



HARGASSNER

INSTALLATION MANUAL SOLAR COLLECTORS

TS 300 · TS 330/M · TS 400
TS 500 · TS 530/M



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1 General Instructions

1.1 Intended Use

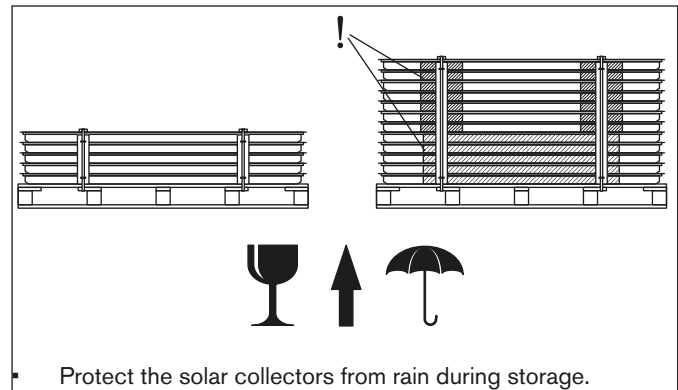
Solar collectors are used for domestic hot water heating, swimming pool heating and low-temperature space heating by converting solar radiation into thermal energy.

The maximum operating temperature of the collectors is 120 °C. The thermal resistance of all components in the primary circuit must be at least equal to the collector stagnation temperature specified in the product technical datasheet.

The solar collectors are designed for year-round operation. They operate in a closed primary circuit and must be filled with a heat-transfer antifreeze fluid supplied by the solar collector manufacturer.

Solar collectors are not suitable for direct domestic hot water heating.

The use of solar collectors for direct domestic hot water heating or the use of a heat-transfer fluid other than that supplied by the solar collector manufacturer may result in permanent damage to the collectors.



1.2 Transport

- Solar collectors are transported horizontally on a wooden pallet with the glass facing upwards. A maximum of 12 collectors may be stacked on a pallet..
- During transport, the collectors must be secured against movement and the glass surface must be protected with cardboard.
- Spacer inserts must be used when stacking more than three collectors..

Unloading, Inspection and Damage Reporting

- ☐ Check the solar collectors for any transport damage.
- ☐ Check the delivery for completeness.
- Any incomplete delivery must be documented immediately in writing and reported to the supplier.
- Any transport damage must be documented immediately in writing, photographed and reported to the supplier.
- If the damage was caused by the carrier, the claim must also be recorded in the transport documents.

If the delivery is significantly damaged, acceptance of the goods may be refused. Subsequent claims for mechanical damage cannot be accepted.

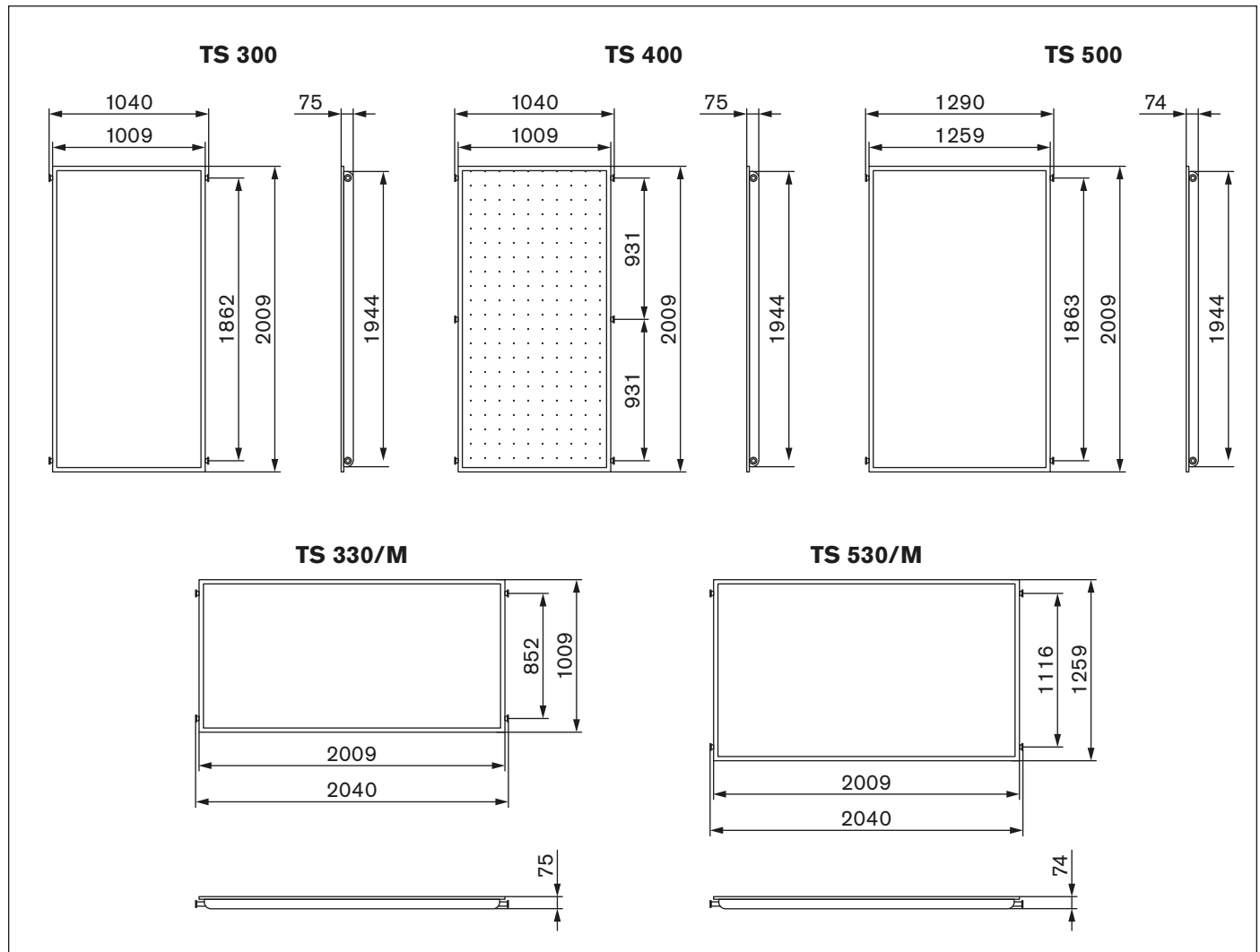
1.3 Storage

Solar collectors may be stored indefinitely in temperature-controlled storage facilities.

Store solar collectors with the glass facing upwards.

- The glass must be protected with a cardboard cover.
- A maximum of 12 solar collectors may be stacked.
- Spacer pads must be used when stacking more than three collectors.
- Cover the collectors to protect them from direct sunlight.
- Do not store solar collectors in dusty or damp environments.

2 Dimensions



2.1 Technical Data

	TS 300	TS 400	TS 500	TS 330/M	TS 530/M
Gross area	2,03 m ²	2,03 m ²	2,53 m ²	2,03 m ²	2,53 m ²
Absorption area	1,78 m ²	1,85 m ²	2,26 m ²	1,78 m ²	2,26 m ²
Weight	37,5 kg	48,0 kg	46,0 kg	38,0 kg	47,0 kg
Collector Volume	1,7 l	1,7 l	2,15 l	1,96 l	2,2 l
Recommended Heat Transfer Fluid Flow Rate	30 - 100 l/h per collector				
Optimum Heat Transfer Fluid Flow Rate	60 l/h	60 l/h	75 l/h	60 l/h	75 l/h
Maximum Output	1452 W	1464 W	1810 W	1436 W	1790 W

3 Installation Preparation

3.1 Safety Precautions

**DANGER**

Risk of Falling
Fatal injuries may occur when working at height on roofs.

- Use a safety harness.
- Prevent tripping hazards. Keep the work area free of obstacles.
- Use ladders in accordance with applicable safety regulations.

**DANGER**

Risk of burns
Ignition caused by contact of solar piping with combustible materials.

- Uninsulated sections of solar piping must never come into contact with wooden materials.

**WARNING**

Risk of Injury
Injuries caused by handling components with sharp edges.

- Wear safety footwear

**WARNING**

Risk of Injury and Property Damage
Injuries and damage caused by improper installation.

- Installation work may only be carried out by trained personnel.
- Work on electrical systems may only be carried out by qualified electricians.

The collectors do not present any potential hazard to users or third parties during operation.
Components forming part of the safety system are subject to applicable legal regulations.

The collector array and the primary circuit must be grounded in accordance with applicable regulations. If a lightning protection system is already installed, it must be used.
When connecting the collector array to a lightning protection system, no part of the collector may be drilled.

Personal Protective Equipment



- Safety harness



- Safety helmet



- Safety footwear



- Safety glasses



- Protective gloves

Qualifications of Installation Personnel

The installation is not intended to be performed by persons with limited physical, sensory, or mental capabilities.

3.2 Country-Specific Regulations

**INFO**

Applicable local, national and international standards and regulations must be observed.

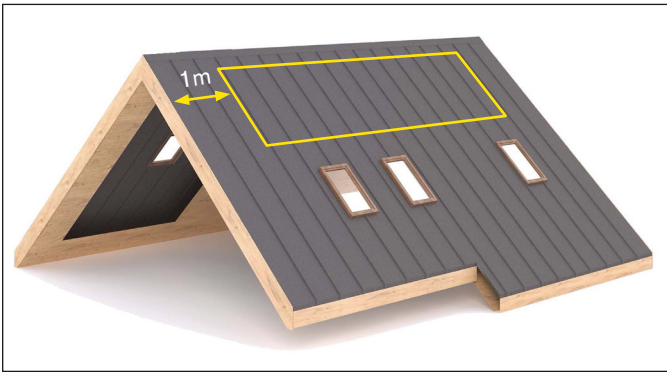
In addition to this installation manual and the accident prevention regulations that are mandatory in the country and at the site of installation, all recognised technical rules and standards for safe and professional workmanship must be observed.

3.3 Installation Instructions

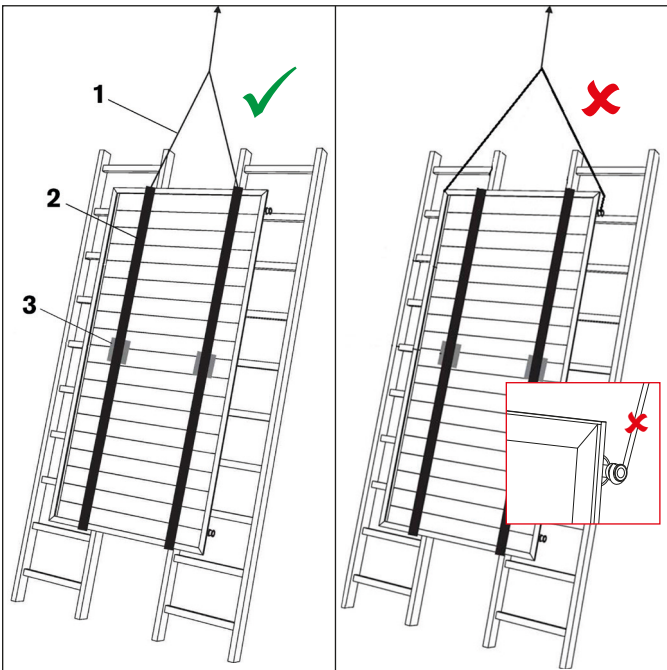
When cutting pipes, ensure that no chips or dirt enter the pipe. Chip-free cutting methods are recommended.

Seal threaded connections with O-rings suitable for the operating pressure and temperature. The O-rings must be resistant to the composition of the heat transfer fluid.

Use only components rated for temperatures up to 170 °C. Exterior materials must be UV-stable and resistant to weathering and mechanical damage (from birds, rodents, etc.). The expansion vessel must have a minimum nominal volume of 6 litres per collector, and the gas pre-charge pressure should correspond to the hydrostatic head of the system (see pressure balancing of the solar thermal system expansion vessel).

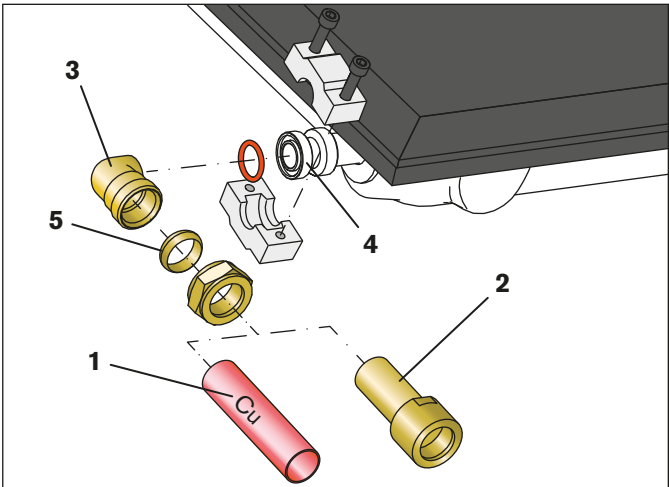


During installation, it is recommended to maintain a minimum distance of 1 m from the roof edge.
 Position the mounting structure as close as possible to the roof gable.
 Minimum clearances must comply with local regulations.



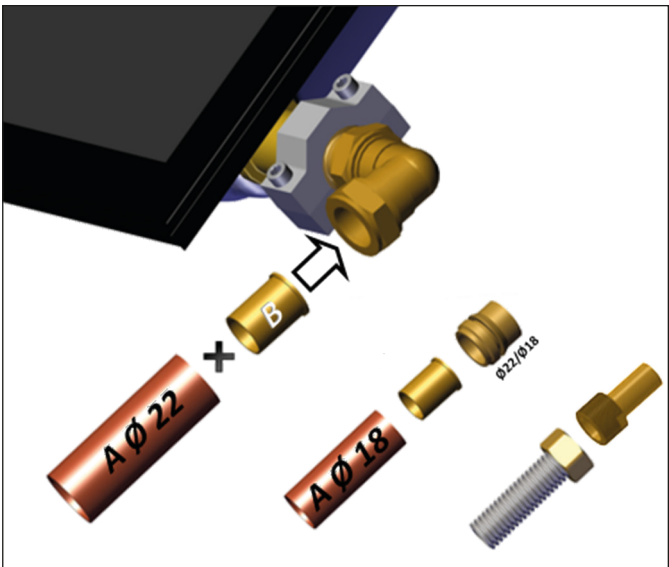
Poz.	Popis
1	Rope
2	Strap
3	Spacer pad

3.3.1 Pipe Connections to Collectors



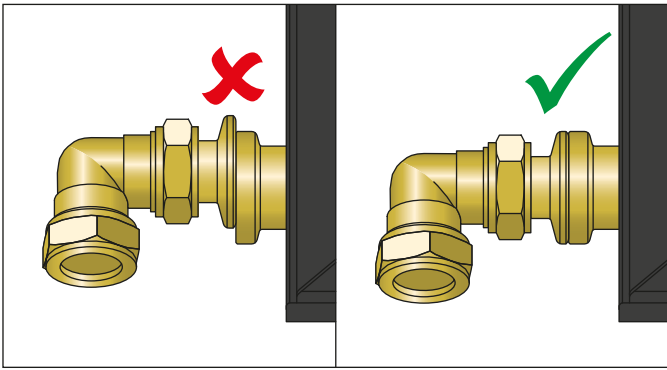
- ❑ When routing pipes, ensure that the collector connections are not bent or damaged.
 - ❑ First connect the pipe (1 or 2) to the elbow (3) or T-piece, and then connect the assembly to the collectors (4).
- This procedure must be followed to prevent damage to the collector connections.

Copper pipe and compression nut connections are installed with a support sleeve (5), which must deform to create a watertight connection. Once deformed, the connection cannot be dismantled without damaging the sleeve.

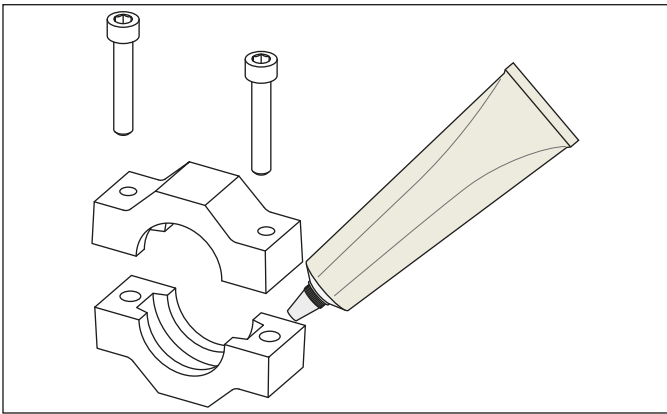


When installing a connection kit with copper pipe, the copper pipe (A) must be reinforced at the end with a support sleeve (B).

Male threaded fittings are installed directly.
 The support sleeve is included in the mounting kit.

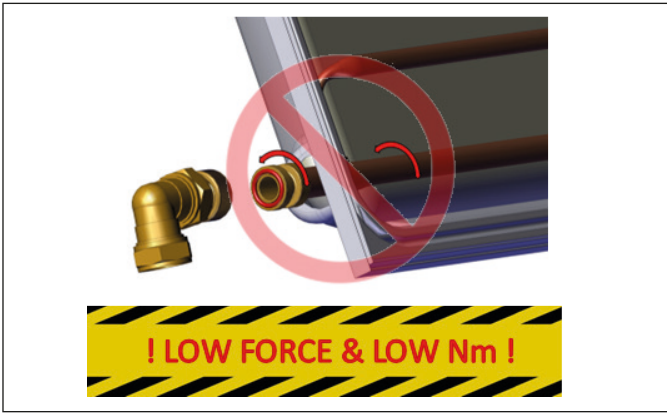


Align the collector connections axially.



Apply lubricant to the clamping threads to provide corrosion protection.

→ Lubricant is not included in the delivery. Align the collector connections axially.



For nut-type collectors, the terminals must not be rotated.
→ Tighten the collector outlets using two pairs of pliers and apply only moderate force

3.4 Requirements for Installation Materials

Piping

Material	Requirements
Stainless Steel	Minimum material grade A4 – AISI 316L. Increased resistance to weather conditions (UV radiation) and mechanical stress.
Copper	Increased resistance to weather conditions (UV radiation) and mechanical stress. EN 1057.
Steel	Non-galvanised steel. Increased resistance to weather conditions (UV radiation) and mechanical stress.

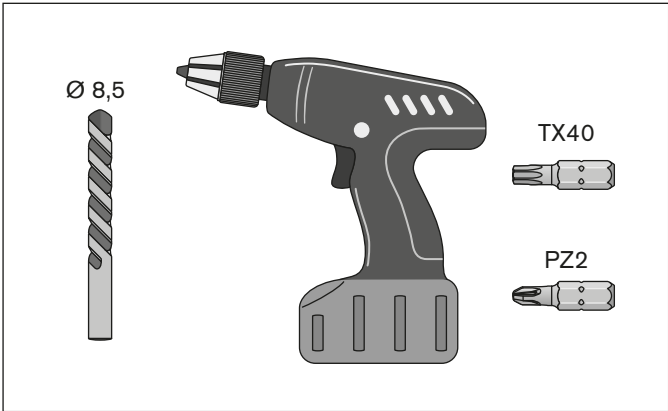
Insulation

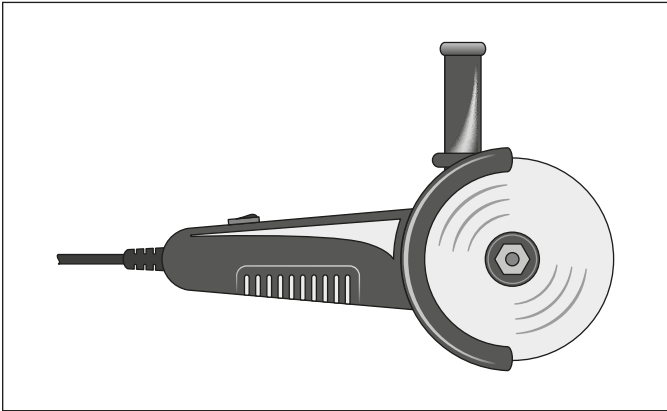
Material	Requirements
Rubber Insulation	DN 12-32 minimum thickness 19 mm
Mineral Wool Insulation 0,038 W/mK	DN 12-32 minimum thickness 30 mm
Nano Insulation 0,014 W/mK	DN 12-32 minimum thickness 10 mm

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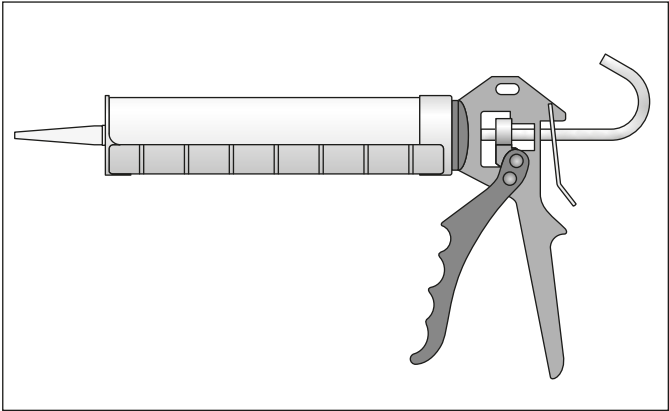
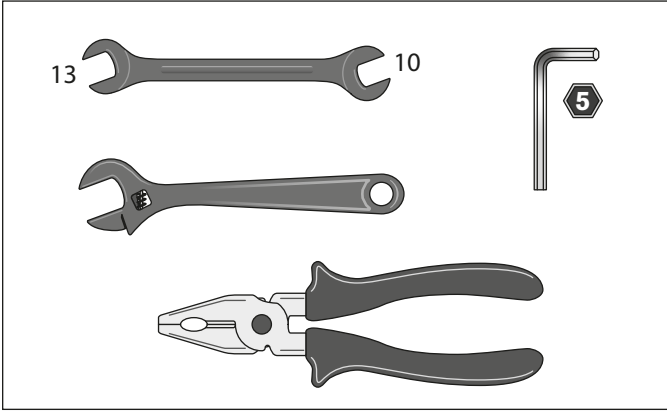
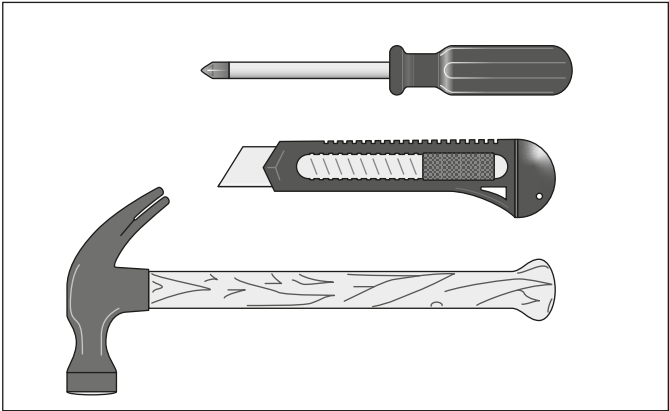
It is recommended that all hydraulic and electrical connections be sealed using heat-shrink tubing, original rubber end caps or protective covers.
Uninsulated sections of solar piping must never come into contact with wooden materials.

3.5 Installation Tools

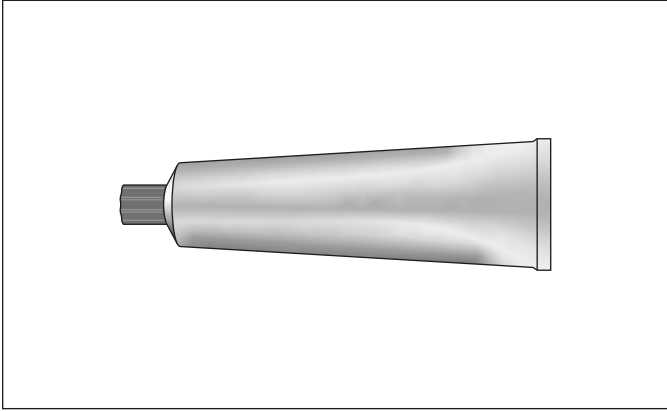
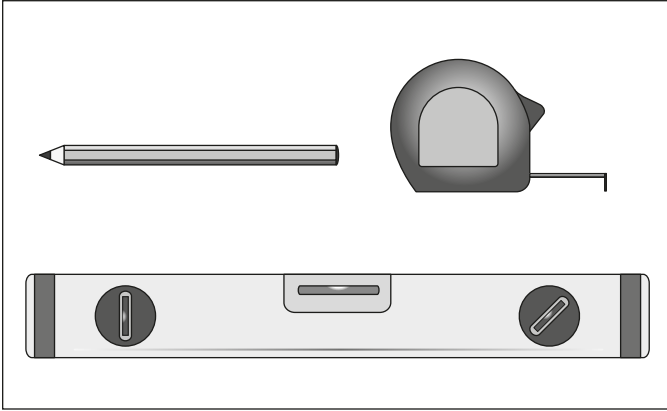




Angle grinder with diamond cutting disc

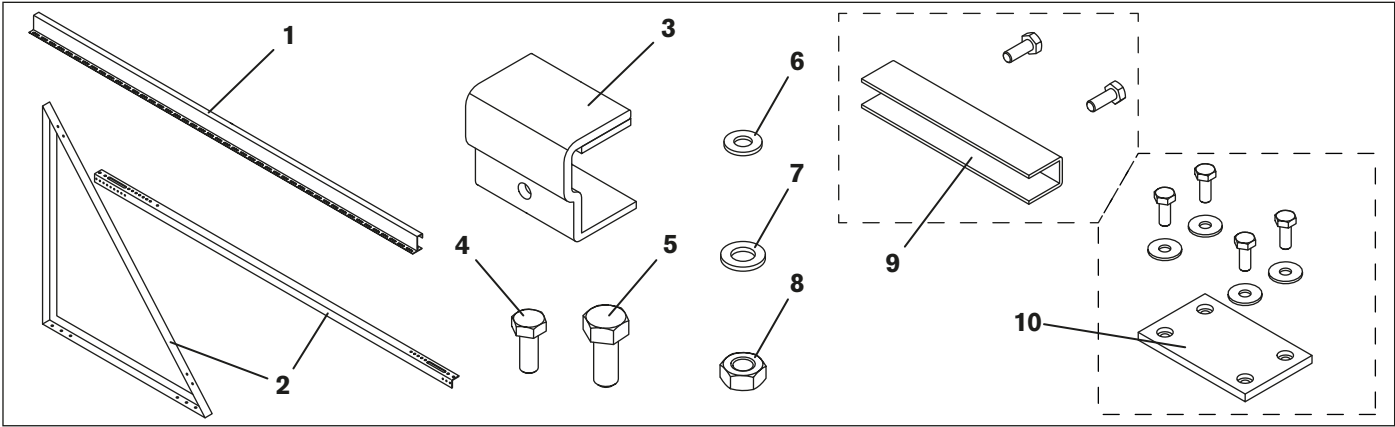
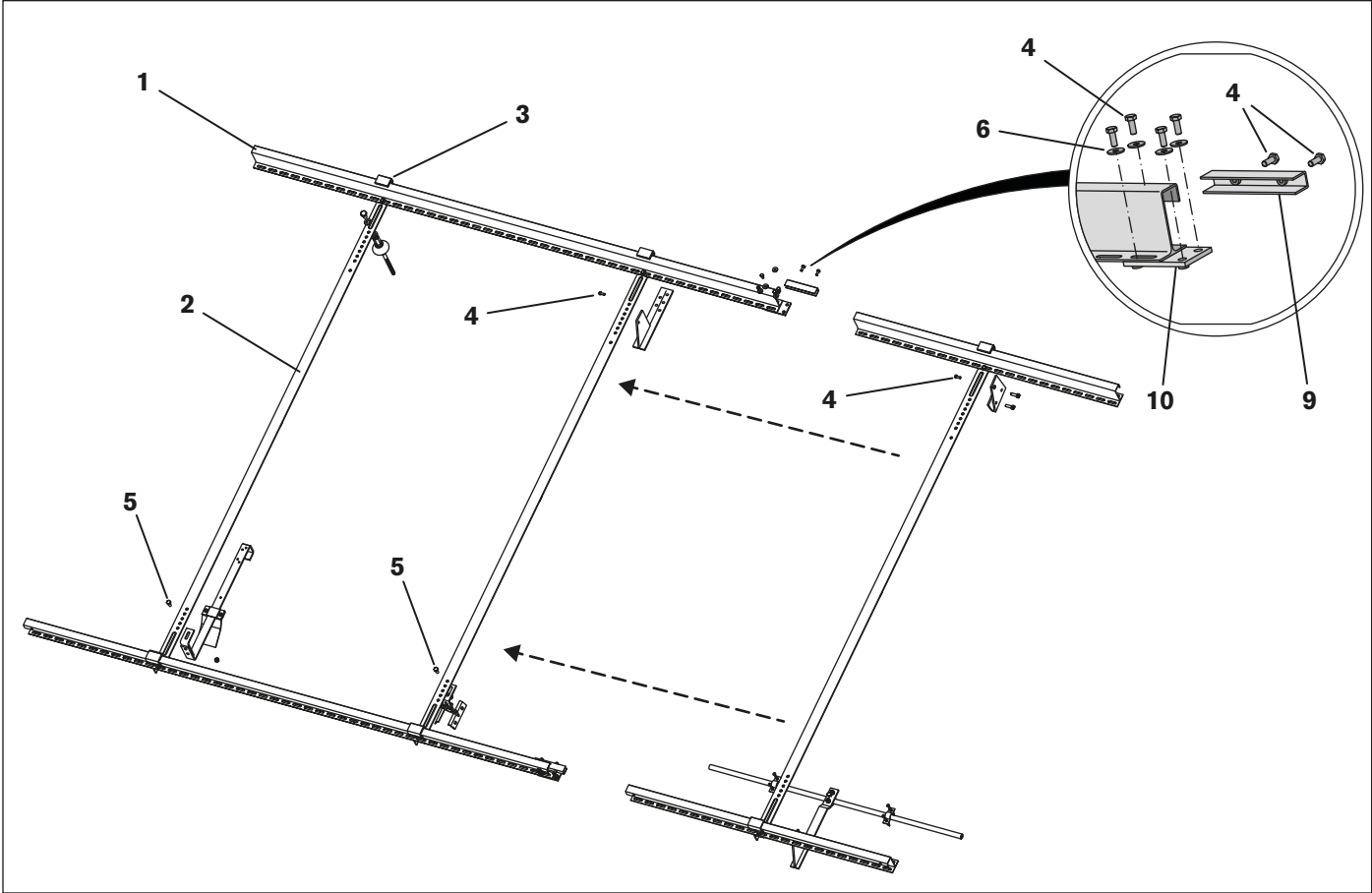


