

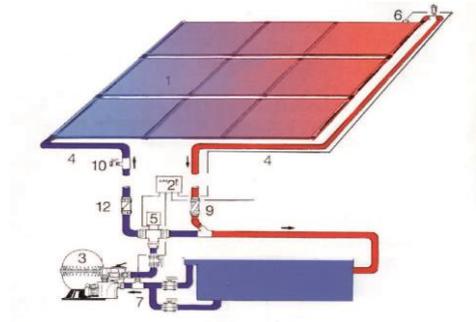
Introduction

Solar heating for swimming pools with OKU-Absorbers normally will be operated with a direct circuit. The water from the pool will be pumped directly through the absorbers. The use of a heat exchanger is not necessary.

Different configurations of OKU swimming pool solar heating

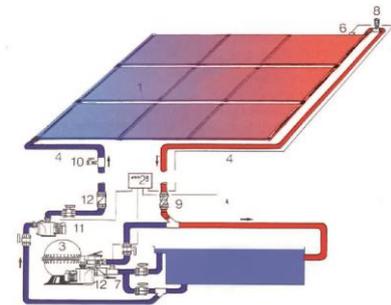
A) Operation with filter pump via three-way motor ball valve with difference-temperature regulation

This configuration can usually be selected if the absorbers are not to be set up higher than 6 m above the surface of the water. The three-way motor ball valve is integrated into the pressure line of the filter installation. Because of the difference-temperature regulation the ball valve is changed over when the absorber temperature is higher than the temperature of the water of the swimming pool. The filter stream is then pumped through the absorbers. The warmed water flows back into the filter circuit by way of a tee.



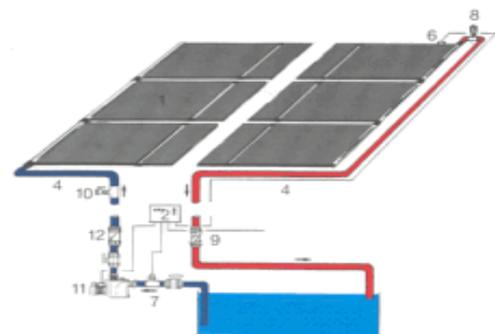
B) Operation with own pump an difference temperature regulation integrated into the filter circuit

In many cases it may be sensible or even necessary to install a separate pump for the solar heating. For example when the delivery head from the water level to the absorber panel is more than 6 m. The water is diverted from the filter installation by way of a tee and pumped through the absorbers by the auxiliary pump. This pump is switched on by the difference-temperature regulation to ensure that it only runs to actually win energy. The filter and solar pump are separately regulated. It is usually advisable to integrate non-return valves in both the solar and the filter circuit.



C) Operation with own pump and difference-temperature regulation - piping independent of filter circuit

This configuration is chosen when the filter piping is difficult to access. The water is sucked out of the swimming pool by an immersion pipe, pumped through the absorbers, and the warmed water is conducted back into the swimming pool. Here again the difference temperature regulation ensures that the pump only runs to win energy. If the pump is mounted above the water level and the delivery head is more than 5 m, a non-return valve should be incorporated.



- 1) OKU-Absorber
- 2) Difference-temperature regulation OE 1
- 3) Filter installation
- 4) Solar circuit forward and return

- 5) Three-way motor ball valve
- 6) Temperature sensor, absorbers
- 7) Temperature sensor, swimming pool
- 8) Vent valve

- 9) Stop cock (downdraft brake)
- 10) Drain cock
- 11) Pump for solar circuit
- 12) Non-return valve

The water of the swimming pool can flow through the OKU absorbers in either direction, so they can be mounted both lengthwise and side by side. The individual rows of absorbers are connected on a Tichelmann principle (same routes for each row). It is not advisable to connect more than ten absorbers in series.

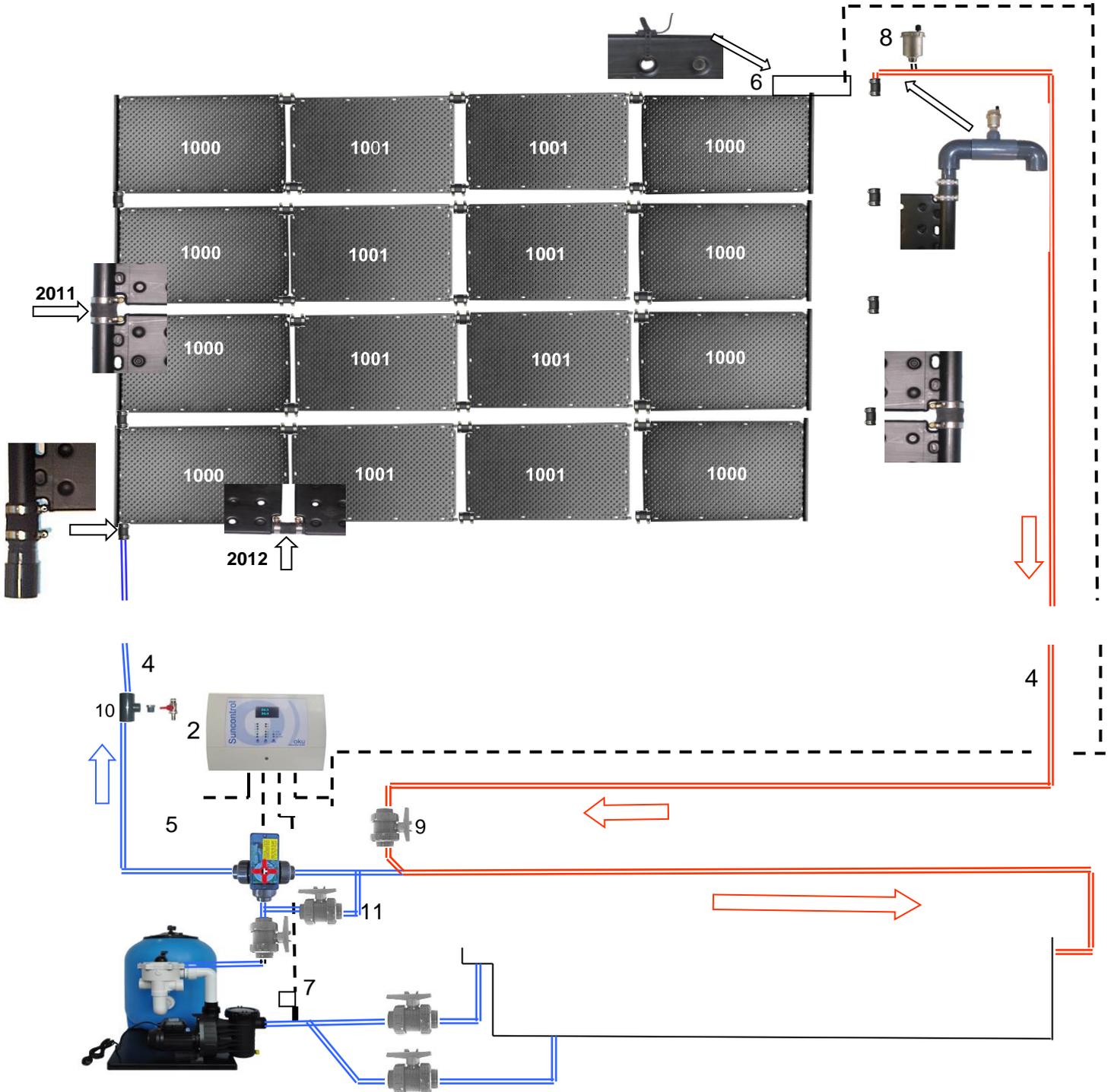
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Example according to version A)

We recommend to read the following instructions thoroughly before starting the installation and to make a plan of how to connect the absorbers in case your arrangement of absorbers differs from the example shown below. This example represents a system with 16 OKU absorbers in 4 lines at 4 items. Depending on the size of your swimming pool and the area available for the absorbers, numerous other schemes of installation are also possible. **Warning: flow rate maximum 250 Liters / hour per panel**

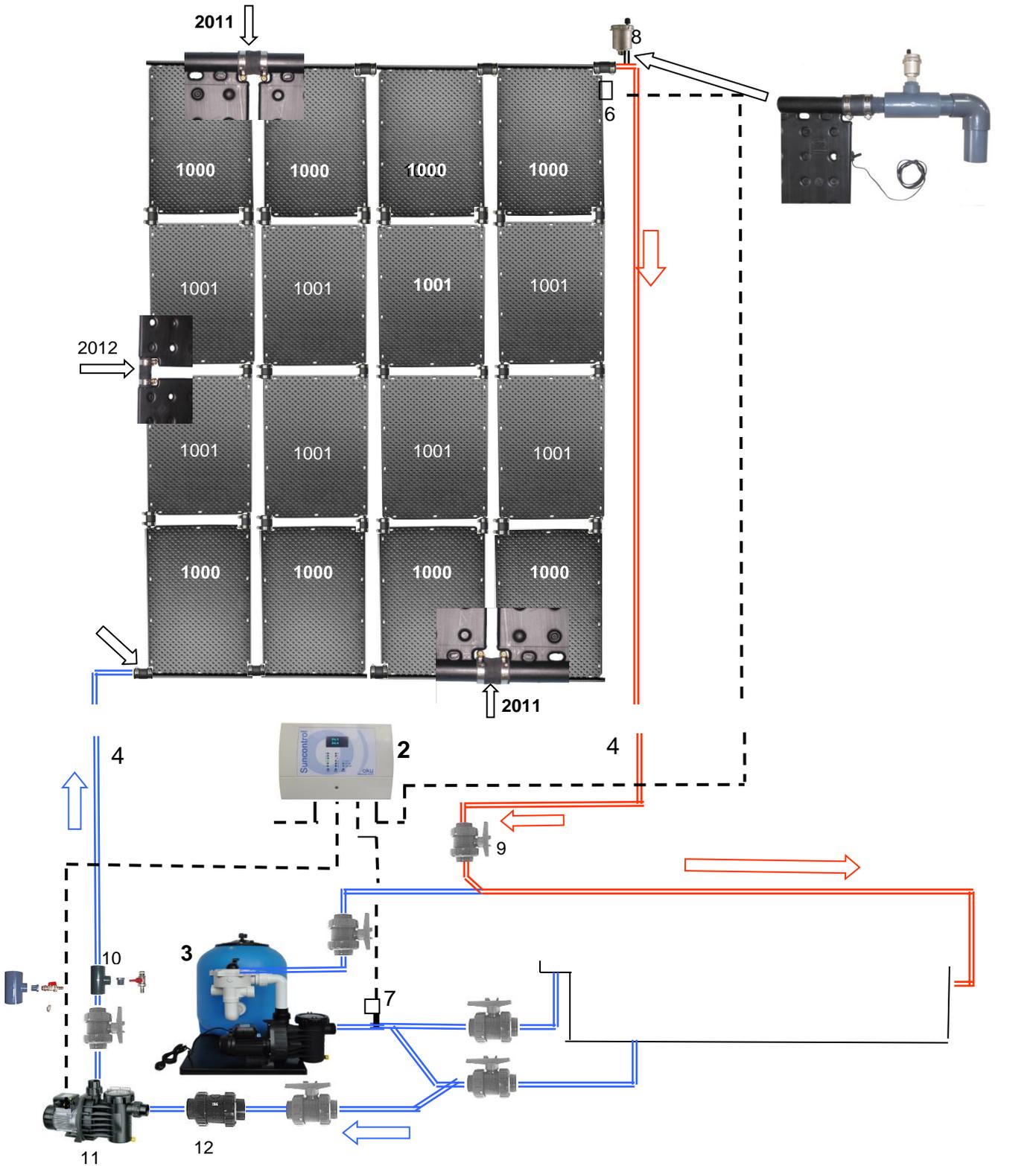
Operation with filter pump via three-way motor ball valve with difference-temperature regulation



