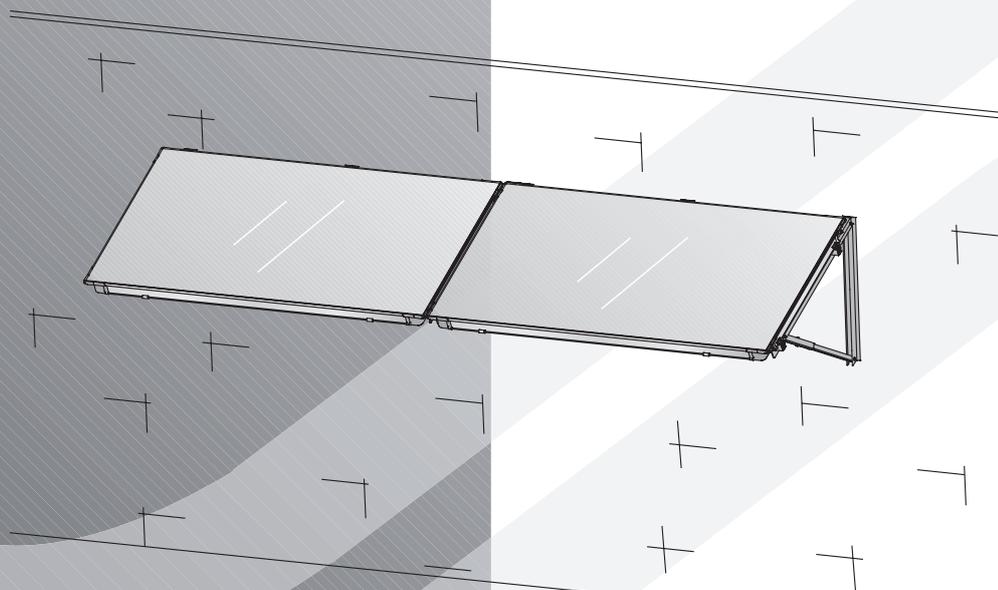
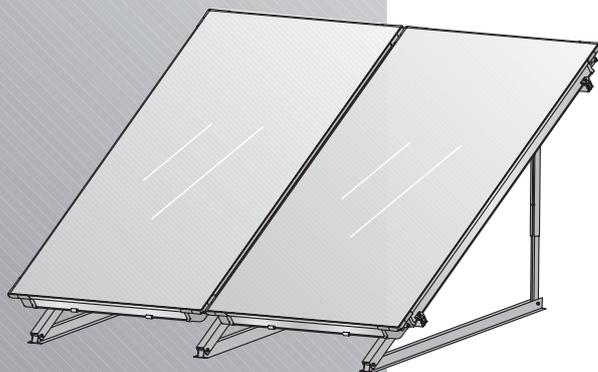


FKT SERIES FLAT PANEL SOLAR COLLECTORS

FLAT ROOF AND WALL MOUNTED INSTALLATION FOR WORCESTER
SOLAR HEATING SYSTEMS



63043970.01-1.SD.

GB

Installation instructions

About this manual

This installation manual contains important information for the safe and appropriate installation of the roof mounted solar collectors.

Notes are included with important information for situations in which there is no danger for persons or equipment.

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 roof	Connection of thermal solar heating systems	Installation and equipment of DHW cylinders
The Health and Safety at Work etc Act 1974	EN 12976: Thermal solar heating system and their components (pre-fabricated systems).	BS 5546: 2000 Specification for installation of hot water supplies for domestic purposes, using gas-fired appliances of rated input not exceeding 70 kW.
The Management of Health and Safety at Work Regulations 1999	ENV 12977: Thermal solar heating system and their components (bespoke systems).	BS 6700: 1997 Specification for design, installation, testing and maintenance, of servicing supplying water for domestic use within buildings and their curtilages.
The Construction (Health Safety and Welfare) Regulations 1996	BS 6795: Code of practice for solar heating systems for swimming pools.	
The Construction (Design and Management) Regulations 1994		
The Lifting Operations and Lifting Equipment Regulations 1998		

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

Lightning protection

If the building height (installation height) exceeds 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 6795: Latest version

2 Specifications

FKT Solar collectors		
Certificates		  
Length		2,070 mm
Width		1,145 mm
Height		90 mm
Clearance between collectors		25 mm
Fluid content, portrait version	V_f	1.43 l
Fluid content, landscape version	V_f	1.76 l
Gross absorber surface area	A_G	2.37 m ²
Net absorber surface area		2.23 m ²
Net weight, portrait version	m	46 kg
Net weight, landscape version	m	47 kg
Permissible operating pressure of the collector	p_{max}	10 bar

Tab. 2 Specifications

3 Safety

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

Safety and user notes, which specifically refer to the installation, in the installation manual immediately following the individual installation steps, are found here.

Carefully read the safety instructions before commencing the installation.

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

3.1 Correct use

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 pitch ($\leq 25^\circ$).

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

On roofs with a shallow pitch, attach the system to the roof on site.

Application conditions for flat roof supports

Only erect the installation set on roofs whose construction can support the weight.

The installation set is suitable for a max. standard snow load of 2.0 kN/m² and an installation height of max. 20 m. Using appropriate accessories, the installation set can be used for a max. standard snow load of 3.8 kN/m² and a max. installation height of 100 m.

The flat roof installation set must not be used for fixing any other objects to the roof. The kit is intended exclusively for the safe fixing of solar collectors.

Conditions at use for wall mounting supports

Only landscape panel orientations are suitable for wall mounting

Install the wall mounting support only on wall structures with sufficient structural strength. If necessary, ask a structural engineer for assistance.

The wall mounting support must only be installed at a maximum height of 20 m and with a maximum snow load of 2.0 kN/m².

3.2 Notes structure

Two levels are identified by signal terms:



RISK TO LIFE

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



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:



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



RISK TO LIFE

through a fall or falling parts.

WARNING!

- ▶ Ensure you have the correct safety 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.



RISK OF INJURY

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

CAUTION!

- ▶ Never change the system construction.



RISK OF INJURY

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

CAUTION!

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

4 Before installation

4.1 General notes



USER NOTE

It is recommended that the services of a roofing company, who are fully experienced in working on roofs and will be aware of the risk of working at height, are considered.

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 24).
- ▶ the optimum arrangement of the solar collectors. Take the solar radiation into consideration (angle of incidence, southerly orientation). Avoid the shade of high trees or structures and match the collector array to the shape of the building (e.g. flush with windows, doors, etc.).
- ▶ the stability of the support surface. Remove gravel or similar material.



USER NOTE

Only use OEM components and replace any faulty parts immediately.



USER NOTE

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

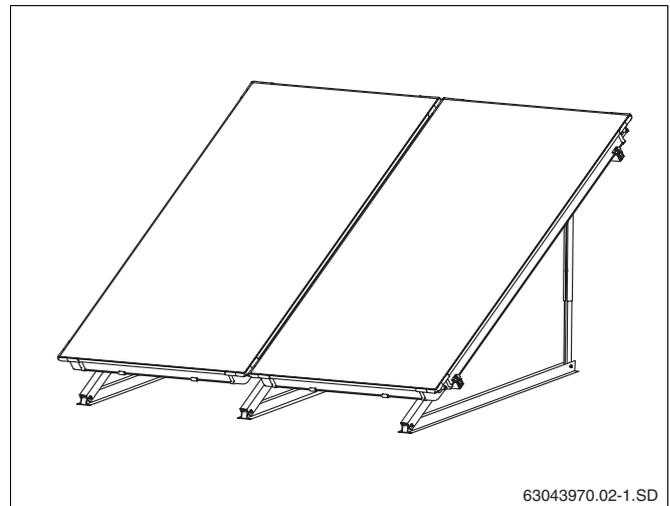


Fig. 1 General overview of collector pair – flat roof mounting

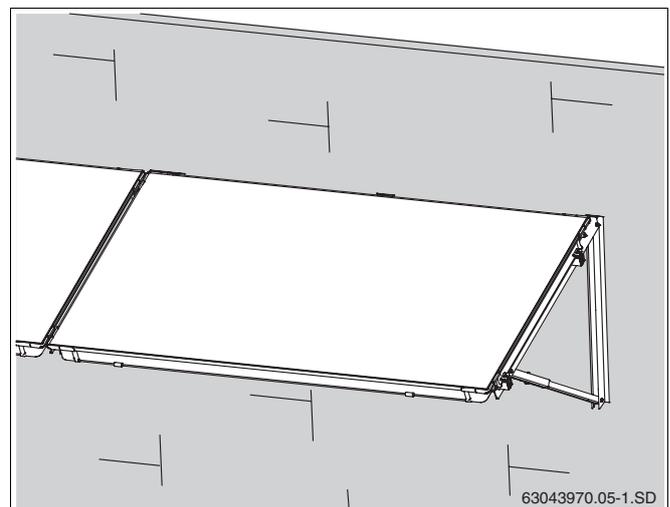
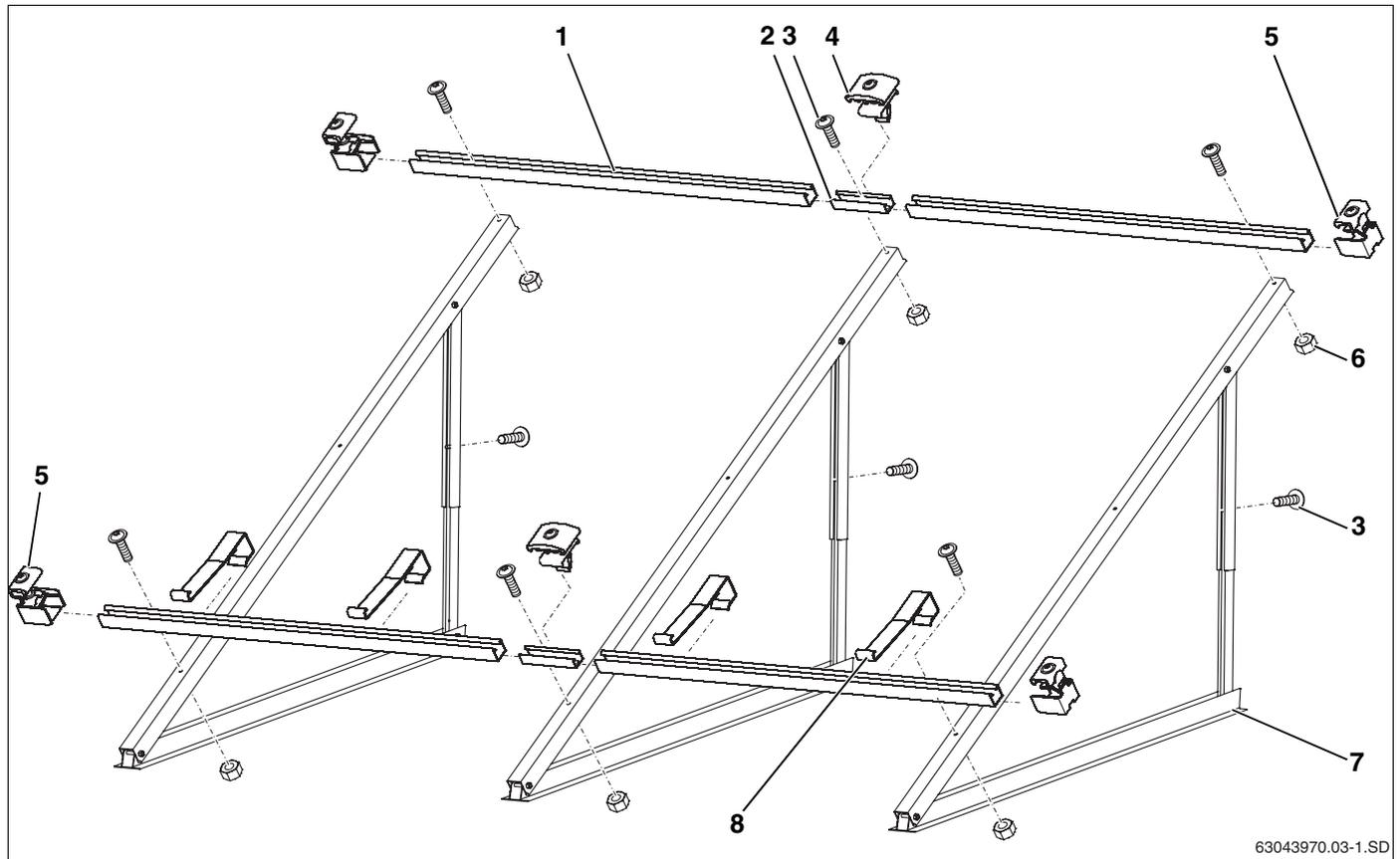


Fig. 2 General overview of collector pair – wall mounted installation

4.2 Component description

4.2.1 Installation set for the collectors

The installation sets are for mounting and fixing the collectors in place.



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Fig. 3 Installation set for 2 collectors - 1 basic installation set, 1 extended installation set

Basic installation set for each collector array and for the first collector (Fig. 3):

Item 1:	Profile rail	2 ×
Item 3:	M8 screw × 20	6 ×
Item 5:	Single-sided collector clamp	4 ×
Item 6:	M8 nut	4 ×
Item 7:	Collector brace	2 ×
Item 8:	Anti-slip protection	2 ×

Extended installation set for each additional collector (Fig. 3):

Item 1:	Profile rail	2 ×
Item 2:	Plug connector with threaded studs	2 ×
Item 3:	M8 screw × 20	3 ×
Item 4:	Double-sided collector clamp	2 ×
Item 6:	M8 nut	2 ×
Item 7:	Collector brace	1 ×
Item 8:	Anti-slip protection	2 ×



USER NOTE

Depending on the use of the flat roof support, auxiliary braces and additional profile rails may be needed, and are dealt with in the relevant sections.

4.2.2 Pipework connection

One connection kit for each collector array is required. The collectors are connected together by a connection set.