Polyurethane or bitumen sealant



Lubricant

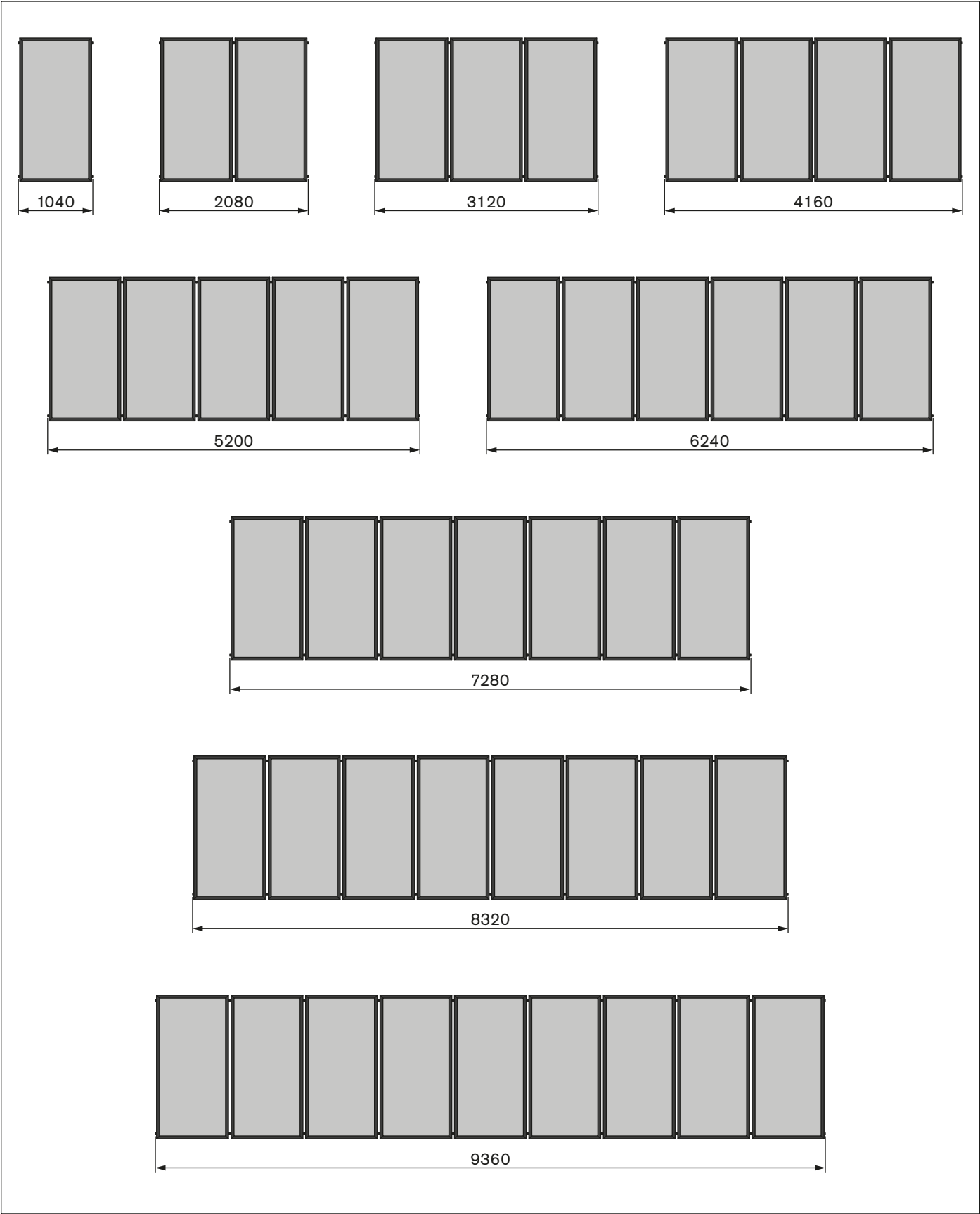
3.6 Overview of Components Used

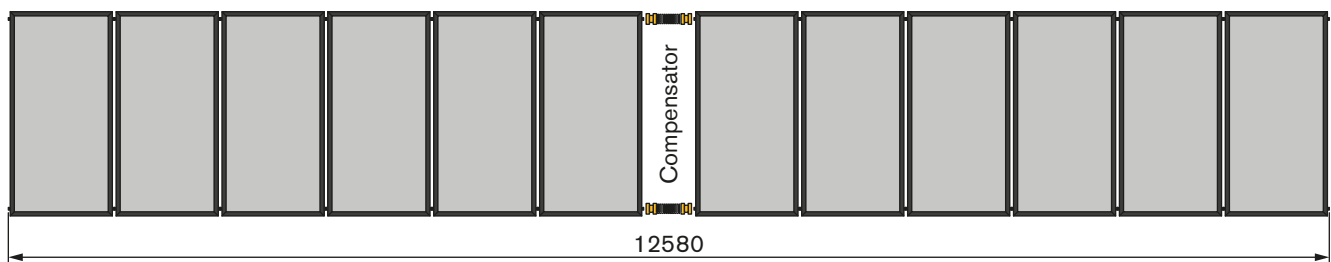
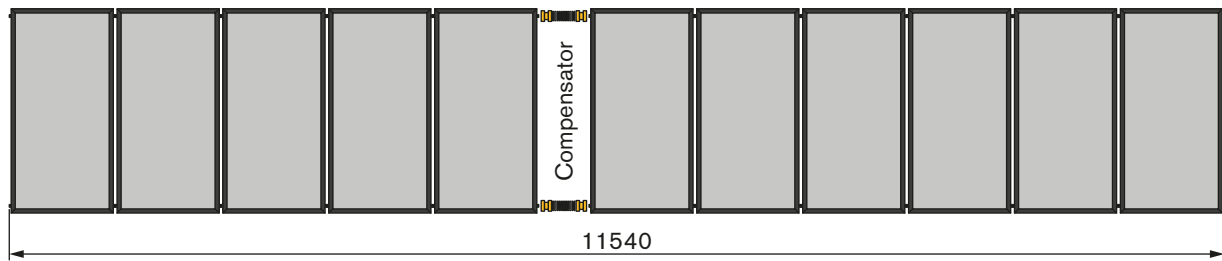
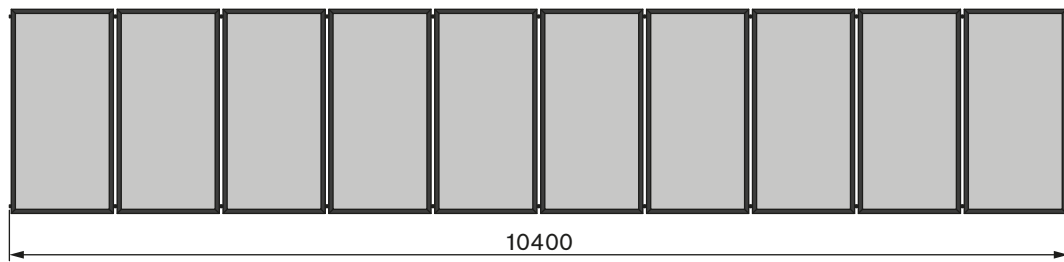


Item	Description	Item	Description
1	Z-Profile	6	Washer 6,4 mm
2	L-Profile or Triangle	7	Washer 8,4 mm
3	Wind anchorage	8	Nut M8
4	Bolt M6x16	9	Connection set for Z-Profil
5	Bolt M8x20	10	Connection set for Z-Profil (reinforcing)

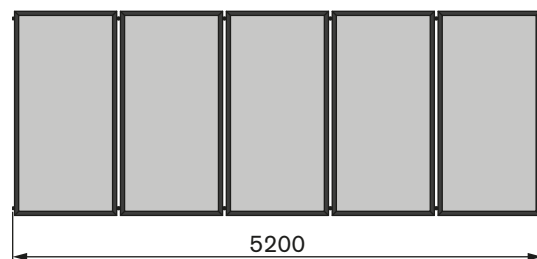
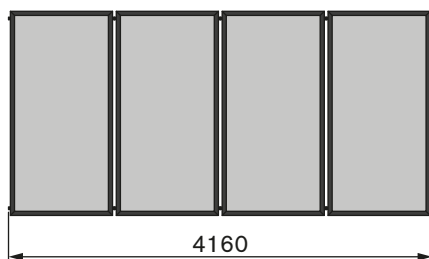
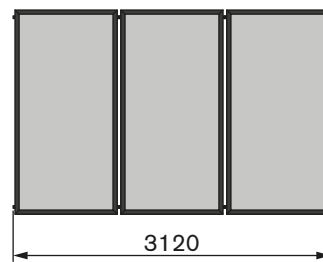
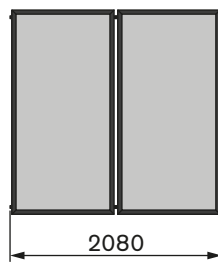
3.7 Overall Dimensions of Collector Arrays

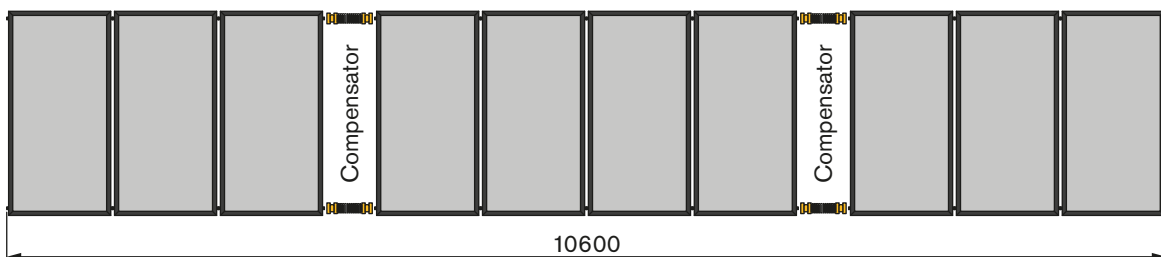
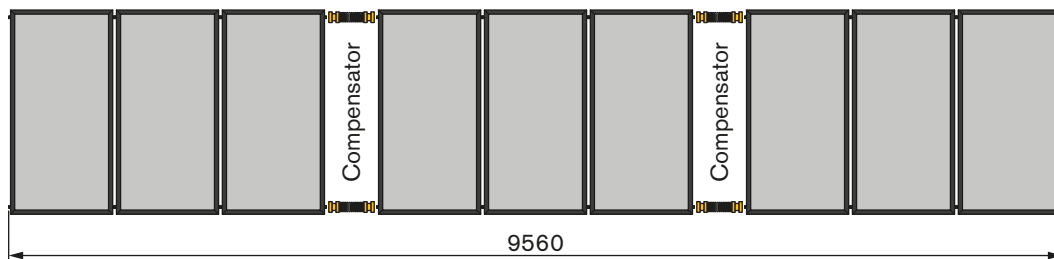
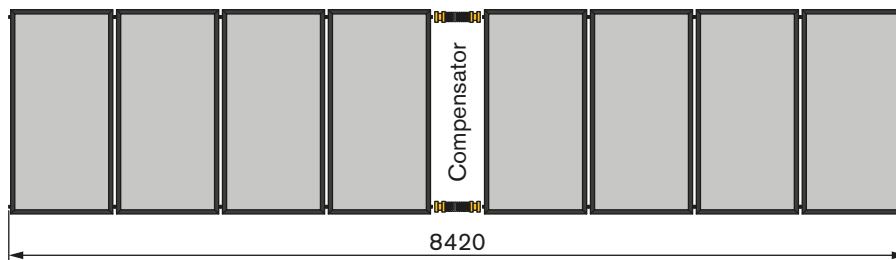
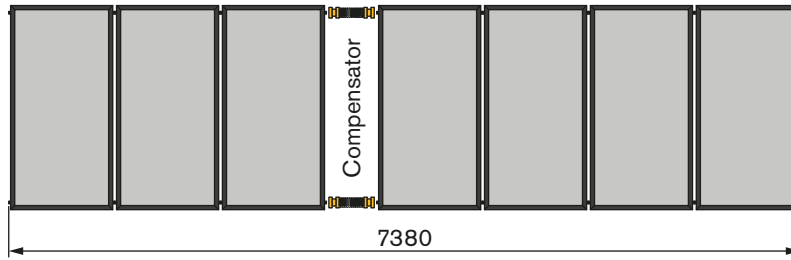
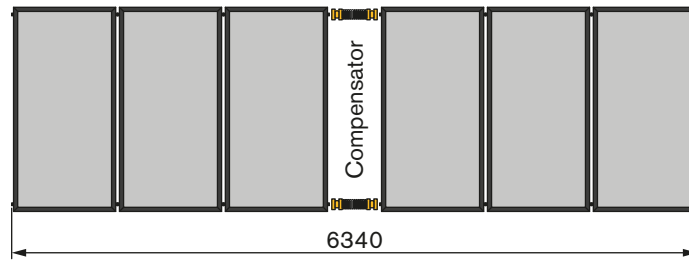
3.7.1 TS 300

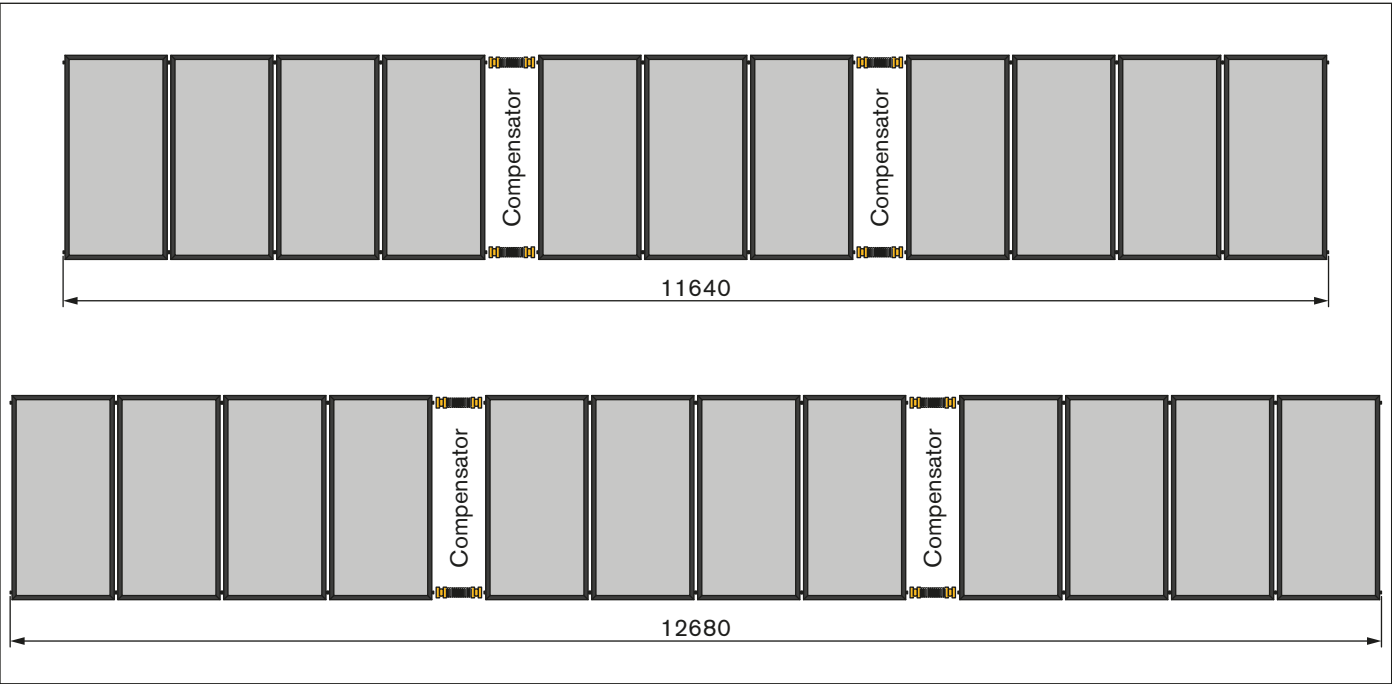




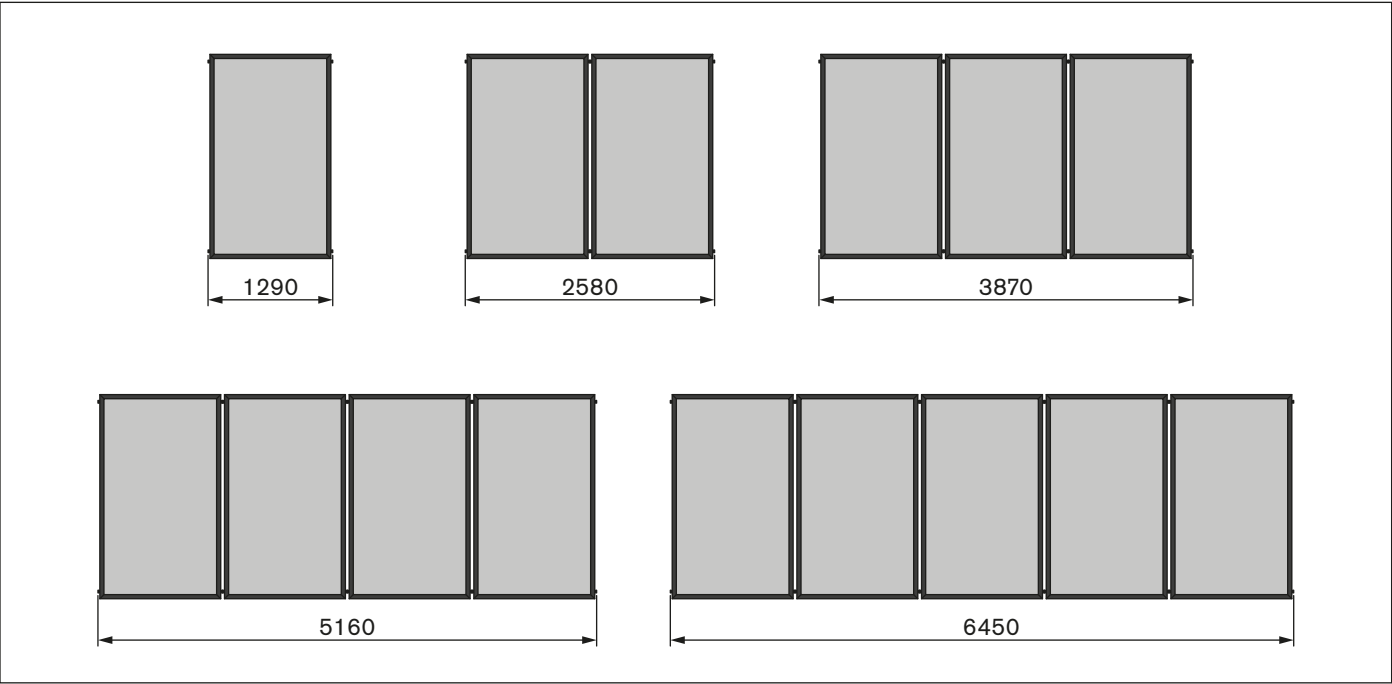
3.7.2 TS 400

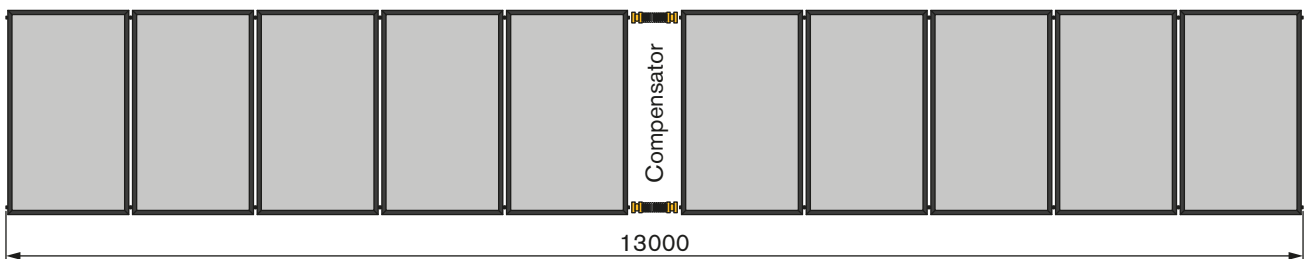
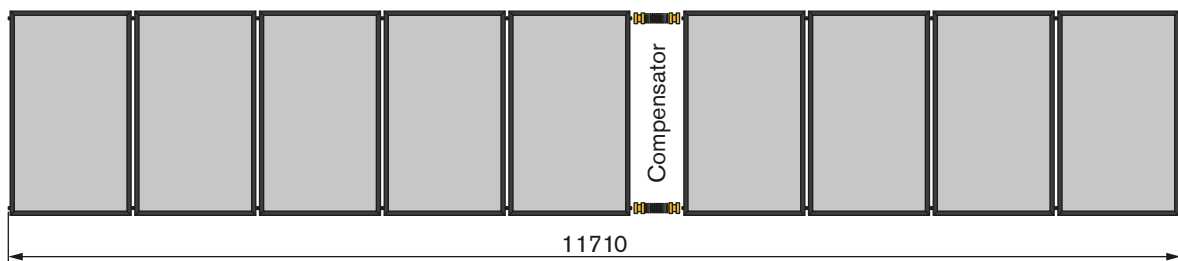
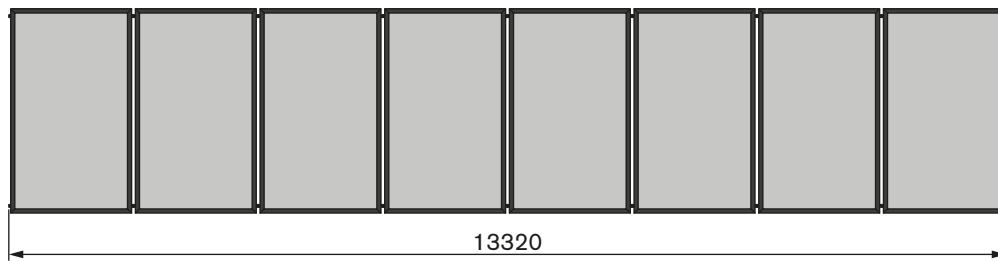
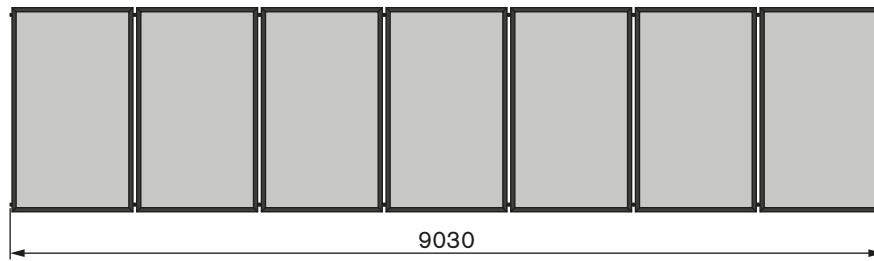
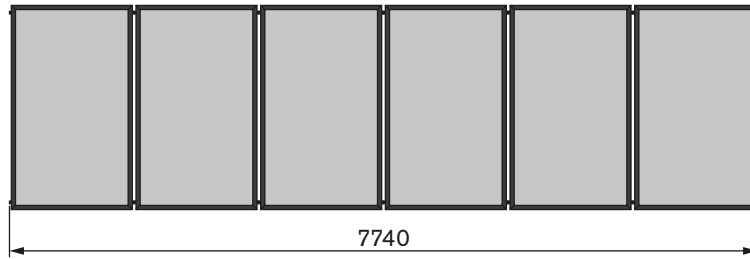




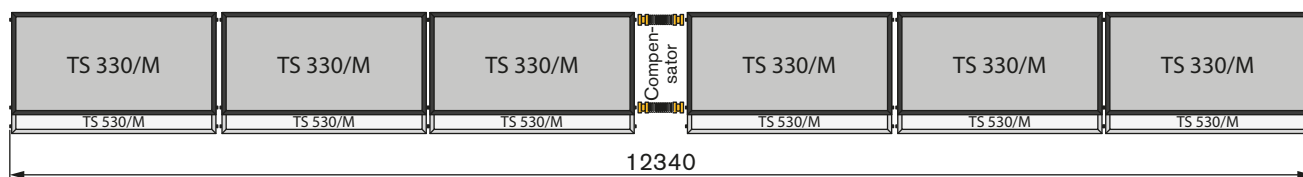
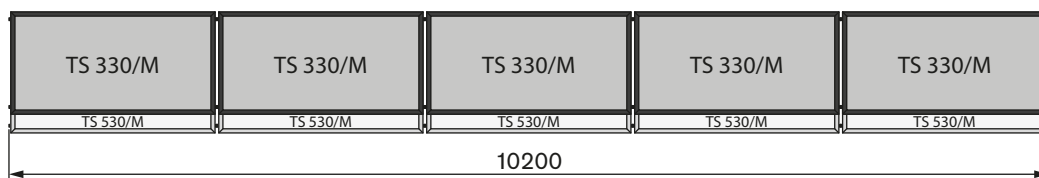
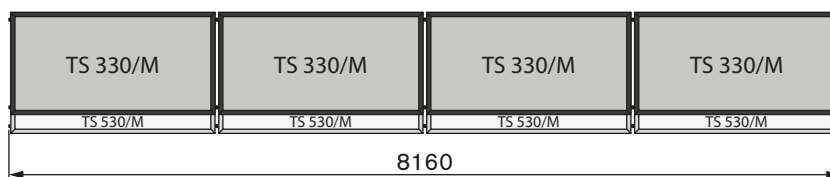
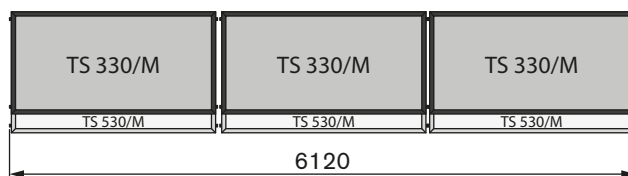
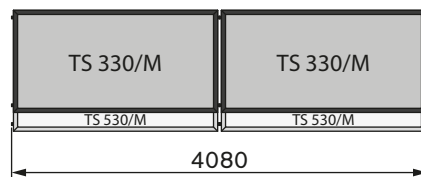


