

Item 2: Weather protection cap

Item 3: Automatic air-vent valve (accessory)

Item 4: Ball valve, 3/8", 1/4" with winged handle (accessory)

Item 5: Air trap (accessory)

Item 6: Solar heating station header

Item 7: Header from the solar collectors

7.3 Connection of air trap and venting valve (accessory)



USER NOTE

During the installation ensure that the return pipe is run below the collector array rising to the array (Fig. 41, page 34).

The manifold terminates as pipeline under the roof. The connection with the collector array is achieved via $\frac{3}{4}$ -inch solar hoses (part of the basic pipework set).

Connection of flow pipe and venting valve (accessory)

- ▶ The flow connection (top connection of the last collector in the hydraulic chain) requires that the short solar hose (Fig. 43, **Item 2**) is fitted to the collector using a hose clip (Fig. 43, **Item 1**).
- ▶ Fit the hose coupling supplied (Fig. 43, **Item 3**) to the air trap (Fig. 43, **Item 4**).
- ▶ Provide an air trap with metallic air-vent valve (accessory) at the highest point of the system (flow).



CAUTION!

SYSTEM DAMAGE

You may only adjust the location of the hose clip with the blue clamping ring and in the taut state. You cannot later slacken the clip with pliers, otherwise you would damage the corrosion protection of the hose clip.



USER NOTE

The hose clips are held open with a blue clamping ring. The clamping ring must be removed from the hose clip to close or secure the solar hose.



CAUTION!

RISK OF INJURY

Only pull the blue clamping ring onto the solar hose in the installed state and in the correct position.

- ▶ Push the hose clip right up to the collector.

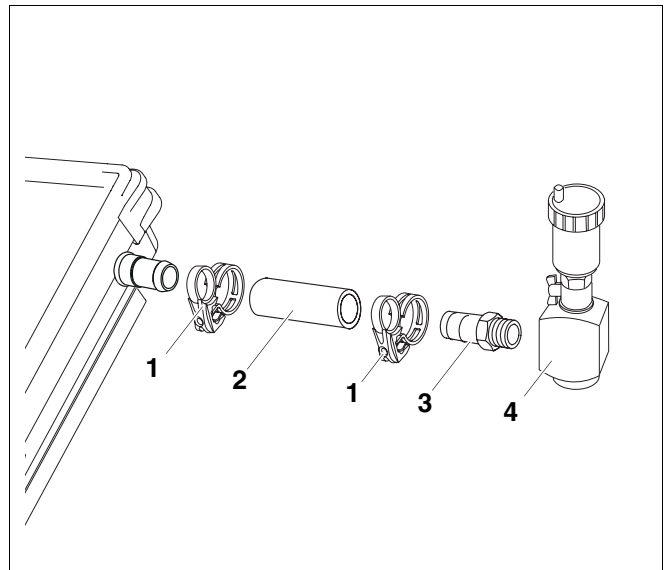


Fig. 43 Connection of air trap and venting valve

Item 1: Hose clip

Item 2: Solar hose (short)

Item 3: Hose coupling

Item 4: Air trap and venting valve (accessory)

Connection of the return pipe

- Secure the long solar hose onto the lower connection of the first collector in the hydraulic chain using a hose clip.

7.4 Dummy plug installation

Seal the collector connections which are not required using the dummy plug supplied with the basic pipework set.

- To do this, insert the dummy plug (Fig. 44, **Item 1**) head first into the short solar hose.
- Push the hose clip (Fig. 44, **Item 2**) up to the head of the dummy plug (Fig. 44, **Item 1**).