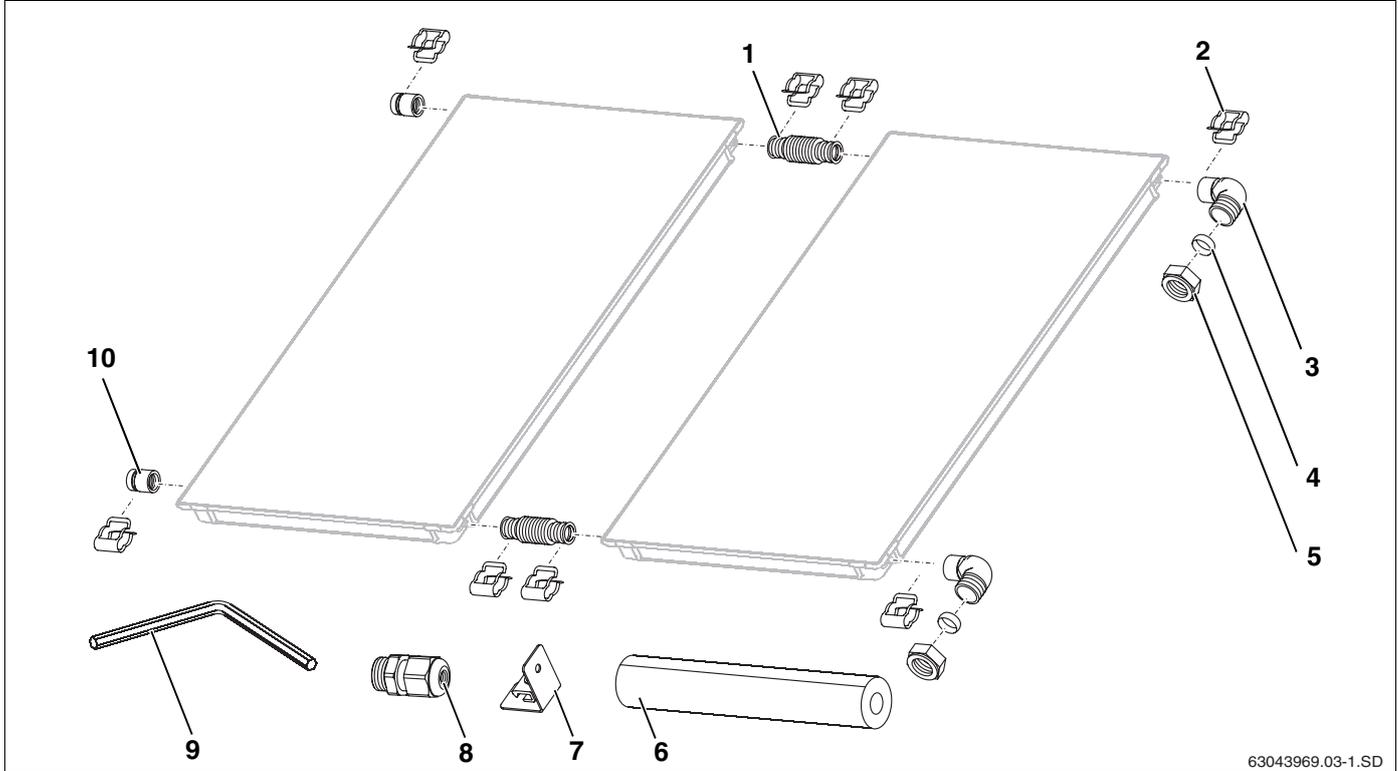


Fig. 4 Connection kit and connection set (illustration shows 2 portrait collectors)

Connection kit, per collector array (Fig. 4)

Item 2: Bracket (spare)	2 x	Item 7: Holder for header pipe	2 x
Item 3: Elbow	2 x	Item 8: Compression fitting for collector sensor	1 x
Item 4: Olive	2 x	Item 9: Size 5 spanner	1 x
Item 5: Nut	2 x	Item 10: End cap	2 x
Item 6: Insulation for corrugated pipe connector 710 mm	1 x		

Connection set between the collectors, for each collector (in two corner protectors, Fig. 5)

Item 1: Corrugated pipe connector	2 x
Item 2: Connector clip	4 x

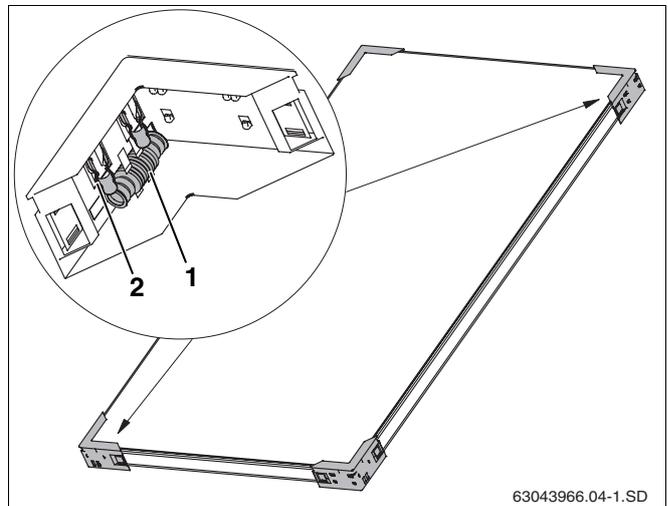


Fig. 5 Two corner protectors with one connection set

4.3 Other equipment

- Spirit level
- Plumb line
- Filling pump
- Vest harness with safety rope
- Pipe insulation
- Scaffolding
- Roofing ladder
- Crane or mobile hoist



USER NOTE

When fitting the roof installation set and water connection, the only tool required is the size 5 allen key from the connection kit.

4.4 Transport and storage

Please ensure that the corner protectors are retained. They contain pipework connection pieces which are required for installation. All components are protected by transport packaging.



USER NOTE

Dispose of the transport packaging in an environmentally friendly recycling system.

Transport protection for collector connections

The collector connections are protected against damage by rubber caps.



SYSTEM DAMAGE

through damaged sealing faces.

CAUTION!

- ▶ Do not remove the rubber caps (Fig. 6, **Item 1**) until immediately prior to installation.

Storage

The collectors must be stored in dry conditions.



USER NOTE

Do not store collectors outside without protection from the rain.

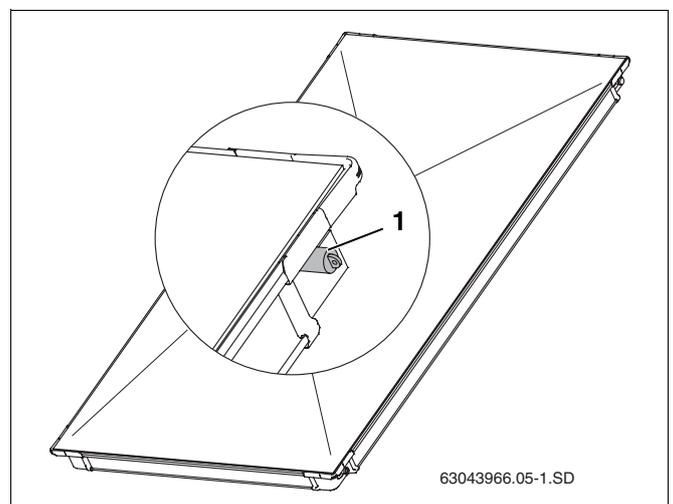


Fig. 6 Plastic caps on collector connections

4.5 Technical documentation

The solar heating system consists of various components (Fig. 7). Installation, operation and maintenance documentation is provided for each component. Accessories may be accompanied by a separate document.

- Item 1:** Collector: instructions for roof installation are enclosed with the connection kit
- Item 2:** Pump station: instructions enclosed with the complete station
- Item 3:** Solar Controller: instructions are enclosed with the controller.
- Item 4:** DHW Cylinder: instructions enclosed with the DHW cylinder.

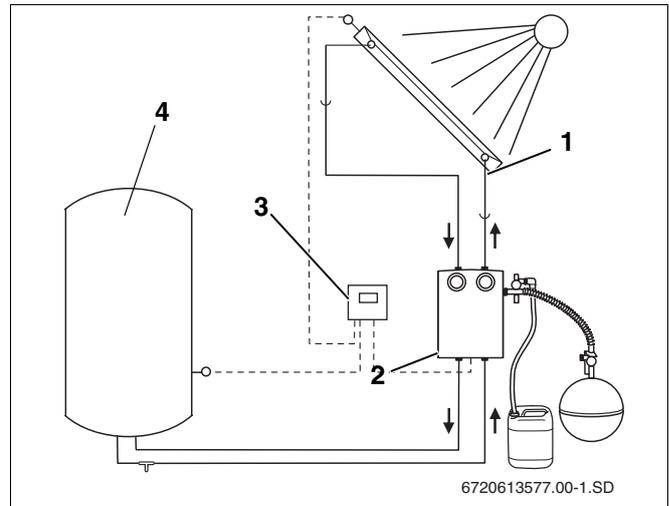


Fig. 7 Solar heating system components and technical documentation

4.6 Determining the angle of incidence of the collectors

The collectors' angle of incidence to be selected depends on the desired area of application. It can be adjusted using the telescopic rails (Fig. 8).

4.6.1 Determining the area of application

The different areas of application of solar heating systems provide angles of incidence that 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, angle of incidence range

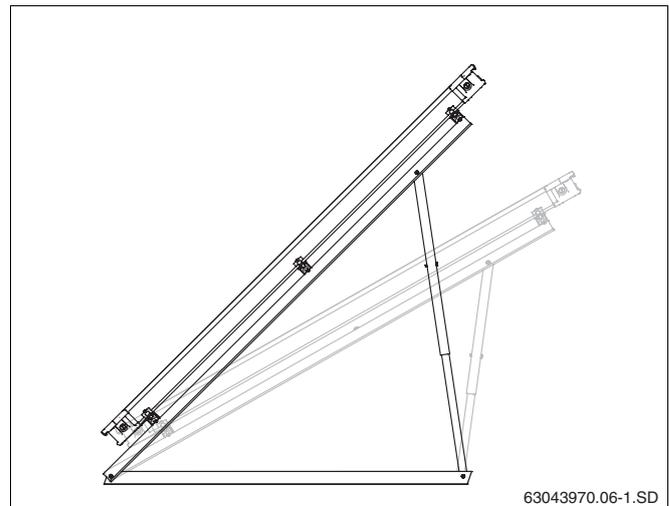


Fig. 8 Angle of incidence of the collector on a flat roof

4.6.2 Sloping roofs

On roofs that slope slightly in a southerly direction, the pitch angles are deducted from the angle of incidence. On roofs that slope slightly in a northerly direction, the pitch angles are added to the angle of incidence (Fig. 9).



WARNING!

RISK TO LIFE

If there is a risk that larger quantities of snow might accumulate behind the collectors (towards the roof ridge), prevent this by fitting a suitable protective grille on site.



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.

4.6.3 Walls

The landscape collector braces can be used as flat roof supports or wall-mounting supports.

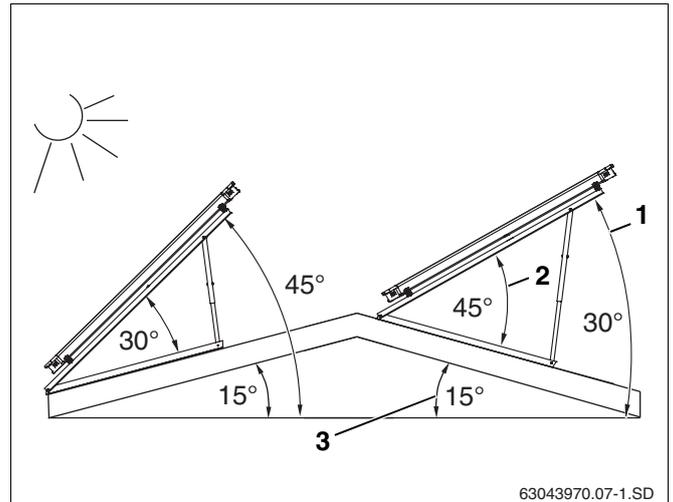


WARNING!

RISK TO LIFE

from falling collectors, due to incorrect use.

- ▶ The collector angle of incidence (Fig. 10, **Item 1**) to the horizontal must be between 45° and 60° (or the angle of inclination Fig. 10, **Item 2** of the collectors must be between 30° and 45°)



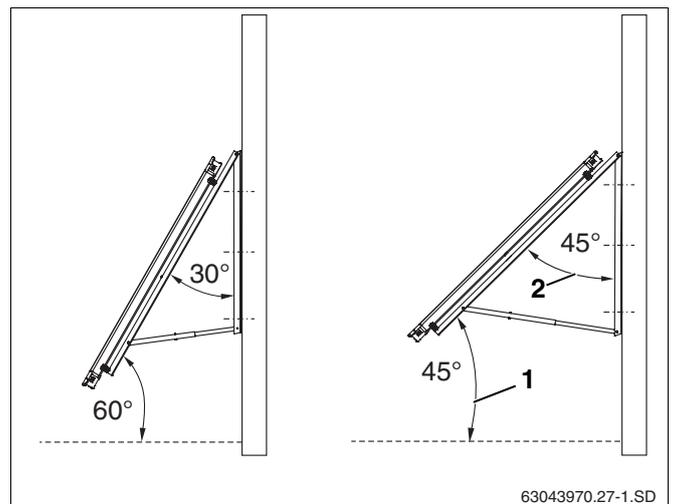
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Fig. 9 Angle of incidence of the collector on a flat roof

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

Item 2: Collector angle of inclination

Item 3: Roof pitch



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Fig. 10 Angle of incidence of the collector on a wall

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

Item 2: Collector angle of inclination

4.6.4 Fitting telescopic rails

Different angles of incidence can be set using the telescopic rails.

- ▶ Select holes on the upper and lower telescopic rails as shown in Fig. 12 and Fig. 13.
- ▶ Insert telescopic rails into each other and fasten with M8 × 20 screw (Fig. 11).

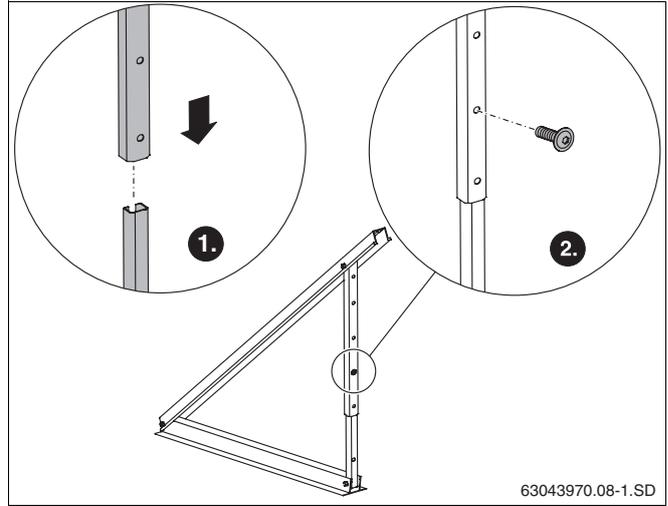


Fig. 11 Connecting telescopic rails



USER NOTE

For vertical installation of a collector with an angle of inclination of 30° to 60°, use the uppermost hole on the lower telescopic rail (Fig. 12, **Item 1**).

For an angle of inclination of 25°, you must shorten the top of the lower rail by 140 mm and use the lower hole (Fig. 12, **Item 2**).

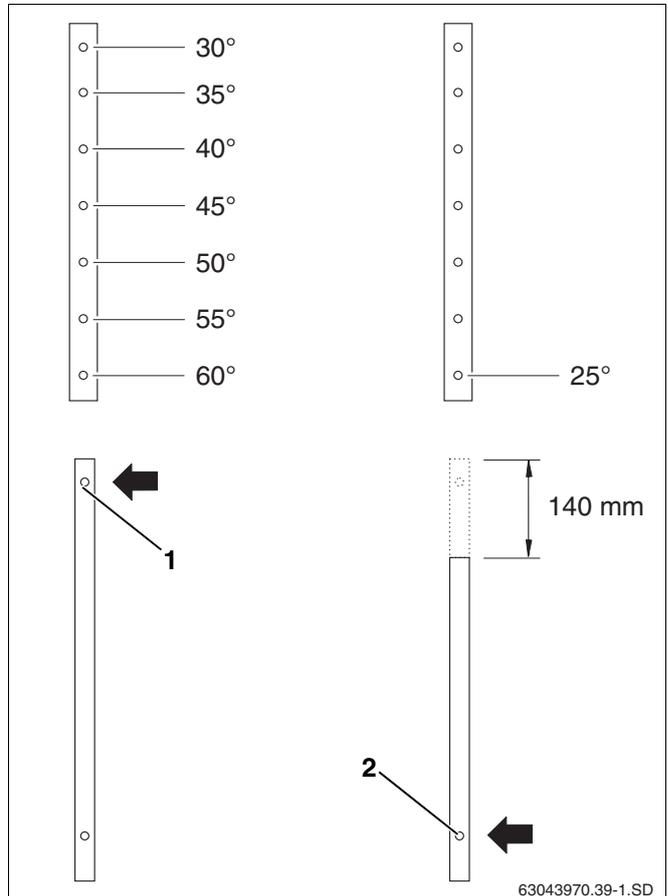


Fig. 12 Adjust angle of inclination for portrait collectors



USER NOTE

For landscape installation of a collector with an angle of inclination of 35° to 60°, use the uppermost hole on the lower telescopic rail (Fig. 13, **Item 3**).