- | | | |
|--|--------------------------------------|--------------------------------|
| 1) OKU absorber | 5) Three-way motor ball valve | 9) Stop cock (downdraft brake) |
| 2) Difference-temperature regulator OE 1 | 6) Temperature sensor, absorbers | 10) Drain cock |
| 3) Filter installation | 7) Temperature sensor, swimming pool | 11) By-Pass |
| 4) Solar circuit forward and return | 8) Vent valve | |

**If pump flow rate is higher 250 Liters/hour per panel, a by-pass must be installed, otherwise there is the risk of too much pressure in the panels.
If not observed, a warranty will not be recognized**

Operation with additional pump and difference-temperature regulator



- | | | |
|-------------------------------------|--------------------------------------|----------------------------|
| 1) OKU absorber | 6) Temperature sensor, absorbers | 10) Drain cock |
| 2) Difference-temperature regulator | 7) Temperature sensor, swimming pool | 11) Pump for solar circuit |
| 3) Filter | 8) Vent valve | 12) Non-return valve |
| 4) Solar circuit forward and return | 9) Stop cock (downdraft brake) | |

Pump flow rate maximum 250 Liters/hour per panel
 otherwise there is the risk of too much pressure in the panels.

If not observed, warranty will not be recognized

Warranty

OKU-solar panels produced from HDPE 5 years

Pumps 2 years

Controllers 2 years

under consideration of our technical datas and specifications

Please note: Warranty is void if panels are installed:

without vent valve

with an oversized pump

more than 1,5 m below water level

the solar circuit is not permanent open to the pool inlets (also when system is switched off)

These points can take negative influences on the panels, such as by example too high pressure or negative pressure. The lifetime of the panels can thereby be reduced

Brief instruction for the selection of the pump for independent systems

| Quantity OKU-panels | delivery head meter | Pump kW output | delivery head meter | Pump kW output | delivery head meter | Pump kW output | |
|---------------------|---------------------|----------------|---------------------|----------------|---------------------|----------------|------|
| 9 | 1800 | 3 - 4 | 0,18 | 5 - 7 | 0,18 | 8 - 10 | 0,25 |
| 12 | 2400 | 3 - 4 | 0,18 | 5 - 7 | 0,18 | 8 - 10 | 0,25 |
| 16 | 3200 | 3 - 4 | 0,18 | 5 - 7 | 0,18 | 8 - 10 | 0,40 |
| 20 | 4000 | 3 - 4 | 0,18 | 5 - 7 | 0,25 | 8 - 10 | 0,40 |
| 24 | 4800 | 3 - 4 | 0,18 | 5 - 7 | 0,25 | 8 - 10 | 0,40 |
| 28 | 5600 | 3 - 4 | 0,25 | 5 - 7 | 0,40 | 8 - 10 | 0,45 |
| 32 | 6400 | 3 - 4 | 0,25 | 5 - 7 | 0,40 | 8 - 10 | 0,45 |

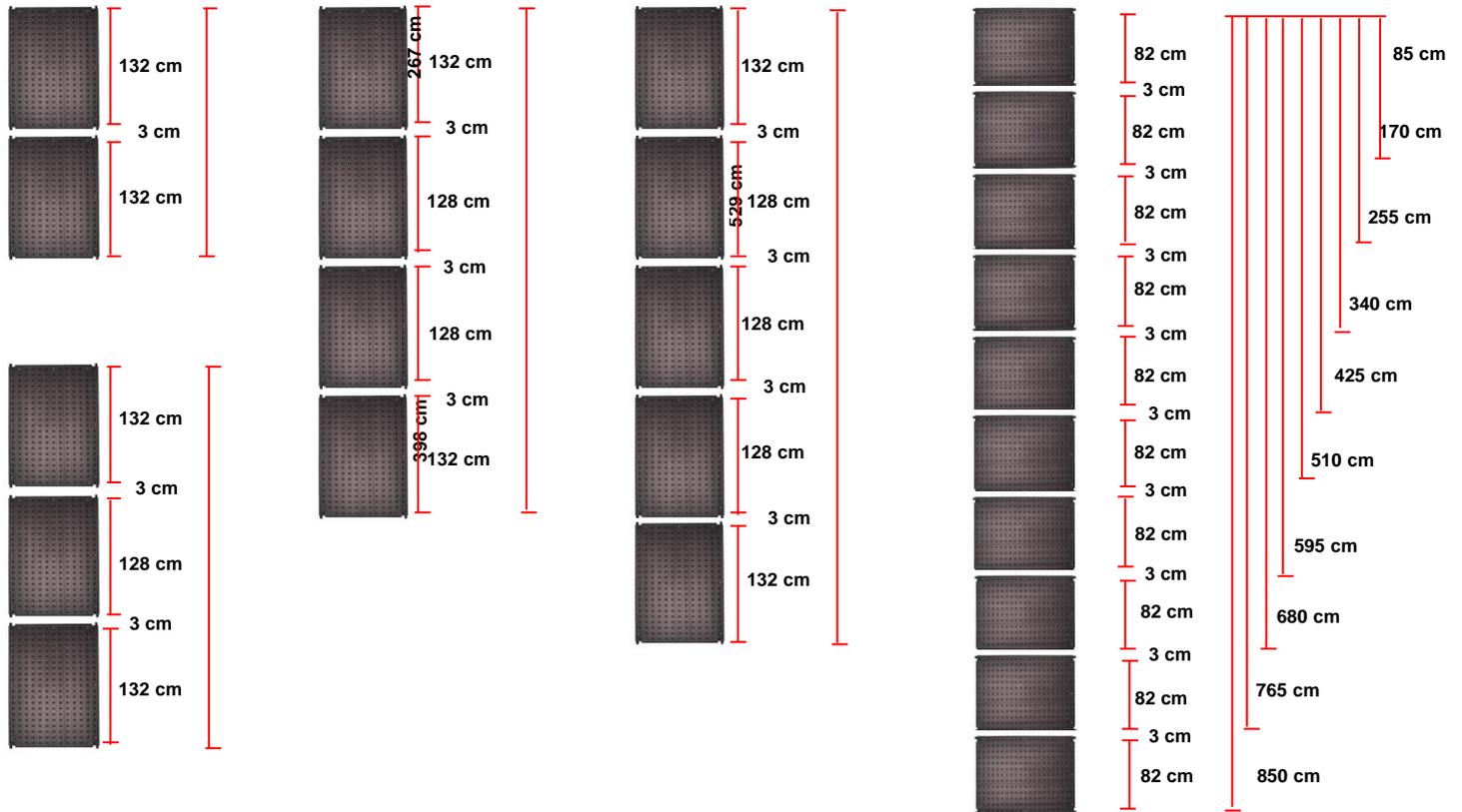
The values given are approximate values for a pipe diameter of 40 mm. In individual cases such as especially long piping may require heavier pumps or a larger pipe dimension

For easy calculation of the pressure loss in pipes:

<http://www.pressure-drop.com/Online-Calculator/index.html>

In systems operated with the filter pump is to check whether the pump is strong enough, to pump the required flow rate for the solar to the existing delivery height. But often the filter pumps are too strong for the solar system. Then a by-pass must be installed - see page 1 of this manual

required space of OKU-solar panels



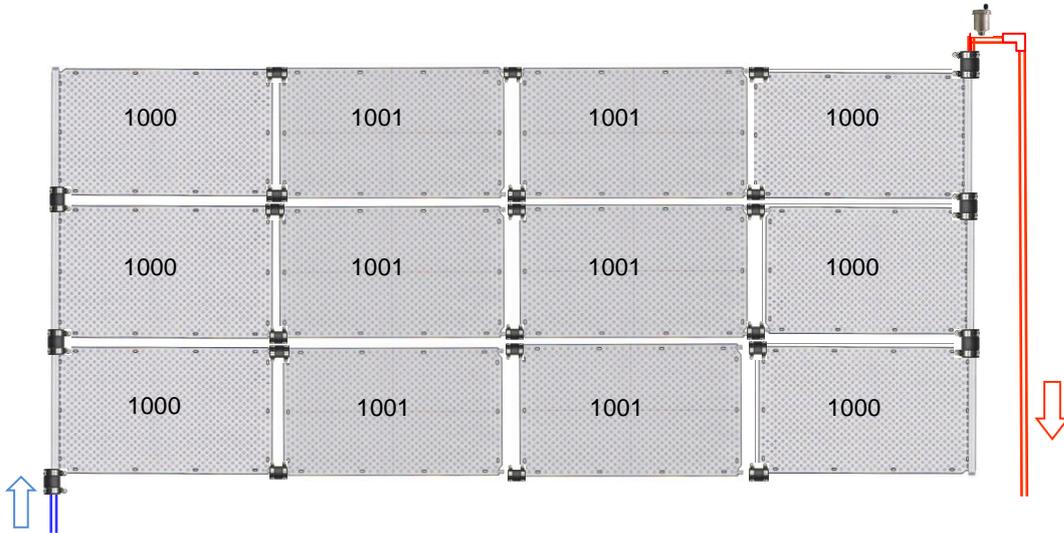
Thermal expansion of OKU-solar panels

| length | Delta T 40 ° | Delta T 60 ° |
|--------|--------------|--------------|
| 132cm | 10,5mm | 16,0mm |
| 265cm | 21,0mm | 32,0mm |
| 394cm | 31,5mm | 48,0mm |
| 523cm | 42,0mm | 64,0mm |
| 652cm | 53,5mm | 80,0mm |