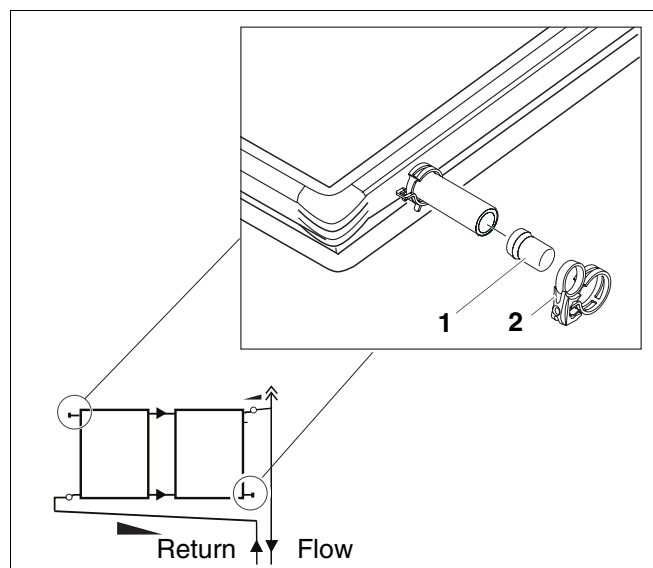


Fig. 44 Connection of the dummy plug

Item 1: Dummy plug

Item 2: Hose clip

8 Collector sensor connection



USER NOTE

Observe the installation location for single or dual row collector systems.

Location

- Insertion point (Fig. 45, **Item A**) for single row collector systems.
- Insertion point (Fig. 45, **Item B**) for dual row collector systems.

Collector sensor connection



USER NOTE

The collector sensor is part of the control unit package.

- ▶ Insert the collector sensor (Fig. 45, **Item 3**) through the compression fitting (Fig. 45, **Item 1** and **2**) and push the collector sensor approx. 170 mm until it reaches the end of the sensor pocket (Fig. 45, **Item 4**).
- ▶ Turn the bottom part of the compression fitting (Fig. 45, **Item 1**) into the sensor pocket thread (Fig. 45, **Item 4**).
- ▶ Tighten the compression fitting (Fig. 45, **Item 1** and **2**).

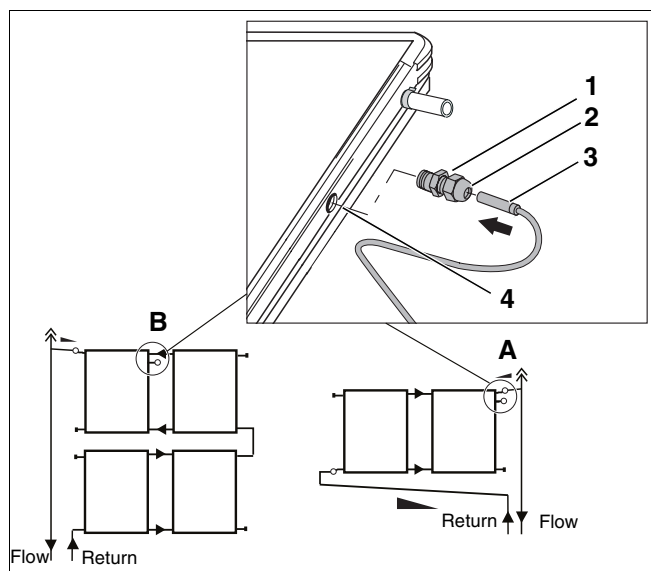


Fig. 45 Collector sensor connection

Item 1: Lowest part – compression fitting

Item 2: Upper part - compression fitting

Item 3: Collector sensor

Item 4: Sensor pocket for collector sensor

9 Insulating the connection and header pipes



USER NOTE

Carry out the following insulating work only after completion of the pressure test and when all connections are tight.

- Finally, check the secure positioning of the installed set and that of the collectors.

Insulation of the manifolds in internal or external installations

- For the insulation of external pipework, use only UV and high temperature resistant insulating materials.
- For the insulation of internal pipework, use only high temperature resistant insulating materials, e.g. Armaflex HT for solar installations.



USER NOTE

Also insulate the connections between the collectors.

INSTALLATION INSTRUCTIONS

EXCELLENCE COMES AS STANDARD

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