For an angle of inclination of 25° and 30°, you must shorten the top of the lower rail by 140 mm and use the lower hole (Fig. 13, **Item 2**).

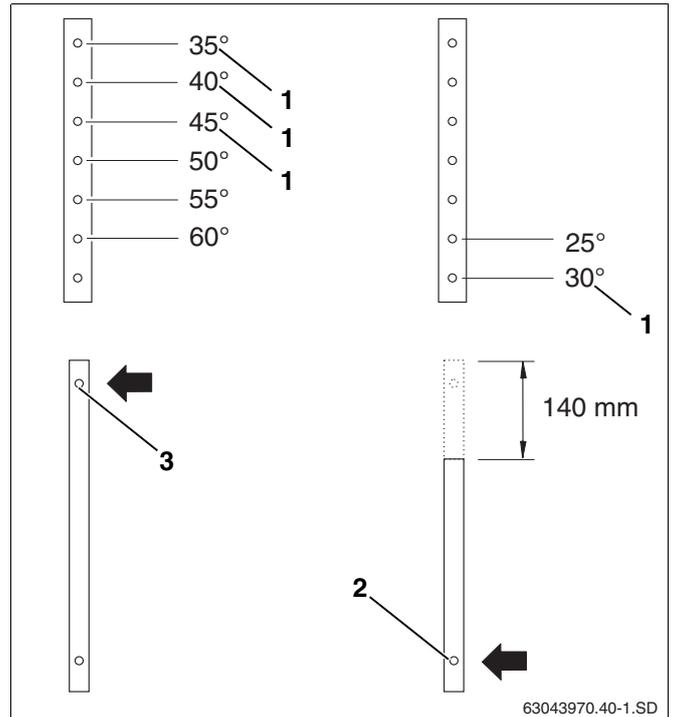


WARNING!

RISK TO LIFE

from falling collectors, due to incorrect use.

- ▶ For wall-mounted installation, use only the positions for the collector angles of inclination 30°, 35°, 40° and 45° (Fig. 13, **Item 1**).



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Fig. 13 Adjusting angle of inclination for landscape collectors

4.7 Determining space requirements

4.7.1 Ascertaining the clearance between collector arrays

The minimum spacing between the collector arrays is determined by the angle of inclination of the collector.



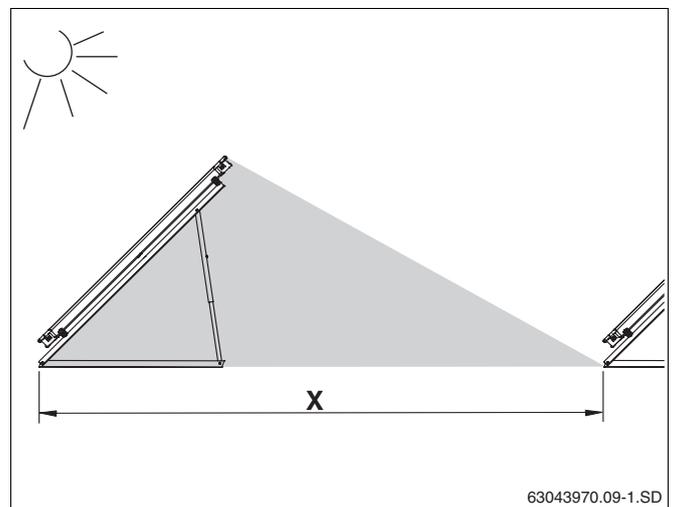
USER NOTE

When using multi-row arrays, note that the clearance X (Fig. 14) between the arrays must be large enough to avoid shadows falling over adjacent collectors.

Maintain the clearance stated in the tables or calculate the require clearance (Technical Guide).

Angle of inclination – collector	Clearance X	
	Portrait installation	Landscape installation
25°	4.74 m	2.63 m
30°	5.18 m	2.87 m
35°	5.58 m	3.09 m
40°	5.94 m	3.29 m
45°	6.26 m	3.46 m
50°	6.52 m	3.61 m
55°	6.74 m	3.73 m
60°	6.90 m	3.82 m

Tab. 4 Dependency of clearance X on the angle of incidence and the minimum altitude of the sun (17°)



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Fig. 14 Shadow – clearance X

4.7.2 Estimating your space requirements



CAUTION!

SYSTEM DAMAGE

through wind, eddies and pressure peaks around the roof edges.

- ▶ Before commencing the installation, ensure that at least one metre is allowed between the flat roof supports and the edge of the roof (Fig. 15).

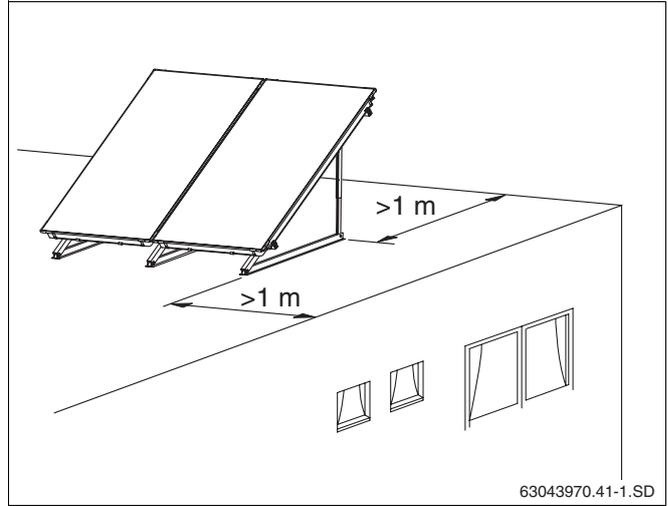


Fig. 15 Distance from the edge of the roof

Allow sufficient installation space for the different forms of installation (landscape, portrait).

These dimensions (Tab. 5 and Tab. 6) relate to the roof surface area which must be available.

The quoted dimensions 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.

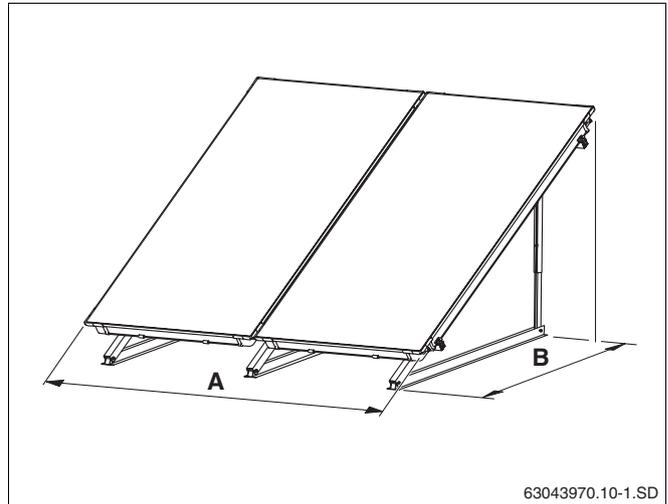


Fig. 16 Space requirements – collector array – portrait version

Space requirements for portrait collectors:

Number of collectors	Dimension A	Angle of inclination	Dimension B
2	2.34 m	25°	1.84 m
3	3.51 m	30°	1.75 m
4	4.68 m	35°	1.68 m
5	5.85 m	40°	1.58 m
6	7.02 m	45°	1.48 m
7	8.19 m	50°	1.48 m
8	9.36 m	55°	1.48 m
9	10.53 m	60°	1.48 m
10	11.70 m		

Tab. 5 Space requirement for portrait installed collectors

Space requirements for landscape collectors:

Number of collectors	Dimension A	Angle of inclination	Dimension B
2	4.18 m	25°	1.06 m
3	6.28 m	30°	1.02 m
4	8.38 m	35°	0.96 m
5	10.48 m	40°	0.91 m
6	12.58 m	45°	0.85 m
7	14.68 m	50°	0.85 m
8	16.78 m	55°	0.85 m
9	18.88 m	60°	0.85 m
10	20.98 m		

Tab. 6 Space requirements for landscape installed collectors

5 Installing flat roof and wall mounting supports



WARNING!

RISK TO LIFE

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



WARNING!

RISK OF INJURY

through a fall or falling parts.

- ▶ Take appropriate action to prevent accidents when working on roofs.
- ▶ Always wear your personal protective clothing and safety equipment.



USER NOTE

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

Ensure sufficient stability at the installation surface, and removing any gravel and similar material.



USER NOTE

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

This installation method also applies to the flat roof support for landscape collectors.

The following describes the installation of flat roof supports for portrait collectors. The landscape version is installed in the same way.

Notes identify any variations.

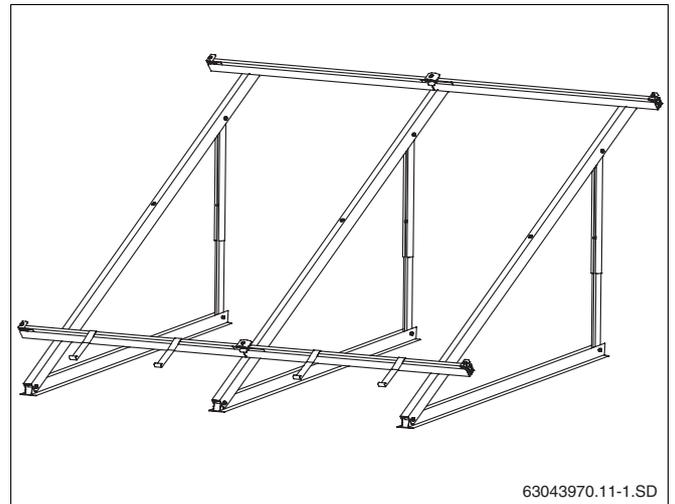


Fig. 17 Portrait flat roof supports for 2 collectors

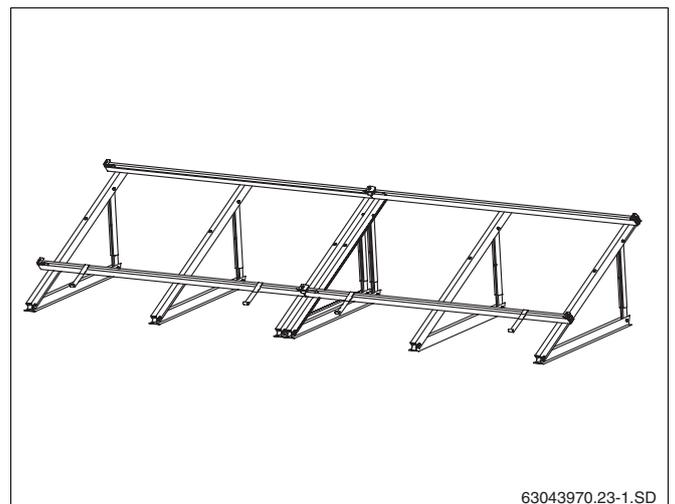


Fig. 18 Landscape flat roof supports for 2 collectors

5.1 Distances between collector braces for on-site base anchoring

The distances between the collector braces (middle/middle, in mm) depend on:

- the collector version (portrait, landscape)
- and the maximum snow and wind loads



USER NOTE

You must strictly observe the clearances between the collector braces so that the profile rails can still be installed at a later stage.

5.1.1 Basic version

Two collector braces are required for the first collector. For every additional portrait collector, another collector brace is required (Fig. 19). For every additional landscape collector, two further collector braces are required (Fig. 21).

The basic version can be used for the following loads:

- building height max. 20 m (installation height)
- max. 2.0 kN/m² snow load

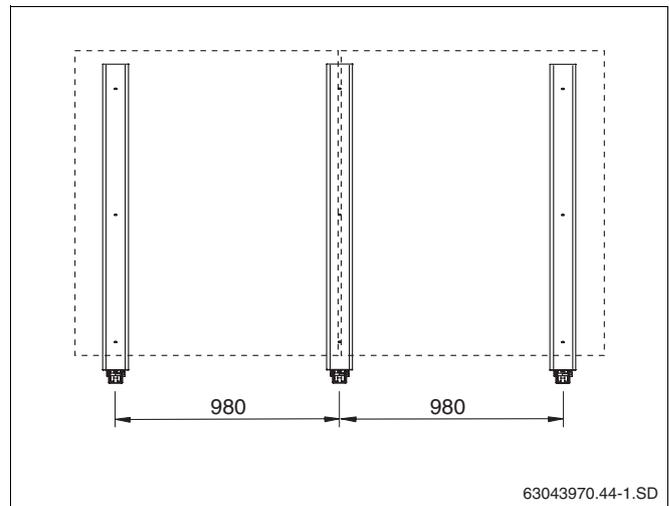


Fig. 19 Basic version for 2 portrait collectors

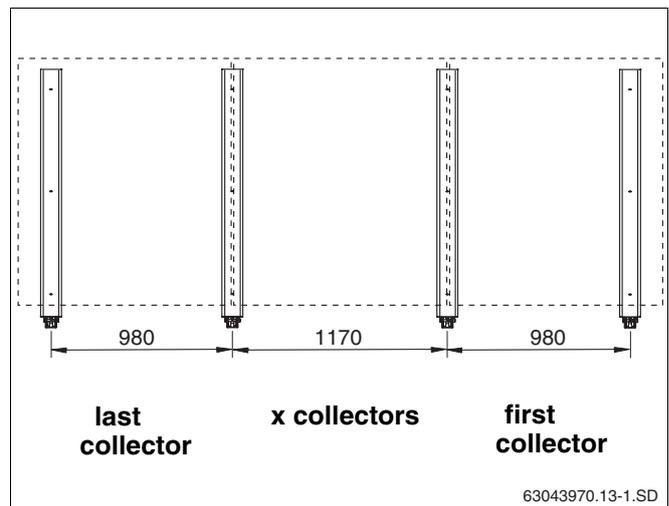


Fig. 20 Basic version for 3 – 10 portrait collectors

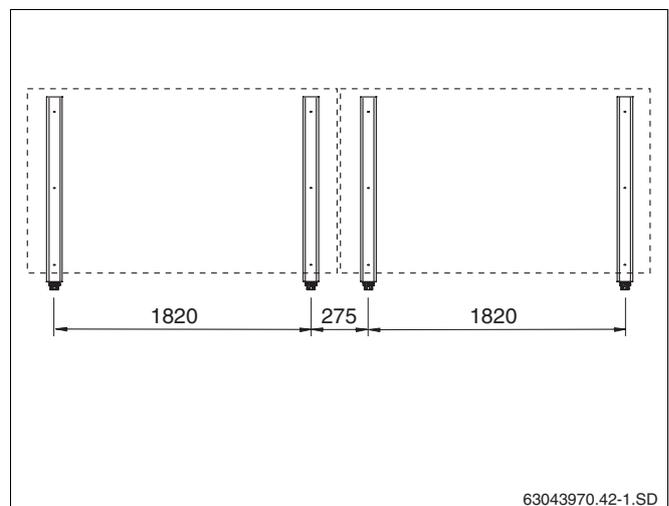


Fig. 21 Basic version for 2 landscape collectors

5.1.2 Version with auxiliary brace (accessory)

For greater loads, an auxiliary brace (and additional profile rails, page 29) is required for portrait installation for the second and all further collectors (Fig. 22). This version can be used for the following loads:

- Building height max. 100 m (installation height)
- max. 3.8 kN/m² snow load



USER NOTE

For landscape installation, a max. building height of 100 m and a max. snow load of 3.8 kN/m² are permitted using the basic version (Fig. 21, provided that an additional rail is fitted, page 29).