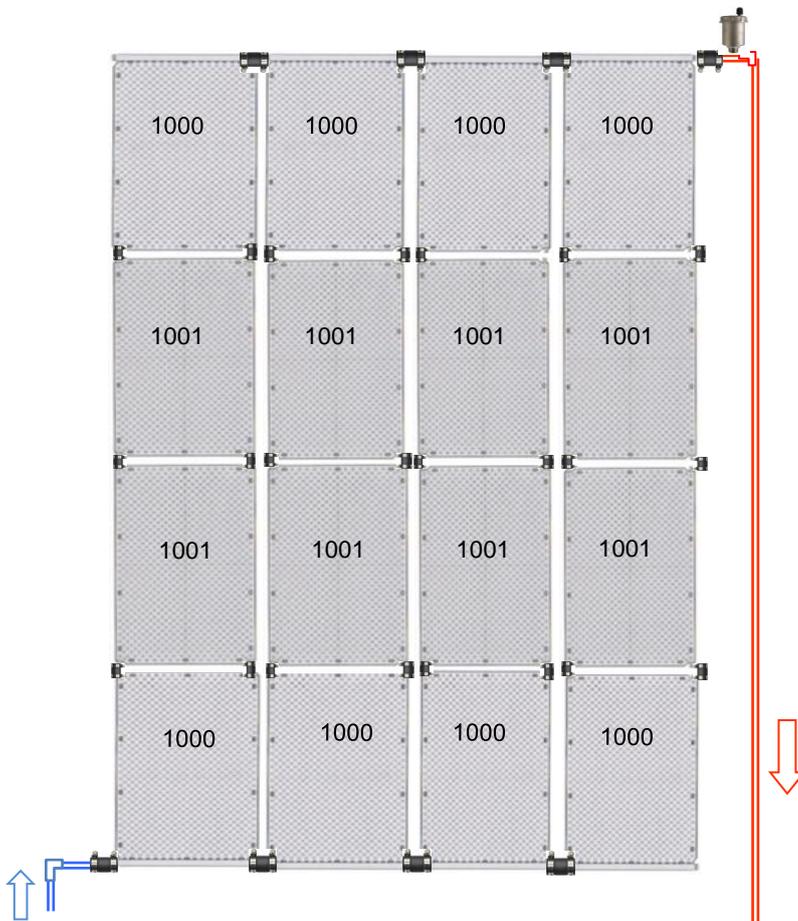
| width | Delta T 40 ° | Delta T 60 ° |
|-------|--------------|--------------|
| 85cm | 6,8mm | 10,2mm |
| 170cm | 13,6mm | 20,4mm |
| 255cm | 20,4mm | 30,6mm |
| 344cm | 27,2mm | 40,8mm |
| 425cm | 34,0mm | 51,0mm |
| 510cm | 40,8mm | 61,2mm |
| 595cm | 47,6mm | 71,4mm |
| 680cm | 54,4mm | 81,6mm |
| 765cm | 61,2mm | 91,8mm |
| 850cm | 68 mm | 102 mm |

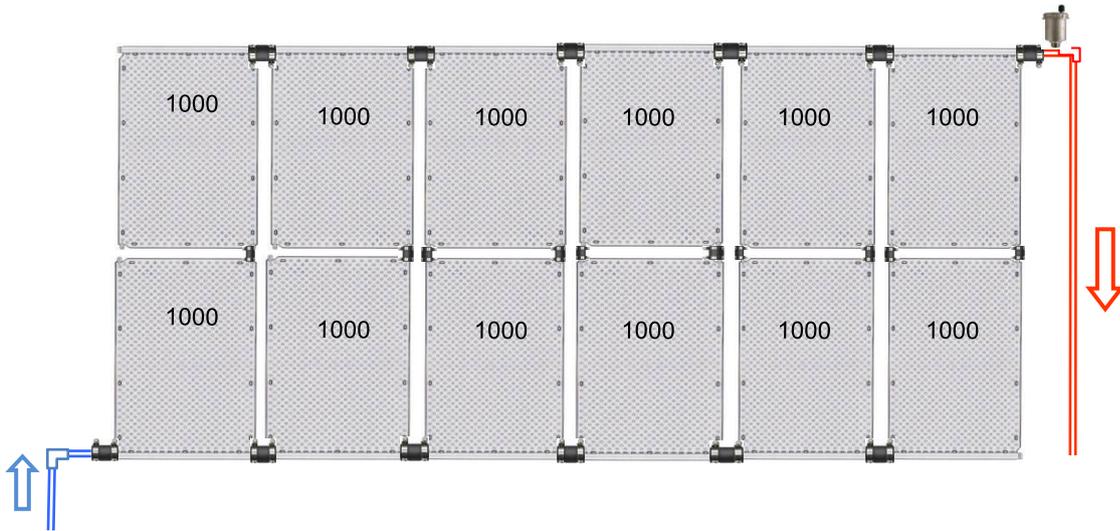
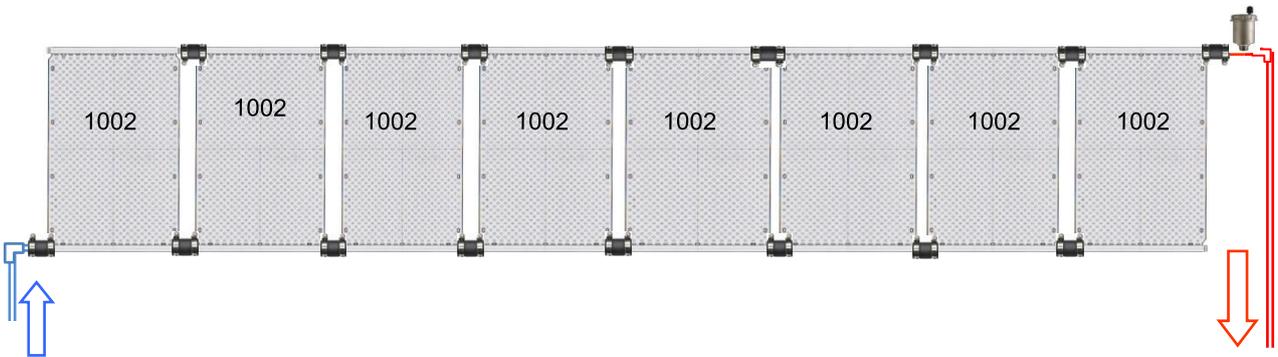
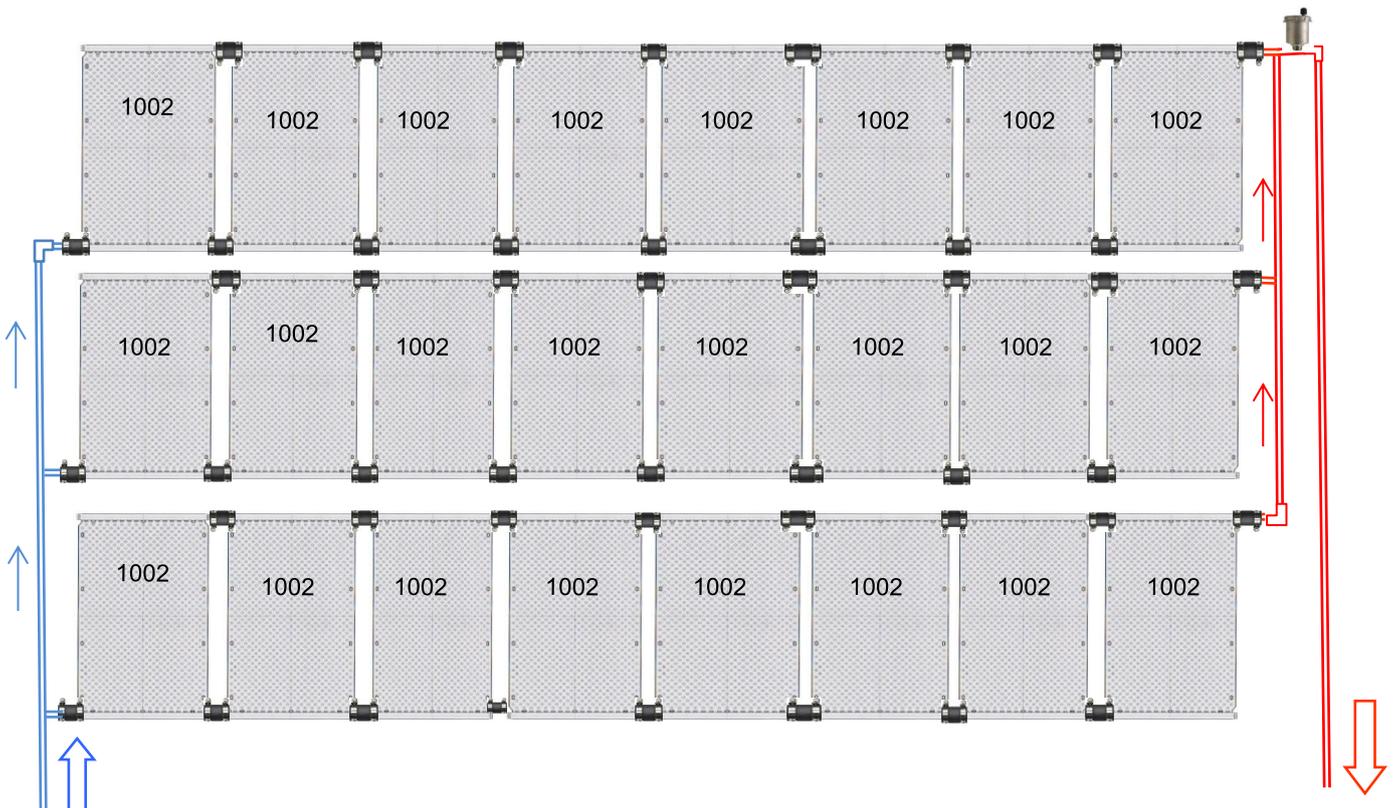
OKU-solar panels - examples for layouts

OKU-solar panels Art. N° 1000 und 1001 two or more rows mounted parallel lengthwise