3.7.3 TS 500



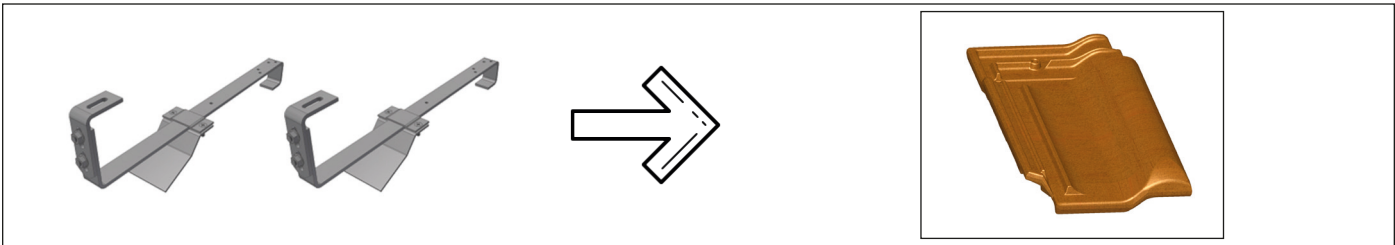


3.7.4 TS 330/M a TS 530/M

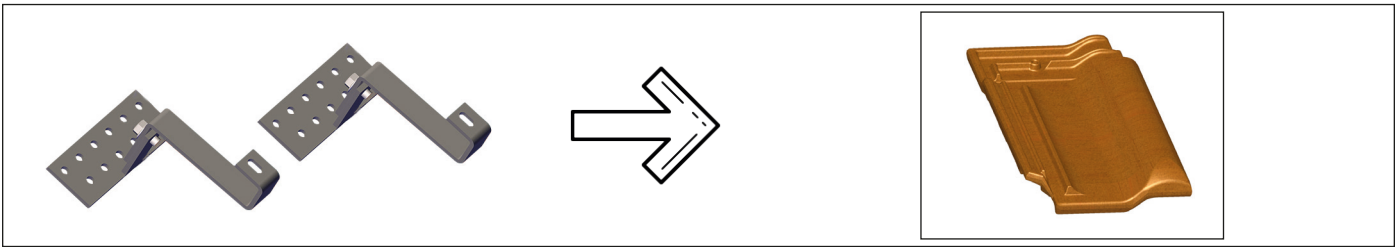


3.8 Types of Mounting Elements

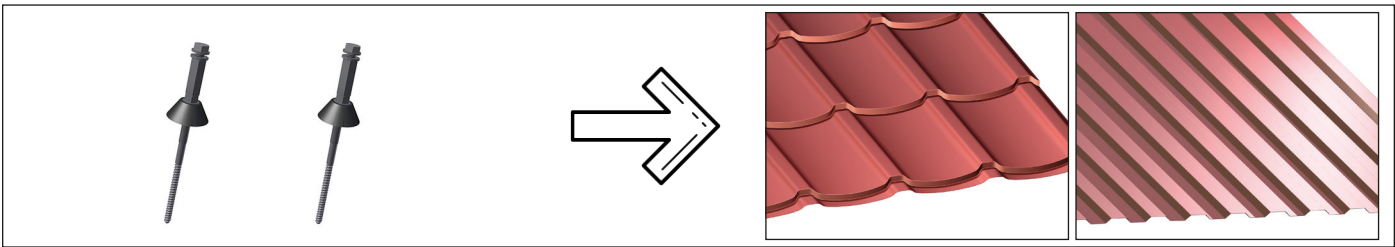
3.8.1 Stainless steel roof hook



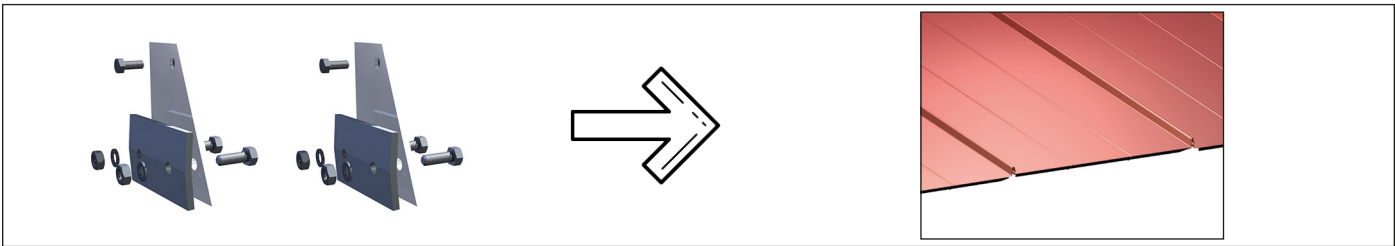
3.8.2 Height Adjustable Roof Hook



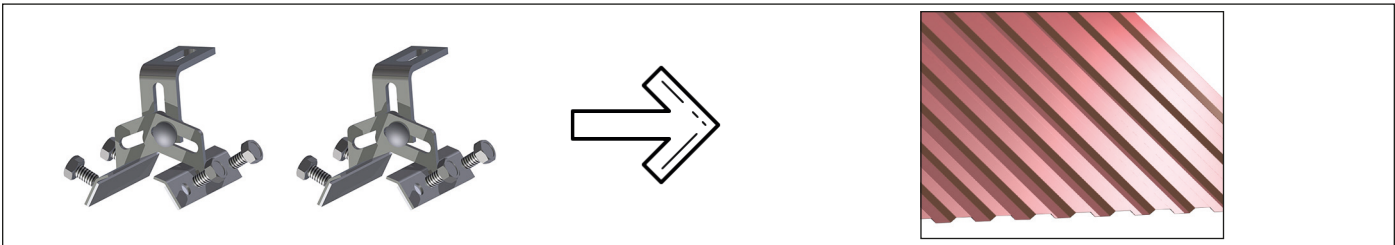
3.8.3 Combi Screw



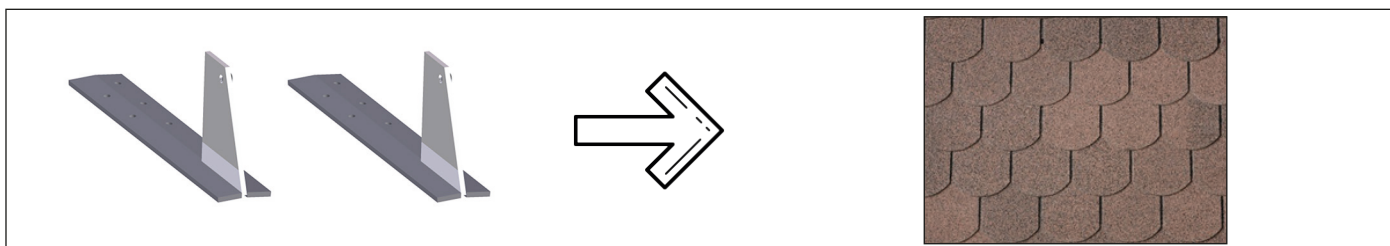
3.8.4 Clamp with strut



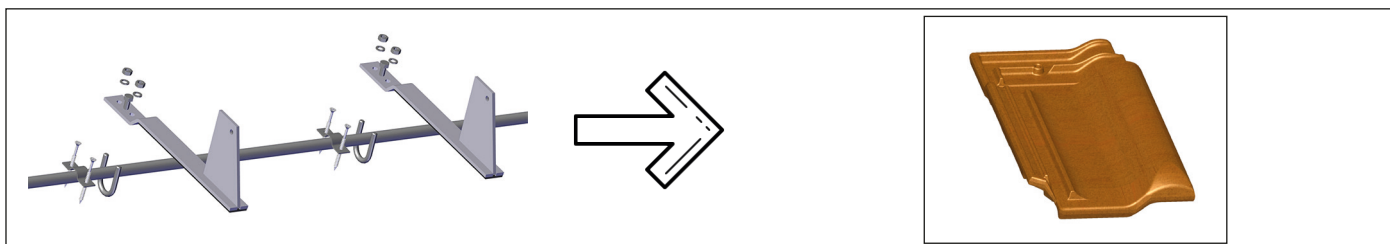
3.8.5 Stainless steel holder



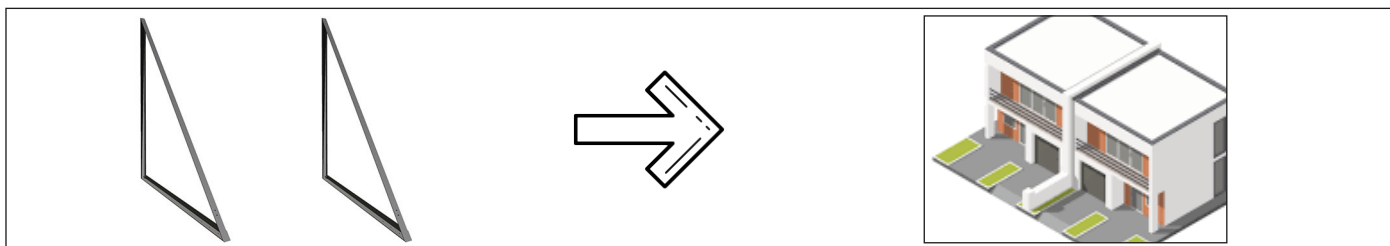
3.8.6 Straight roof hook



3.8.7 Aluminium Hook with Steel Tube



3.8.8 Triangle



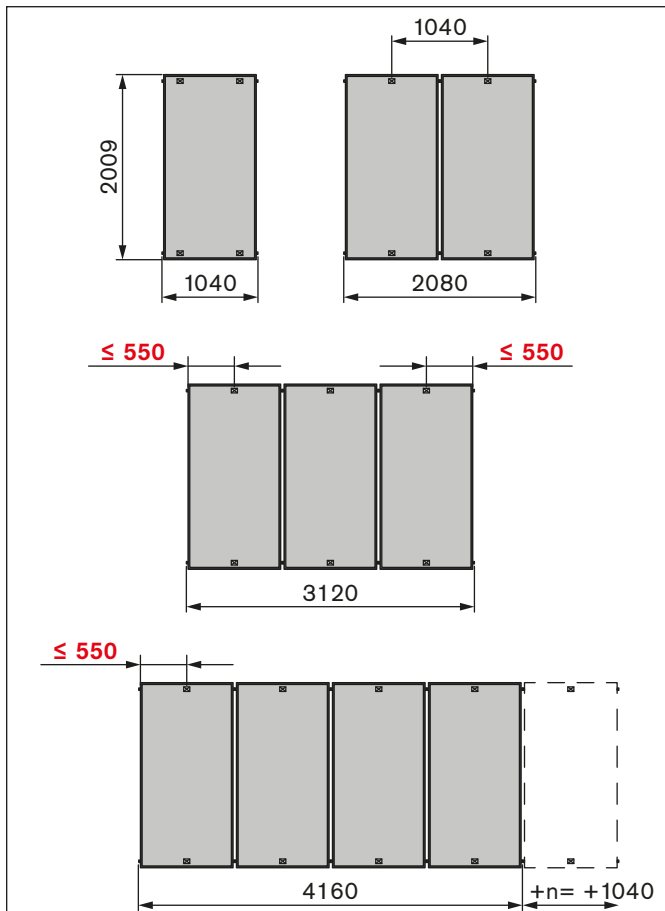
4 Installation

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The dimensions of the mounting elements are provided for reference only. During installation, the dimensions of the mounting elements may vary depending on the roof construction and its characteristics. The number of mounting elements may also vary when combining the basic and extension mounting structures. The use of a compensation kit increases the width of the collector array by 100 mm.

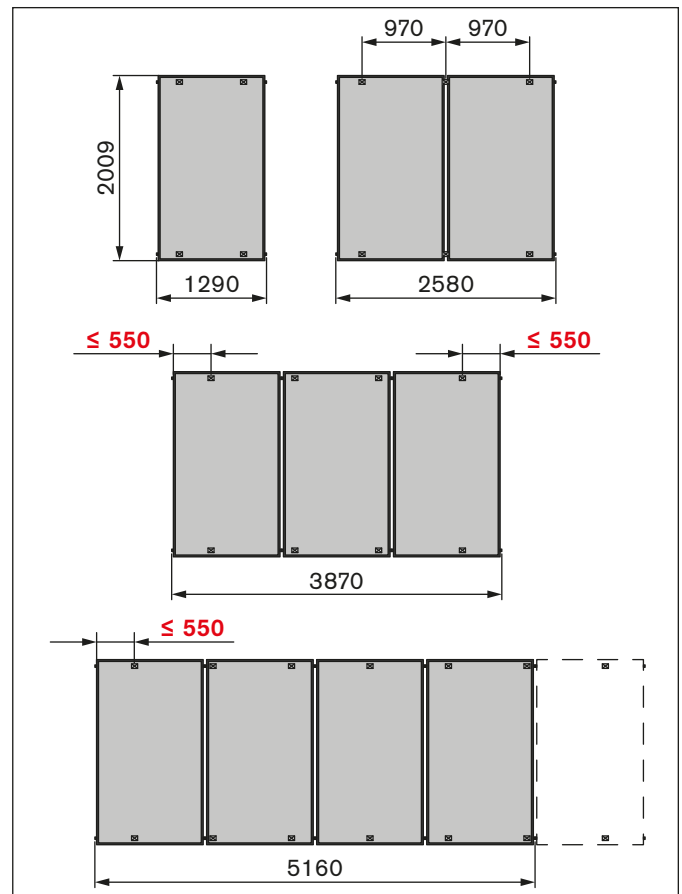
Ensure a symmetrical arrangement of the mounting elements.

TS 300 a TS 400



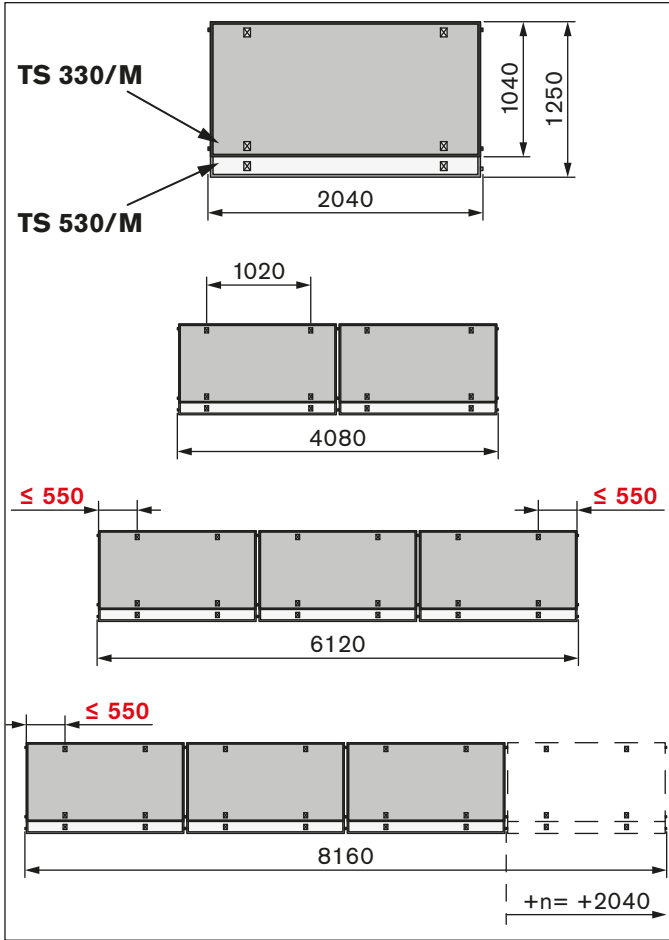
The first mounting element must be installed no more than 550 mm from the outer edge.

TS 500



The first mounting element must not be installed more than 550 mm from the outer edge..

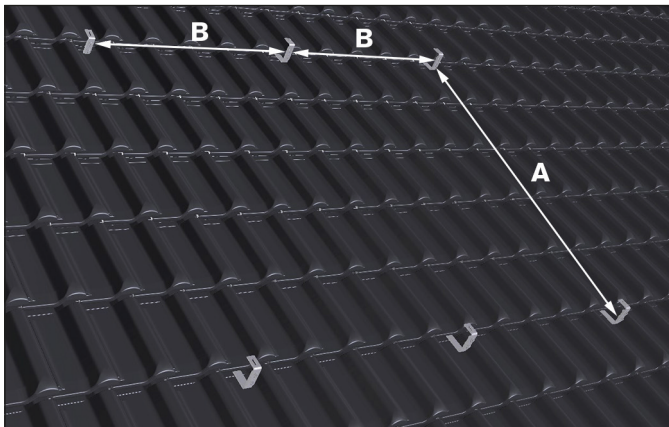
TS 330/M a TS 530/M



The first mounting element must not be installed more than 550 mm from the outer edge.

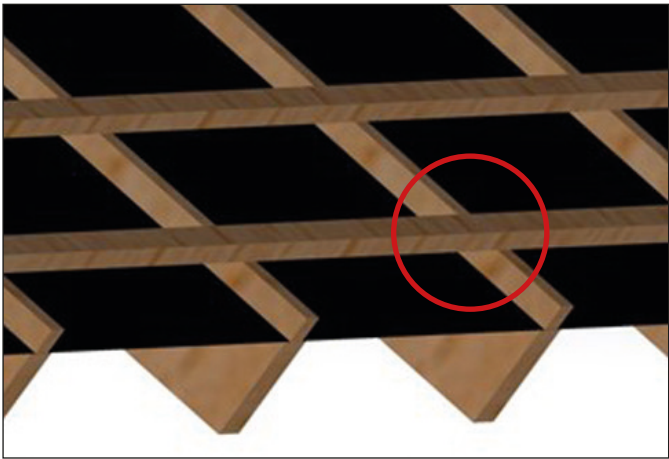
4.1 Stainless Steel Roof Hook

4.1.1 Positioning



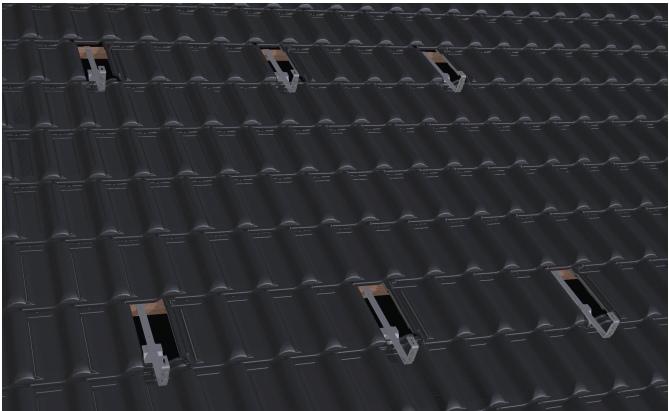
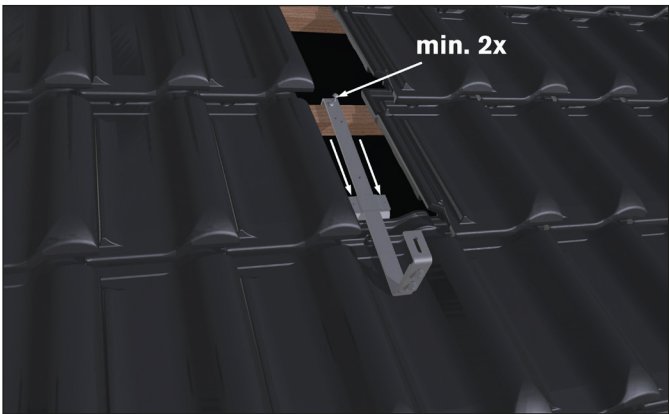
Type	A	B
TS 300, TS 400	1420 - 1660 mm	1040 ± 100 mm
TS 330/M	420 - 660 mm	1040 ± 100 mm
TS 500	1420 - 1660 mm	800 ± 100 mm
TS 530/M	680 - 910 mm	1040 ± 100 mm

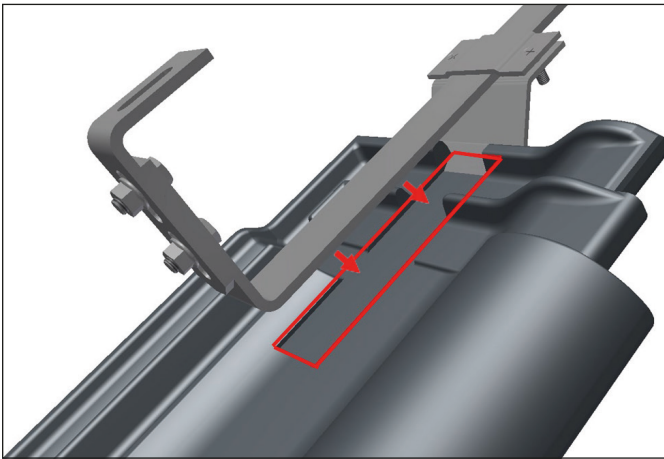
4.1.2 Installation Preparation



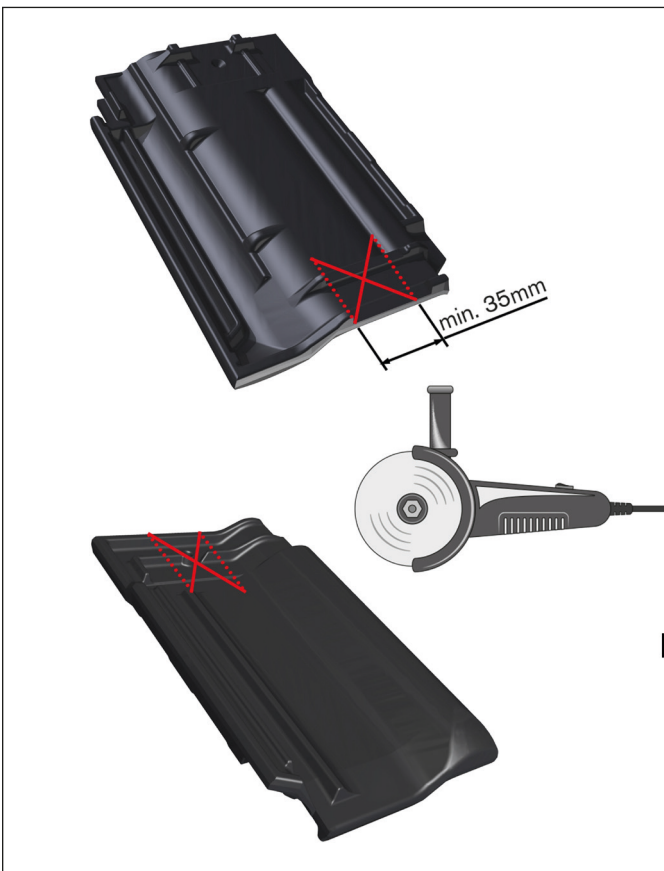
→ During the installation of the collectors, the wooden structure must not be connected using nails. If it is found that the wooden structure has been nailed together, it must be reinforced with additional screws.

4.1.3 Installation





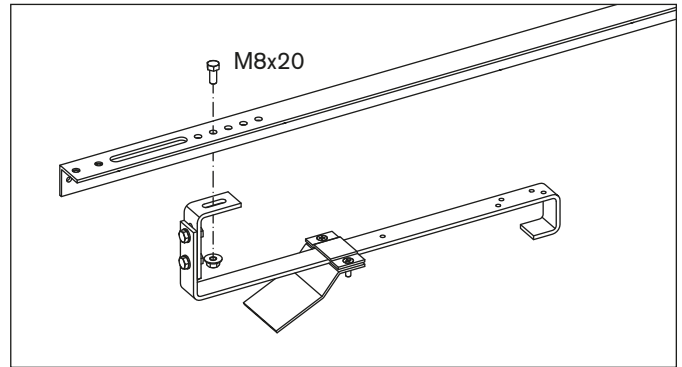
→ The stainless steel hook must rest flat against the roof tile with its entire surface.



□ If necessary, level the contact surface on the roof tile.

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If the roof tile is not strong enough at the hook attachment point, it must be replaced with a steel component or the area under the hook must be reinforced.

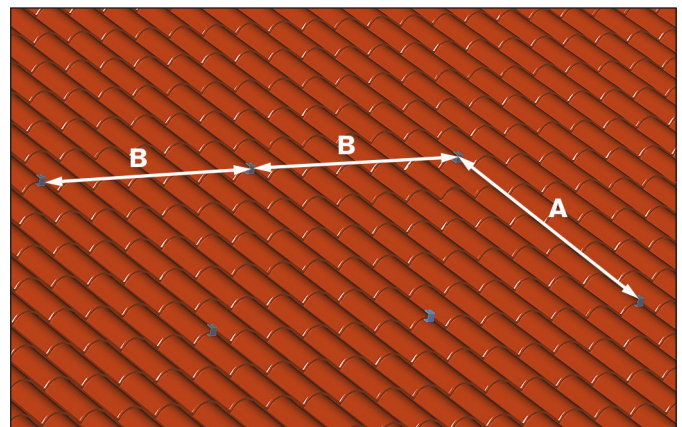


□ Bolt the L-Profile to the stainless steel hook



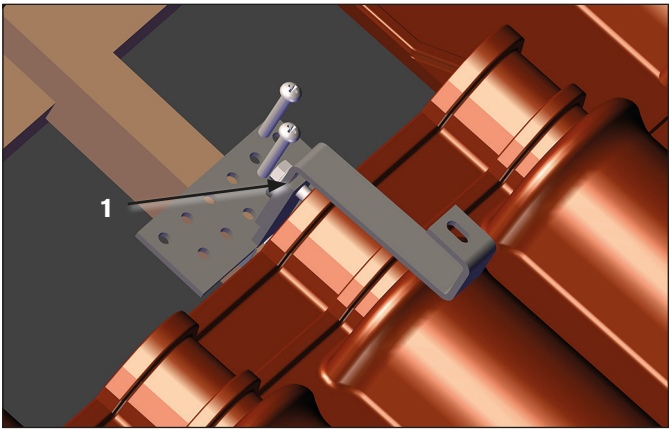
4.2 Height Adjustable Roof Hook

4.2.1 Positioning

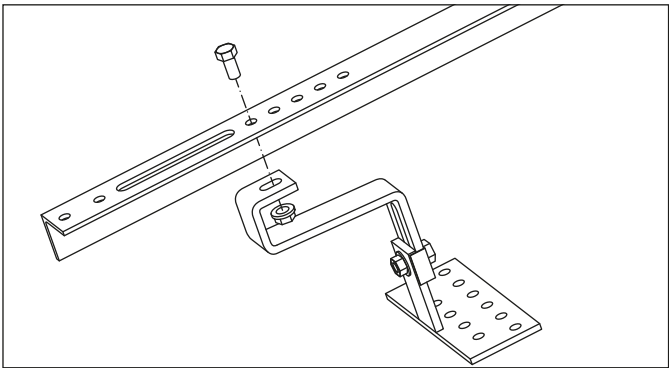


Type	A	B
TS 300, TS 400	1420 - 1660 mm	1040 ± 100 mm
TS 330/M	420 - 660 mm	1040 ± 100 mm
TS 500	1420 - 1660 mm	800 ± 100 mm
TS 530/M	680 - 910 mm	1040 ± 100 mm

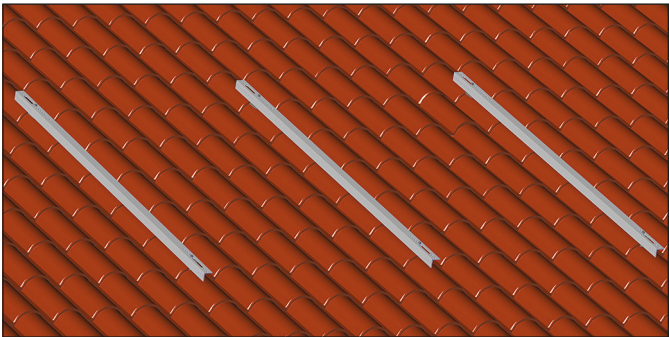
4.2.2 Installation



- ❑ Screw the Height Adjustable Roof Hook to the roof rafter..
- ❑ Align the hooks vertically with the roof tile (1).