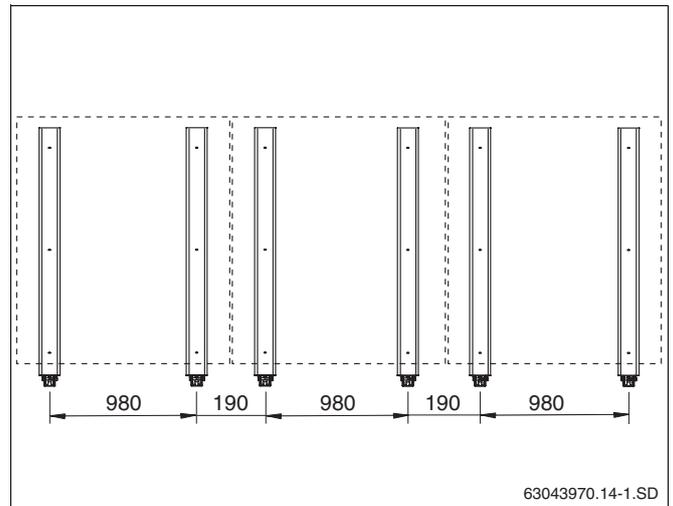


Fig. 22 Auxiliary braces for 3 portrait collectors

5.2 Clearances between the collector braces when using loading trays (accessory)

The distances between the collector braces (middle/middle, in mm) depend on:

- the collector version (portrait, landscape)
- and the maximum snow and wind loads.

For portrait installation, an auxiliary brace must be erected for the 4th, 7th and 10th collectors (Fig. 23, **Item 1**).



USER NOTE

Strictly observe the clearances between the collector braces so that the profile rails can be installed.

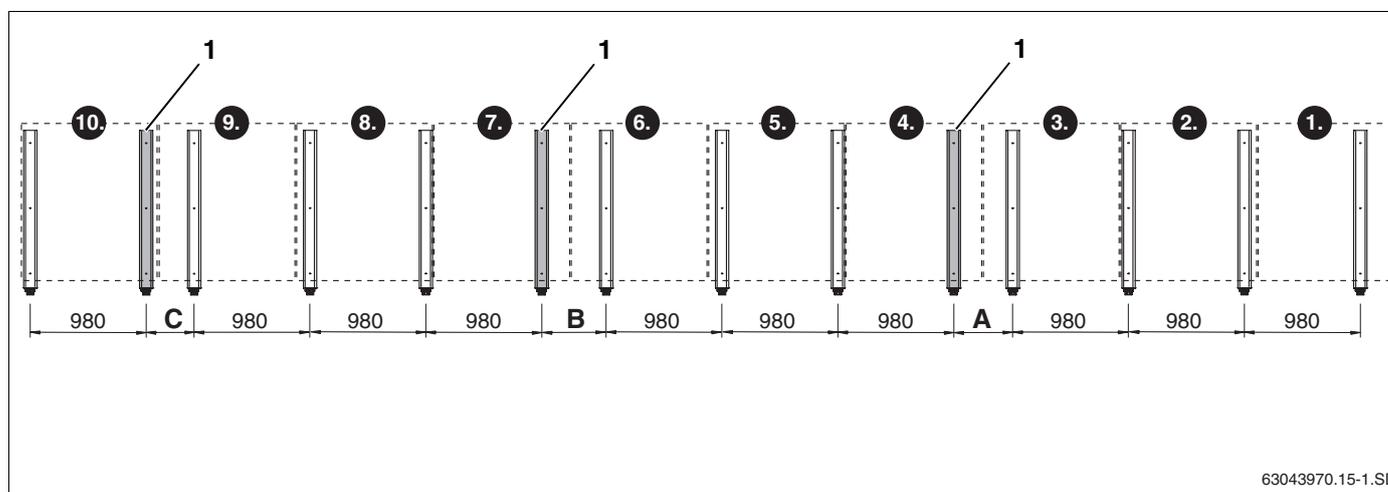
5.2.1 Basic version

The basic version can be used for the following loads:

- Building height max. 20 m (installation height)
- max. 2.0 kN/m² snow load

Number of collectors	Dim. A	Dim. B	Dimension C
4	381 mm	-	-
5	381 mm	-	-
6	571 mm	-	-
7	571 mm	381 mm	-
8	571 mm	381 mm	-
9	571 mm	571 mm	-
10	571 mm	571 mm	381 mm

Tab. 7 Distances between auxiliary braces



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Fig. 23 Basic version for up to 10 portrait collectors (in mm)



USER NOTE

Landscape installation can be carried out using only the auxiliary brace (accessory).

For landscape installation, 3 collector braces must be fitted for each collector (Fig. 24).

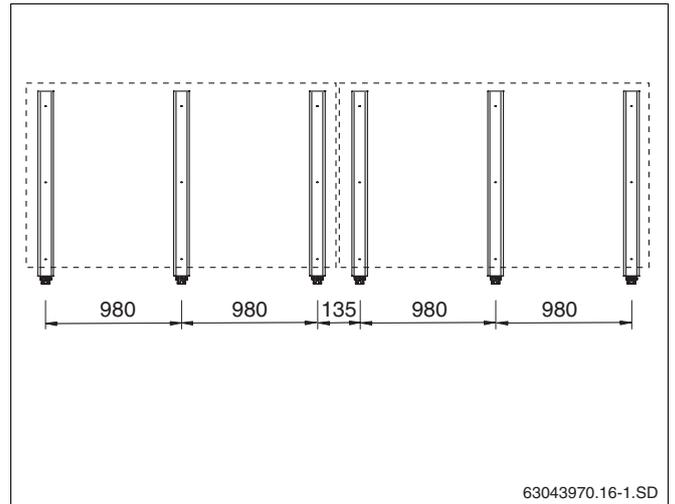


Fig. 24 Basic version for 2 landscape collectors

5.2.2 Version for maximum loads (accessory, Fig. 25)

For greater loads, ropes (page 25) and additional rails (page 29) are also required. This version can be used for the following loads:

- Building height max. 100 m (installation height)
- max. 3.8 kN/m² snow load



USER NOTE

For distances between the landscape collector braces for maximum loads, refer to Fig. 24.

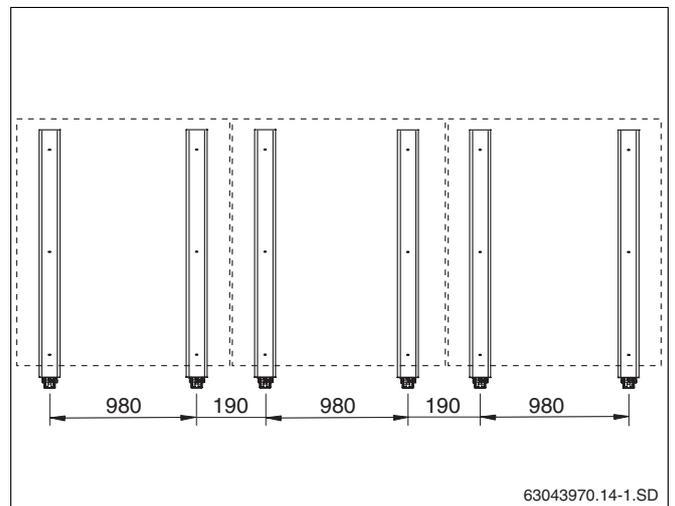


Fig. 25 Version for maximum loads, 3 portrait collectors

5.3 Stabilising the flat roof supports

The following details refer to a single collector. These details are based on DIN 1055, part 4 "Design loads for buildings".

Individual flat roof supports may be secured in the following three ways to prevent slippage or tipping of the structure due to the effect of the wind:

- Securing flat roof supports with anchor bolts (on-site).
- Weigh down flat roof supports with concrete slabs, gravel or similar material (loading trays required).
- Weigh down flat roof supports with concrete slabs, gravel or similar material (loading trays required) and make more secure using rope as necessary.

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



USER NOTE

Using gravel in the loading trays, a maximum load of 320 kg is possible per collector (Tab. 8).



USER NOTE

For the following table, please also consider the clearances and number of additional collector braces (Chapter 5.1 "Distances between collector braces for on-site base anchoring").

Stabilising a collector					
Height of building	Wind velocity	Base anchor	Weighting	Ropes	
		Number and type of screws ²	Weight (e.g. concrete slabs)	Securing against tipping Weight (e.g. concrete slabs)	Securing against slippage Maximum rope tension
0 m to 8 m	102 km/h	2 × M8/8.8	270 kg	180 kg	1.6 kN
above 8 m up to 20 m	129 km/h	2 × M8/8.8	450 kg	320 kg	2.5 kN
above 20 m up to 100 m ¹	151 km/h	3 × M8/8.8	–	450 kg	3.3 kN

Tab. 8 Values to stabilise one collector

¹ With additional rail only

² Per collector brace

5.3.1 Securing flat roof supports on site with base anchoring

You can fasten the flat roof supports with anchor bolts. As an example, we describe fastening onto girders (Fig. 26, **Item 3**).

Design the substructure so that the collectors can withstand the snow loads and wind forces placed upon them.

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



CAUTION!

SYSTEM DAMAGE

through modifications to the design of the flat roof supports.

- ▶ For example, never drill the flat roof support profiles.

- ▶ Transfer the lower profile hole clearances (Fig. 26, **Item 2**) onto the girders, and drill the corresponding holes.
- ▶ Insert screws (see Tab. 8 and Fig. 26, **Item 1**) through the profiles and girders and screw tight with nuts and washers.

5.3.2 Securing flat roof supports with weights

- ▶ Erect collector braces (see Chapter 5.1 "Distances between collector braces for on-site base anchoring").
- ▶ Insert loading trays (Fig. 27, **Item 2**) into lower profiles (Fig. 27, **Item 1**) and into each other (Fig. 27, **Item 3**).
- ▶ Insert concrete slabs or similar into loading trays (for required weight, see Tab. 8).

5.3.3 Providing extra security for the flat roof supports using rope

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

Select the rope depending on the expected loads (see Tab. 8).

- ▶ Fasten each collector on site to the screw on the lower profile and to a suitable point on the roof, using at least 2 wire ropes (Fig. 28, **Item 1**).

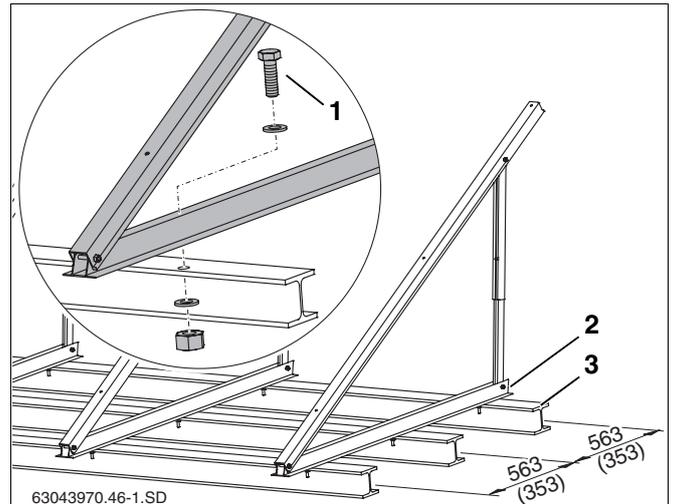


Fig. 26 Flat roof support on girders, dimensions in mm (value in brackets = landscape version)

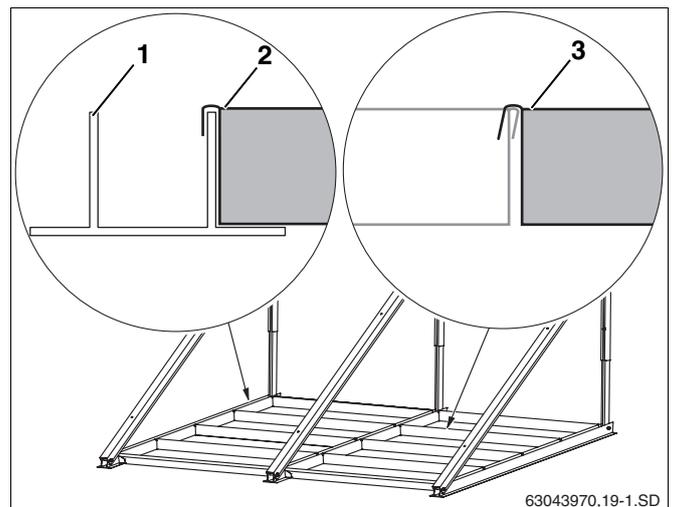


Fig. 27 4 loading trays per collector

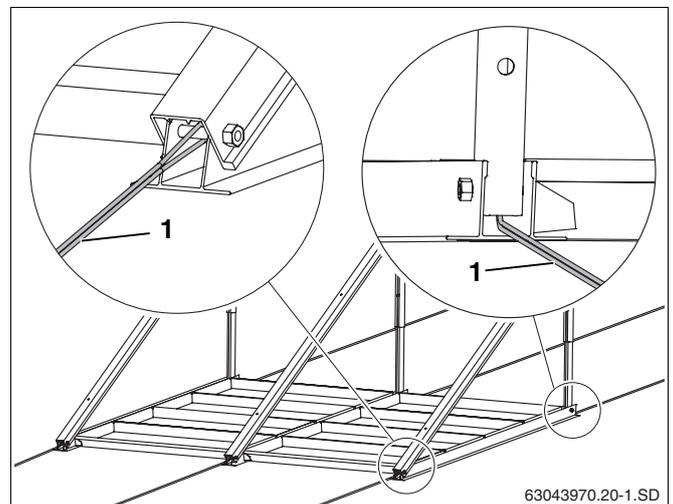


Fig. 28 Flat roof support with ropes

5.4 Wall mounting supports - installation

The landscape collector braces can also be used for wall-mounted installation.



RISK TO LIFE

from falling collectors, due to incorrect use.

- ▶ Only landscape collector braces are allowed for wall-mounted installation.
- ▶ Collectors may only be installed on walls of buildings with a height up to 20 m (wind velocity = 129 km/h) and a snow load of up to 2.0 kN/m².
- ▶ Each collector brace must be fastened to the holes provided, using 3 screws (provided by customer) (Tab. 9).
- ▶ Install only on a sealed, windproof outside wall.
- ▶ Before installing the wall mounting support, check the load-bearing capability of the fixing wall (i.e. of the wall base). If necessary, ask a structural engineer for assistance.
- ▶ Never modify the wall mounting structure.
- ▶ Never place objects in the space underneath the wall mounting support.
- ▶ Never fit facing to the collectors.

▶ Fasten as follows:

Wall structure ³	Fixings per collector brace	Distance from the edge of the wall
Steel-reinforced concrete min. B25 (min. 120 mm)	3 × UPAT MAX Express anchors, type MAX 8 (A4) ¹ or similar and 3 × washers ²	> 100 mm
	3 × Hilti HST-HCR-M8 ¹ or HST-R-M8 ¹ or similar and 3 × washers ²	> 100 mm
Steel base structure (e.g. girder)	3 × M8 (4.6) and 2 × washers ²	–

Tab. 9 Fasteners

¹ A tensile strength of 1.63 kN or a shear strength of at least 1.56 kN must be able to be applied to each fixing.

² 3 × Screw diameter = outside diameter of washer.

³ Brickwork on request

- ▶ Use 3 screws to fasten each collector brace to the wall (see Tab. 9, Fig. 30, **Item 1**).