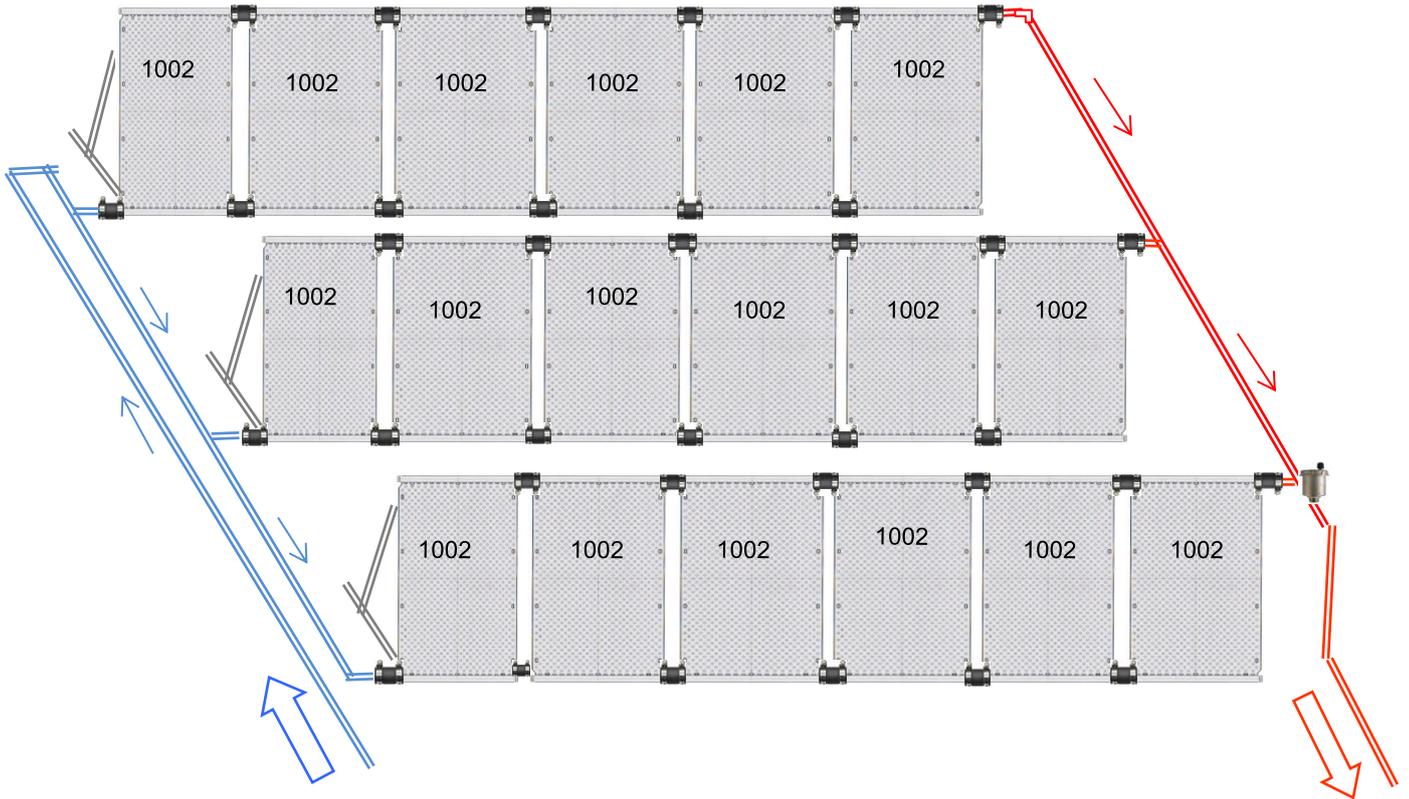


OKU-solar panels Art. N° 1000 und 1001 two or more rows mounted parallel upright

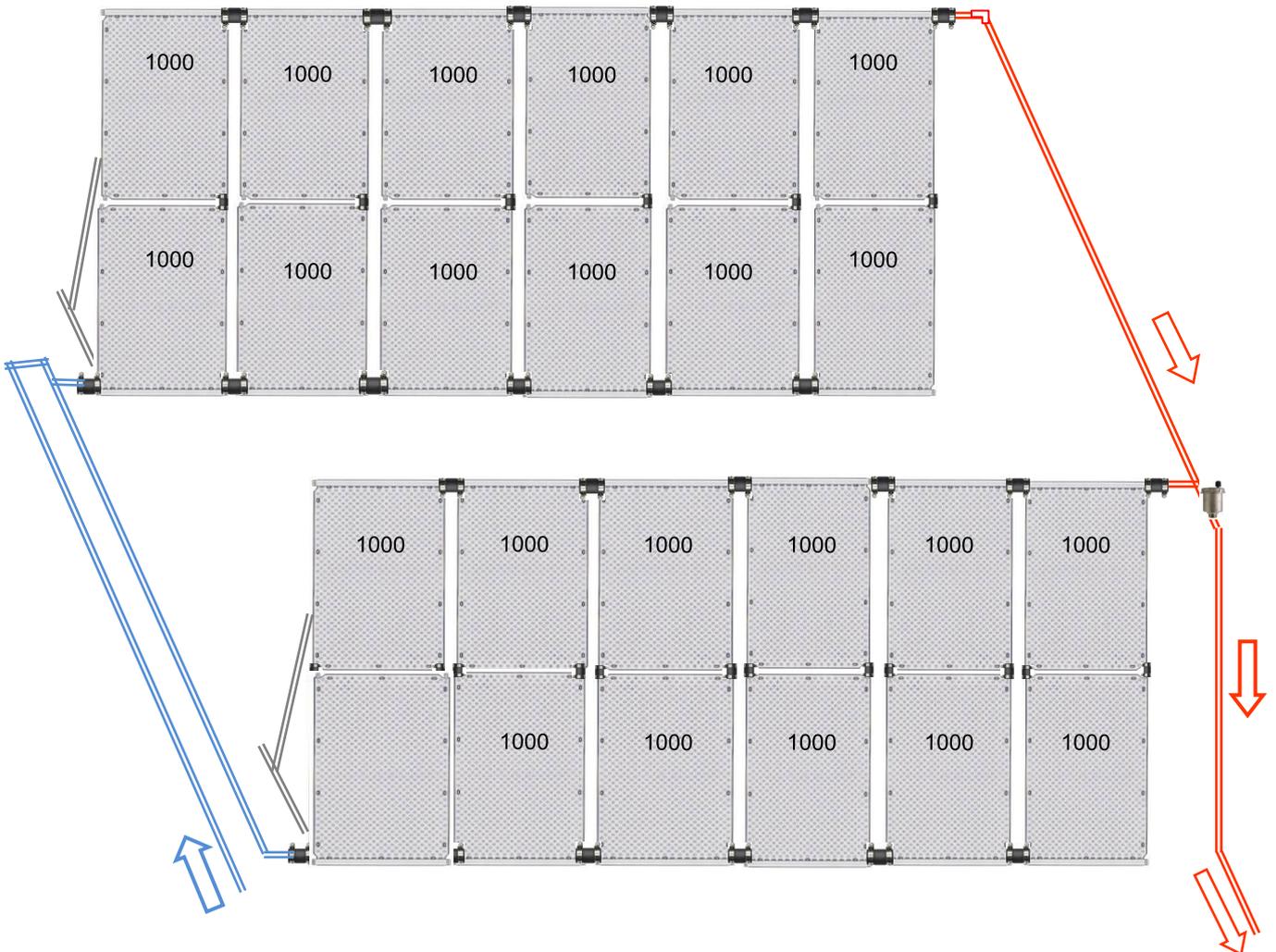


OKU-solar panels Art. N° 1000, two or more rows, mounted upright one above the other**OKU-solar panels Art. N° 1002, two or more mounted parallel in one row****OKU-solar panels Art. N° 1002, mounted parallel in two or more rows**

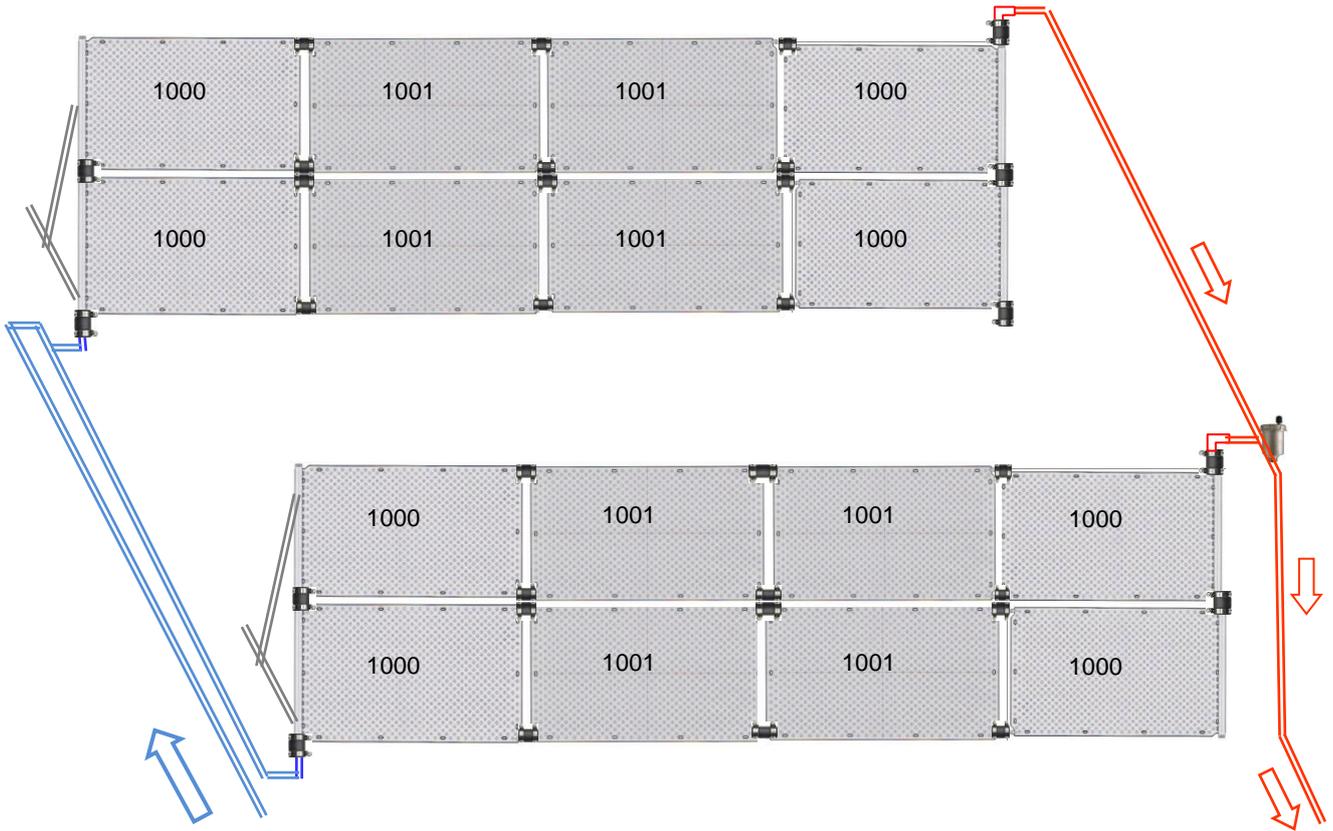
OKU-solar panels Art. N° 1002, two or more rows one behind the other with mounting frames