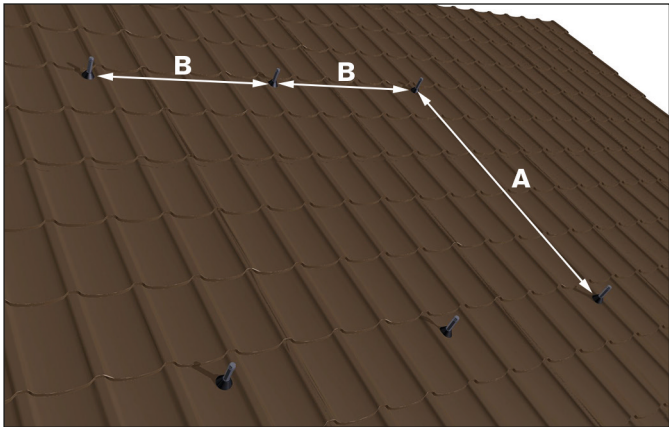


- ❑ Bolt the L-Profile to the Height Adjustable Roof Hook.



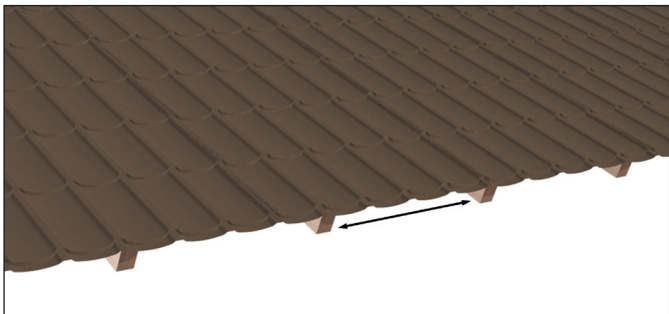
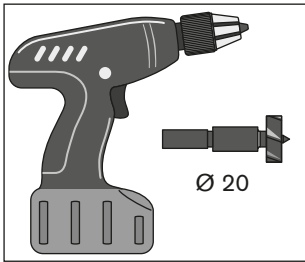
4.3 Combi Screws

4.3.1 Positioning

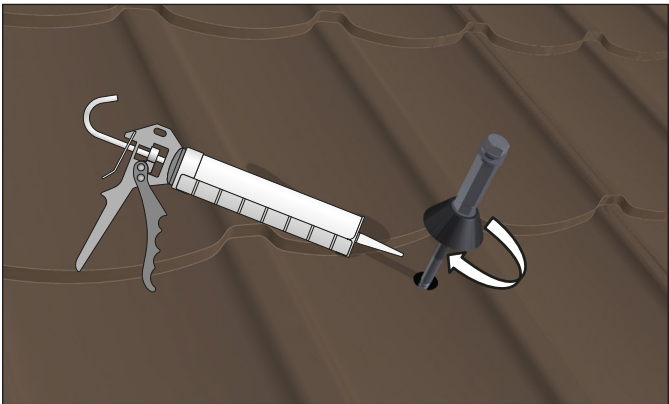


Type	A	B
TS 300, TS 400	1700 - 1870 mm	1020 - 1140 mm
TS 330/M	700 - 870 mm	1020 - 1140 mm
TS 500	1700 - 1870 mm	970 - 1140 mm
TS 530/M	950 - 1130 mm	1020 - 1140 mm

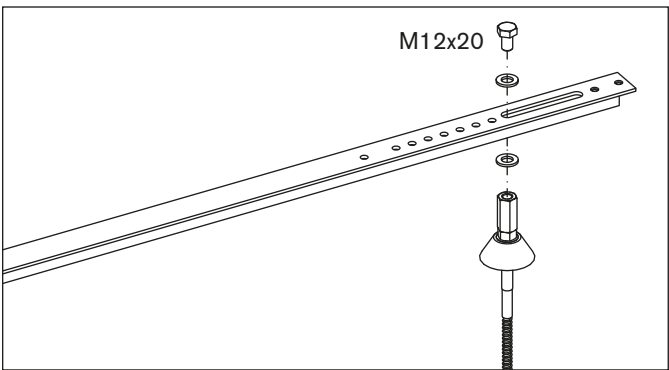
4.3.2 Installation of combi screws



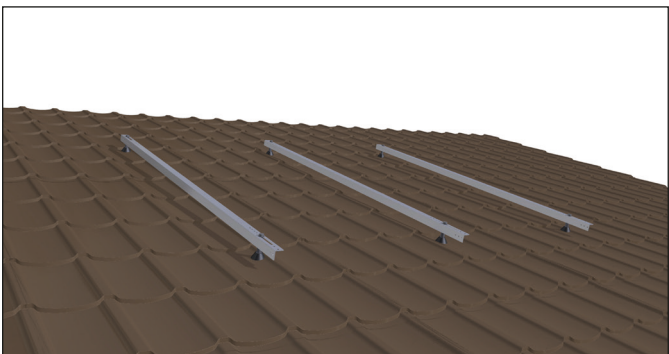
→ Align the mounting spacing of the combination screws with the spacing between the roof rafters.



- ☐ Screw the Combi Screw into the roof rafter
- ☐ Seal all openings using bitumen or polyurethane sealant

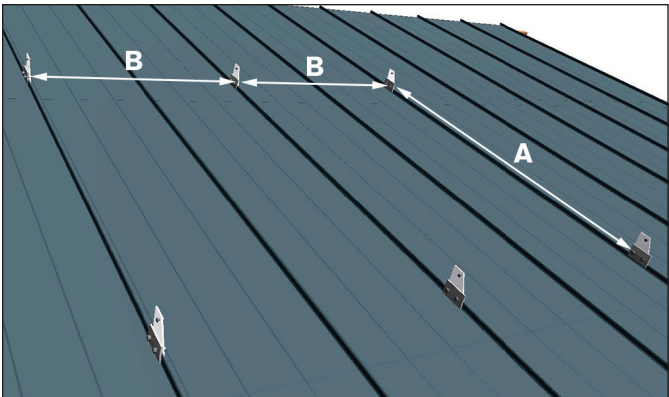


- ☐ Bolt the L-Profile to the Combi Screw



4.4 Clamp with Strut for Metal Sheet Roof

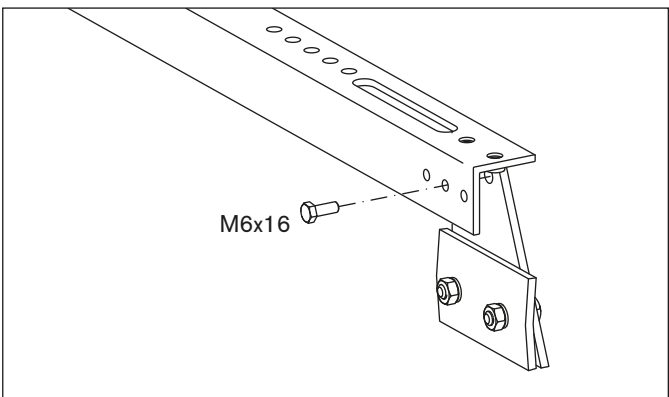
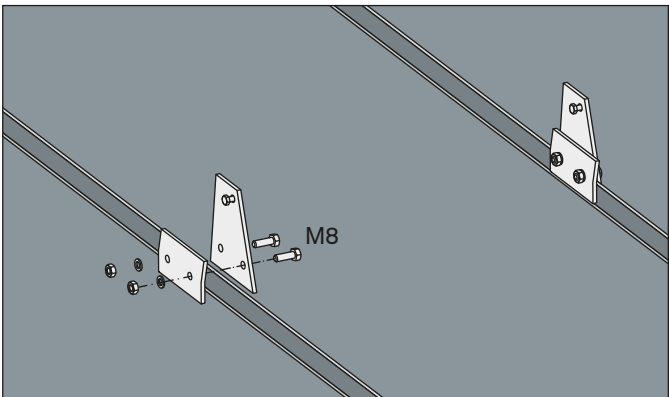
4.4.1 Positioning



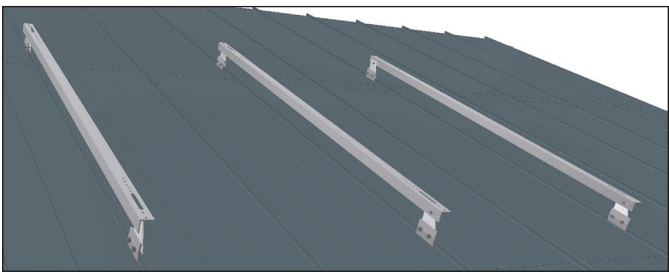
→ The spacing of the clamps with strut for metal sheet roof depends on the type of roof covering.

Type	A	B
TS 300, TS 400	1780 - 1980 mm	1040 ± 100 mm
TS 330/M	780 - 980 mm	1040 ± 100 mm
TS 500	1780 - 1980 mm	800 ± 100 mm
TS 530/M	1230 - 1020 mm	1040 ± 100 mm

4.4.2 Installation of the Clamp with Strut

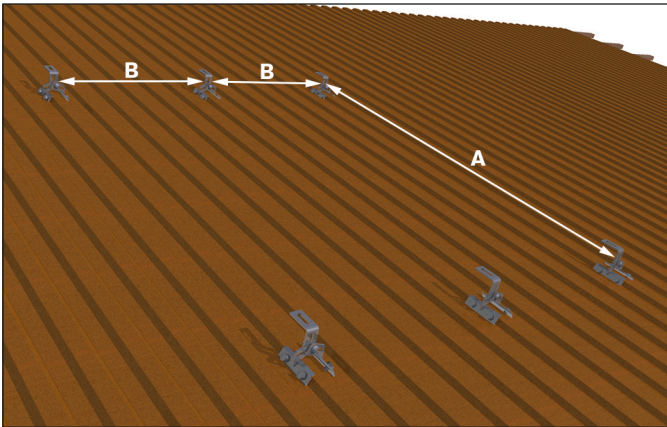


- ☐ Bolt the L-Profile to the Clamp with Strut



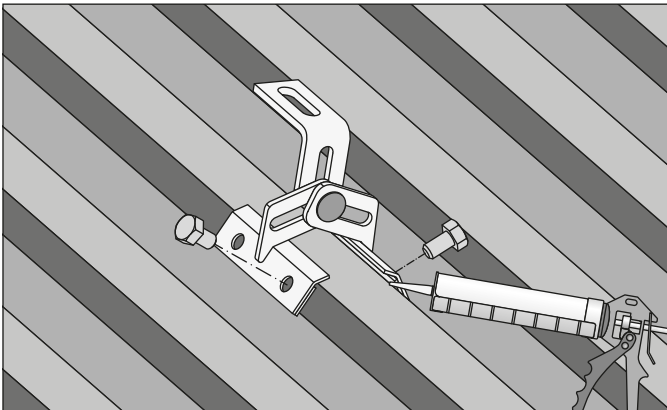
4.5 Stainless Steel Holder

4.5.1 Positioning

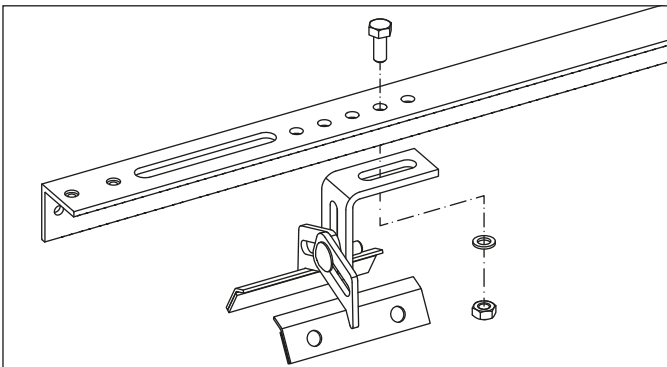


Type	A	B
TS 300, TS 400	1420 - 1660 mm	1040 ± 100 mm
TS 330/M	420 - 660 mm	1040 ± 100 mm
TS 500	1420 - 1660 mm	800 ± 100 mm
TS 530/M	680 - 910 mm	1040 ± 100 mm

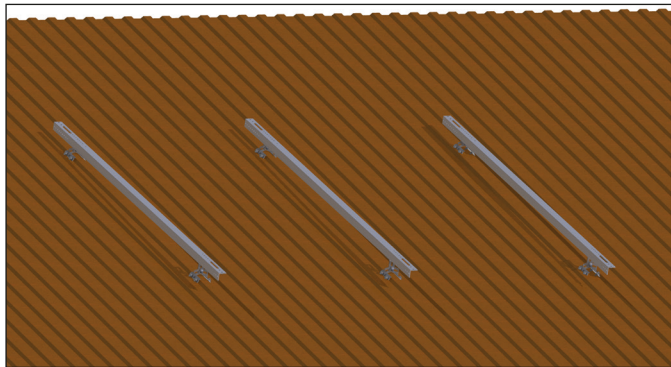
4.5.2 Installation of the Stainless Steel Holder



- ❑ Screw the Stainless Steel Holder to the roof.
- ❑ Seal the holes with bitumen or polyurethane sealant.

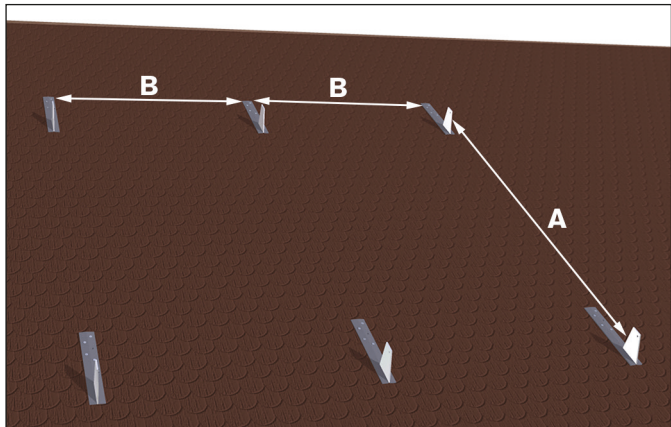


- ❑ Bolt the L-Profile to the Stainless Steel Holder



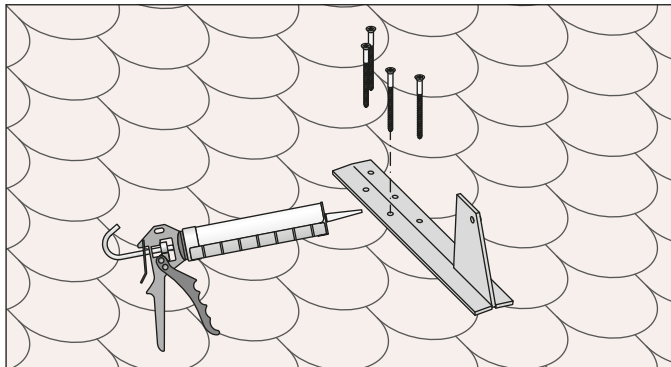
4.6 Straight Roof Hook

4.6.1 Positioning

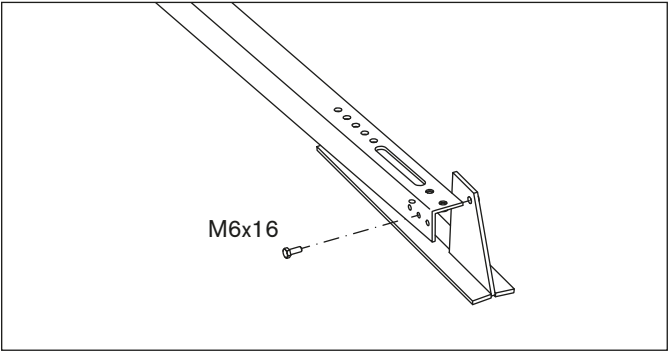


Type	A	B
TS 300, TS 400	1780 - 1980 mm	1040 ± 100 mm
TS 330/M	780 - 980 mm	1040 ± 100 mm
TS 500	1780 - 1980 mm	800 ± 100 mm
TS 530/M	1040 - 1230 mm	1040 ± 100 mm

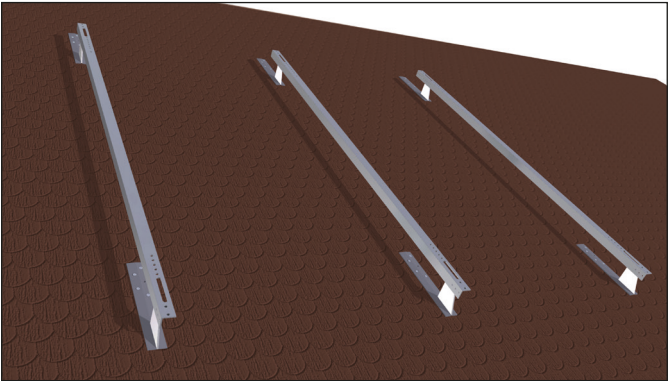
4.6.2 Installation of Straight Roof Hook



- ❑ Screw the Straight Roof Hook to the shingle roof.
- ❑ Seal the holes with bitumen or polyurethane sealant.

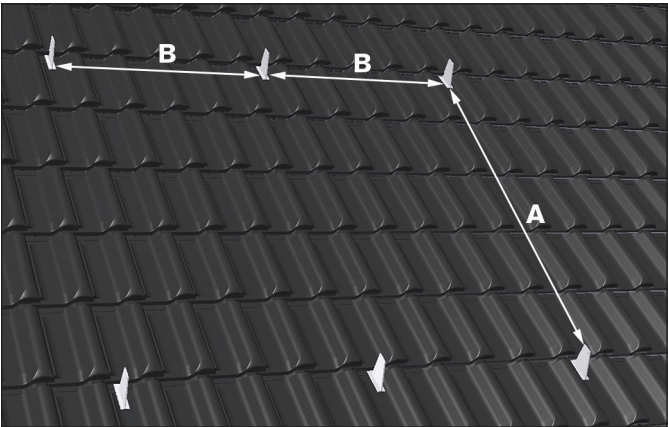


❑ Bolt the L-Profile to the Straight Roof Hook.



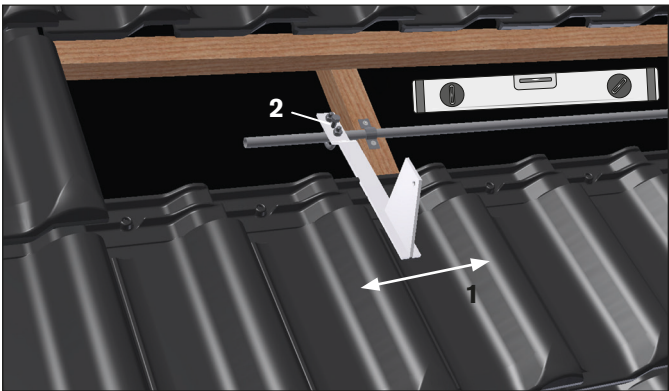
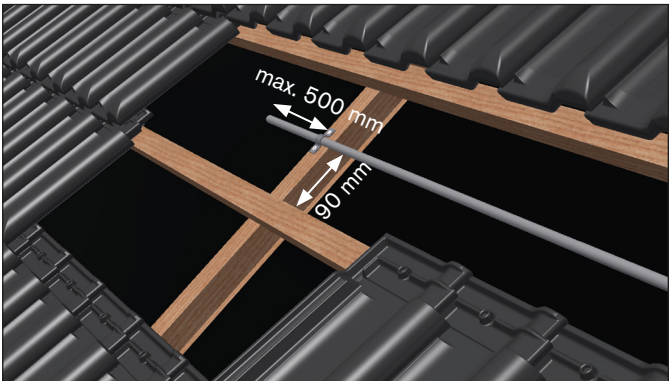
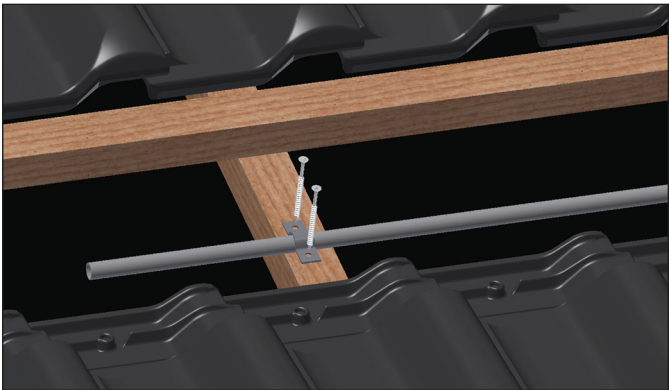
4.7 Aluminium Hook with Steel Tube

4.7.1 Positioning

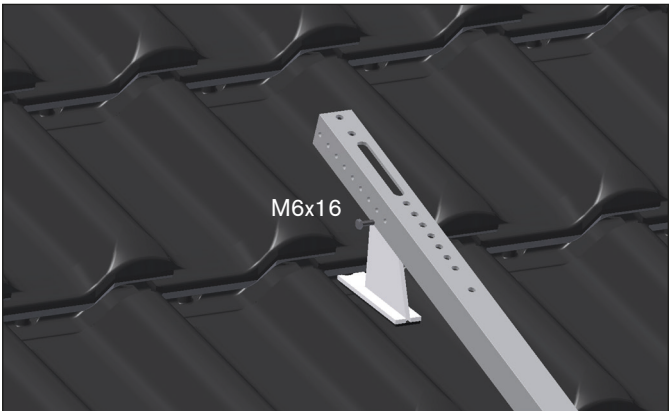


Type	A	B
TS 300, TS 400	1780 - 1980 mm	1040 ± 100 mm
TS 330/M	780 - 980 mm	1040 ± 100 mm
TS 500	1780 - 1980 mm	800 ± 100 mm
TS 530/M	1040 - 1230 mm	1040 ± 100 mm

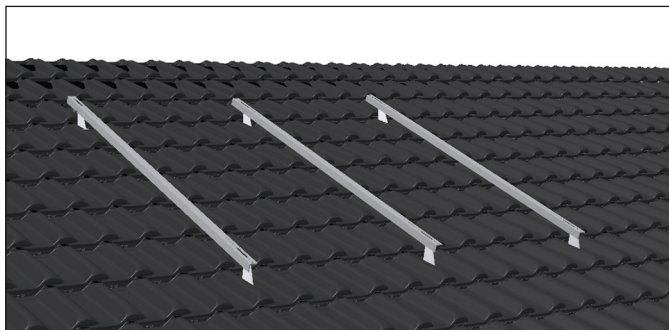
4.7.2 Installation of the Aluminium Hook with Steel Tube



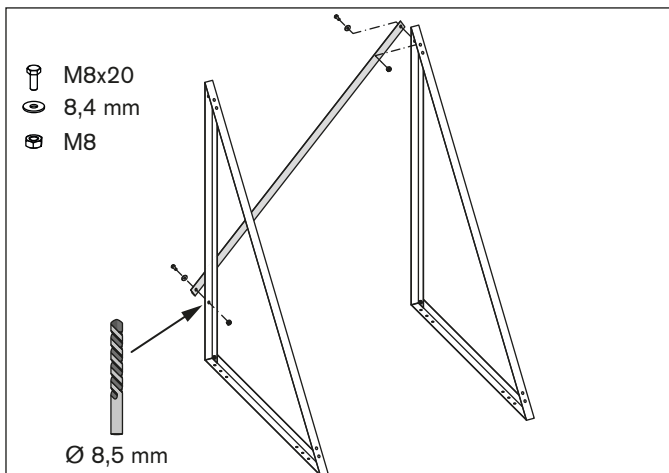
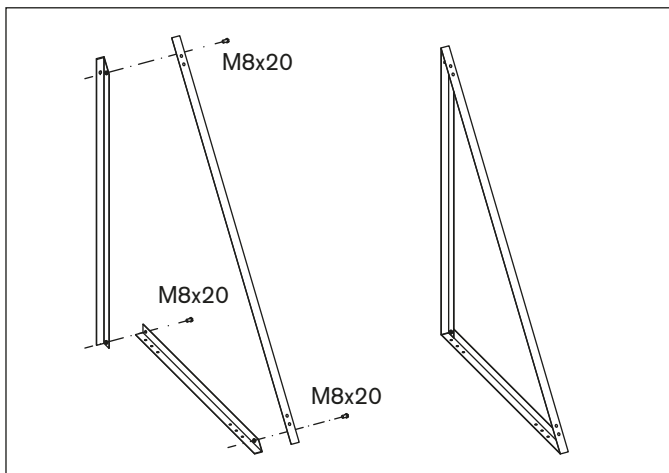
- ❑ Align the aluminum hooks with the center of the roof tile (1)
- ❑ Attach the hook to the steel pipe (2)



❑ Bolt the L-Profile to the Aluminium Hook



4.8 Triangle for Flat Roof, Ground or Facade

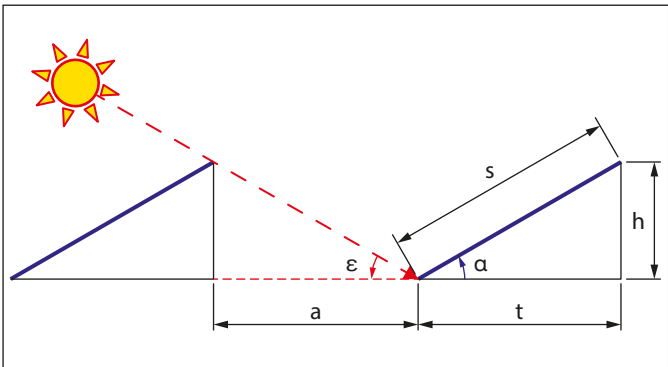


→ Depending on the number of installed triangular frames, additional reinforcement must be installed (L-Profile included in the delivery).