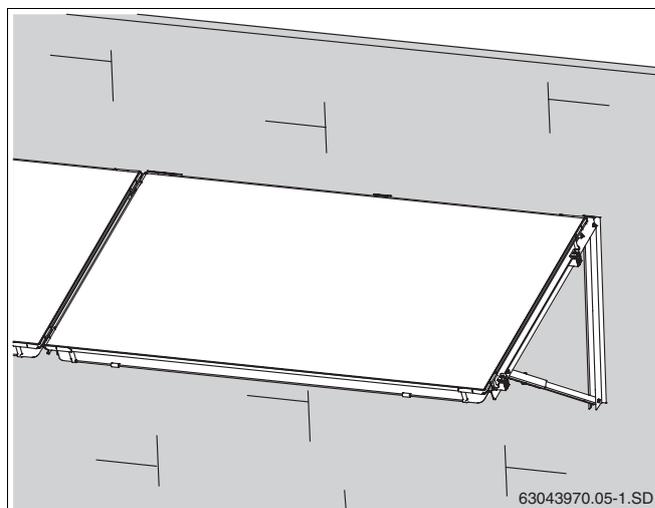
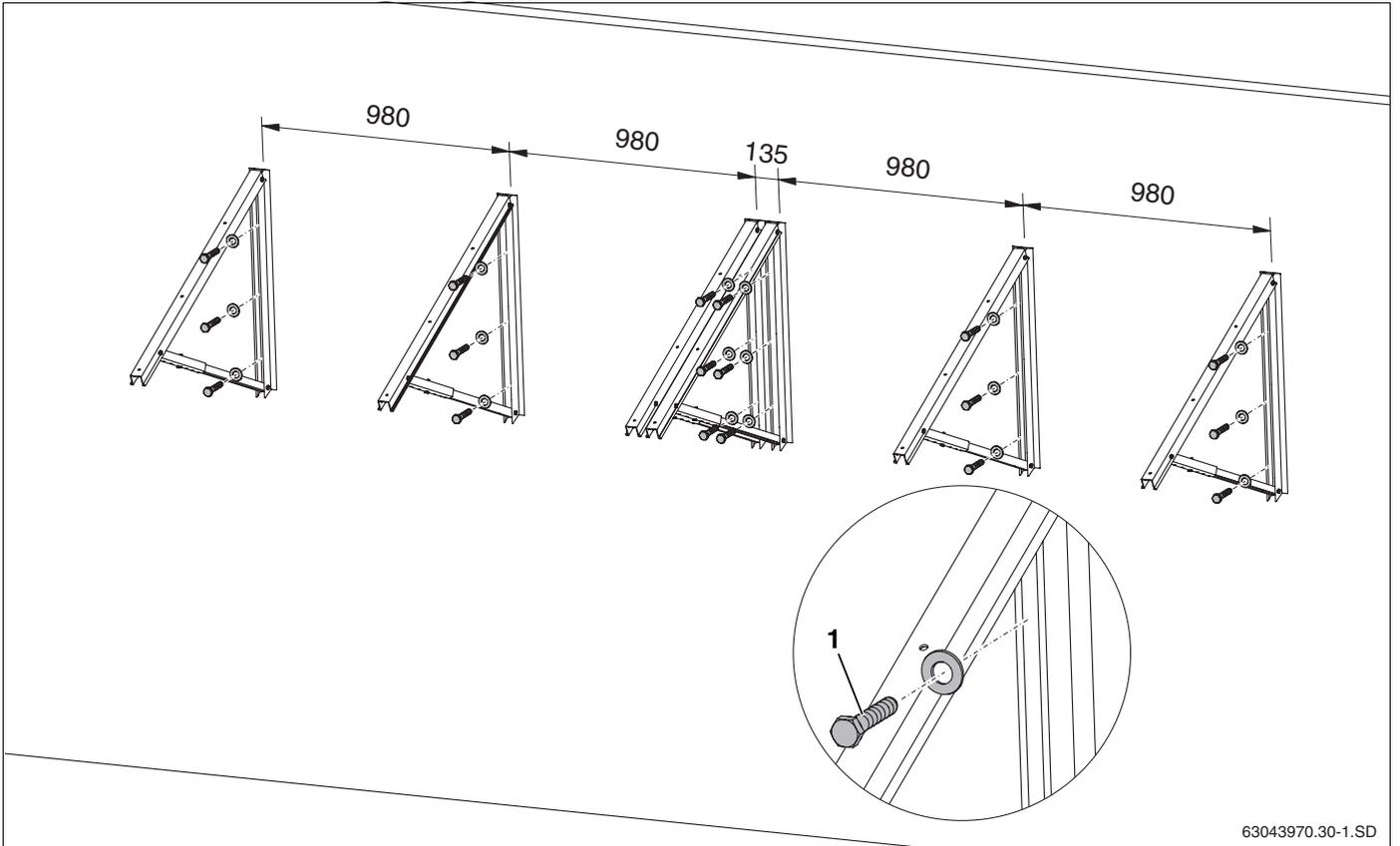


Fig. 29 Wall mounting support



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Fig. 30 Fastening collector braces to the wall (for 2 collectors, dimensions in mm)

5.5 Installing the profile rails

The profile rails must be joined together using plug connectors. Each collector is provided with an upper and lower profile rail.

5.5.1 Connecting profile rails

- ▶ Push plug connector (Fig. 31, **Item 1**) as far as it will go into both profile rails (Fig. 31, **Item 2**).
- ▶ To lock, tighten both fitted M10 threaded studs (Fig. 31, **Item 3**) in the plug connector using a size 5 spanner.

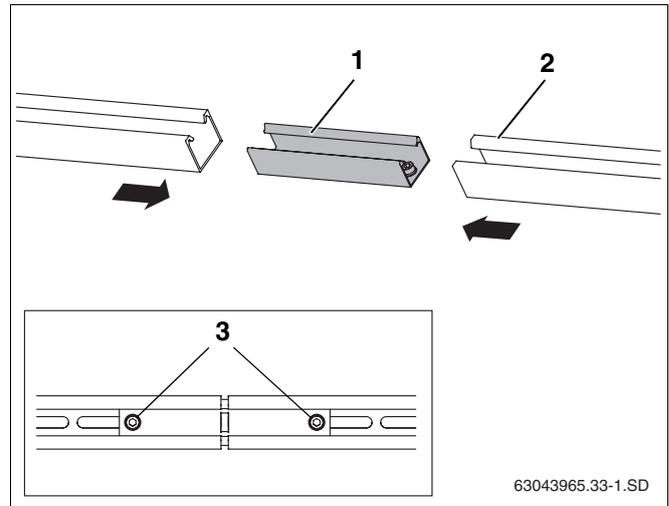


Fig. 31 Connecting profile rails

5.5.2 Installing profile rails

Positioning the profile rails depends on

- whether they are being installed portrait or landscape
- and on the clearances between the collector braces.

If using base anchoring, begin fastening the profile rails as follows:

	Base anchoring	
	Basic version	Auxiliary brace
portrait:	Align with middle hole on plug connector (Fig. 32, Item 1)	Align with second slotted hole from right (Fig. 32, Item 3)
landscape:	Align with third slotted hole from right (Fig. 32, Item 2)	--

Tab. 10 Aligning the lower and upper profile rails when using base anchoring

If using loading trays, begin fastening the profile rails as follows:

	Loading trays	
	2 collectors	3 to 10 collectors
portrait:	Align with middle hole on plug connector (Fig. 33, Item 1)	Align with sixth slotted hole from right (Fig. 33, Item 2)
landscape:	Align with second slotted hole from right (Fig. 33, Item 3)	Align with second slotted hole from right (Fig. 33, Item 3)

Tab. 11 Aligning the lower and upper profile rails when using loading trays

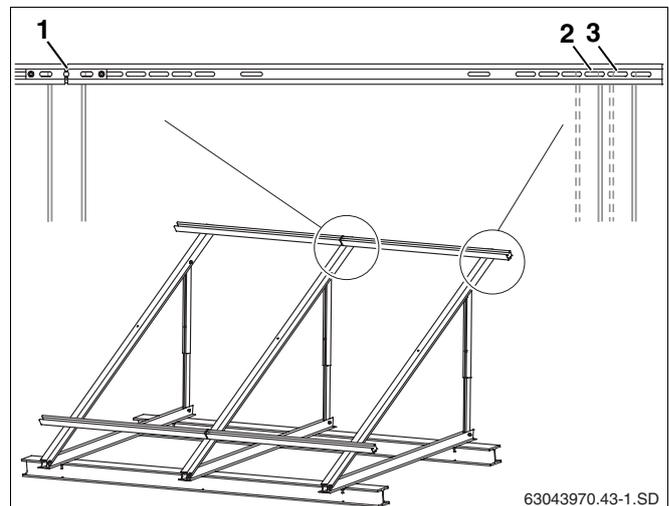


Fig. 32 Aligning the profile rails for on-site base anchoring

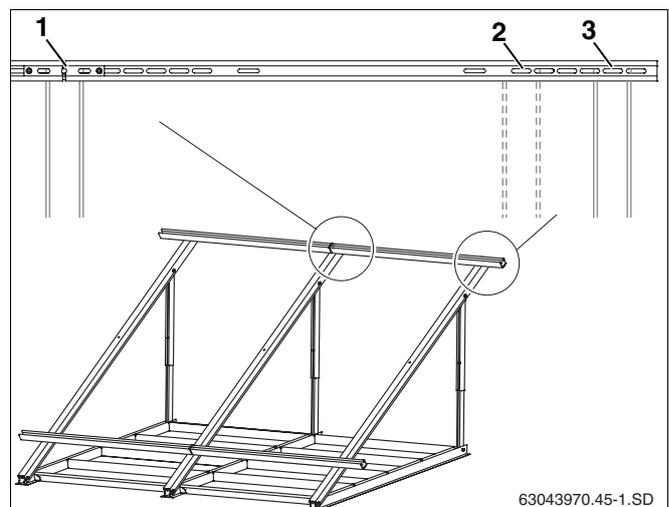


Fig. 33 Aligning the profile rails for loading trays

- ▶ Lightly tighten the pre-assembled profile rails (Fig. 34, **Item 2**) with M8 x 20 bolts (Fig. 34, **Item 1**) so that the profile rails can still be aligned.
- ▶ Align the sides of the upper and lower profile rails.
- ▶ Tighten bolts.

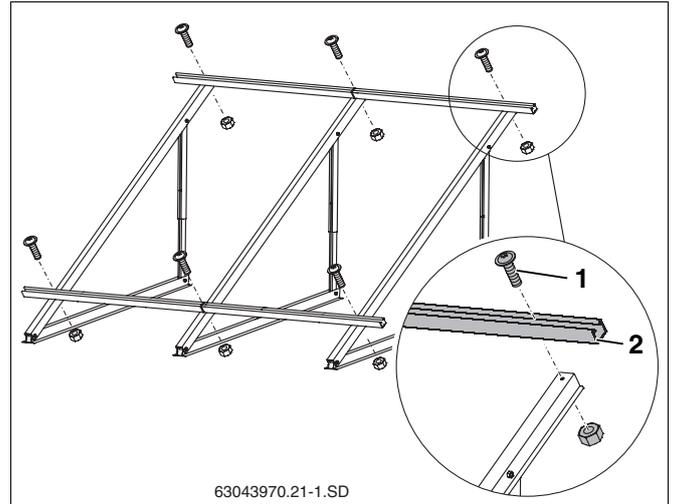


Fig. 34 Fitting profile rails (for two portrait collectors in this example)

5.5.3 Fitting additional profile rails (accessory)

If the collector array is exposed to greater loads (building or installation height of over 20 m and/or snow load of over 2.0 kN/m²), additional rails must be fitted.

- ▶ Fasten additional profile rails as described in Chapter 5.5.2 "Installing profile rails", using the middle hole on the profile (Fig. 35, **Item 1**).
- ▶ Align sides of the profile rails.
- ▶ Tighten bolts.

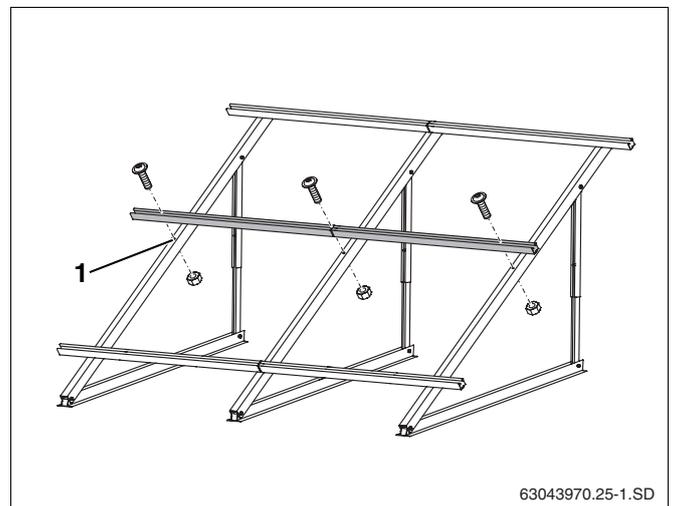


Fig. 35 Fitting additional profile rails

5.5.4 Installation of anti-slip protection

To prevent the collectors from slipping, you must fasten two anti-slip protectors to the lower profile rails for each collector.

- ▶ Push each anti-slip protector (Fig. 36, **Item 3**) into the innermost slotted holes (Fig. 36, **Item 1**) over the profile rails until it clicks into place (Fig. 36, **Item 2**).

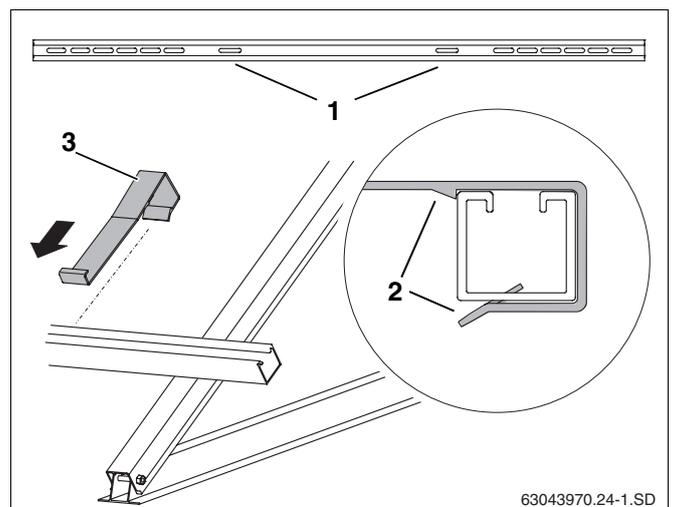


Fig. 36 Attaching anti-slip protection

Item 1: Fixing holes for the anti-slip protection

Item 2: Clicking the anti-slip protection into place

Item 3: Anti-slip protection

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 that the installed set and the collectors are fastened securely.



RISK OF INJURY

through interruption of work.

CAUTION!

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



SYSTEM DAMAGE

through damaged sealing faces.

CAUTION!

- ▶ Do not remove the rubber caps on the collector connections until immediately prior to installation.



USER NOTE

Use lifting equipment as used by roofing contractors, sufficiently strong 3-point suction handles or special carry handles for the installation (for easier lifting).



USER NOTE

Unsecured collectors may fall during handling and installation.