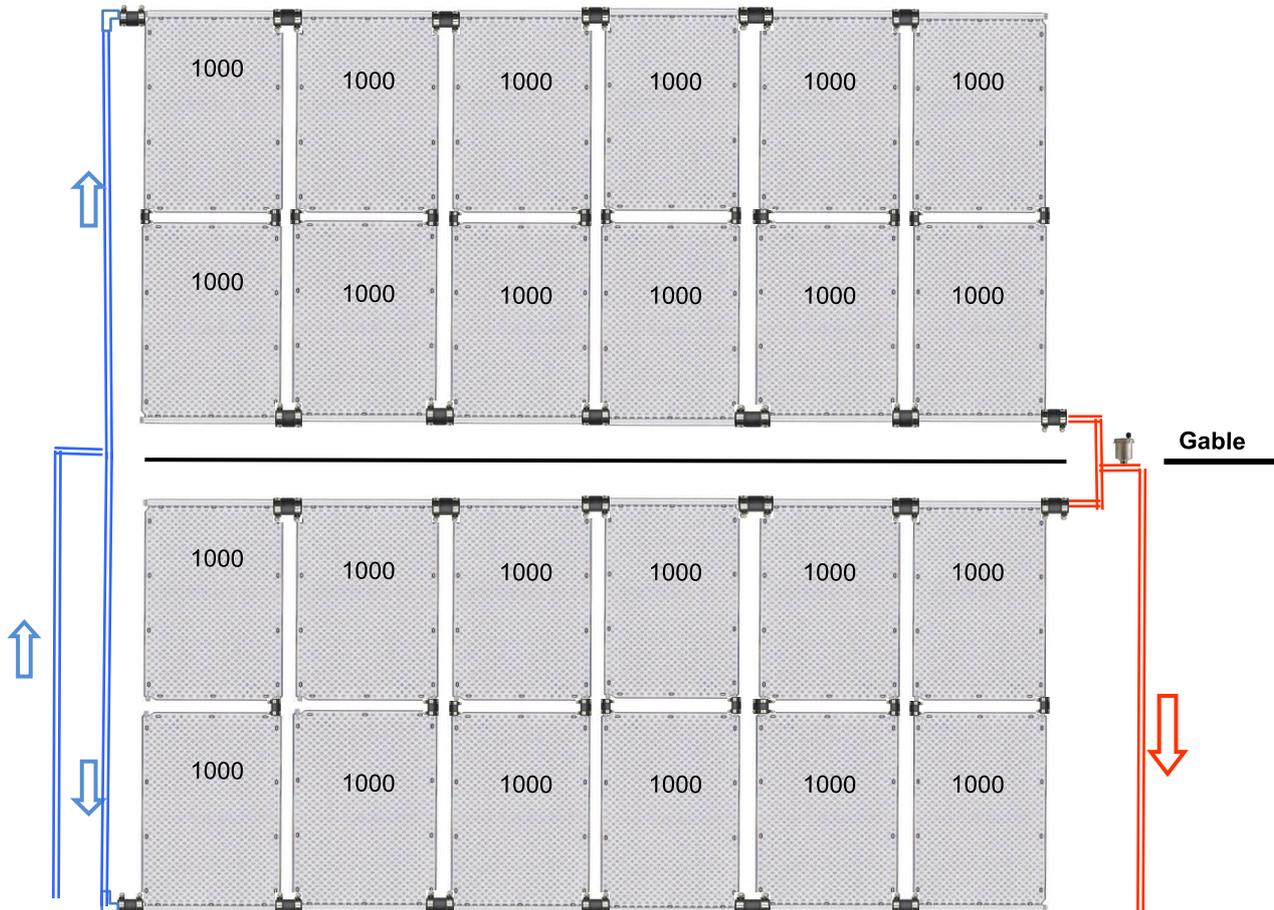
OKU-solar panels Art. N° 1000, two or more rows one behind the other with mounting frames



OKU-solar panels Art. N° 1000 und 1001, two or more rows one behind the other with mounting frames

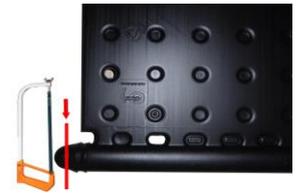


OKU-solar panels mounted on 2 roof sides, not recommended unless the roof pitch is less than 15°

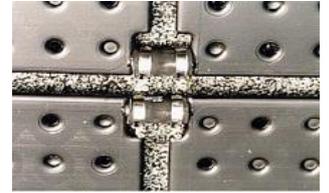


Installation of the system

1. OKU-Absorbers are supplied with a onesided closed header. If further connections are required to connect the absorbers parallel to one another, simply cut off the cap.



2. Place the OKU-Absorbers on the designated areas in the arrangement that is desired and connect them with hose connections and hose saddles according with the the scheme of connection. In case of steeper sloping roofs, roof fastenings must be carried out simultaneously to prevent absorbers from slipping away during installation.



3. To make circuit points for supply and return lines, glue the hose nozzle into the elbow or the socket and add it with the hose coupling on the absorber. If you use a pipe dia. 50 mm or bigger, you have to glue a reduction piece into place.



4. Vent valve (8): The vent valve must be installed vertically. Glue in connection correspondingly and screw in vent valve.

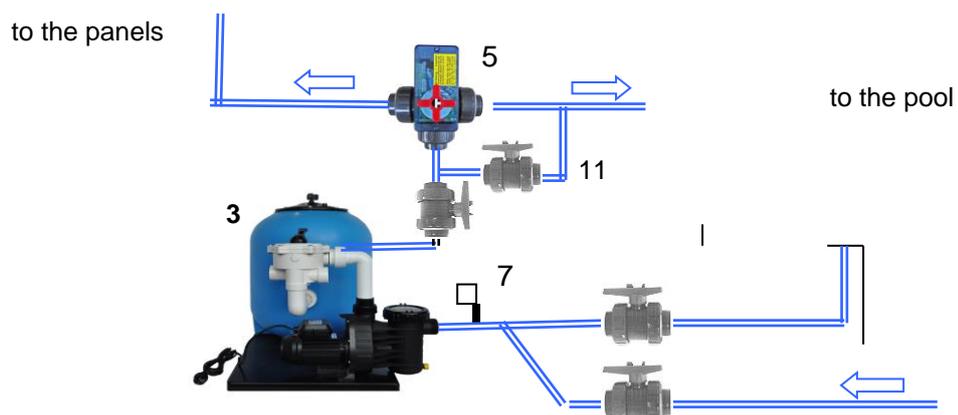
panels mounted vertical



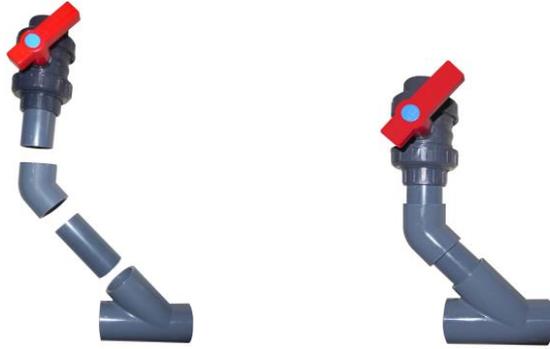
panels mounted horizontal



5. Install 3-way valve (5) behind filter pump (3).



6. Put tee for collector flow line into pipe leading to the pool. Glue stop cock (9) - downdraft brake into flow line pipe.



7. Construct and fix flow line and return travel of collector (4). If for winter a drain cock is needed, glue a reducing tee with reducing piece 1/2" for the drain cock.



8. Regulation: Please take a look at the instruction for installation and operating for the difference-temperature regulation and the three-way motor ball valve in connection with the pump. Close attention should be paid to the manner of the electrical installation. Swimming pool systems have to be equipped with an earth leakage circuit breaker. Fix the difference-temperature regulator and connect it according to the wiring diagram. Use wires with cross-section 2 x 1 mm² to lengthen sensor adaptors.

Temperature sensor panel (6): fasten panel sensor (6) to the panel

Suncontrol



Suncontrol

Pumps that have more than 2000W power intake and three-phase current pumps should install a security switch.

Minisol, Solax, Digisol, Kombisol



Minisol, Solax, Digisol, Kombisol

Pumps that have more than 600W power intake and three phase current pumps should install a security switch

Temperature sensor pool (7):

Glue reducing tee with 1/2" nipple for swimming pool sensor (7) into pipe coming from the pool and screw in sensor



Operating instruction

To start the system adjust the difference temperature **DIF** to approx. 3 or 4 °C and place the hand switch on automatic. At **MAX** you can adjust a maximum temperature if required. For systems working with filter pump the filter cycle equivalent to the hours of sunshine. The system stops then automatically if the adjusted maximum temperature is reached.

Adjustment **EIN** is continuous operation, at adjustment **AUS** the system stays switched of.



Installations with own pump work independently from the filter circuit.

If after a few minutes the system still operates with air in it, close the stop cock (downdraft brake) a little until the water escapes at the intake nozzle and free of air. The stop cock should now be left in this position.

Operating the system in winter

OKU-Absorbers are frost resistant. Due to the pipes the system must be emptied in winter nevertheless. Usually systems that are emptied once they are switched off, do not need any further precautions.

Advice to glue pvc pipes

Glue pvc pipes only if they are absolutely dry. Water, condensation and humidity prevent a good connection.

Do not glue under a Temperature of 5°C. The time for drying is approximately 24 hours.

Do not use the pvc pieces under pressure before that time.

Clean ends and fittings with a cleaner. Glue both parts the same way. Use a flat brush.

It's important to disperse the glue lengthwise from the inside to the outside.

Directly after applying the glue, you have to plug ends and fittings together.

Take off the surplus glue. Clean the brush with cleaner.

Fastening the panels on the roof

Warning:

because of the thermal expansion, the panels may not be screwed to fastening surface.