4.8.1 Installation of the Triangle on a Mounting Element or on the Ground



4.8.2 Spacing Between Collector Rows to Prevent Mutual Shading



Calculation Example

Symbol	Description
a	Distance between two collector arrays
s	Collector array length
h	Triangle height
t	Triangle depth
α	Tilt angle
ε	Lowest solar elevation angle

$$s = 2 \text{ m}$$

$$\alpha = 30^\circ$$

$$\epsilon = 20^\circ$$

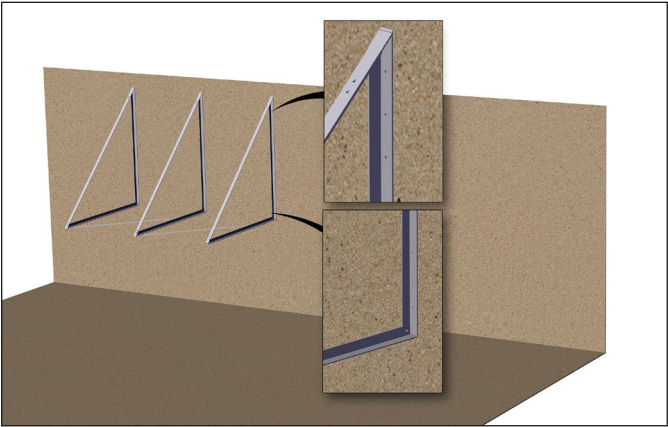
$$a = \frac{s \cdot \sin\left(\frac{\alpha \cdot \pi}{180}\right)}{\tan\left(\frac{\epsilon \cdot \pi}{180}\right)} = \frac{2 \text{ m} \cdot \sin\left(\frac{30^\circ \cdot \pi}{180}\right)}{\tan\left(\frac{20^\circ \cdot \pi}{180}\right)}$$

$$a = 2,75 \text{ m}$$

$$t = s \cdot \cos\left(\frac{\alpha \cdot \pi}{180}\right) = 2 \text{ m} \cdot \cos\left(\frac{30^\circ \cdot \pi}{180}\right)$$

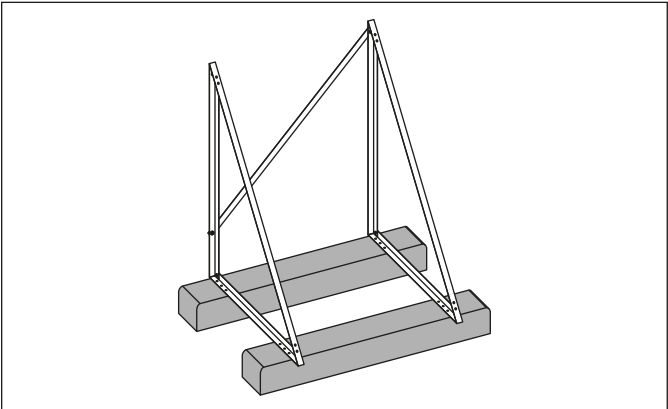
$$t = 1,73 \text{ m}$$

4.8.3 Installation of the Triangle on a Facade

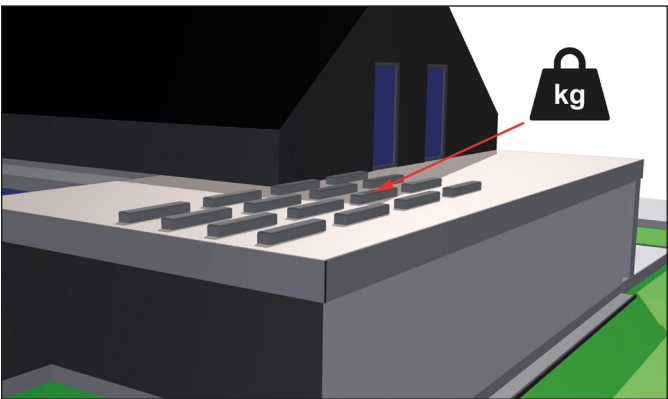


Anchoring to vertical structures is a specific process and shall be assessed by a qualified professional.
Anchoring elements for securing the support structure shall be selected according to the project specifications. Anchoring elements are not included in the delivery.

4.8.4 Ballasting of Non-Anchored Triangular Structures



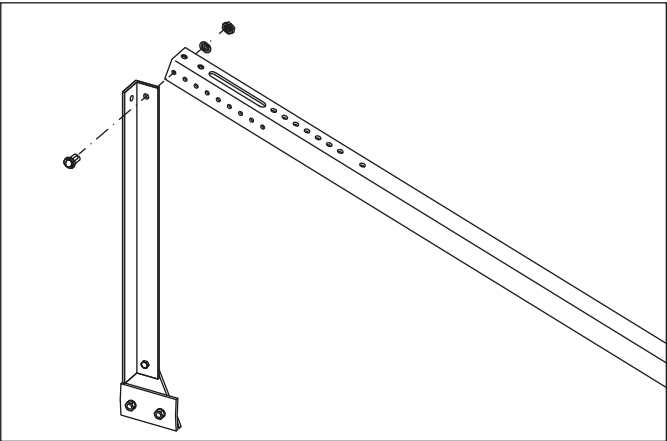
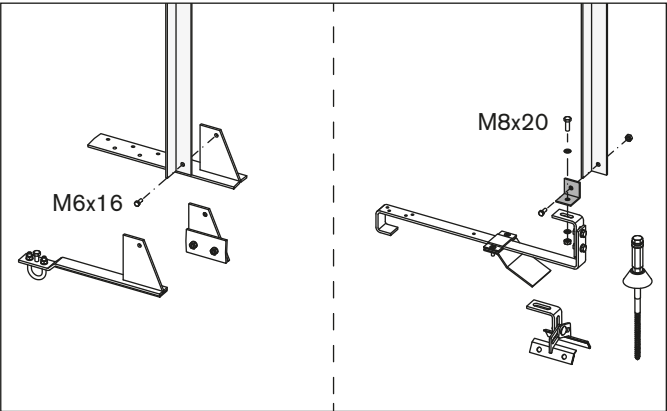
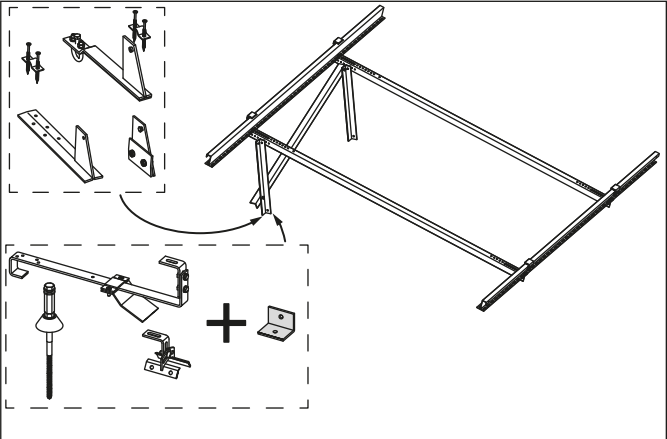
If the collector array cannot be directly fixed to the underlying roof structure, a ballast structure shall be installed on the roof or on the ground. This stabilizing structure must secure the supporting structure against wind pressure by applying sufficient load (reinforced concrete blocks, steel structure, etc.).

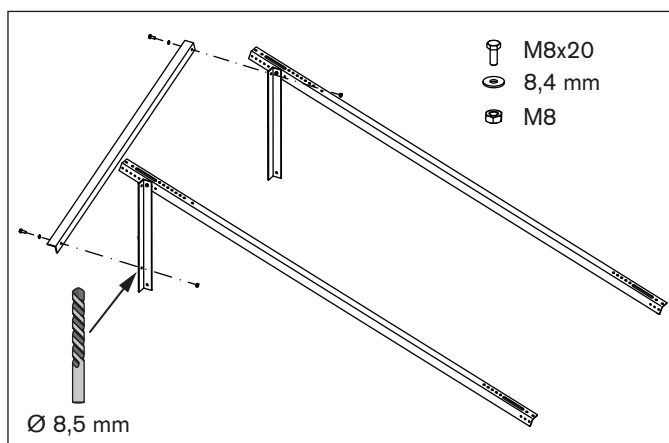


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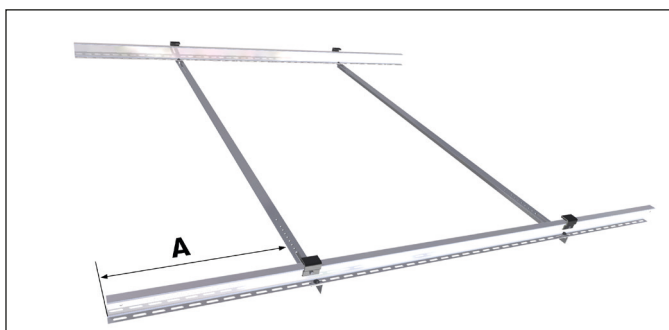
The required ballast weight shall be determined by a qualified professional. The supplier assumes no liability for any damage resulting from an incorrectly designed installation.
The recommended ballast load per collector is 150 to 350 kg.

4.9 Lifting

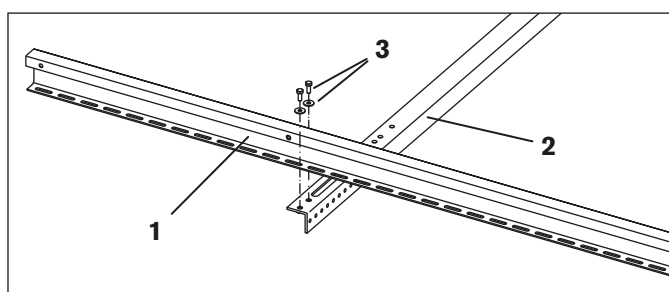




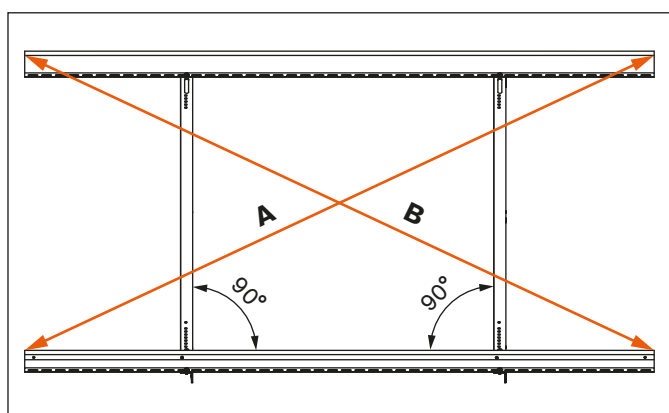
4.10 Connection of L- and Z-Profiles



Optimálna vzdialenosť **(A)** L-profilu od bočnej hrany je 400 mm, maximálne 550 mm..

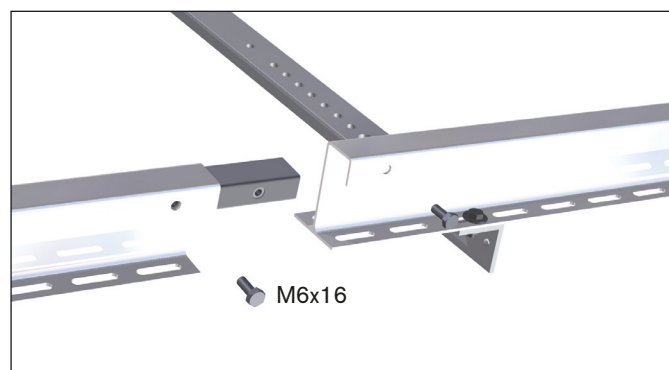


☐ Connect the Z-profile **(1)** and the L-profile **(2)** using M6x16 screws and washers **(3)**.

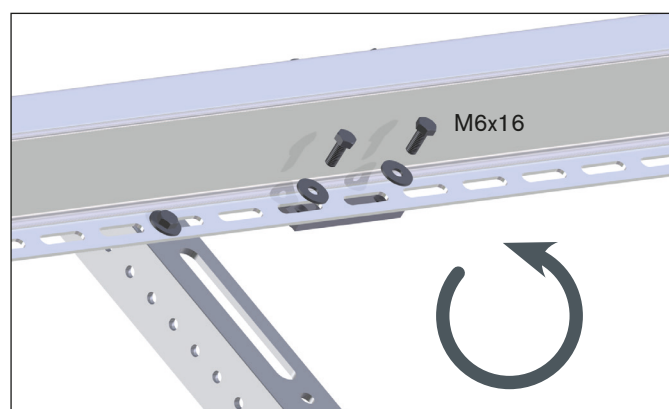
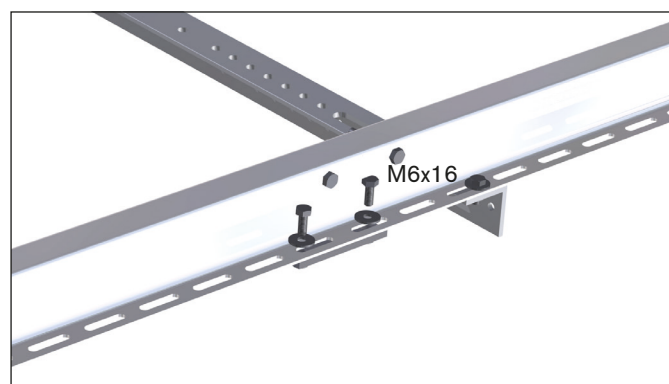


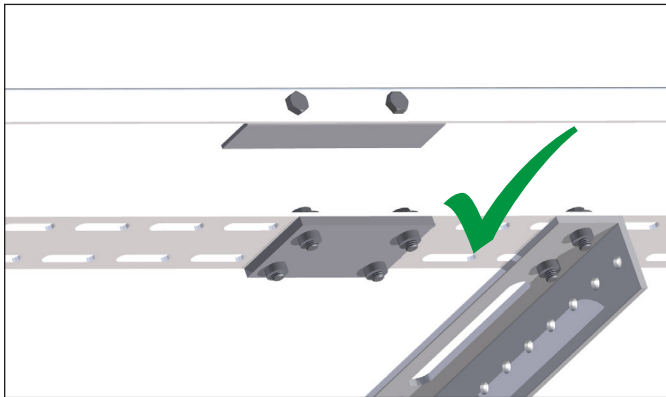
☐ Screw the frame profiles together at a right angle
 ☐ Measure diagonals A and B
 → The diagonals must be equal, ± 1 cm

4.10.1 Connecting the Z-Profile with a connecting set

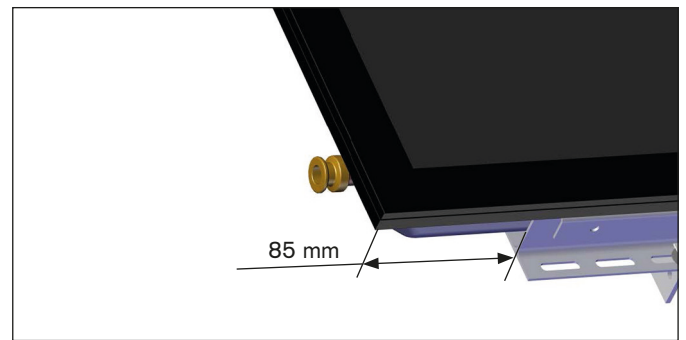


4.10.2 Additional connection of Z-profiles using a connecting set (reinforcing)





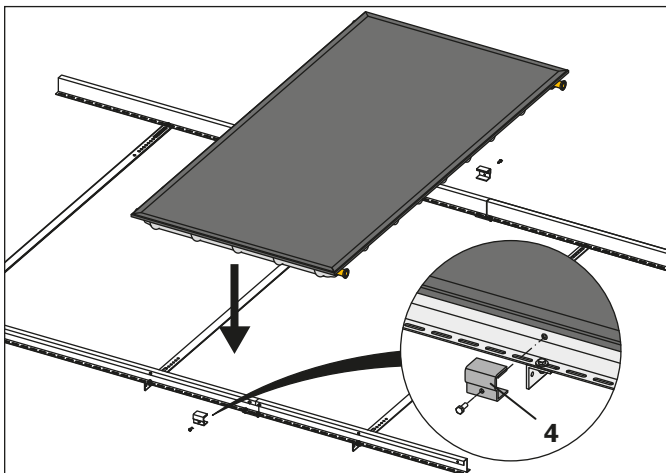
2 x Compensator



4.11 Inserting and securing the collector

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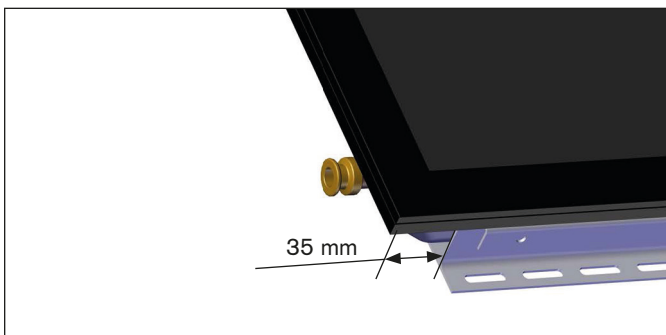
Start by inserting the panels into the center of the frame.



- ☐ Insert the panel into the frame.
- ☐ Use wind anchors **(4)** to secure the panels at the top and bottom.

When using compensators, the collectors must be installed with the specified overlap on both sides of the collector array.

1 x Compensator



5 Hydraulic System

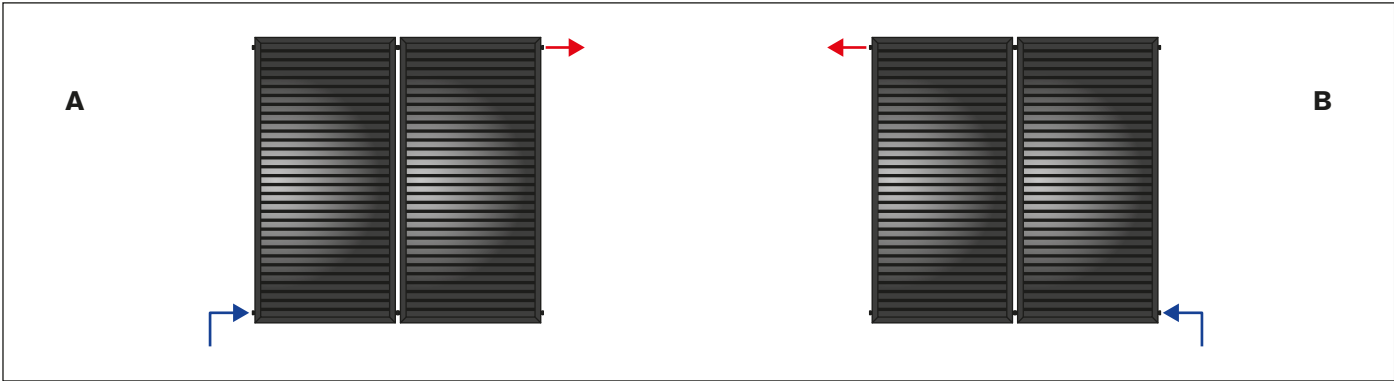
5.1 General

Maximum Number of Collectors					
Collector Type	TS 300	TS 400	TS 500	TS 330/M	TS 530/M
Without compensation kit	10	5	8	5	5
1 × compensation kit (set)	12	8	10	6	6
2 × compensation kit (set)	-	12	-	-	-

The connection diagrams shown represent only a selection of possible configurations. For any other collector array connection, an individual design and quotation are required.

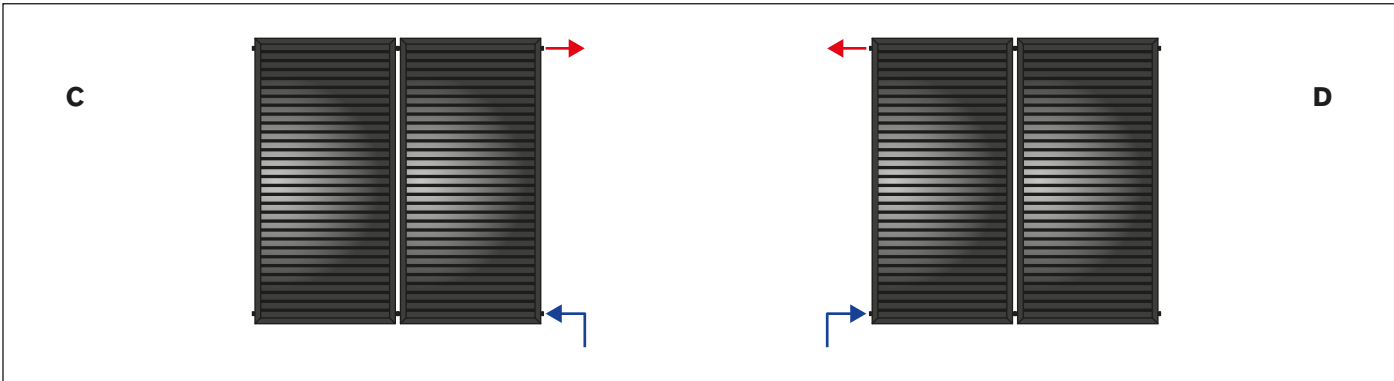
5.2 Connection Diagrams

Standard Connection



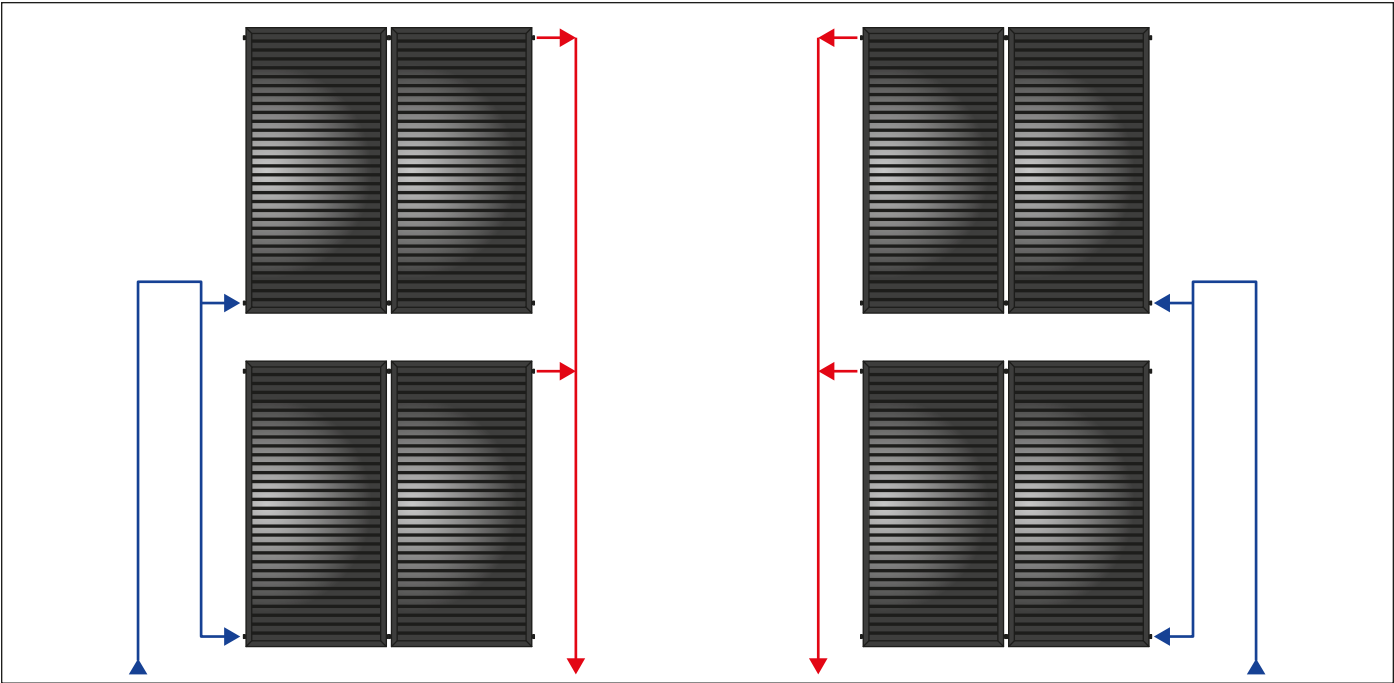
Standard connection set (A) and Reversed connection set (B).

Special Single-Sided Connection

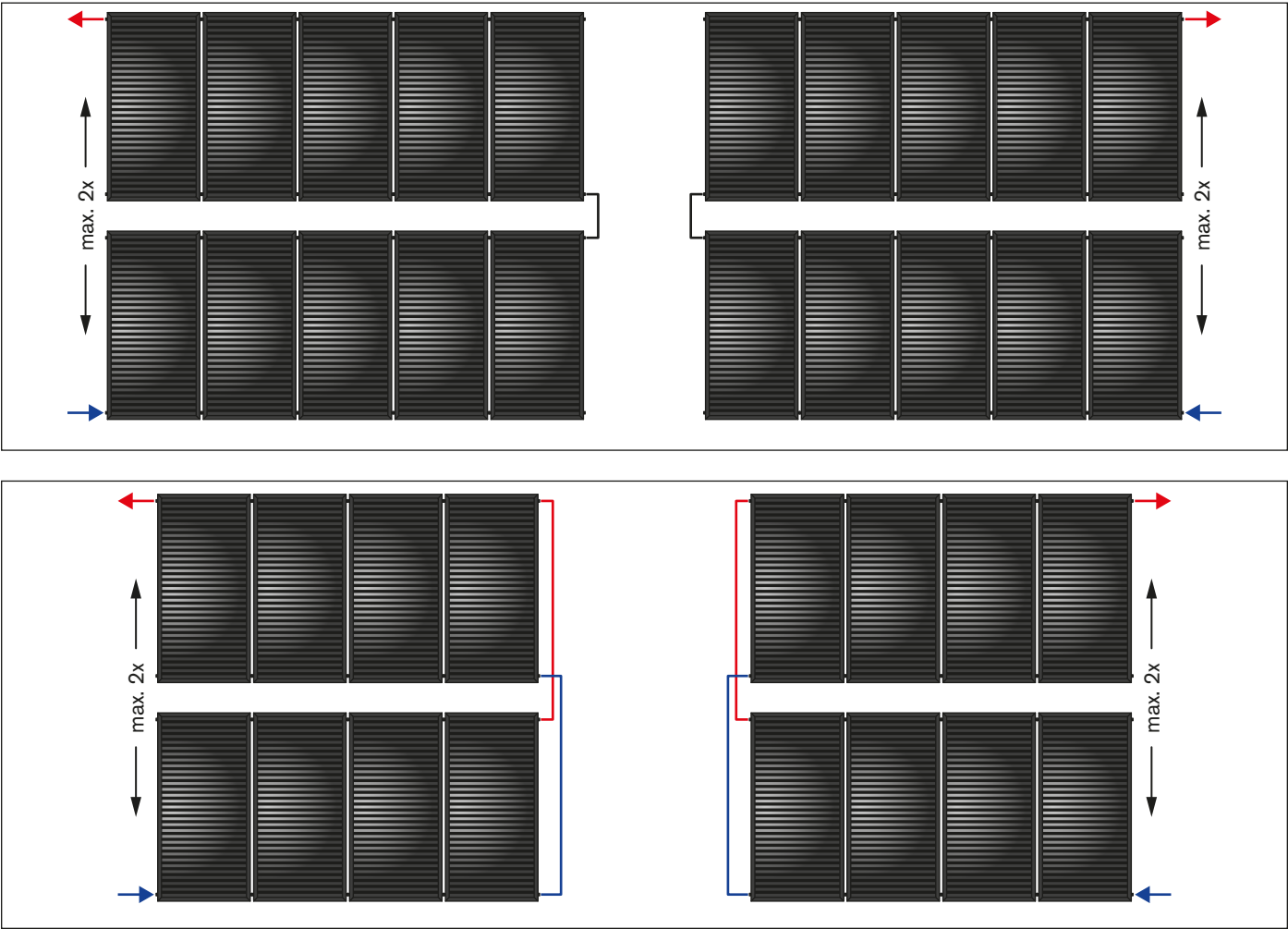


A maximum of 4 TS 300 and TS 400 collectors, and a maximum of 3 TS 330/M, TS 530/M and TS 500 collectors. Right-hand single-sided connection set (C) and Left-hand single-sided connection set (D).