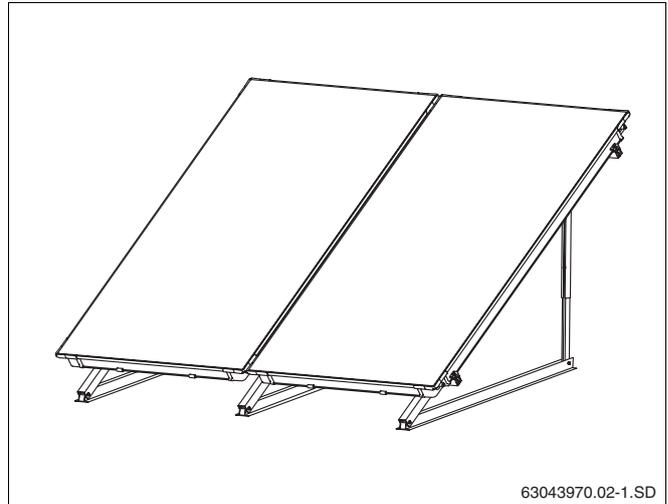


Fig. 37 Flat roof installation: 2 collectors

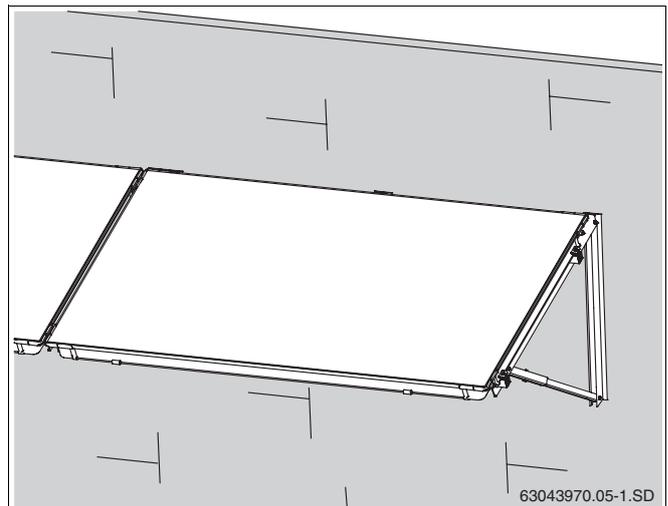


Fig. 38 Wall mounted installation

6.1 Preparing to install the collectors

Before beginning actual installation on the roof, preassemble the locking caps on the ground to make work on the roof easier.

To secure the locking caps (and later the corrugated pipe connectors and connecting pipes as well), attach brackets to the connections.



CAUTION!

SYSTEM DAMAGE

through leaks in the collector connections.

The corrugated pipe connectors, connecting pipes and collector connections must not display any signs of damage or contamination.

- ▶ The collector connections have had special grease applied in the factory to make installation easier. Do not use any other grease.

6.1.1 Pipework connections

The collectors must be installed in such a way that the sensor bushes for taking up the collector sensor (Fig. 40, **Item 1**) are at the top.



USER NOTE

The water connection pipes can be connected on the right (Fig. 39) or left (Fig. 40). In this manual, the connection pipes are shown on the right.

The pipework in the collector is designed as a double meander, which enables you to carry out two different water connections:

Single-sided connection of up to 5 collectors

Up to 5 collectors can be connected to one side of a collector array (Fig. 39 and Fig. 40).

Two-way connection of up to 9 collectors

If there are more than 5 collectors installed in one collector array, the water connection must be two-way (Tichelmann principle, Fig. 41).

The two-way connection can also be made if there are fewer than 6 collectors (Fig. 41).

If more than 9 collectors are required then a further AGS pump station is required.

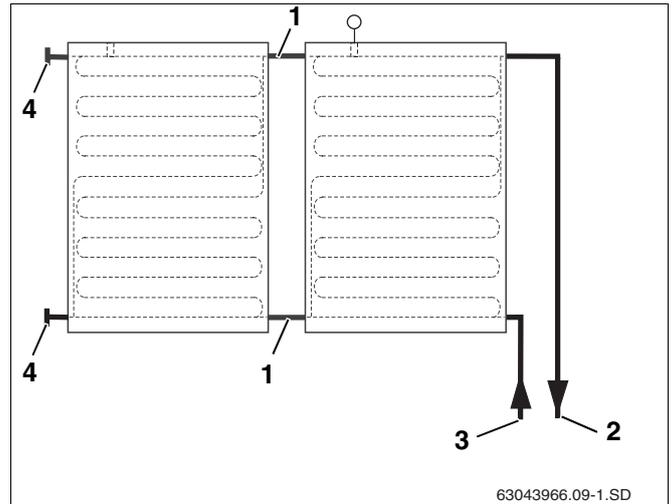


Fig. 39 Water connection (right) up to max. 5 collectors

Item 1: Corrugated pipe connector

Item 2: Flow line

Item 3: Return line

Item 4: Locking cap

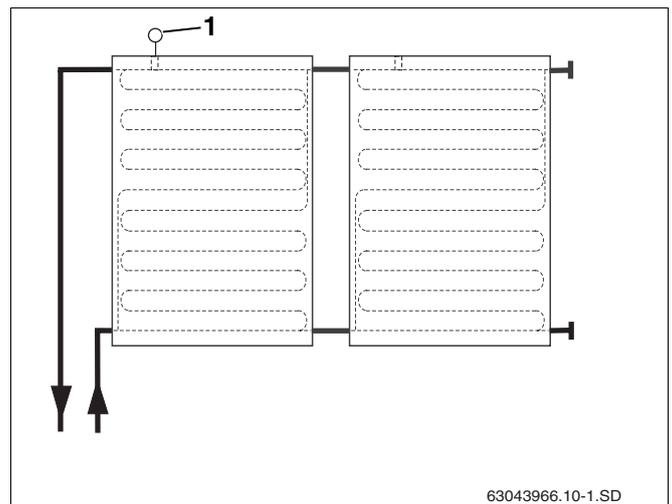


Fig. 40 Water connection (left) up to max. 5 collectors

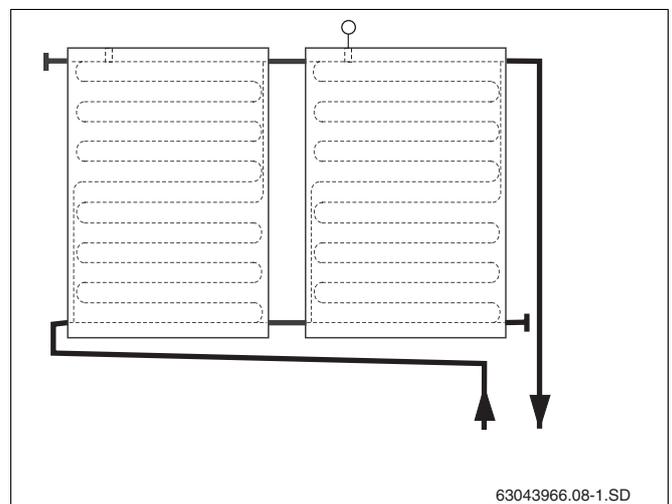


Fig. 41 Two-way pipework connections

6.1.2 Fitting the end cap

Not all the connections are needed when connecting a collector array, so those that are not used must be closed.

- ▶ Remove rubber caps (transport protection) from the relevant collector connections.
- ▶ Push end cap with the O-rings (Fig. 42, **Item 3**) onto the collector connection.
- ▶ Push bracket (Fig. 42, **Item 2**) over the end cap and collector connection to secure the connection.



SYSTEM DAMAGE

from unsecured end caps.

CAUTION!

- ▶ Secure each end cap with a bracket (Fig. 42, **Item 1**).

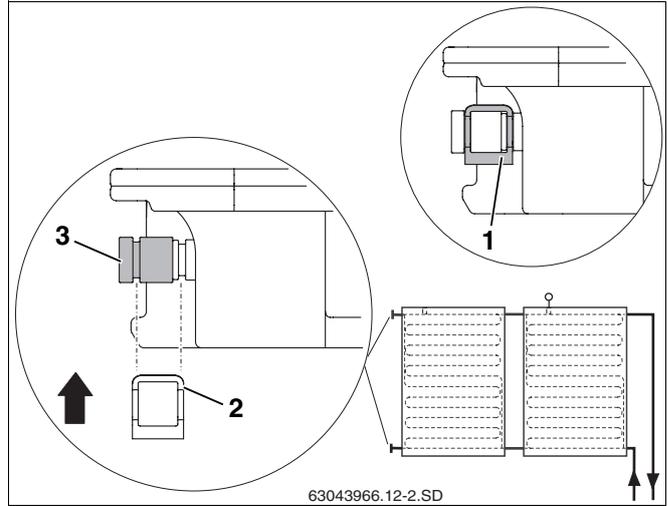


Fig. 42 Securing end cap with bracket

6.2 Fastening the collectors

The collectors are fastened to the profile rails using the single-sided collector clamps (Fig. 43, **Item 2**) at the beginning and end of a collector array, and double-sided clamps (Fig. 43, **Item 1**) between each collector.

In addition, the anti-slip protectors (Fig. 43, **Item 3**) prevent the collector from slipping.



USER NOTE

The plastic parts on the collector clamps do not have any support function. They are simply intended to make installation easier.

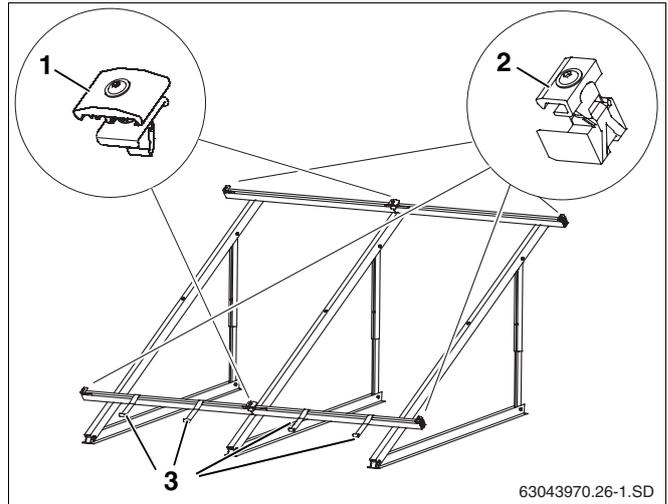


Fig. 43 Fasteners for the collector

Fitting the single-sided collector clamp on the right

- ▶ Push single-sided collector clamps (Fig. 44, **Item 1**) into the profile rails at the right-hand end of the collector array until they click into place in the first slotted hole on the profile rails.



USER NOTE

Do not fit the single-sided collector clamps to the left-hand side of the collector array until the last collector has been installed.

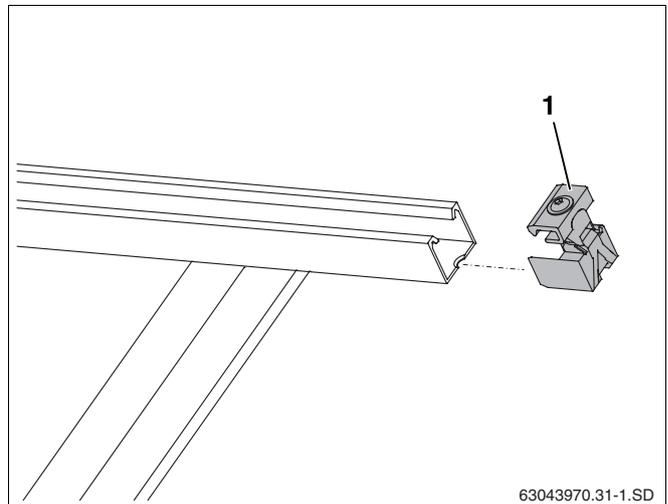


Fig. 44 Pushing on the single-sided collector clamp

Putting the first collector in place

Lay the collector on the profile rails in such a way that the sensor bush to receive the collector sensor is at the top. Begin by laying the collectors on the right-hand side of the profile rails.



RISK OF INJURY

Install collectors with at least one assistant.

CAUTION!

- ▶ Place the first collector onto the profile rails and allow it to slide into the anti-slip protectors (Fig. 45, **Item 2**) (Fig. 45).

The lower collector edge must lie in the opening of the anti-slip protector (Fig. 45, **Item 1**).

- ▶ Carefully push collector (Fig. 46, **Item 1**) up against the single-sided collector clamp and align horizontally.
- ▶ Screw in single-sided collector clamp using size 5 spanner (Fig. 46, **Item 2**).



USER NOTE

When the screw is tightened, the plastic guide at the pre-determined cut-off points breaks away and can be discarded.

The grip (Fig. 46, **Item 2**) on the collector clamp now grips the lower collector edge.

Inserting a double-sided collector clamp

- ▶ Insert the double-sided collector clamp, nut first, into the opening made by the profile rail and plug connector so that the plastic spacer (Fig. 47, **Item 1**) surrounds the profile rail.
- ▶ Push double-sided collector clamp up against the collector frame.



USER NOTE

Do not tighten the screw until the second collector has been pushed up against the double-sided collector clamp.

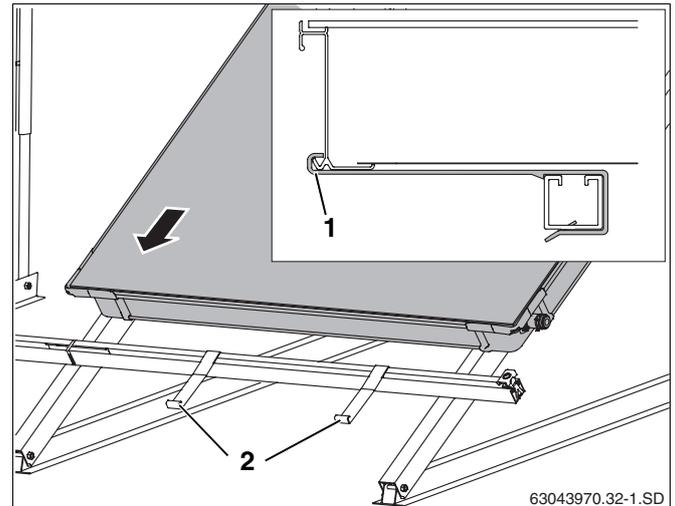


Fig. 45 Laying the first collector on the profile rails

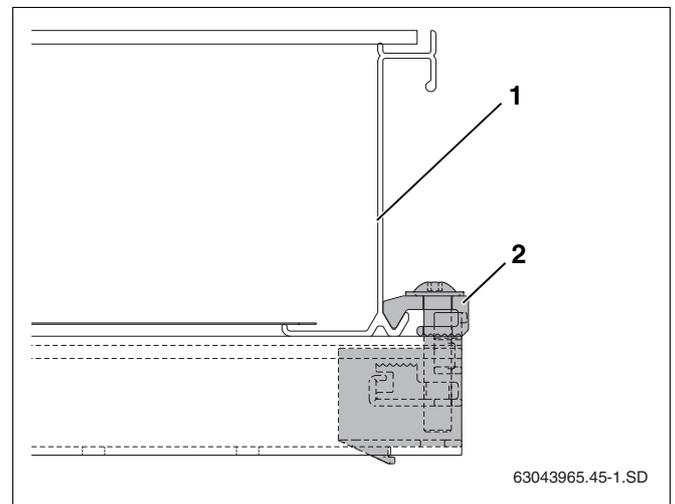


Fig. 46 Single-sided collector clamp screwed in place

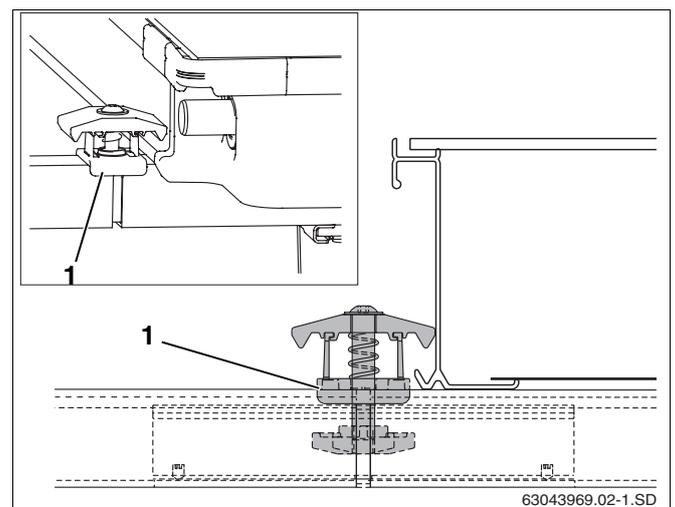


Fig. 47 Fitting a double-sided collector clamp

Fitting corrugated pipe connectors to the first collector

- ▶ Remove the rubber caps from the connections.
- ▶ Push corrugated pipe connectors (Fig. 48, **Item 1**) onto the left-hand connections on the first collector.
- ▶ Push bracket (Fig. 48, **Item 2**) over the corrugated pipe connector and collector connection to secure the connection.