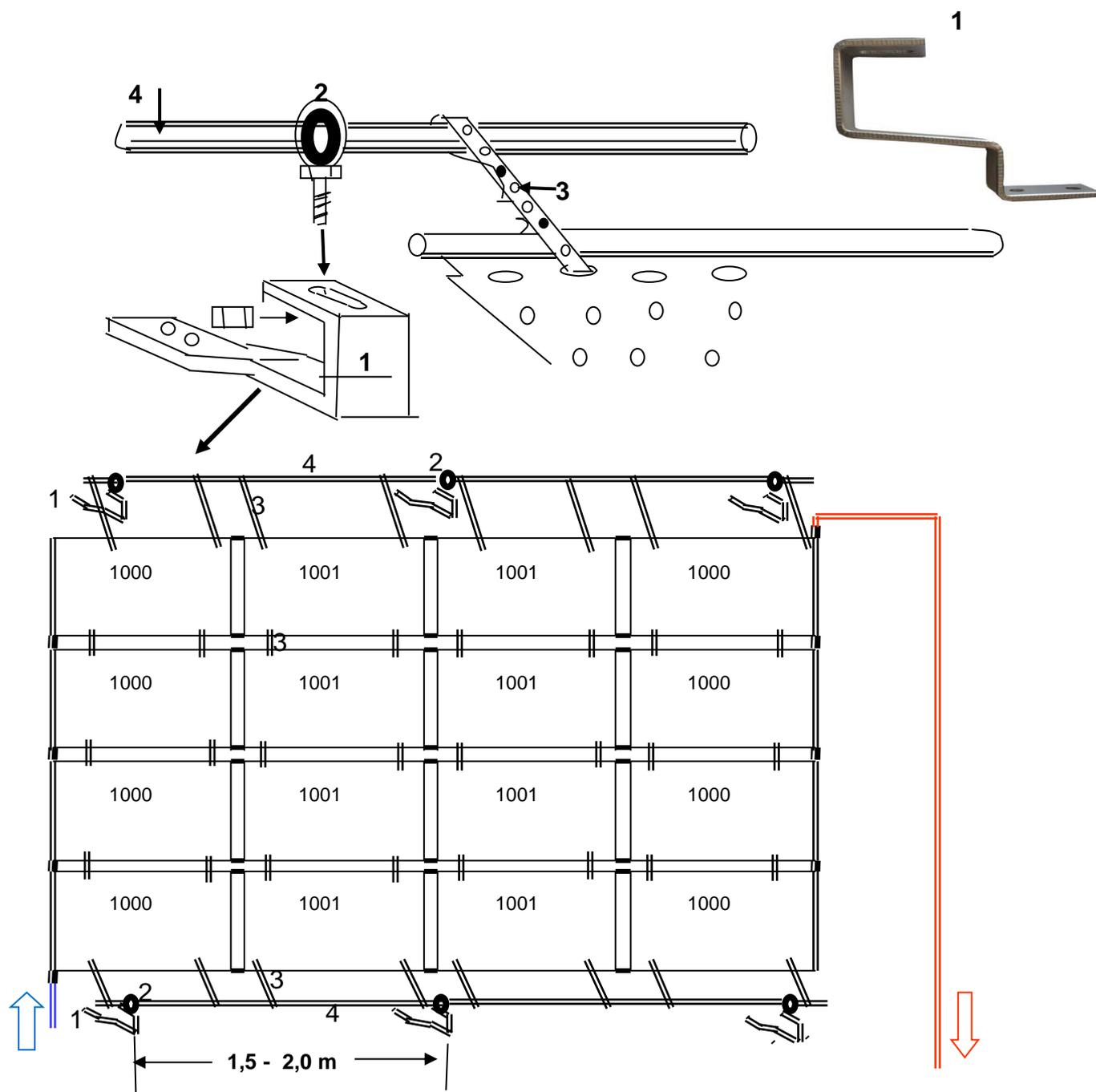
Thermoplastic material (HDPE) in comparison to metal and duroplastic proves to have a higher coefficient thermal expansion. For this reason, the fastening of the panels must be done in a flexible manner. In extreme cases temperature differences of up to 100° C may occur. For example, in summer as high as 80° C and in winter as low as -20° C. Calculation Formula: Heat expansion = 0,20 mm x Length of Part x Delta T

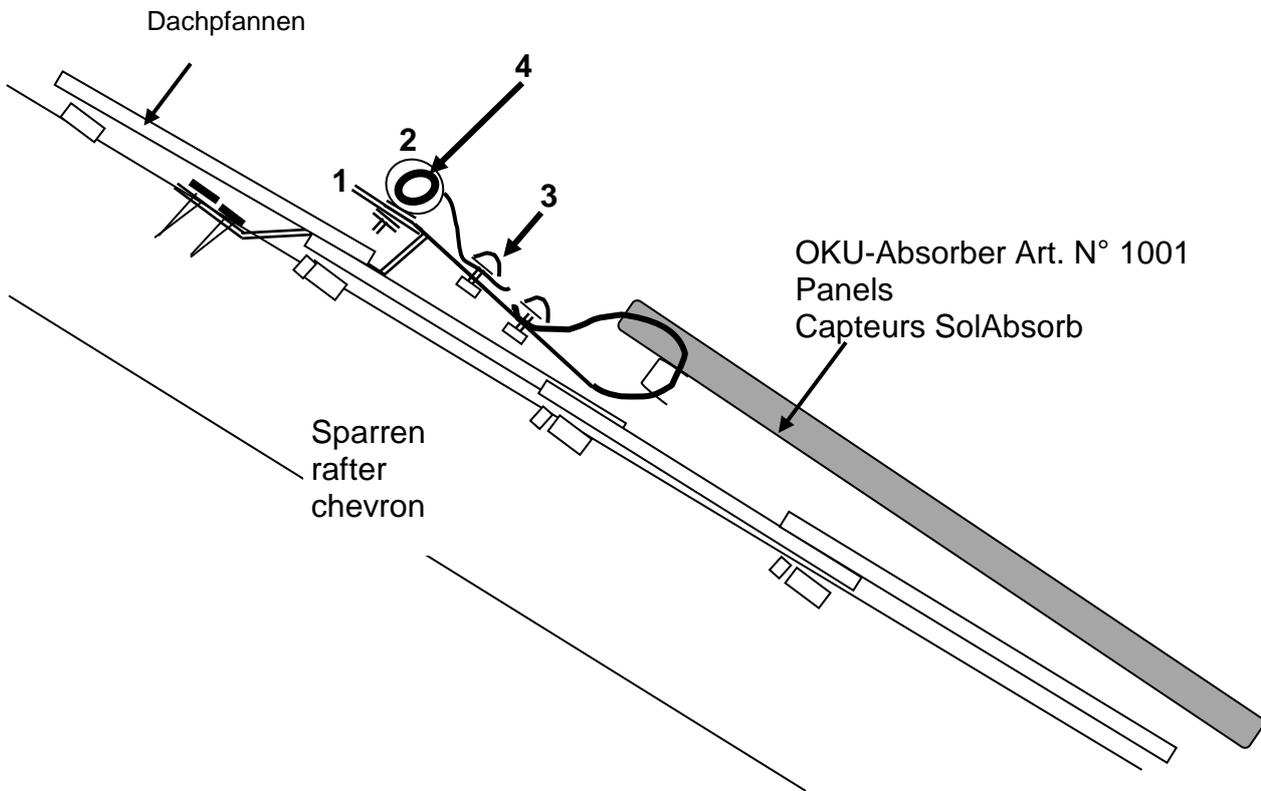
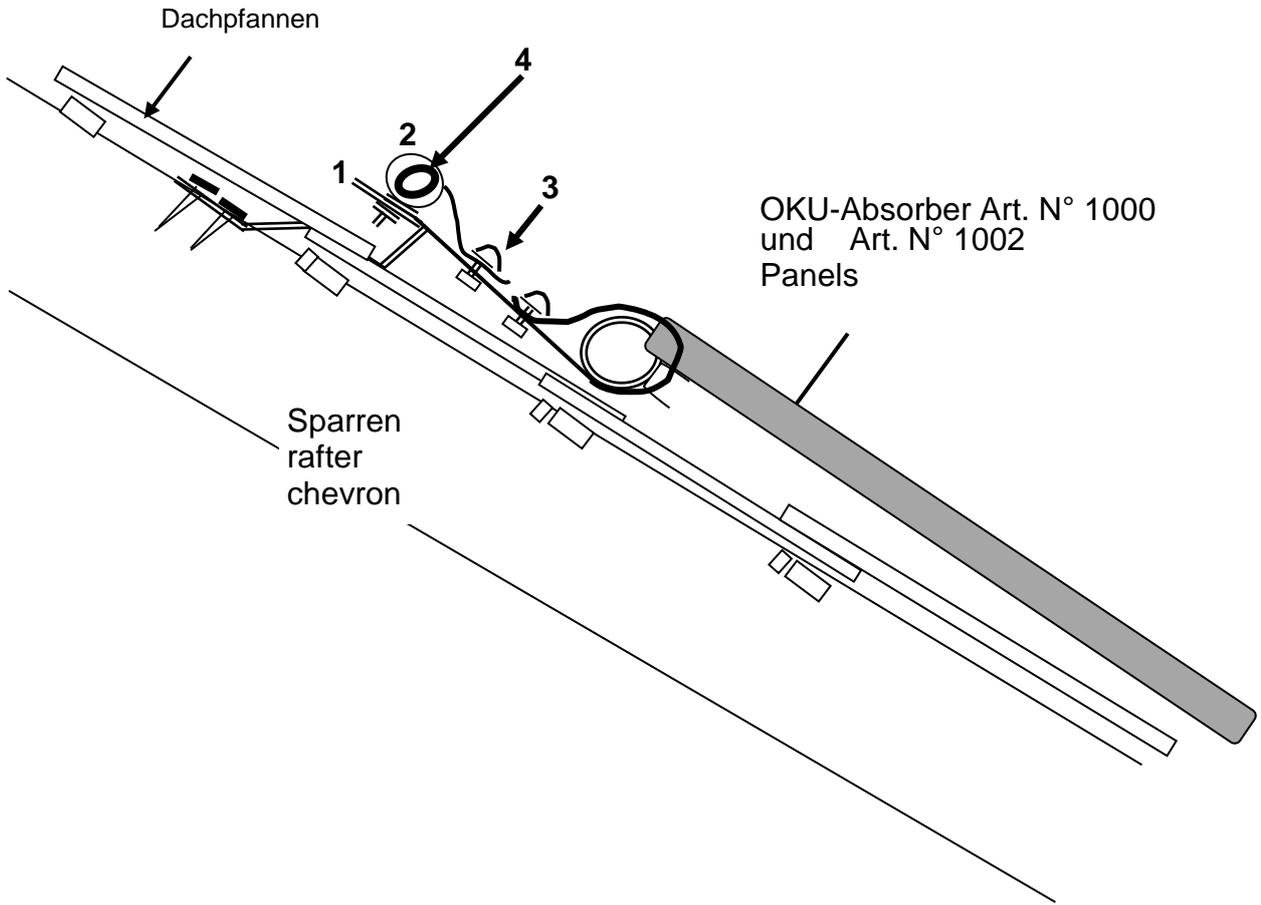
Example for 1 OKU panel - Longitudinal change by 30° C temperature change