Connection

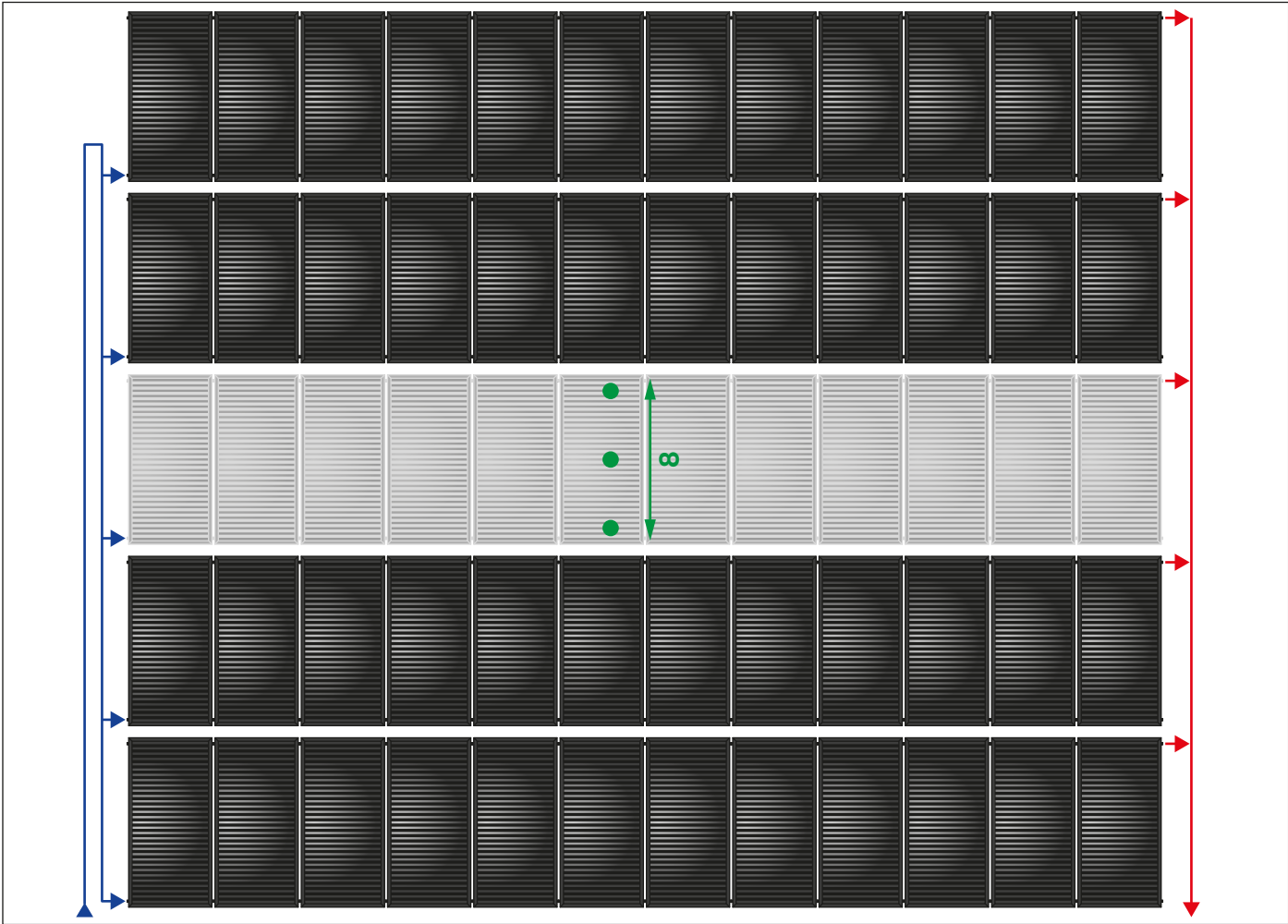
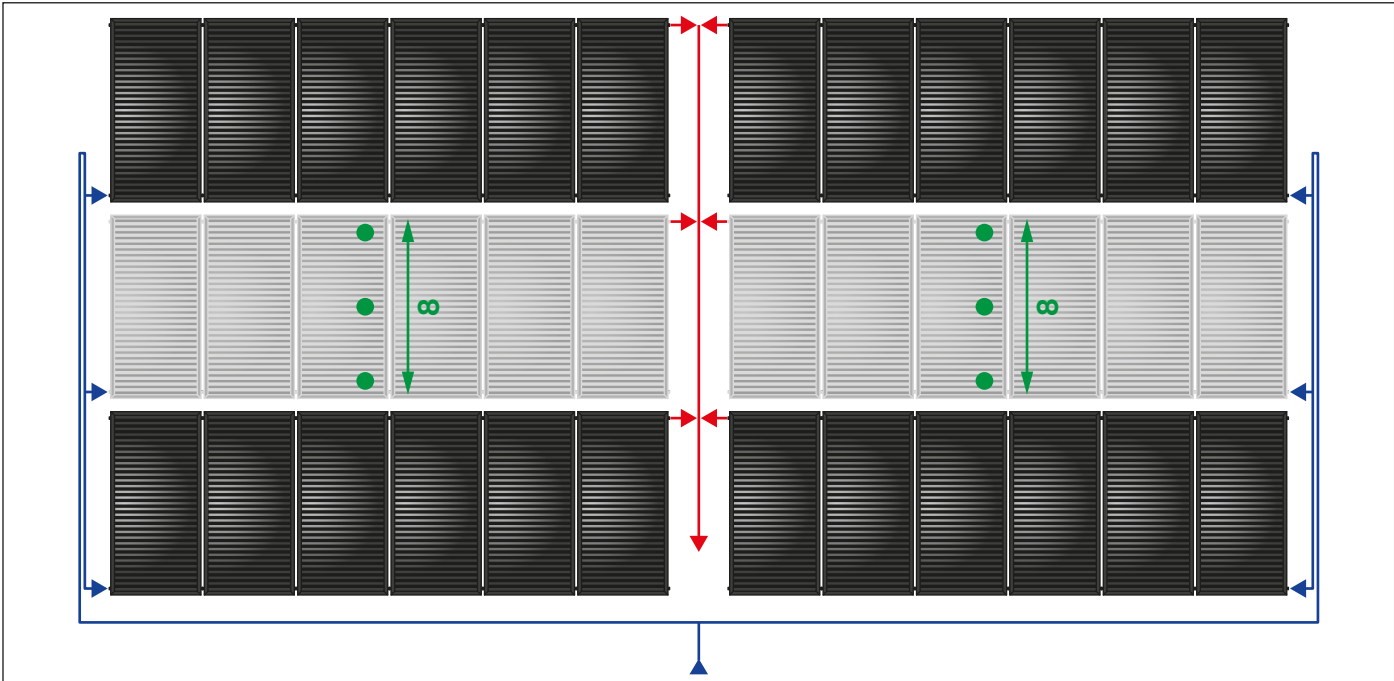


5.3 Two-Row Collector Arrays



A maximum of 2 rows is allowed for this type of configuration. See the table at the beginning of this chapter.

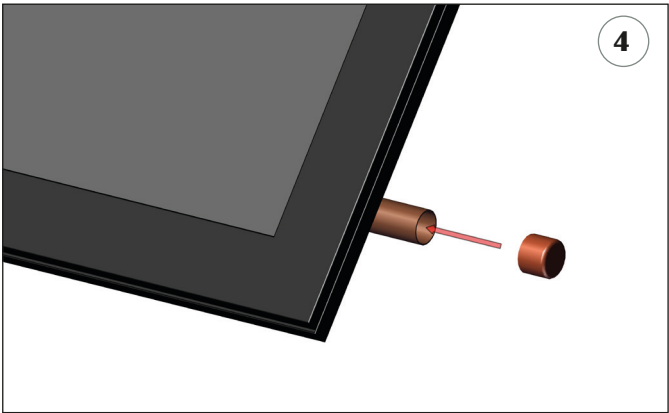
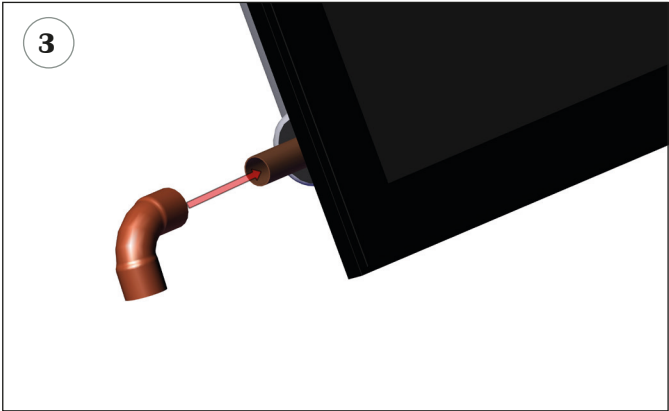
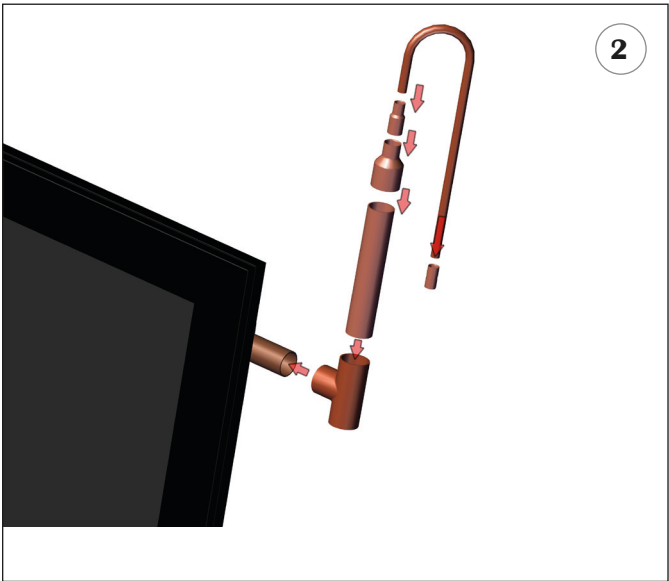
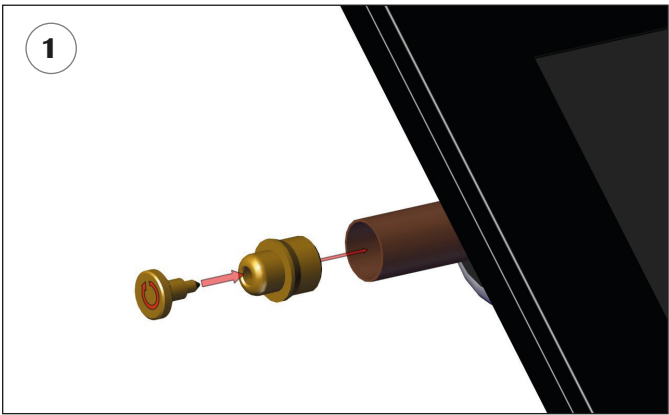
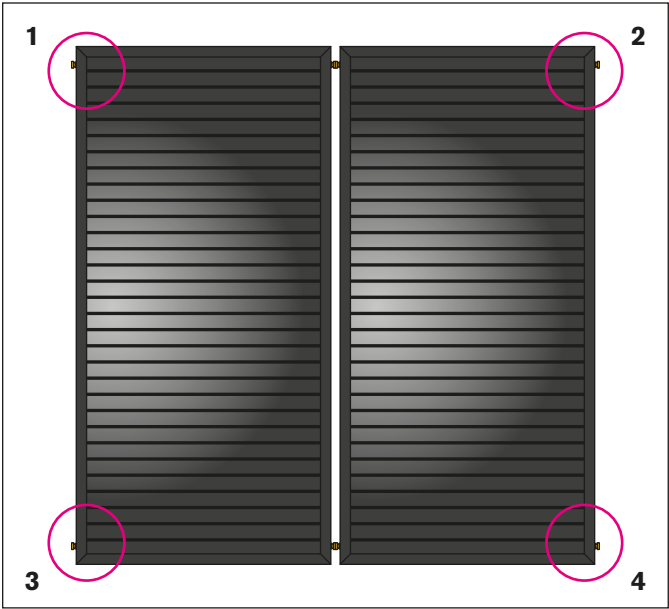
5.4 Large collector arrays



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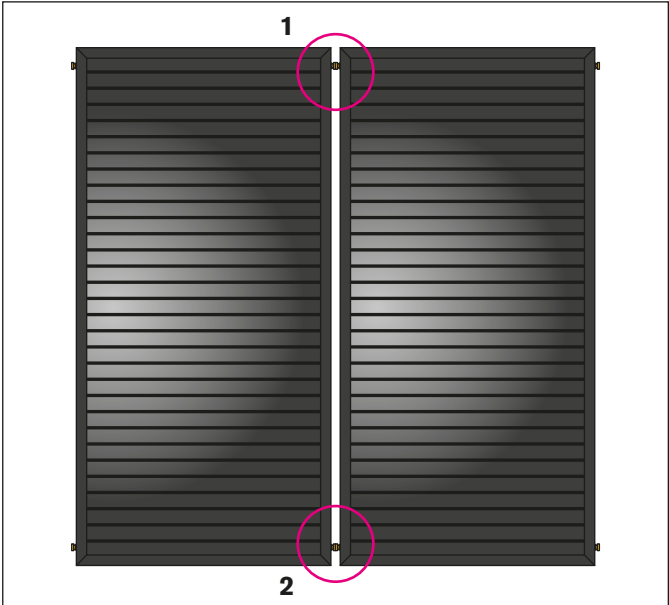
Other collector array configurations require a custom design.

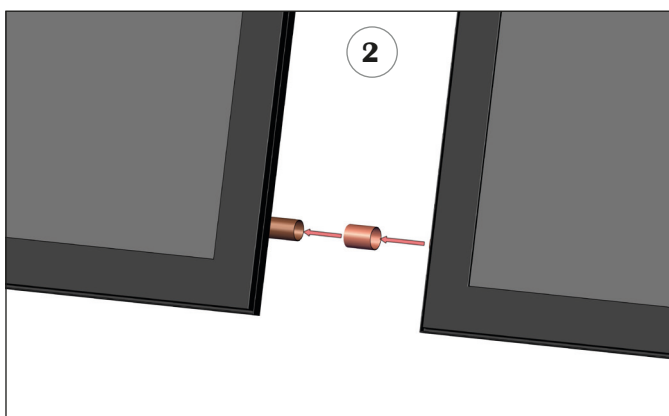
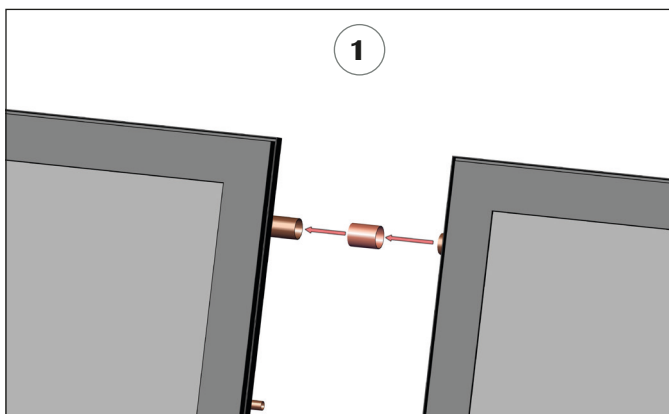
5.5 Basic assembling set (soldering)



Recommended soldering with hard copper or silver solder.

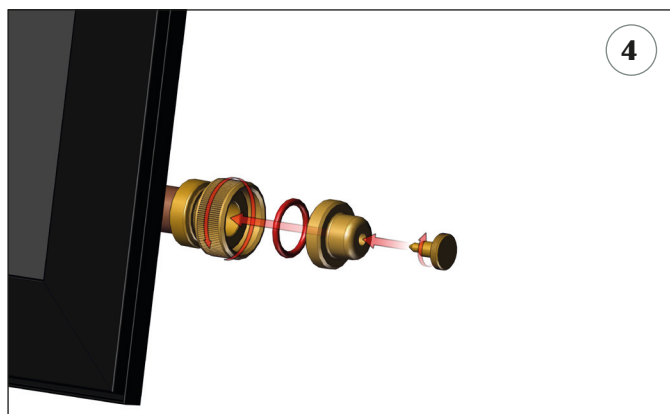
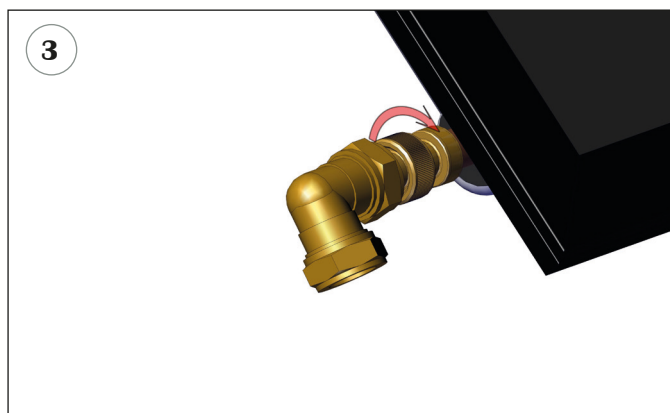
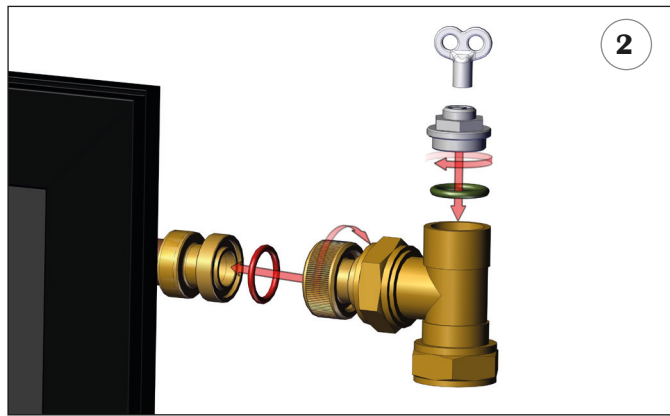
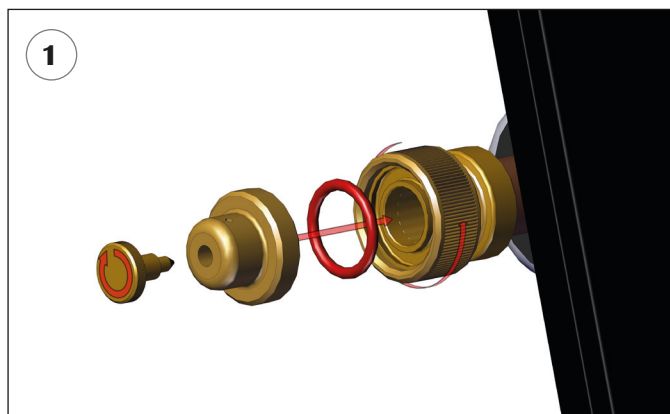
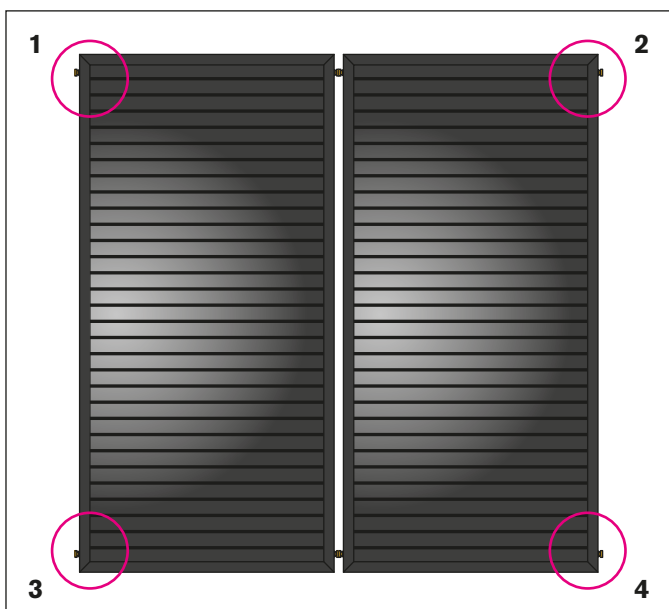
5.6 Basic assembling set (soldering) - extension



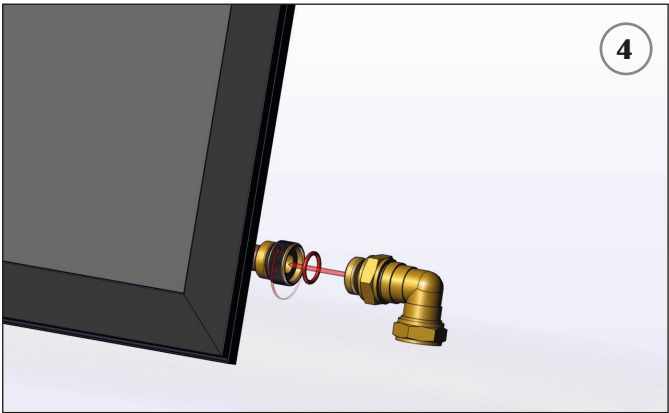
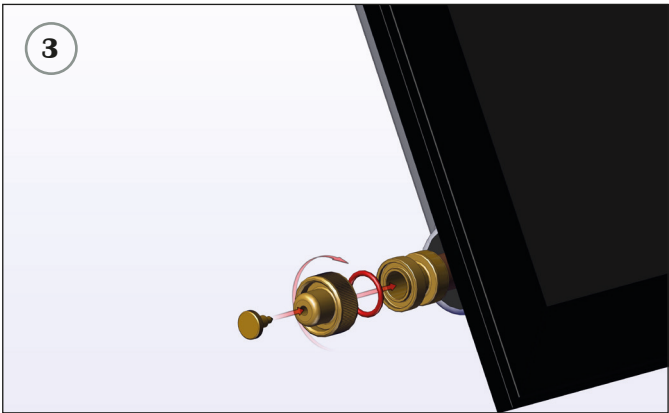
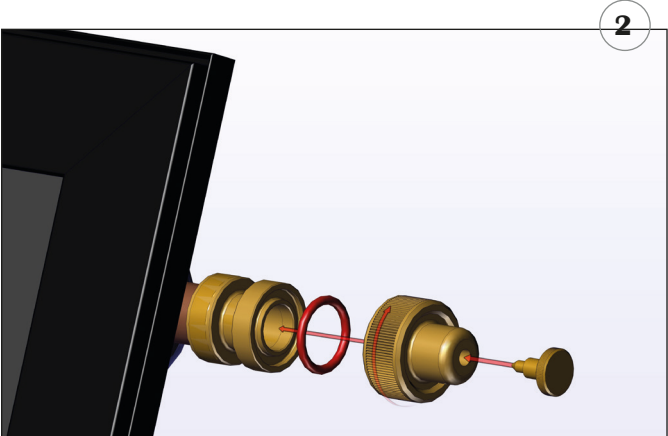
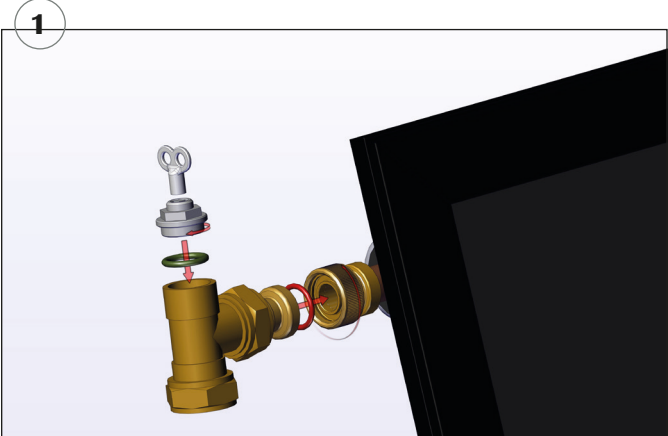
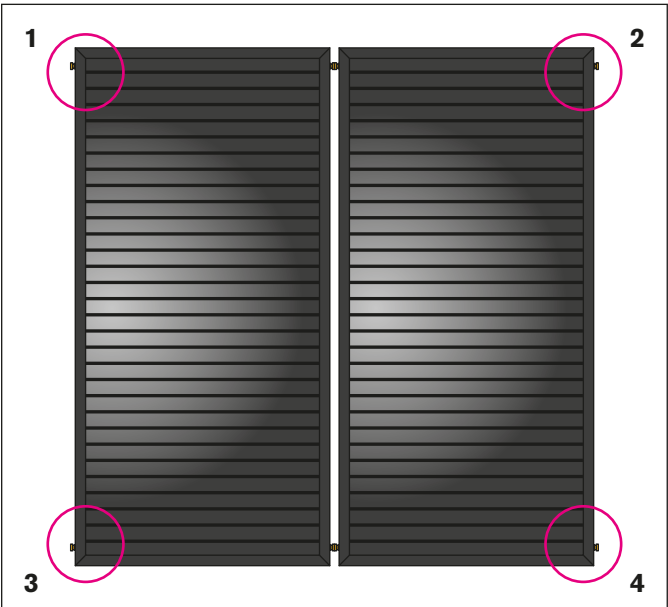


Recommended soldering with hard copper or silver solder.