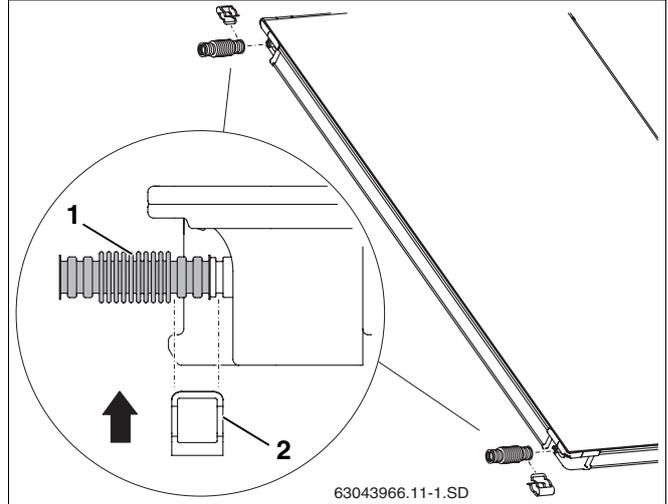


Fig. 48 Fitting corrugated pipe connectors to the first collector

Putting the second collector in place

- ▶ Place the second collector onto the profile rails and allow it to slide into the anti-slip protectors.



CAUTION!

SYSTEM DAMAGE

through damaged corrugated pipe connectors.

- ▶ Do not use any tools, e.g. pliers (Fig. 49, **Item 2**). These could render the corrugated pipe connector unusable.

- ▶ Push the second collector on to the first in such a way that the collector connections are pushed into the preassembled corrugated pipe connectors (Fig. 49, **Item 1**) on the first collector.
- ▶ Place second bracket (Fig. 49, **Item 3**) over the corrugated pipe connector and collector connection.

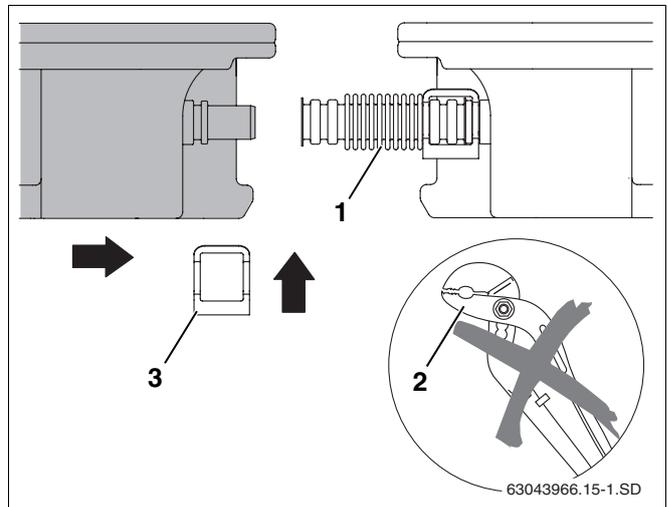


Fig. 49 Pushing second collector towards the first



CAUTION!

SYSTEM DAMAGE

through unsecured corrugated pipe connectors and end caps.

- ▶ Secure each end cap with one bracket and each corrugated pipe connector with two brackets (Fig. 50, **Item 1**).

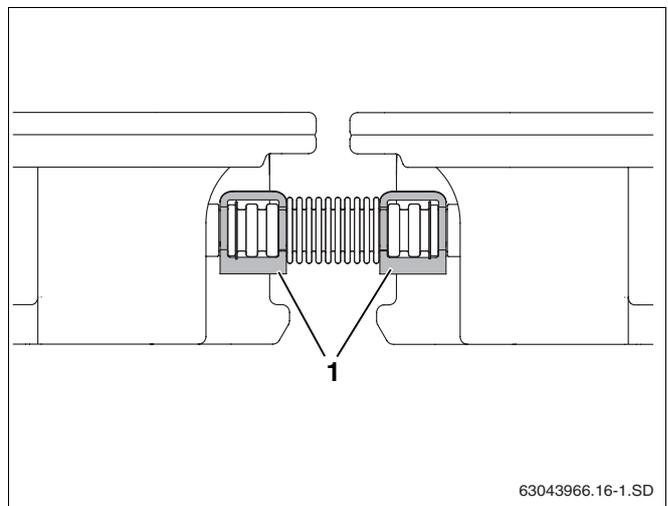


Fig. 50 Corrugated pipe connector secured with brackets

- ▶ Tighten the screw on the double-sided collector clamp using the size 5 spanner.



USER NOTE

When the screw is tightened, the plastic lugs at the pre-determined cut-off points break away.

The grip (Fig. 51, **Item 1**) on the collector clamp now grips the lower collector edge.

Repeat the procedure for all the other collectors.

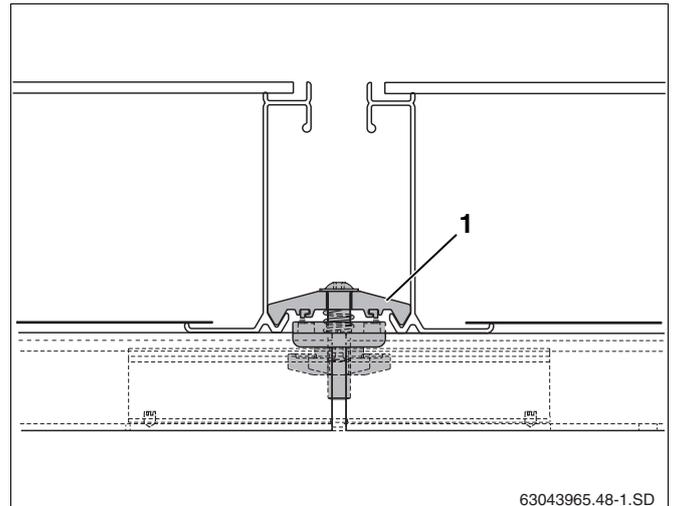


Fig. 51 Double-sided collector clamp between two collectors

Fitting the single-sided collector clamp on the left

Once all collectors are fitted, the two remaining one-sided collector clamps can be attached.

- ▶ Push single-sided collector clamp (Fig. 52, **Item 1**) into upper and lower profile rails.
- ▶ Push collector clamp up against the collector frame and screw in place using size 5 spanner (Fig. 52, **Item 2**).

The grip (Fig. 52, **Item 2**) on the collector clamp now grips the lower collector edge.



USER NOTE

When the screw is tightened, the plastic guide at the pre-determined cut-off points breaks away and can be discarded.

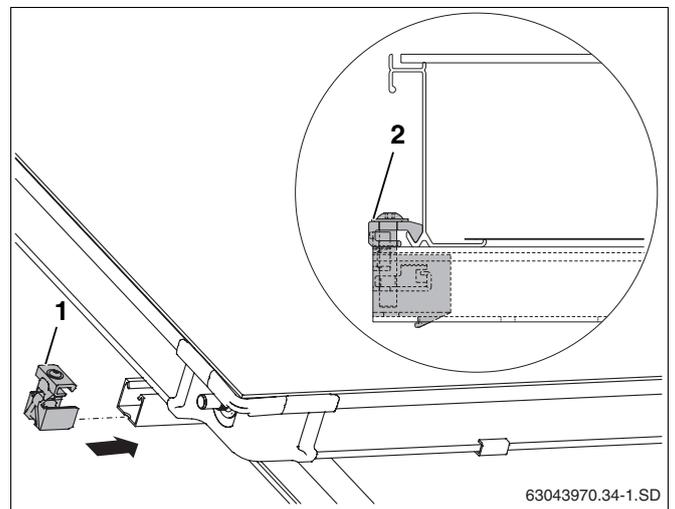


Fig. 52 Single-sided collector clamp (left)

7 Collector sensor connection



USER NOTE

The collector sensor is supplied with the solar controller.

Observe the installation location for single or dual row collector systems (Fig. 53).



SYSTEM DAMAGE

through faulty sensor cable.

CAUTION!

- ▶ Protect the cable from possible damage.

Insertion point

The collector sensor must be fitted in the collector nearest to the flow connection (Fig. 53, **Item 2**).

- Insertion point (Fig. 53, **Item A**) for single row collector systems.
- Insertion point (Fig. 53, **Item B**) for dual row collector systems.

Installing the collector sensor

For perfect functioning of the solar heating system, the collector sensor (Fig. 54, **Item 1**) needs to be inserted into the sensor guide tube as far as it will go (approx. 250 mm).

- ▶ Using the collector sensor or screwdriver, push through the sealing membrane on the sensor bushing (Fig. 54, **Item 3**).
- ▶ Screw compression fitting (Fig. 54, **Item 2**) into sensor bushing.
- ▶ Insert collector sensor approx. 250 mm into the sensor guide tube (as far as it will go).
- ▶ Tighten compression fitting (Fig. 54, **Item 2**), counterhold if necessary.



USER NOTE

If you accidentally push through the sensor bushing (Fig. 54, **Item 3**) on the wrong collector, it can be resealed using the plug from the connection kit. You must first remove the nut in the sensor bushing using the cable gland (Fig. 54, **Item 2**).

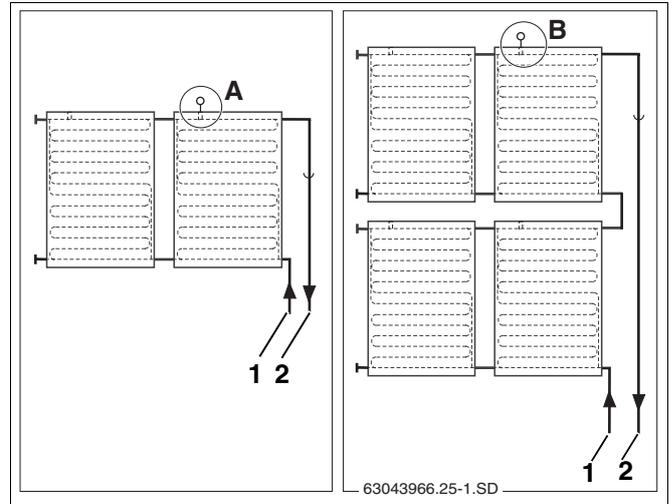


Fig. 53 Collector sensor installation location (schematic)

Item 1: Return line

Item 2: Flow line

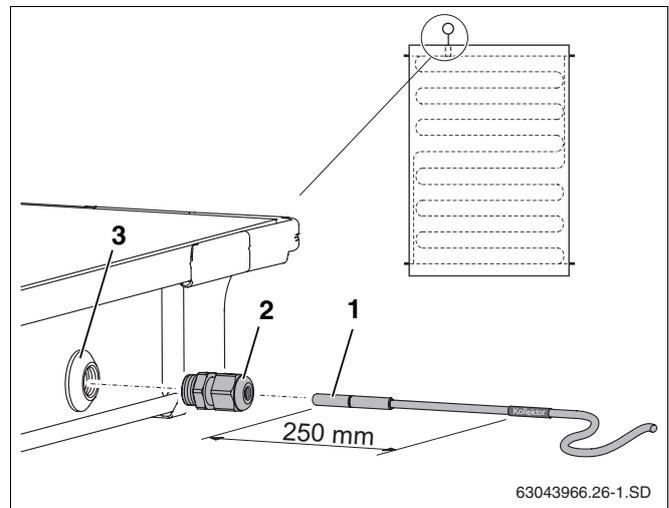


Fig. 54 Inserting the collector sensor into the collector

Item 1: Collector sensor

Item 2: Compression fitting

Item 3: Sensor bushing

8 Header connection

Information on laying the header pipes can be found in the complete station installation instructions.

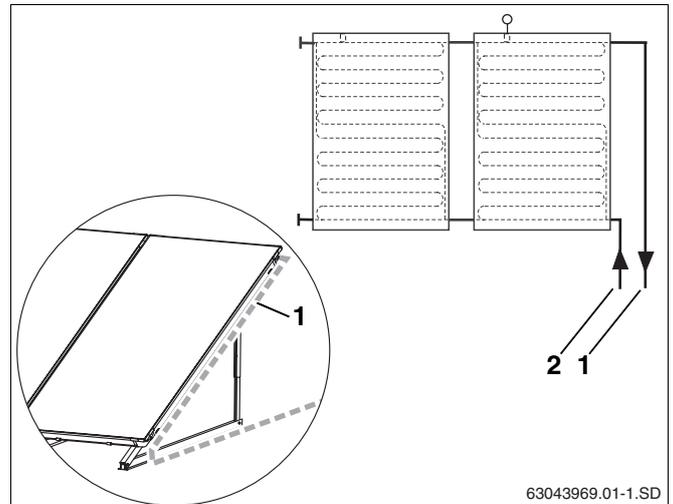


CAUTION!

SYSTEM DAMAGE

from leaks in the collector connection, due to movements caused by heat.

- ▶ Feed the on-site flow line (Fig. 55, **Item 1**) alongside the collector, rather than vertically downwards.



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Fig. 55 Feeding header pipes to the collector array

Item 1: Flow line

Item 2: Return line

8.1 Fitting holder for flow line

Use the holder to fasten the insulated flow line to the collector.

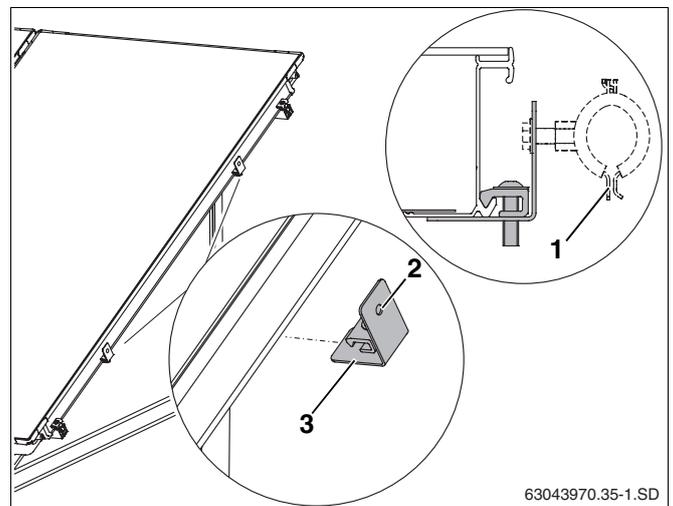


User note:

We recommend commercially available hose clamps (Fig. 56, **Item 1**) for fastening the header to the M8 thread on the holder (Fig. 56, **Item 2**).

Select the diameter on the hose clamp according to the outside diameter of the flow line, incl. insulation.