$0,20 \times 1,3 \text{ m} \times 30^\circ \text{ C} = 7,8 \text{ mm}$

How to fasten on a tiled roof

1. Hook for tiled roof Art.N° 3212
2. Screw-in pipe clamp 1/2" zinc plated with a rubber inlay Art.N° 3213
3. Perforated zinc plated tape; 12 x 1 Art.N° 3210 with a screw 5 x 16 Art.N° 3211
4. galvanized pipe 1/2" or stainless steel

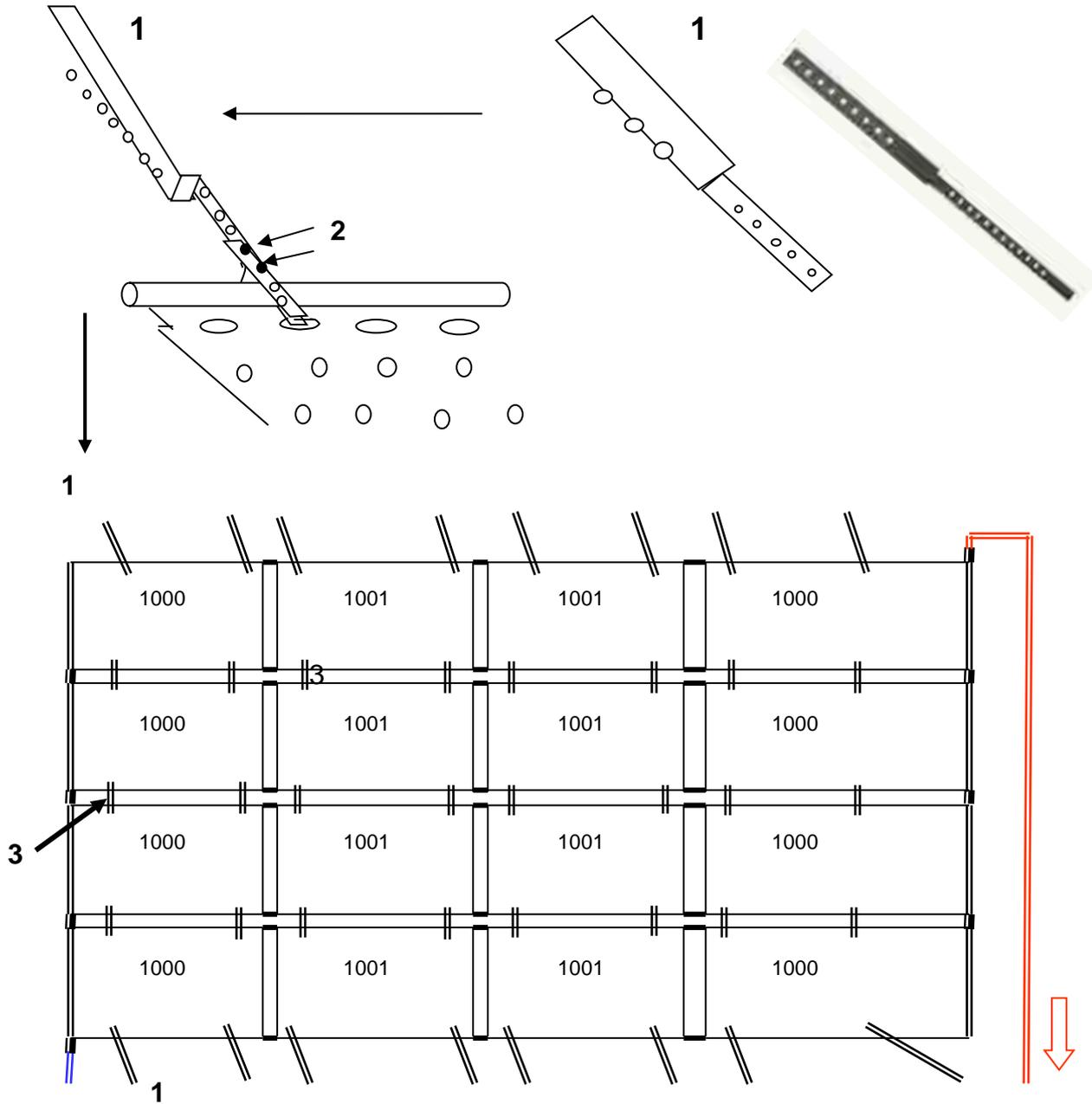


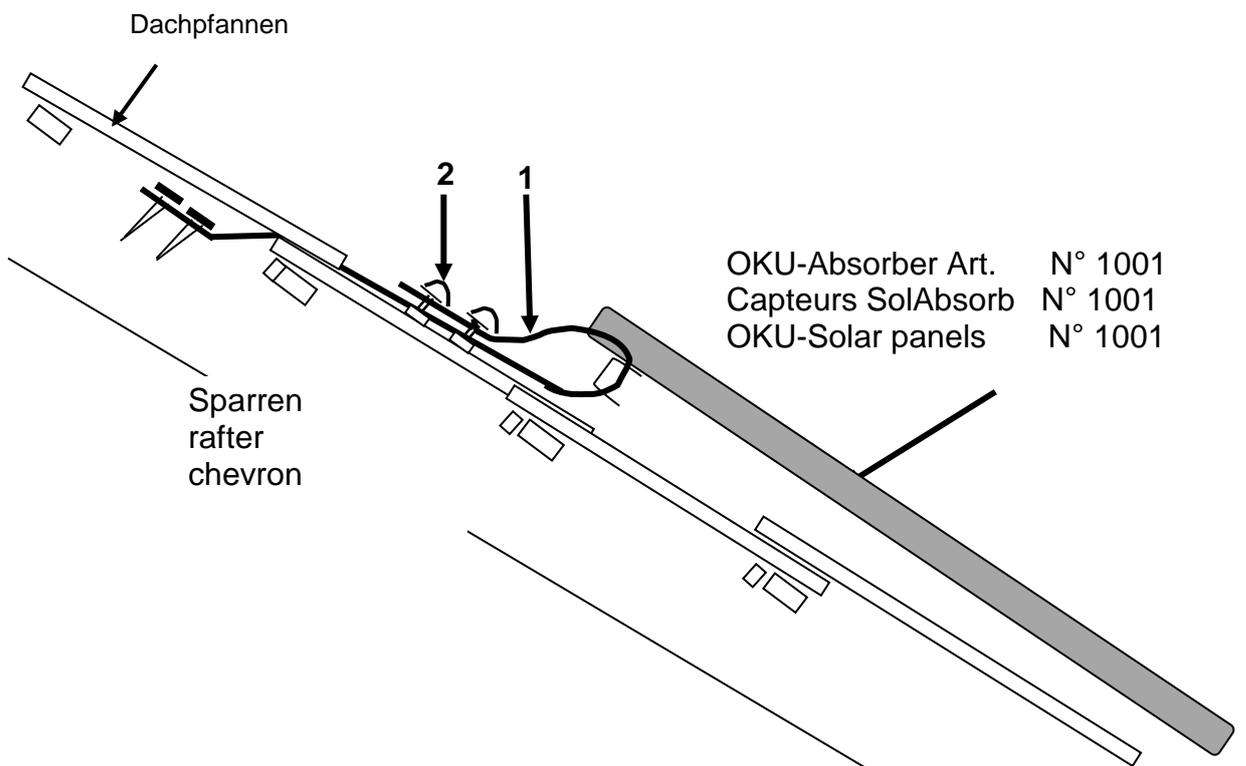
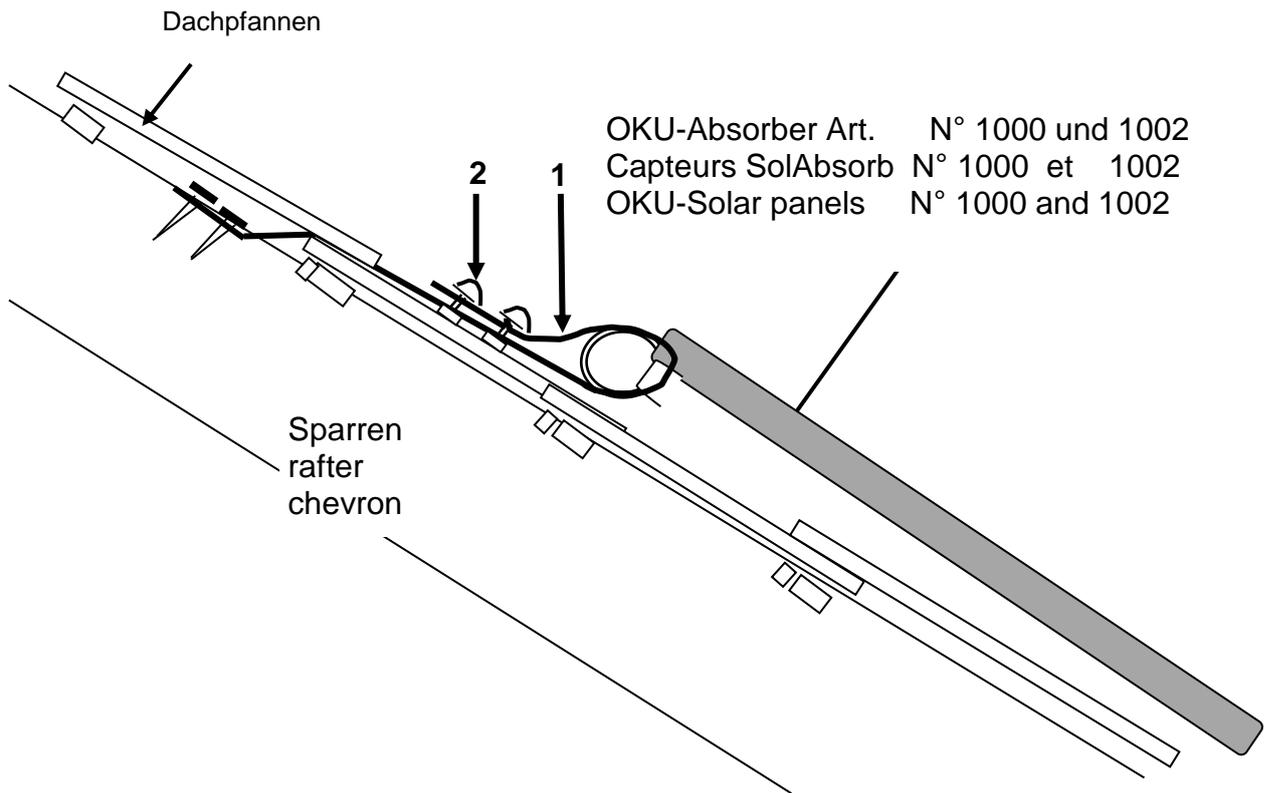