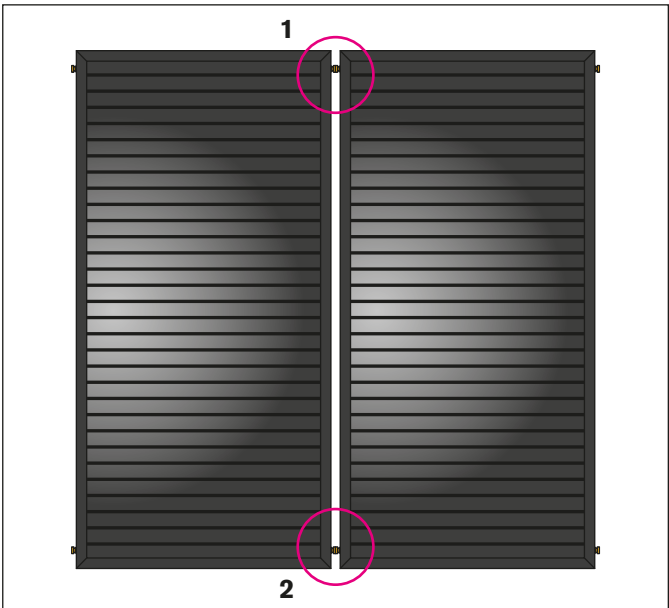
5.7 Basic assembling set - with union nut connections

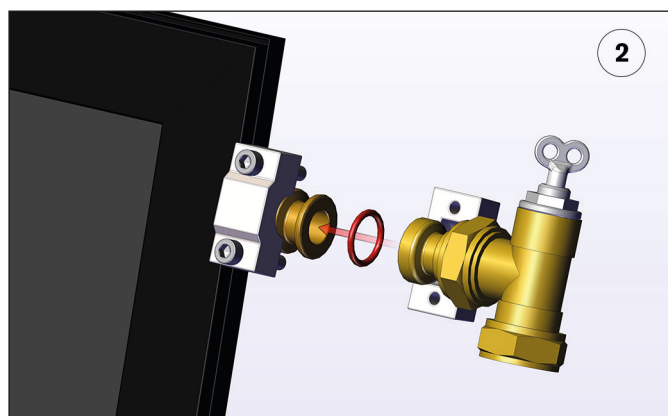
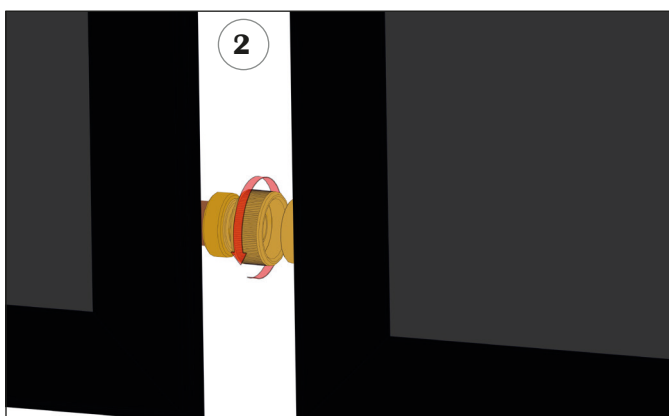
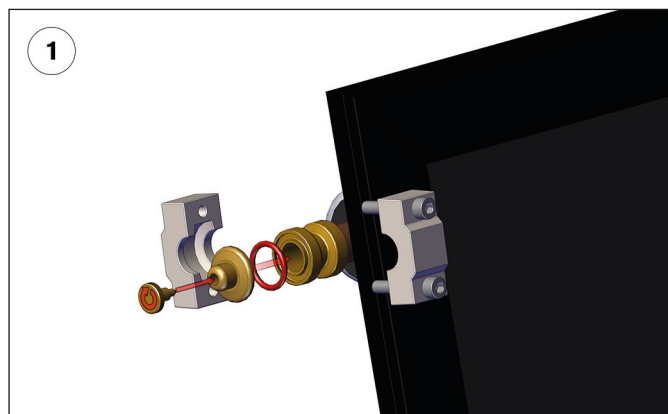
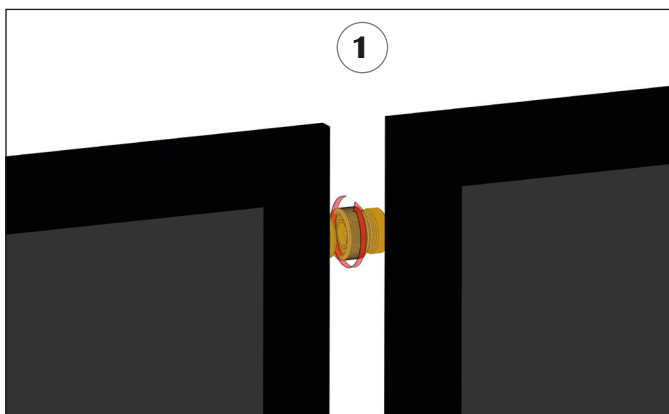


5.8 Basic assembling set - with union nut connections - reversed



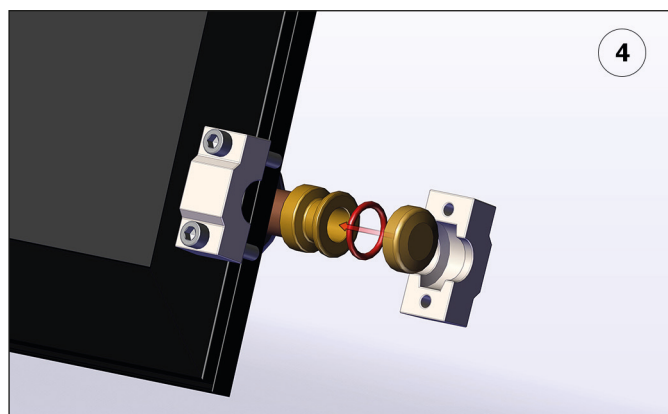
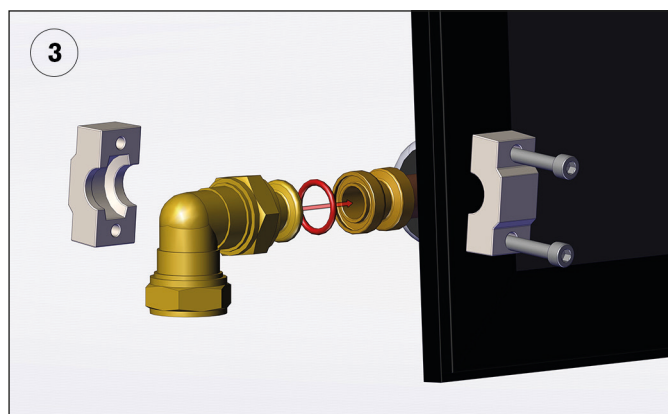
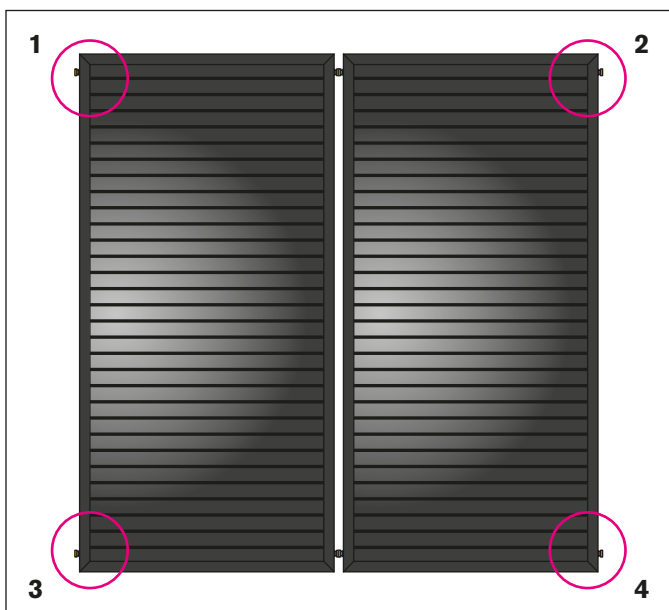
5.9 Connection of collectors with union nut connections



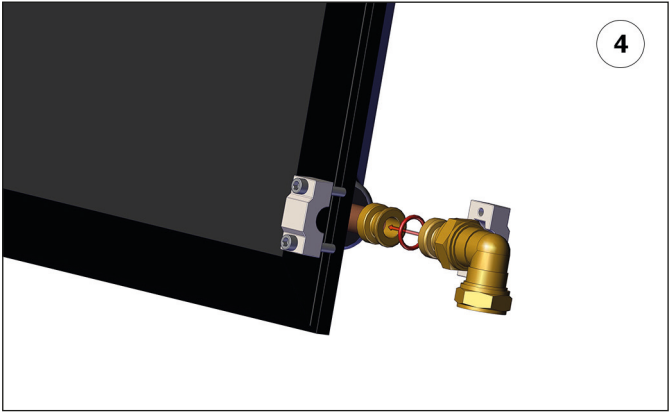
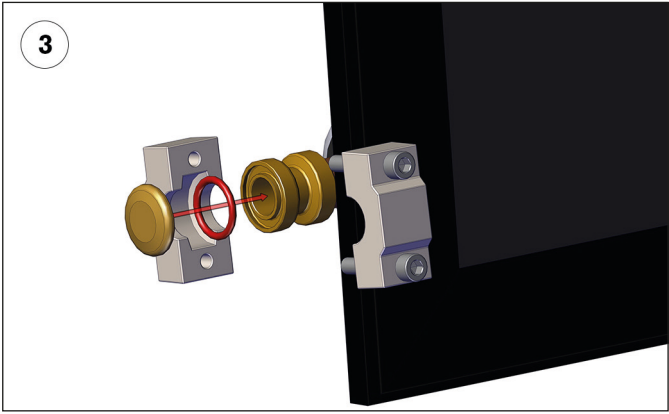
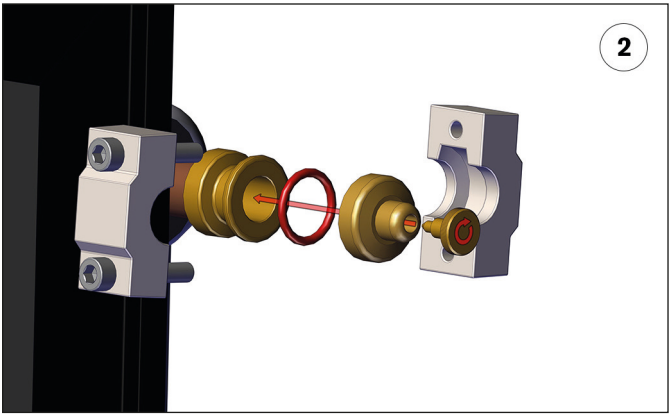
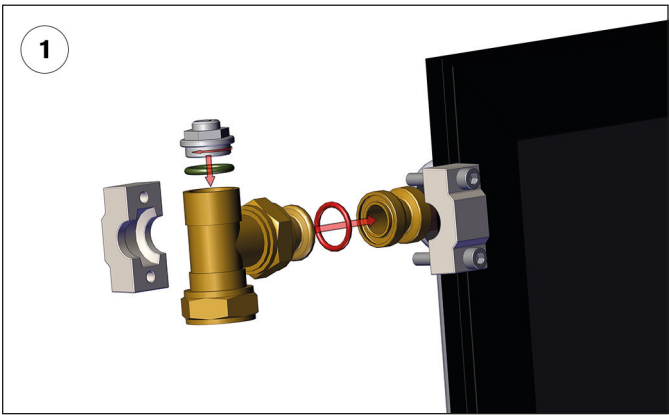
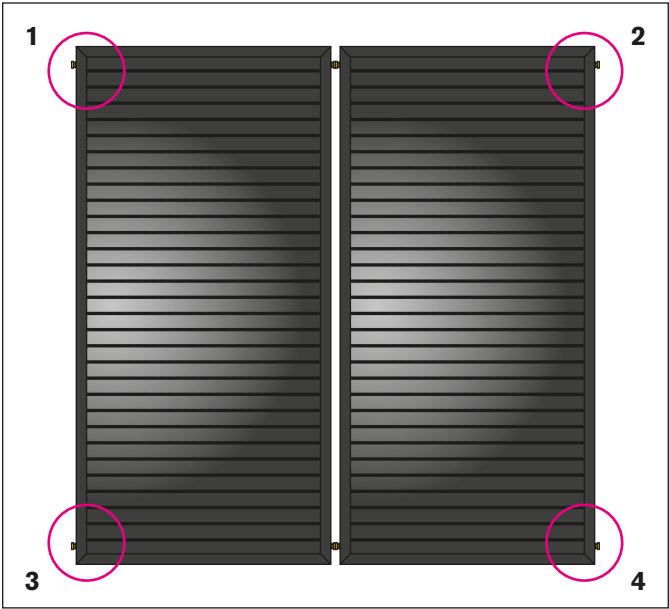


No additional connection kit is required for connecting manifold collectors. The collectors are connected using the integrated manifold couplings.

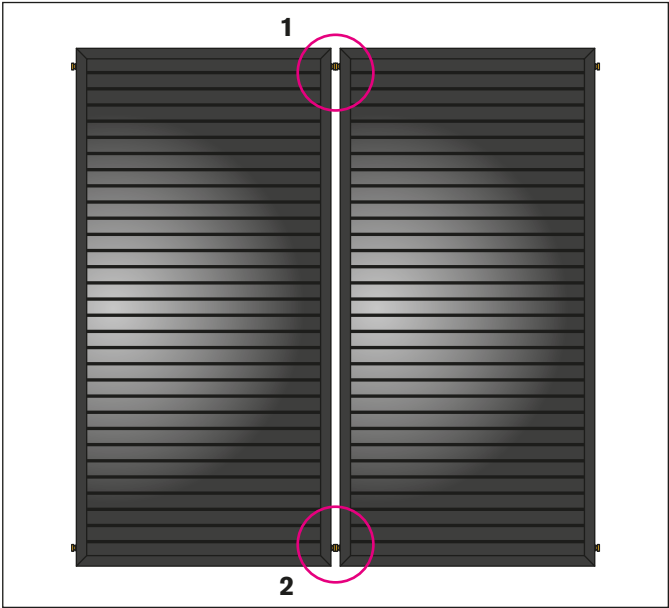
5.10 Basic set for flanged connections

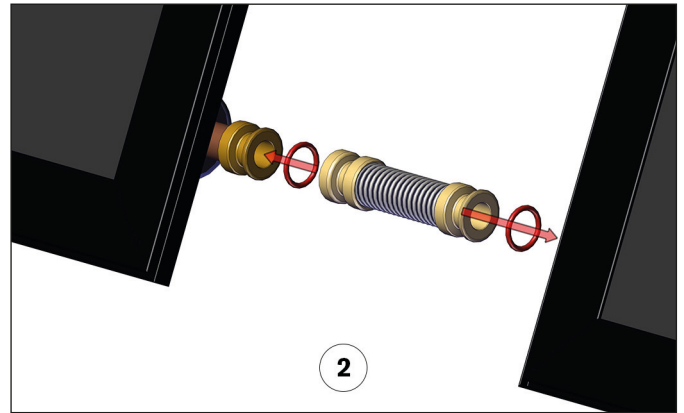
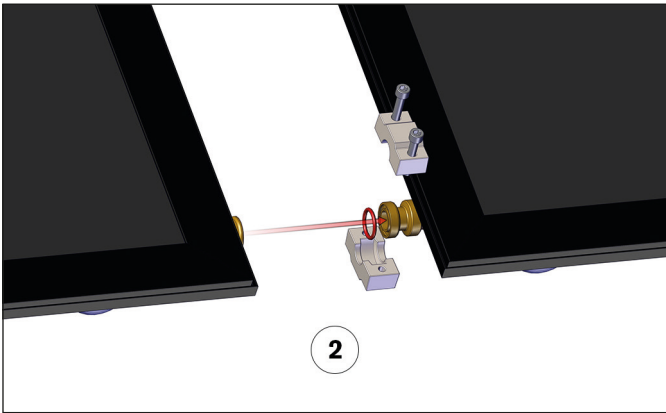
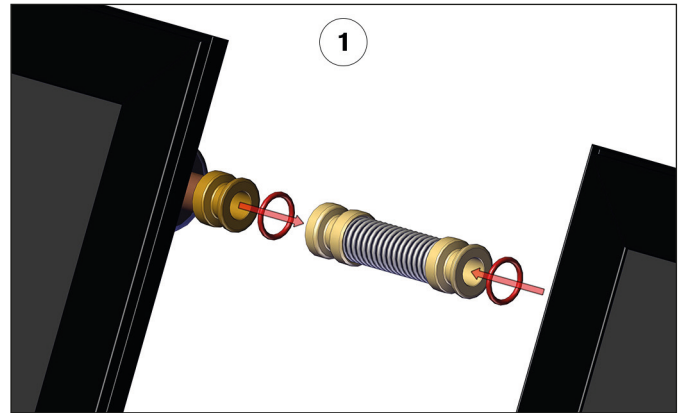
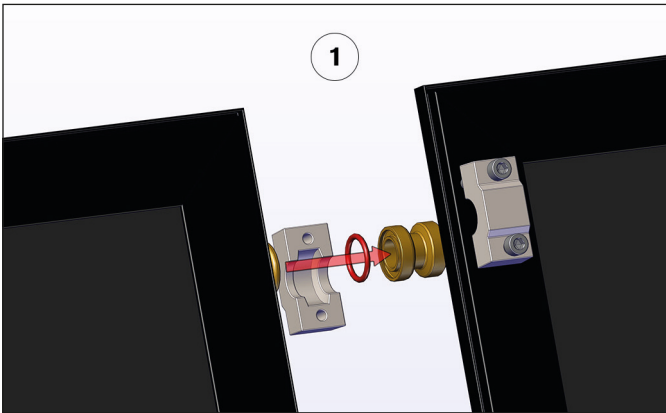


5.11 Basic set for flanged connections reversed



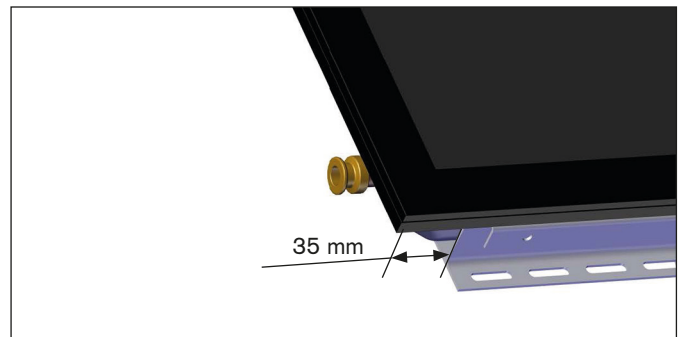
5.12 Extension set





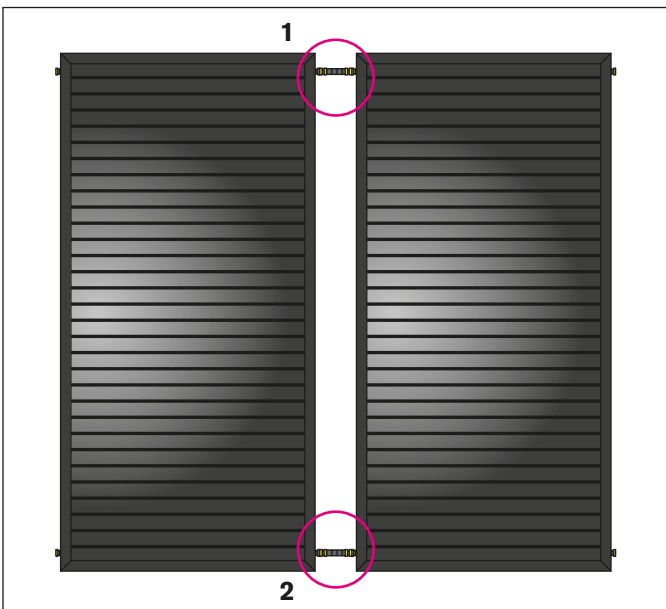
For larger collector arrays, use a Compensation Kit.

- TS 300: from 11 collectors
- TS 500: from 9 collectors
- TS 330M, TS 350M: from 6 collectors
- Install the Compensation Kit as close as possible to the centre of the collector array.

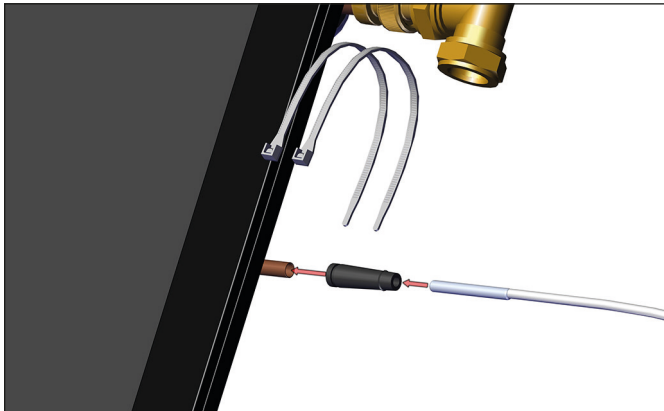
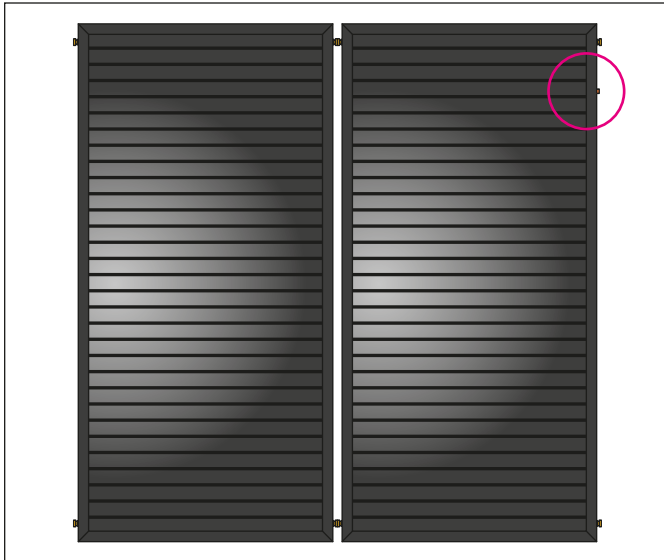


When using compensators, the collectors must be installed with the specified overlap on both sides of the collector array.

5.13 Flanged compensation set

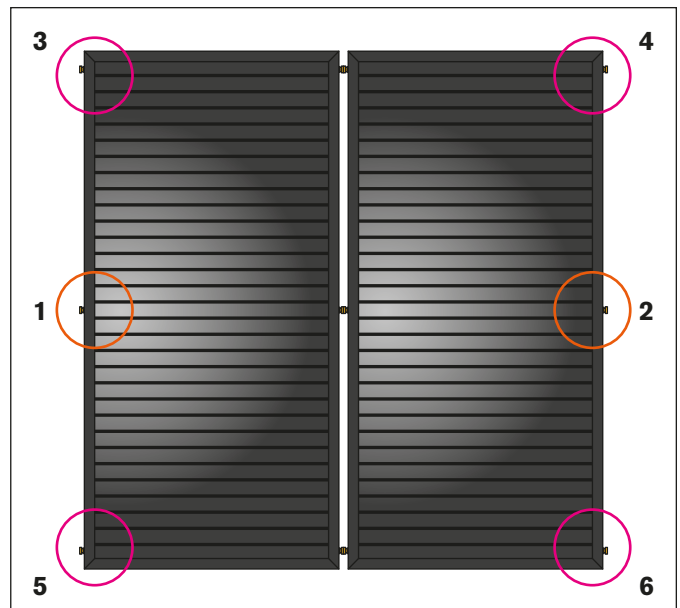


5.14 Installation of a Temperature sensor



- ☐ Apply thermal paste to the sensor.
- ☐ Secure the sensor with cable ties to prevent it from falling out.
- ☐ Protect the cable with a suitable cover (protective tube) against UV radiation and damage by animals.
- ☐ Place the cable connections in a UV-resistant junction box; minimum protection class IP44.

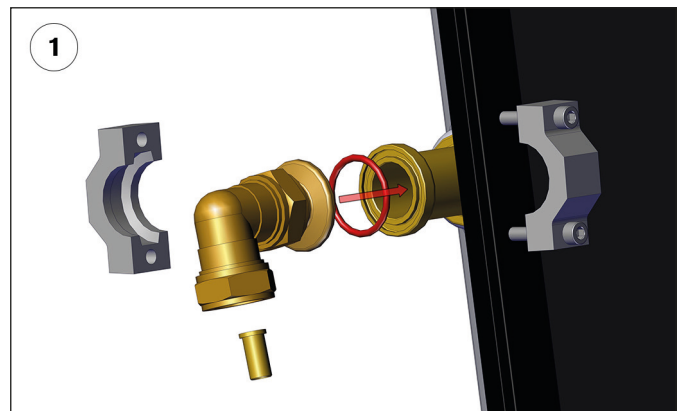
5.15 Basic set for TS 400



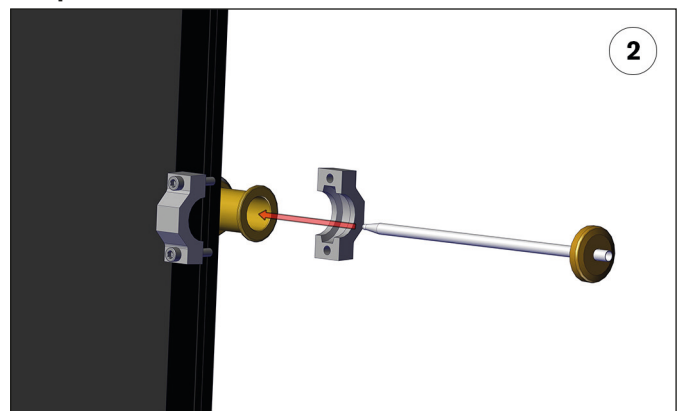
Recommended installation order:

First, the vacuum circuit (**1-2**); then, the hydraulic circuit (**3-6**).

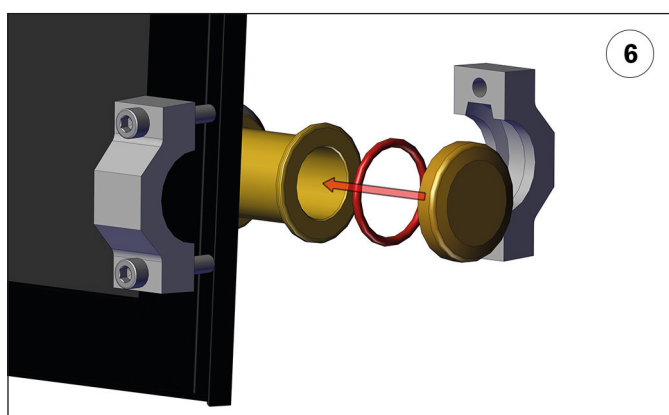
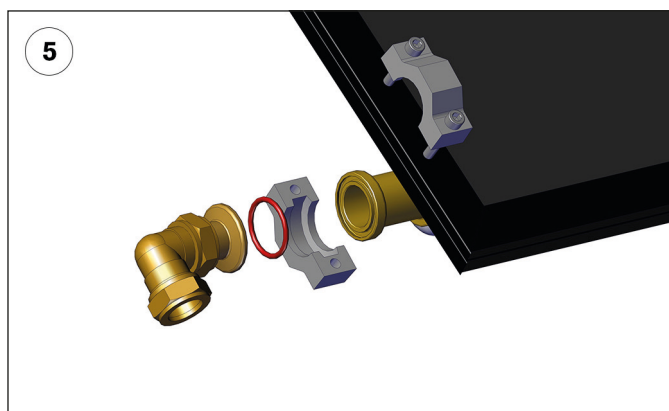
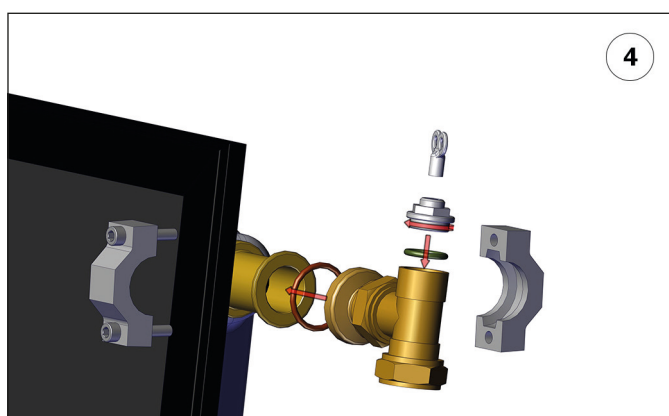
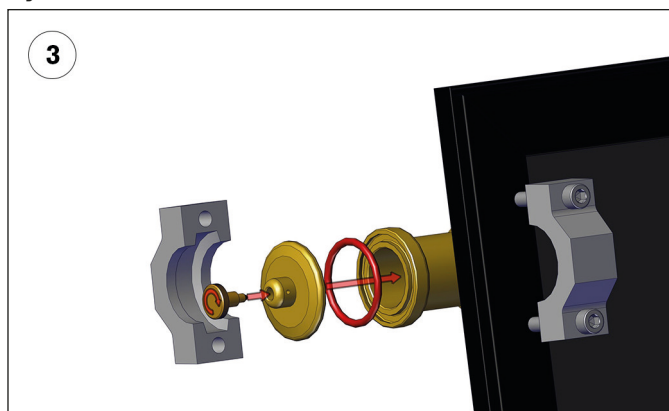
Vacuum circuit



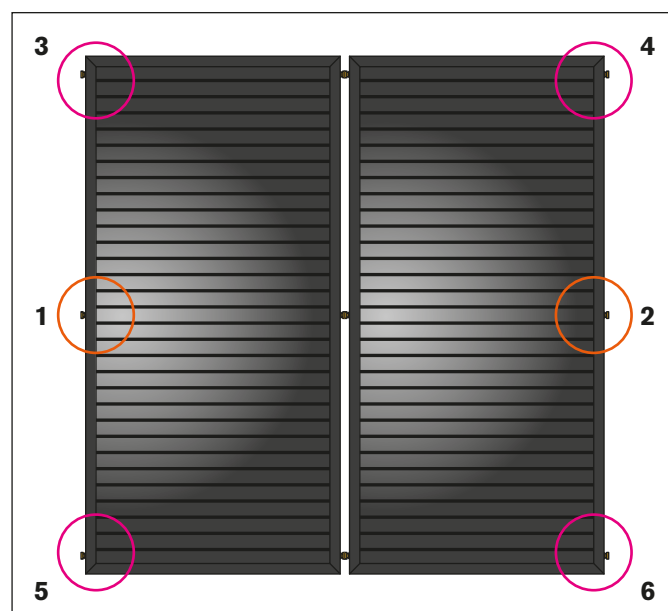
Temperature Sensor



Hydraulics



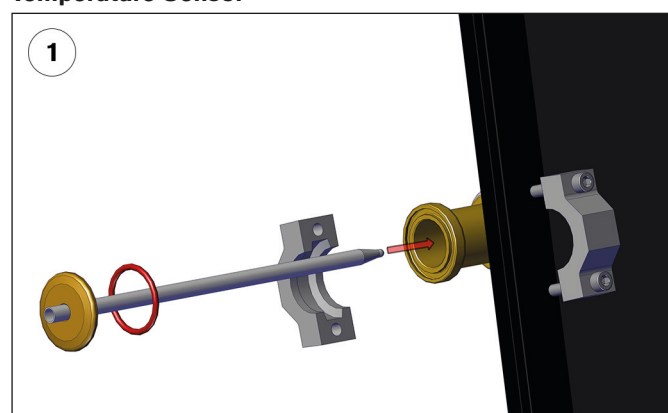
5.16 Basic set for TS 400 reversed



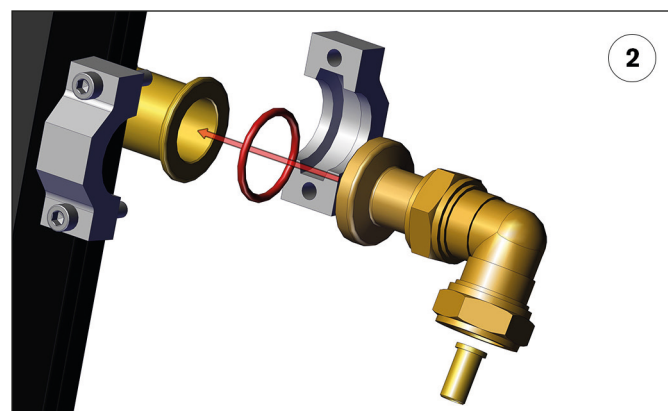
Recommended installation order:

First, the vacuum circuit (1-2); then, the hydraulic circuit (3-6).