- ▶ Place holder (Fig. 56, **Item 3**) onto collector frame and tighten with size 5 spanner.
- ▶ Fasten insulated header to holder on site.



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Fig. 56 Fastening holder to the collector frame

Item 1: Hose clamp (on building)

Item 2: M8 thread

Item 3: Holder

8.2 Venting through pressure filling

If venting of the solar heating system is carried out using a pressure filling pump, no vent is required on the roof.

- ▶ Remove rubber caps (transport protection) from the relevant collector connections.
- ▶ Push elbow (Fig. 57, **Item 2**) with olive and union nut onto collector connection.
- ▶ Secure elbow with bracket (Fig. 57, **Item 1**).

Perform the same procedure with the return connection.

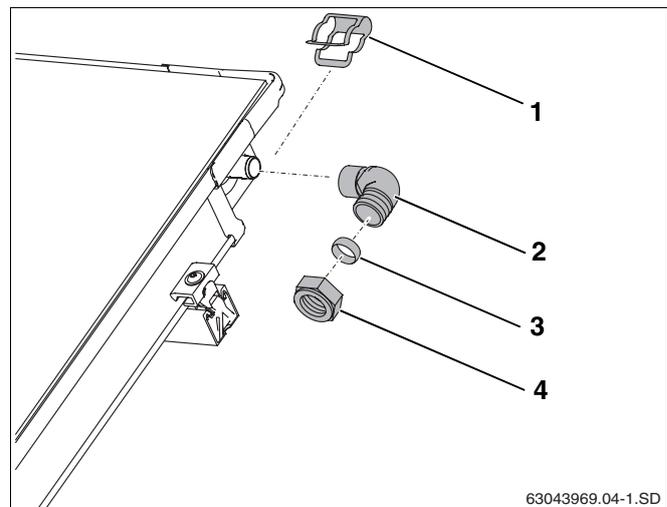


Fig. 57 Fitting flow line (with no vent on roof)

Item 1: Connector clip

Item 2: Elbow

Item 3: Olive

Item 4: Nut

8.3 De-airing through air vent (accessory) at highest point in the system

If you intend to vent the solar heating system with an automatic air-vent valve (accessory) at the highest point of the system, run the flow line rising to the air-vent valve (Fig. 58, **Item 2**) and the return line rising to the collector array (Fig. 58).

Avoid frequent changes in direction.



User note:

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

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

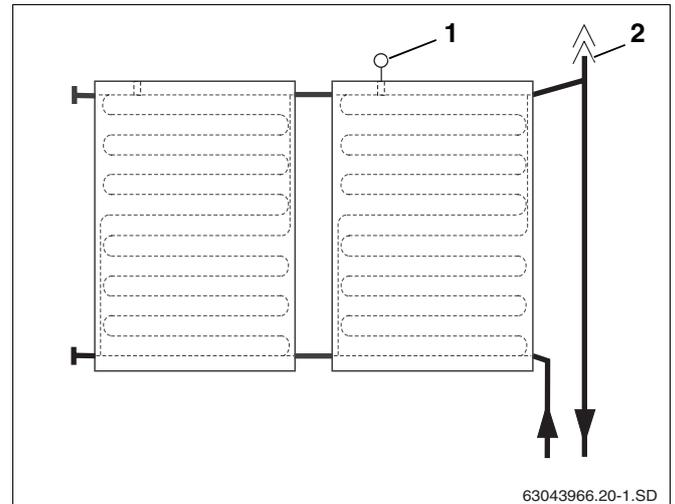


Fig. 58 View – air pot with vent valve for flow connection

Item 1: Collector sensor

Item 2: Automatic air vent valve on roof

Function of the grub screw and weather protection cap on the automatic air vent valve

The solar heating system is vented through the opened grub screw. When in operation, the weather protection cap (Fig. 59, **Item 1**) must always be positioned over the grub screw to prevent moisture entering through the opened grub screw into the solar heating system).

Open the air vent valve by unscrewing the grub screw one full revolution.

Universal air vent set (Fig. 59):

Item 1:	Weather protection cap	1 x
Item 2:	Automatic air vent	1 x
Item 3:	Ball valve	1 x
Item 4:	Gasket	1 x
Item 5:	Vent pot	1 x
Item 6:	Double threaded fitting with O-ring	1 x
Item 7:	Threaded fitting	1 x
Item 8:	Union nut	2 x
Item 9:	Gasket	1 x
Item 10:	Large diameter washer	1 x
Item 11:	Clamping disc	1 x

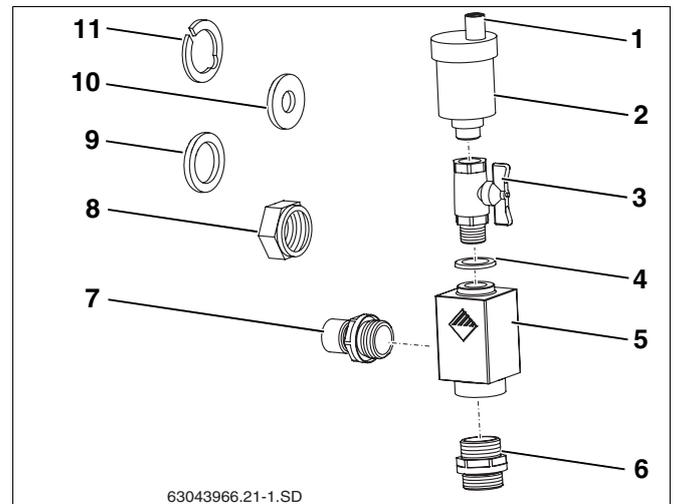


Fig. 59 Universal air vent set

Fitting the air vent

- ▶ Firmly screw threaded fitting (Fig. 60, **Item 6**) and double threaded fitting (Fig. 60, **Item 4**) into air pot (O-ring gasket).
- ▶ Push air pot (Fig. 60, **Item 5**) and fitting onto collector connection and secure with clip.
- ▶ Connect header pipe to the compression fitting (22 mm) (Fig. 60, **Item 2**).

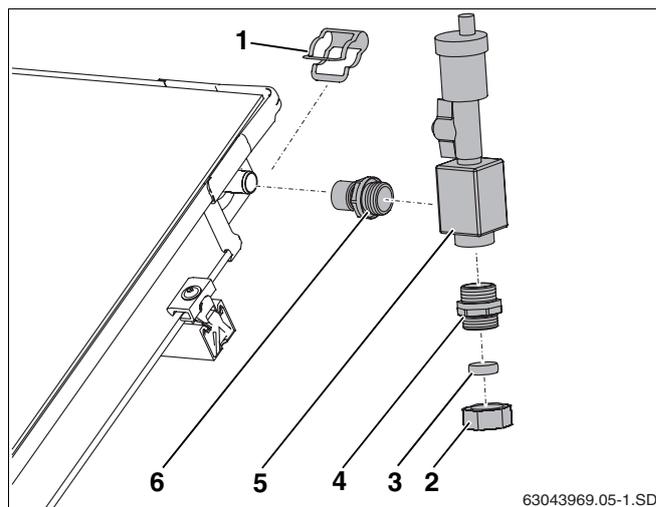


Fig. 60 Connecting the air vent

Item 1: Connector clip

Item 2: Union nut for 22 mm compression fitting

Item 3: Olive

Item 4: Double threaded fitting with O-ring

Item 5: Air pot

Item 6: Threaded fitting

8.4 Connecting two arrays

If connecting two collector arrays (Fig. 61, **Item 1**) you will need a second connection kit.

- ▶ Fit individual parts as described in Chapter 8.2 "Venting through pressure filling".
- ▶ Make on-site connection between collector arrays using copper pipe.

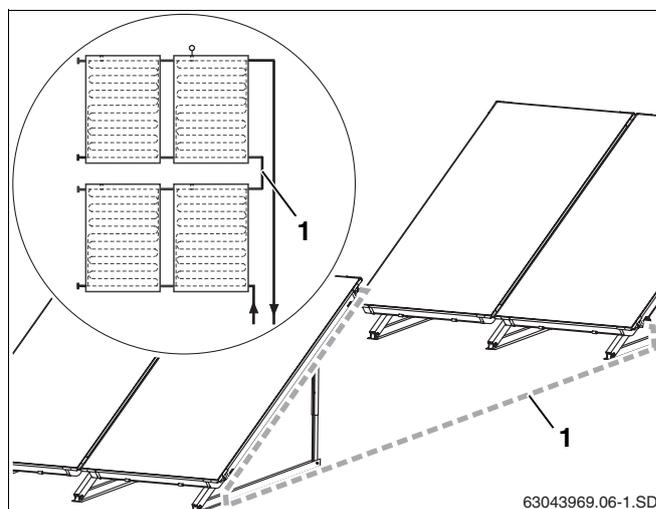


Fig. 61 Two collector arrays, one behind the other

9 Final activities

9.1 Checking the installation



CAUTION!

SYSTEM DAMAGE

through corrosion if water remains in the solar heating system for an extended period after it has been flushed or after a pressure test.

- ▶ Start up the solar heating system immediately after flushing/pressure test with solar fluid (for instructions on flushing/pressure test see pump station instructions). Otherwise, carry out flushing/pressure test later.



USER NOTE

Do not carry out the final insulating work until the appropriate checks have been performed.

Checks

1.	Corrugated pipe connector, end caps and connecting pipe bends secured with clips?	<input type="checkbox"/>
2.	All collector braces connected to profile rails?	<input type="checkbox"/>
3.	Anti-slip protection installed and clicked into place in profile rails?	<input type="checkbox"/>
4.	Sensor inserted as far as it will go and secured with compression fitting?	<input type="checkbox"/>
5.	Pressure test carried out and all connections leak-proof (see pump station instructions)?	<input type="checkbox"/>



USER NOTE

If you are venting the solar heating system with an automatic air-vent valve (accessory), you must close the ball valve after the venting procedure (see pump station installation instructions).

9.2 Insulating the connection and header pipes

- ▶ Cut enclosed insulation (710 mm long) into 88 mm lengths and place around the corrugated pipe connectors between the collectors.

Insulation of the header pipes in internal or external installations

- For the insulation of external pipework, use only UV and high temperature resistant insulating materials, rated to 150 °C.
- For the insulation of internal pipework, use only high temperature resistant insulating materials, rated to 150 °C.
- Make the insulation bird-proof.

10 Quick reference guide for base anchoring and pressure filling

These instructions are only intended as an overview of the work to be carried out. You **MUST** follow the detailed descriptions for the work on the pages mentioned, and obey all safety and user instructions.

Fitting braces and profile rails

1. Insert telescopic rails into each other according to the selected angle of inclination, and fasten. p. 16
2. Drill holes in girder (or similar), and fasten collector braces with screws. p. 25
3. Connect profile rails together using plug connectors. p. 28
4. Fasten profile rails to collector braces. p. 29
5. Align sides of the profile rails. p. 29
6. Install anti-slip protectors into the two inner slotted holes on the lower profile rails. p. 29

Preparing to install the collectors

7. Push end caps onto those connections that are not required and secure using brackets. p. 32

Fastening the collectors

8. Push single-sided collector clamp (right) into profile rails. p. 32
9. Place first collector (right) onto profile rails and push onto collector clamp. p. 33
10. Screw up collector clamp on the right. p. 33
11. Place double-sided collector clamp into profile rail and push onto first collector. p. 33
12. Push corrugated pipe connectors onto the connections on the first collector and secure with brackets. p. 34
13. Push second collector towards the first and fix in place with brackets. p. 34
14. Tighten screws on the double-sided collector clamp. p. 33
15. Repeat the procedure for all other collectors. p. 35
16. Fit single-sided collector clamps on the left. p. 35

Header connection

17. Insert collector sensor as far as it will go into the collector with the flow line to be connected, and screw tight. p. 36
18. Place holder for flow line onto collector frame and screw in place. p. 37
19. Fasten pipe bend to flow and return connections using clamping ring and nut. p. 38
20. Fix pipe bend with clips. p. 38
21. Perform installation checks. p. 41
22. Insulate header pipes with UV and high temperature resistant material. p. 42

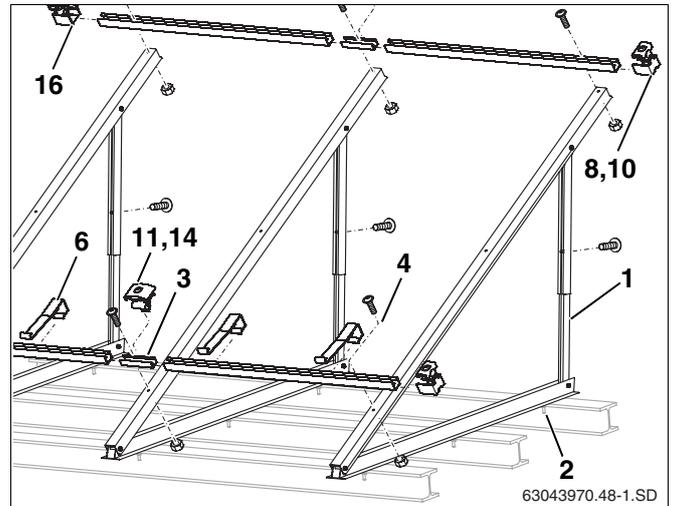


Fig. 62 Installing on a flat roof

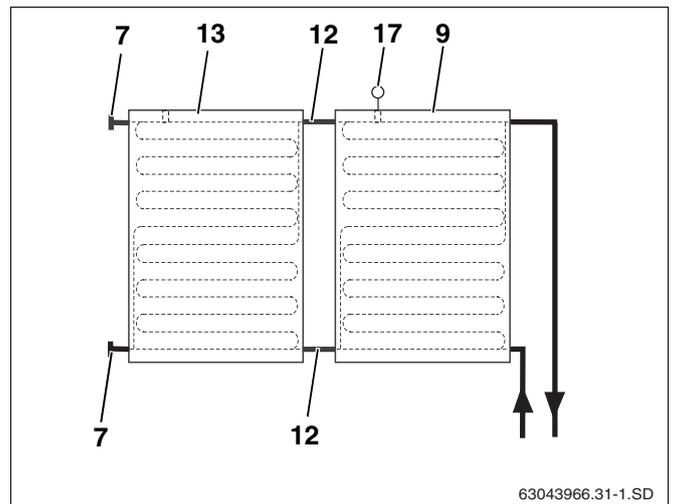


Fig. 63 Water connections

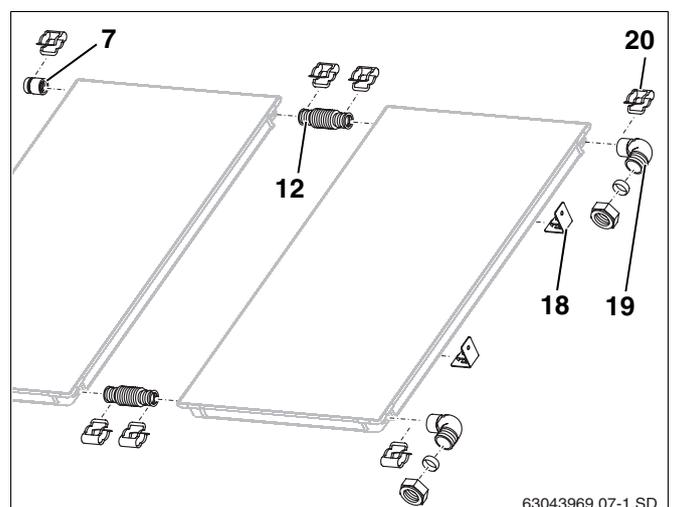


Fig. 64 Fitting the collector sensor and connection parts

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