Fixation of OKU-Solar panels on a tile roof with universal mounting strap Art. N° 3217

- 1 Art. N° 3217 Universallasche
éclisse de fixation universelle, inox
universal mounting strap, stainless steel
- 2 Art N° 3211 Schraube mit Mutter M5x16
vis avec écrou M5x16

- 3 Art. N° 3210 Lochband verz. 12x1
+ 3211 mit Schrauben 5x16 Art.N° 3211
bandeau perforé et vis avec écrou
perforized band, screw with bold

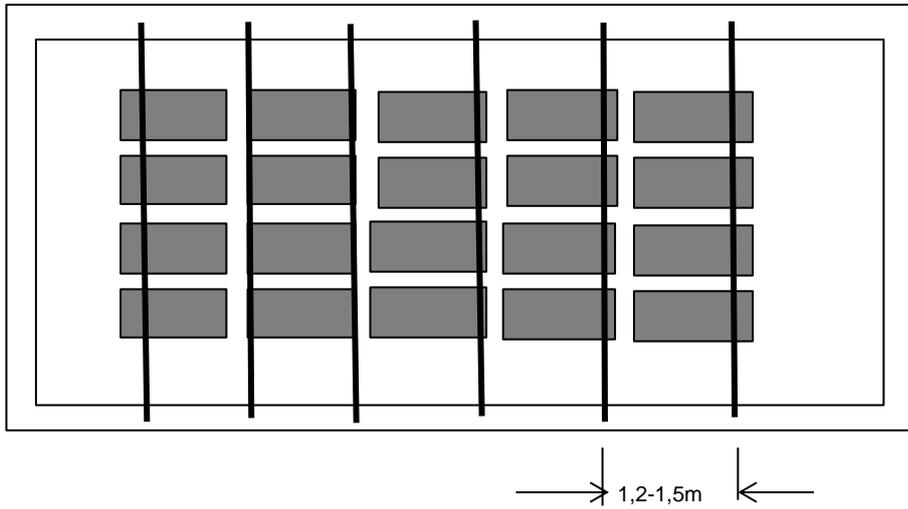
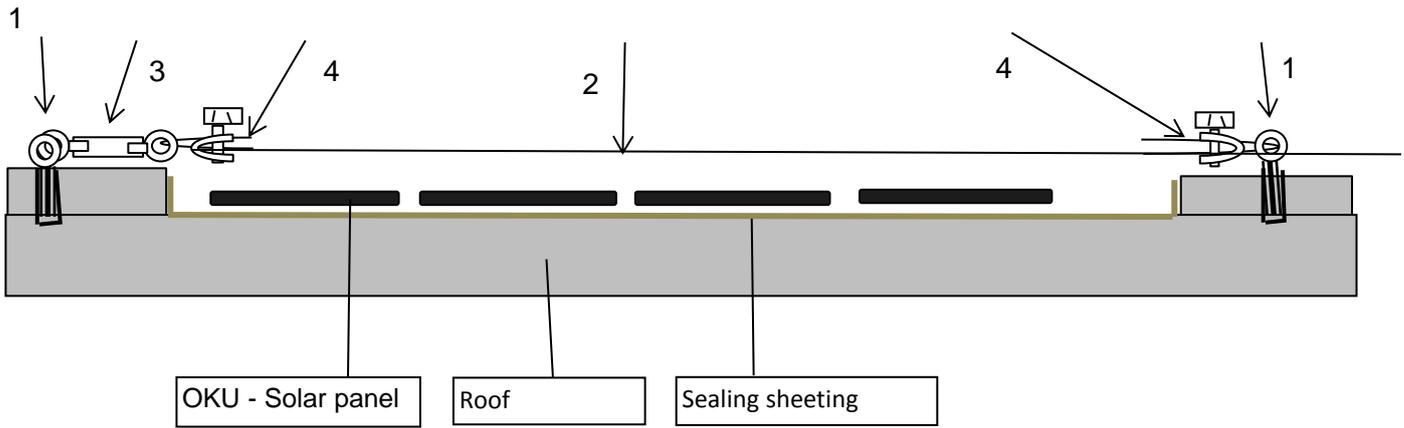




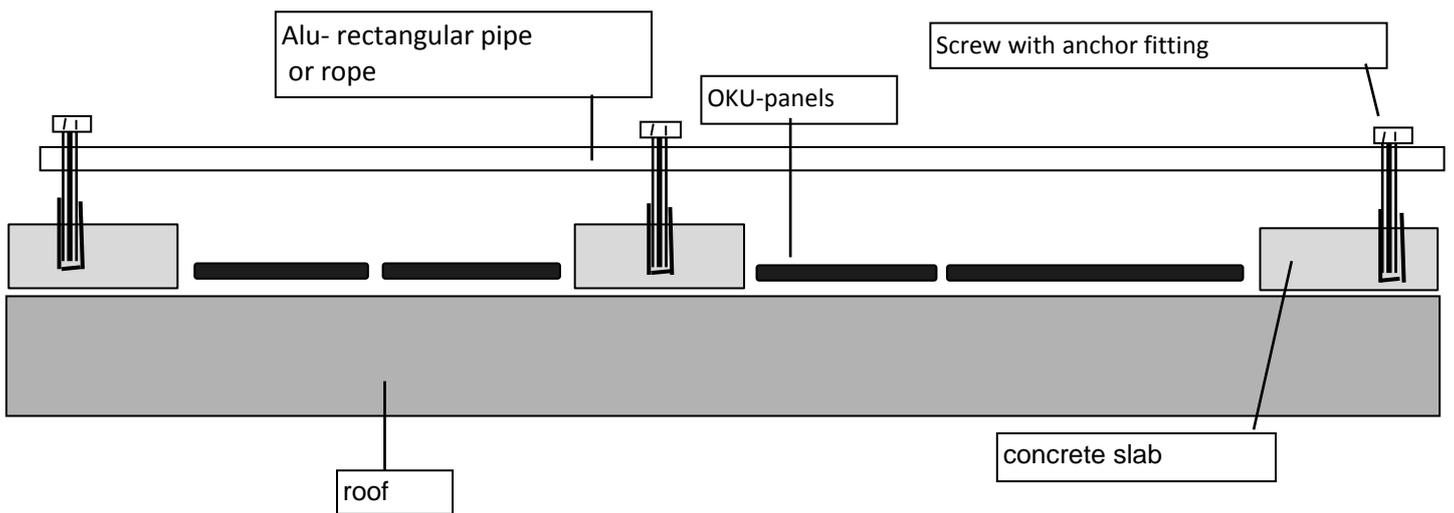
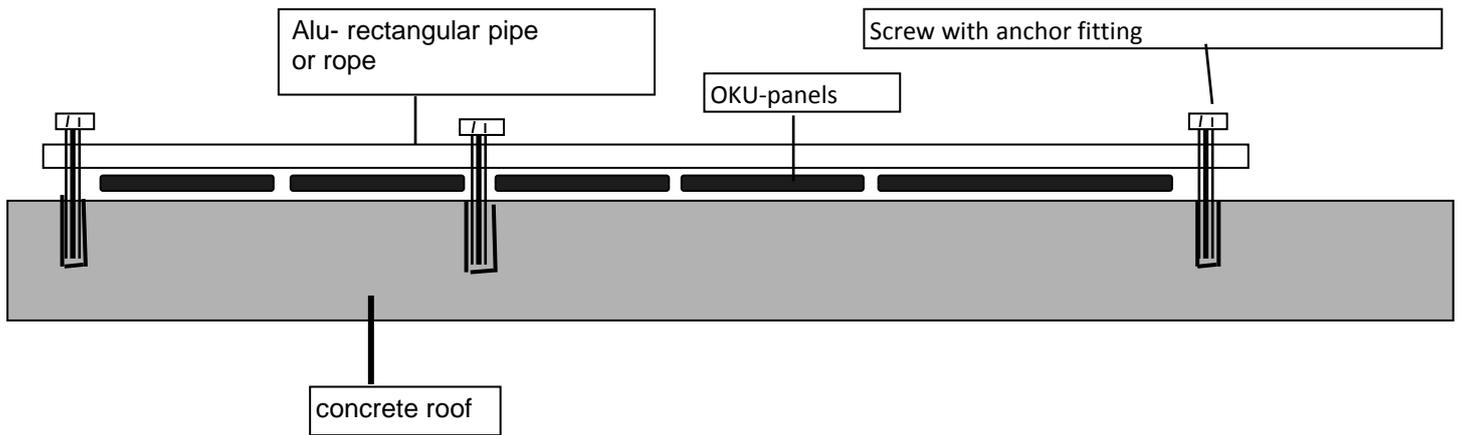
Fastening of OKU-Panels on flat roofs with set F 3219

- 1 ring bolt inox
- 3 tightener inox

- 2 steel rope inox
- 4 rope clamp inox



Proposal on site fastening of OKU-panels on flat roofs fom concrete



Roof fastening on sloped roofs of slate or cement asbestos

Fastening of OKU panels on slate or cement asbestos is similar to that of a tiled roof. However ring bolts must penetrate through the roofs layer and be screwed into the roofs fundement. For roofs with a wooden fundament, it is the same. Be sure to secure into the sheating and furring. In order not to crack slate or cement asbestos, it is important not to use the "hammer mode" when drilling. After securing the screws, it is advised to use a silicone sealing compound for best results.

Uplift loadings OKU-solar panels sublect to the wind speed

| Wind speed km/h | Uplift loading / panel | | |
|--------------------|------------------------|--------|--------|
| | Roof pitch | | |
| | < 10° | 15° | > 20° |
| 80 | 90 kg | 75 kg | 65 kg |
| 90 | 100 kg | 85 kg | 75 kg |
| 100 | 115 kg | 100 kg | 85 kg |
| 110 | 125 kg | 105 kg | 90 kg |
| 130 | 135 kg | 110 kg | 100 kg |
| 150 | 150 kg | 130 kg | 115 kg |
| 180 | 195 kg | 155 kg | 130 kg |
| 200 | 240 kg | 185 kg | 160 kg |
| 250 | 290 kg | 225 kg | 190 kg |

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