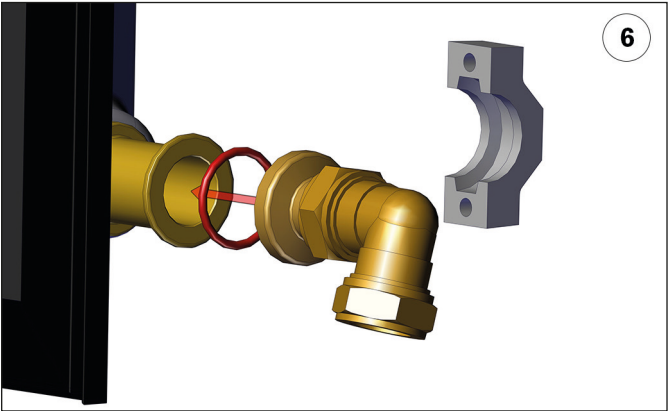
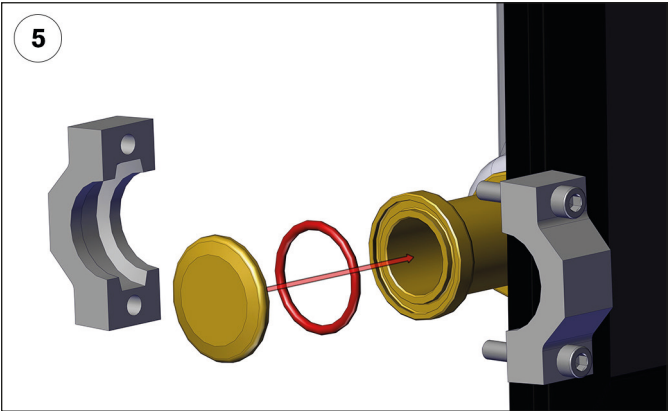
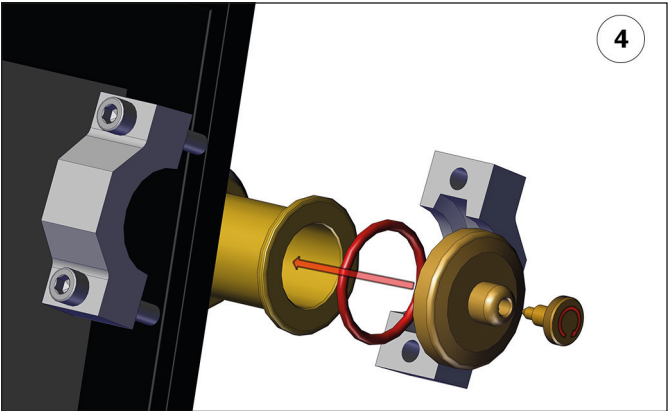
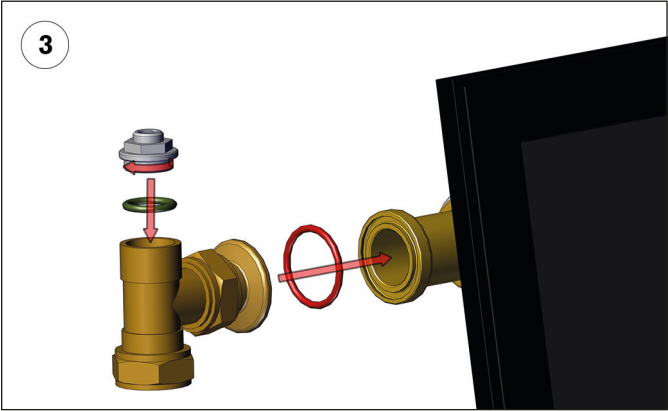
Temperature Sensor



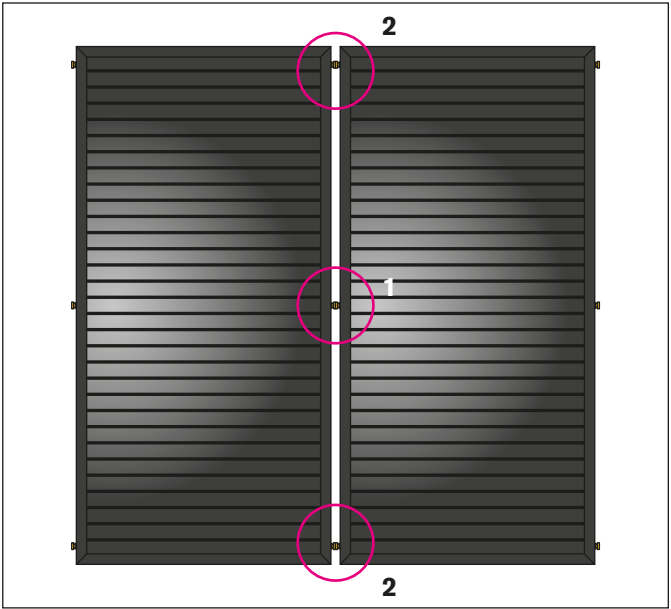
Vacuum circuit



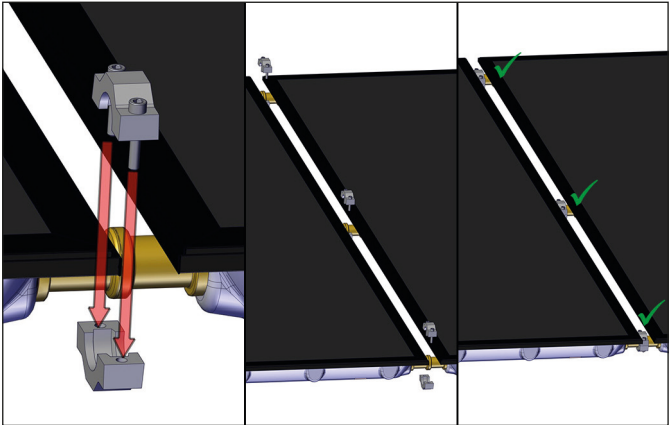
Hydraulics



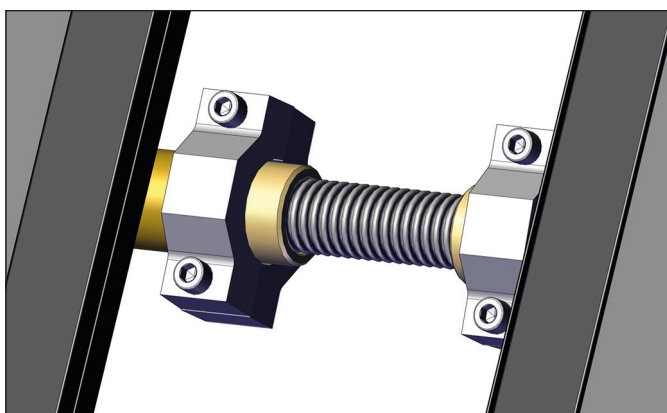
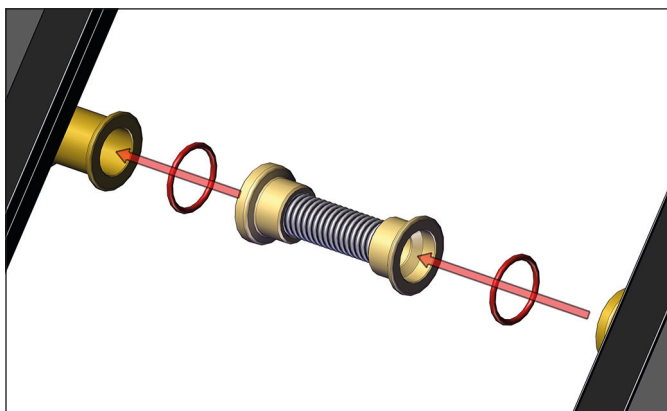
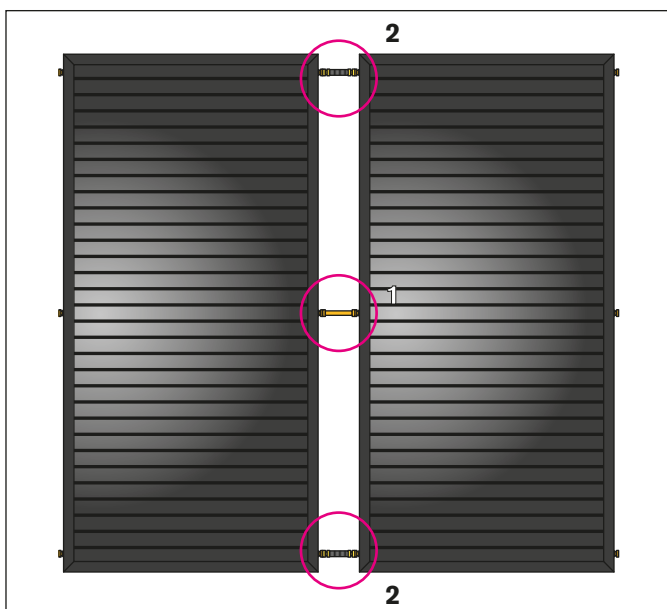
5.17 Extension set for collector TS 400



Recommended installation sequence: Install the vacuum circuit (1) first, followed by the hydraulic circuit (2).



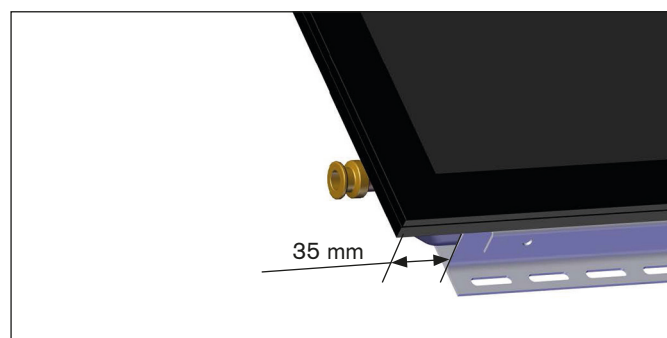
5.18 Compensation set for TS 400



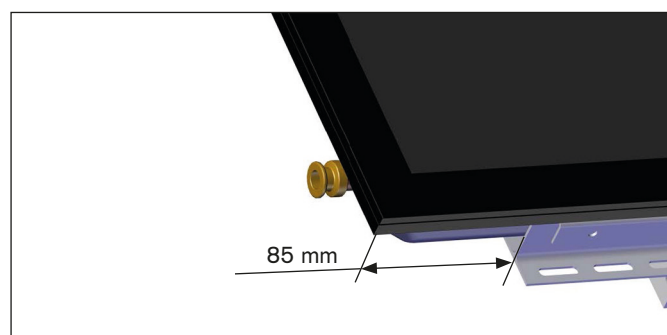
For larger collector arrays (6 collectors or more), use a compensation kit.

→ Install the Compensation Kit as close as possible to the centre of the collector array.

1 x Compensator

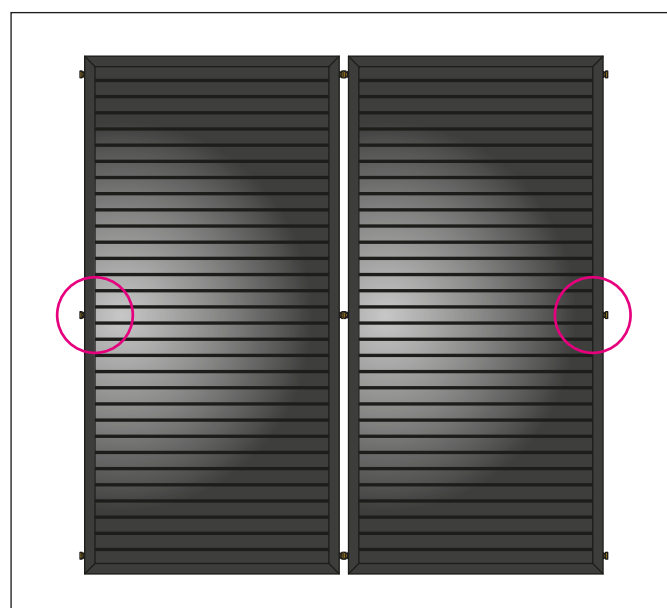


2 x Compensator



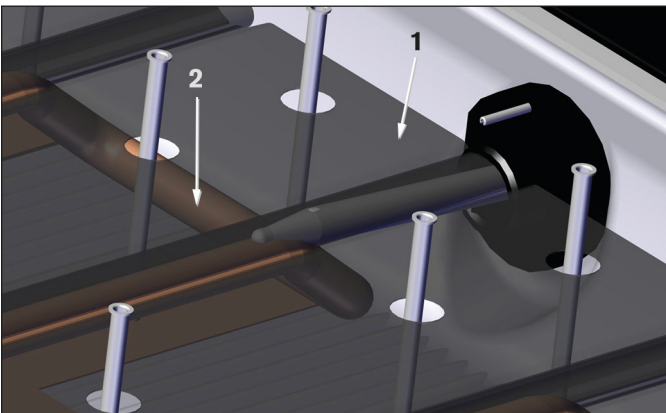
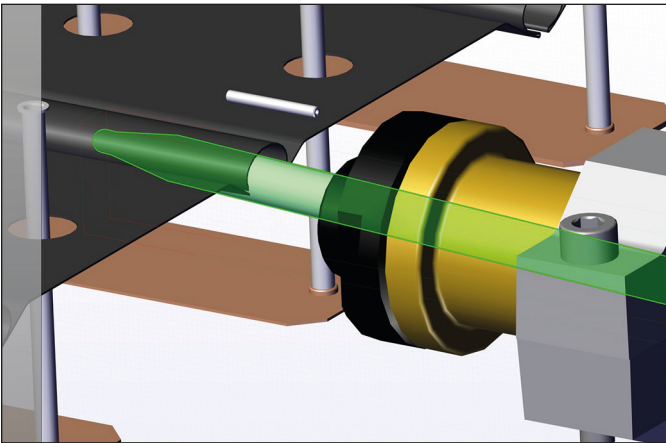
When using compensators, the collectors must be installed with the specified overlap on both sides of the collector array.

5.19 Installation of a Temperature sensor for TS 400

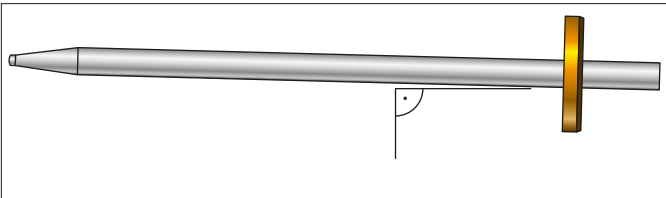


Depending on whether the standard connection set or the reversed connection set is used, select the appropriate side for installing the temperature sensor.

5.19.1 Installation of the Temperature Sensor Sleeve



The sensor sleeve must be inserted between the absorber (1) and the meander tube (2).

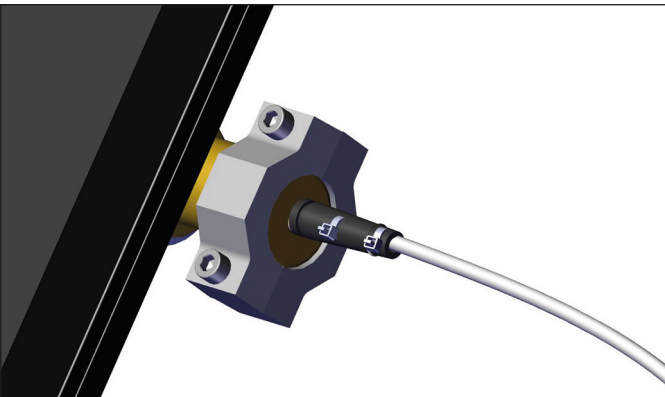
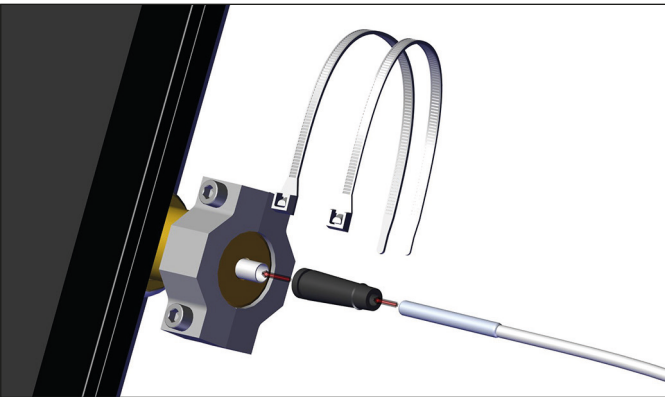


The temperature sensor may be slightly inclined during installation.

i INFO

After installation, ensure that the thermowell is correctly positioned. The temperature sensor must not be installed above the absorber.

5.19.2 Installation of the Temperature Sensor



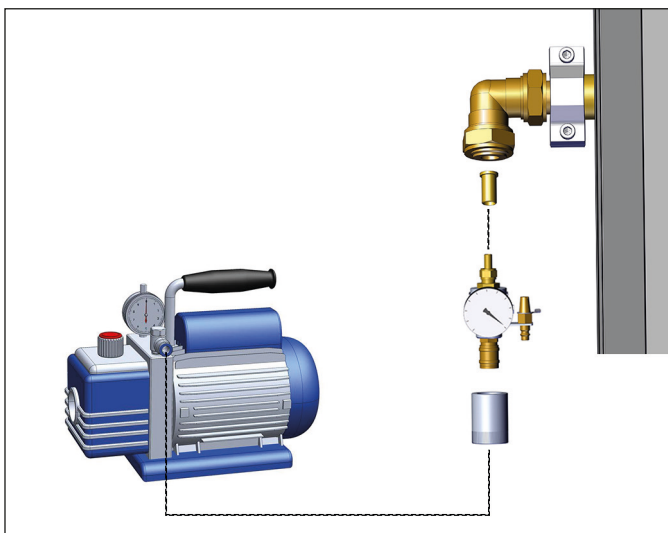
- ☐ Apply thermal paste to the sensor.
- ☐ Insert the temperature sensor firmly into the sensor cap.
- ☐ Secure the temperature sensor with cable ties to prevent it from falling out.
- ☐ Protect the cable with suitable protection (protective conduit) against UV radiation and damage caused by animals.
- ☐ Place all cable connections inside a UV-resistant junction box with a minimum protection rating of IP44.

5.20 Vacuum Evacuation of TS 400 Collectors



Depending on whether the standard or reversed connection kit is

used, select the appropriate side for positioning the evacuation pump.



The vacuum adapter is used to evacuate TS 400 collectors and subsequently serves as a connection port for the vacuum pump.

- ☐ Before evacuating the collectors, disconnect the filter connection from the vacuum adapter.
- ☐ Connect the vacuum pump to the vacuum adapter using a hose and switch on the vacuum pump.
- ☐ Vacuum the collectors to a pressure ranging from -0.8 to -1 bar.
- ☐ Disconnect the hose from the vacuum adapter, turn off the vacuum pump, and screw the protective cover back on.

i INFO

Make sure you are using the correct vacuum pump.
Oil must not be drawn in during the evacuation process.

Evacuation time

Number of collectors	Hours
1 - 3	approx. 1
3 - 10	approx. 3
10 - 15	approx. 4

6 Testing the Hydraulic Circuit and Operating Pressure

! WARNING

Burns and Scalding

Risk of burns and scalding from hot heat transfer fluid when filling the solar thermal system.

- Do not fill the system in direct sunlight or under strong solar radiation.

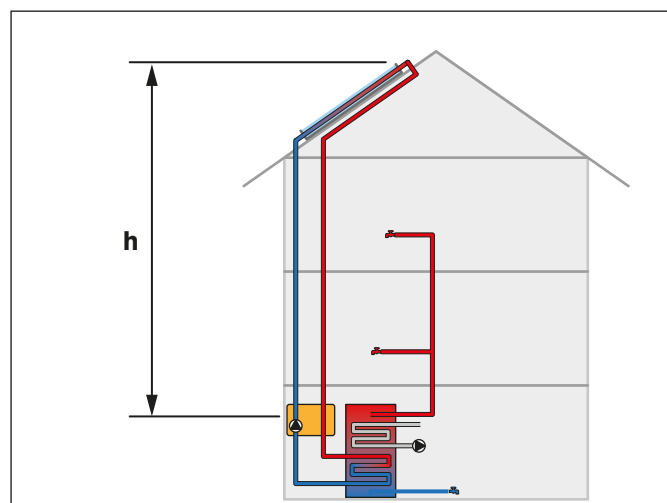
The system shall undergo a pressure test after installation. The pressure test may be carried out using water, heat transfer fluid,

or compressed air.

The following conditions must be met:

- Fill the system only with the original Thesol heat transfer fluid supplied by the manufacturer.
 - Do not mix Thesol heat transfer fluid with any other heat transfer media.
 - Follow the instructions provided on the heat transfer fluid packaging.
 - Do not fill the system in direct sunlight or under strong solar radiation due to the risk of injury from hot heat transfer fluid.
 - Use the original filling station.
 - Fill the system slowly and ensure it is completely vented.
 - Continue filling and flushing until the system has been completely vented.
 - Do not add water or any other substances.
 - Set the pre-charge pressure of the expansion vessel before filling the solar thermal system to the calculated operating pressure.
- The operating pressure shall be determined individually for each system.

6.1 Recommended Operating Pressure for the Solar Thermal System



The hydrostatic head h is the vertical distance between the top of the collectors and the pressure gauge at the solar station.

$$P = P_h + 70 \text{ kPa (0,7 bar)}$$

For every 1 m of height difference, P_h increases by 10 kPa (0.1 bar).

The minimum hydrostatic head used for the calculation is 5 m. If the height difference is less than 5 m, P_h shall be assumed to be 50 kPa (0.5 bar).

The primary circuit is also equipped with a pressure relief valve with an opening pressure of 600 kPa (6 bar). Discharge the fluid released by the pressure relief valve into a suitable container, for example an empty canister.

- ☐ After setting the pressure, vent the system using the manual air vent valve on the collectors.

6.2 Pressure Test

The pressure test shall be carried out in two stages using the heat transfer fluid. During the pressure test, all connections to the pressure relief valve and the expansion vessel shall be closed. In addition, the collectors shall be protected from direct sunlight.

- When pressurising the solar thermal system, the pressure shall not increase at a rate exceeding 500 kPa/min.
- The pressure test may only be performed by a qualified person holding a valid certificate.

Step 1

- ☐ Pressurise the system to the maximum operating pressure of 600 kPa (6 bar).
- ☐ Inspect the system throughout a test period of at least 10 minutes.

Step 2

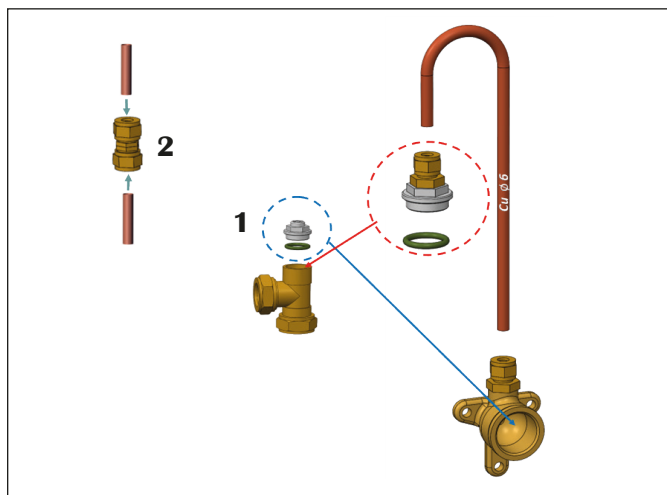
- ☐ Pressurise the system to 1.5 times the operating pressure, i.e. 900 kPa (9 bar).
- ☐ Carry out a visual inspection throughout a test period of at least 10 minutes.

6.3 Commissioning

Before commissioning, check and retighten all bolted connections and inspection covers (storage tank). The solar thermal system may be put into trial operation only after it has been filled with a suitable, air-free heat transfer fluid and the operating pressure has been set.

Significant pressure fluctuations on the pressure gauge indicate the presence of air in the primary circuit or insufficient operating pressure. Vent the system or adjust the operating pressure accordingly.

For information on the setup and configuration of the solar thermal system, refer to the controller operating manual.



- ☐ If there is insufficient space for venting, use the Air Vent Kit.
- ☐ Replace the air vent plug (1) and install it in the wall elbow.
- ☐ Extend the vent line using a $\varnothing$ 6 mm copper tube and connect it using the original screwed fitting (2).

7 Maintenance and Service

i INFO

Maintenance is recommended at least once a year.

Solar collectors require only minimal maintenance and servicing during operation. Maintenance of the system may only be carried out by an authorised person in accordance with applicable legal requirements.

Scope of Maintenance

- Leak test
- System pressure check
- Heat transfer fluid pH check (pH > 7)
- Antifreeze concentration test (-30°C)
- Top up the system if necessary
 - Do not add water
- Inspection of roof penetrations for leaks
- General functional inspection

8 Dismantling and Disposal

The solar collector and its packaging materials are made of fully recyclable materials. At the end of their service life, the collectors may be returned to the manufacturer. The materials will be recycled in an environmentally responsible manner.

9 Troubleshooting

INFO

Before reporting a fault in the solar thermal system to customer service, check whether the system has been temporarily shut down due to the parameters set in the controller.

Status	
The storage tank temperature has reached the set value.	Factory setting: 60 °C
The conditions for system start-up have not been met because the preset temperature difference (Δ) has not been reached.	Factory setting – switch-on temperature difference: 10 K Factory setting – switch-off temperature difference: 5 K

Cause	User Action	Installer Action
The sun is shining, but no heat is being transferred. The fluid flow in the system is low or absent.		
Air in the system	- Check the pump operation - Check the system pressure - Vent the system (morning or evening)	- Vent the system and remove all air - Top up the heat transfer fluid and adjust the system pressure
Low or no pressure due to a fluid leak	Visually inspect the pipework and collector connections	Repair the fluid leak
Low or no pressure due to a damaged expansion vessel	- Visually inspect the expansion vessel valve. - Tap the expansion vessel to check its condition acoustically.	- Check the pressure and leak-tightness of the expansion tank - Repair or replace the expansion tank
Pump not operating	- Check whether the pump is operating (pump noise or illuminated LED indicator). - Check whether the controller indicates any faults	- Check the cables and connections between the pump and the controller. - Verify the correct operation of the control system. - Check the pump's electronics
The controller does not respond, the display is off, and no data are shown	Check the power supply	- Check or replace the fuse in the controller - Replace the controller
Collector temperature sensor malfunction	Check whether the controller displays an error message or refer to the error codes	- Check the cables and connections between the sensor and the controller - Measure the sensor resistance according to the manufacturer's specifications - Replace the sensor
Storage tank temperature sensor malfunction	Check whether the controller displays an error message or refer to the error codes	- Check the cables and connections between the sensor and the controller - Measure the sensor resistance according to the manufacturer's specifications - Replace the sensor
The system is blocked due to contamination	- Check the pump operation - Check the flow rate on the pump display	- Check the pipework for blockages using an external pump - Clean the pipework
One of the valves is closed	- Check the pump operation - Check the position of all valves in the system	Replace any faulty valves
The storage tank is heated but cools down overnight.		
The non-return valve in the system is not working.	Check the position of the non-return valve	Repair or replace the faulty non-return valve or other defective components.



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