

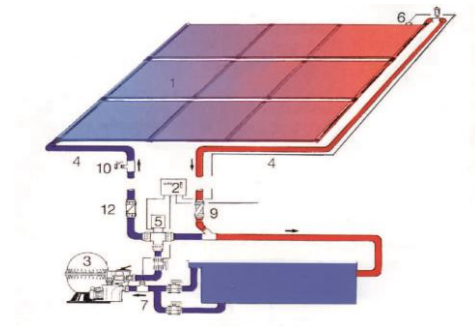
Introduction

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

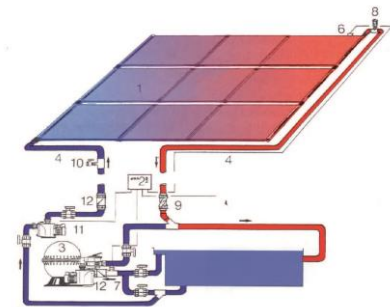
A) Operation with filter pump via three-way motor ball valve with difference-temperature regulation

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.



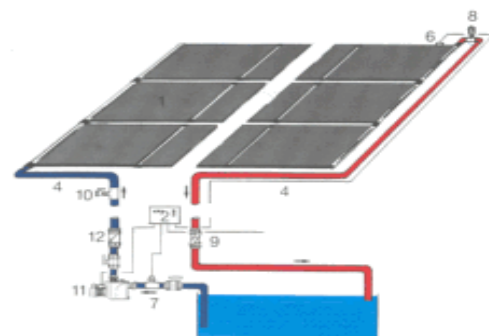
B) Operation with own pump an difference temperature regulation integrated into the filter circuit

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 | 5) Three-way motor ball valve | 9) Stop cock (downdraft brake) |
| 2) Difference-temperature regulation OE 1 | 6) Temperature sensor, absorbers | 10) Drain cock |
| 3) Filter installation | 7) Temperature sensor, swimming pool | 11) Pump for solar circuit |
| 4) Solar circuit forward and return | 8) Vent valve | 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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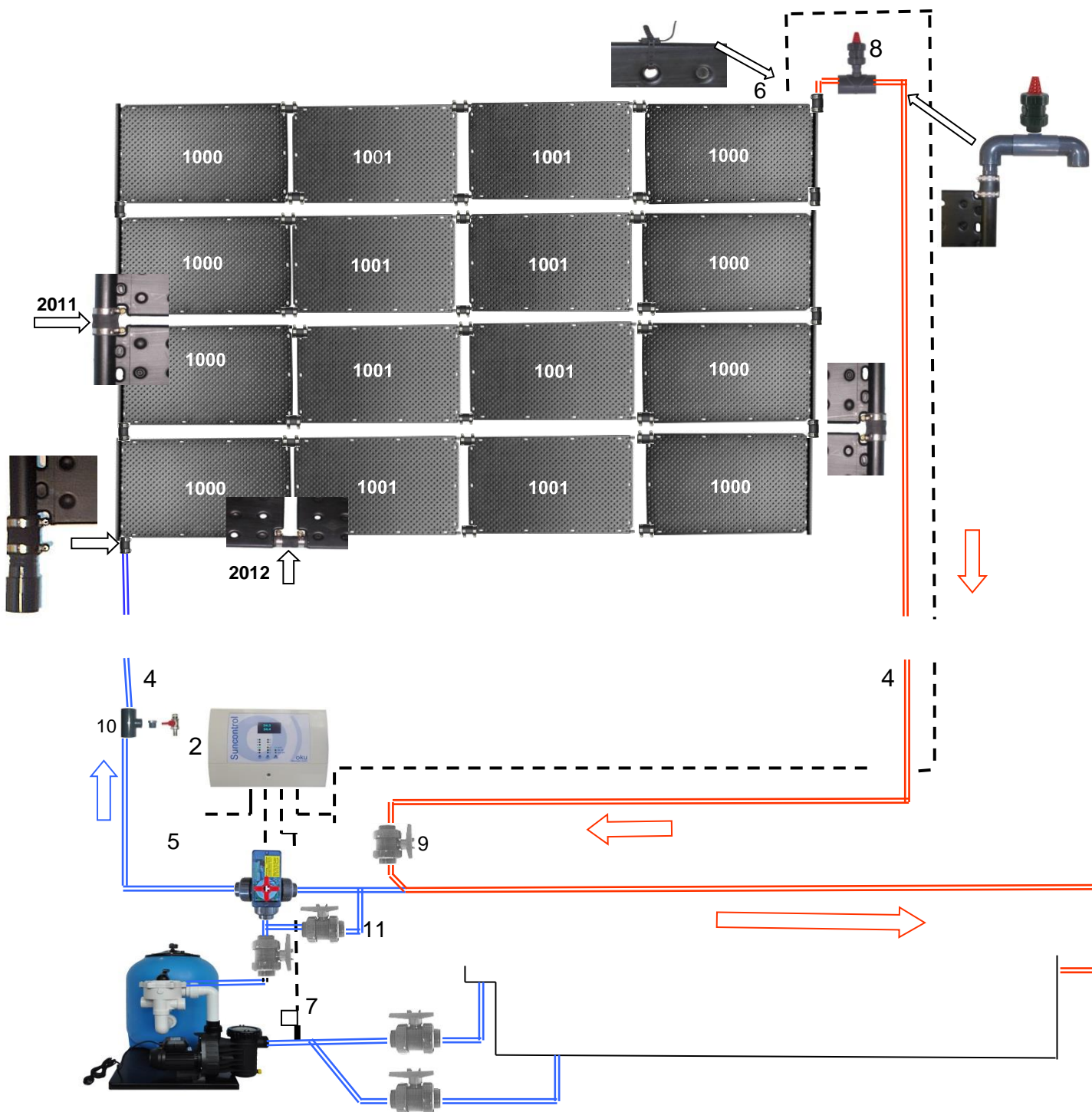
A) Operation with filter pump

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

2) Difference-temperature regulator 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

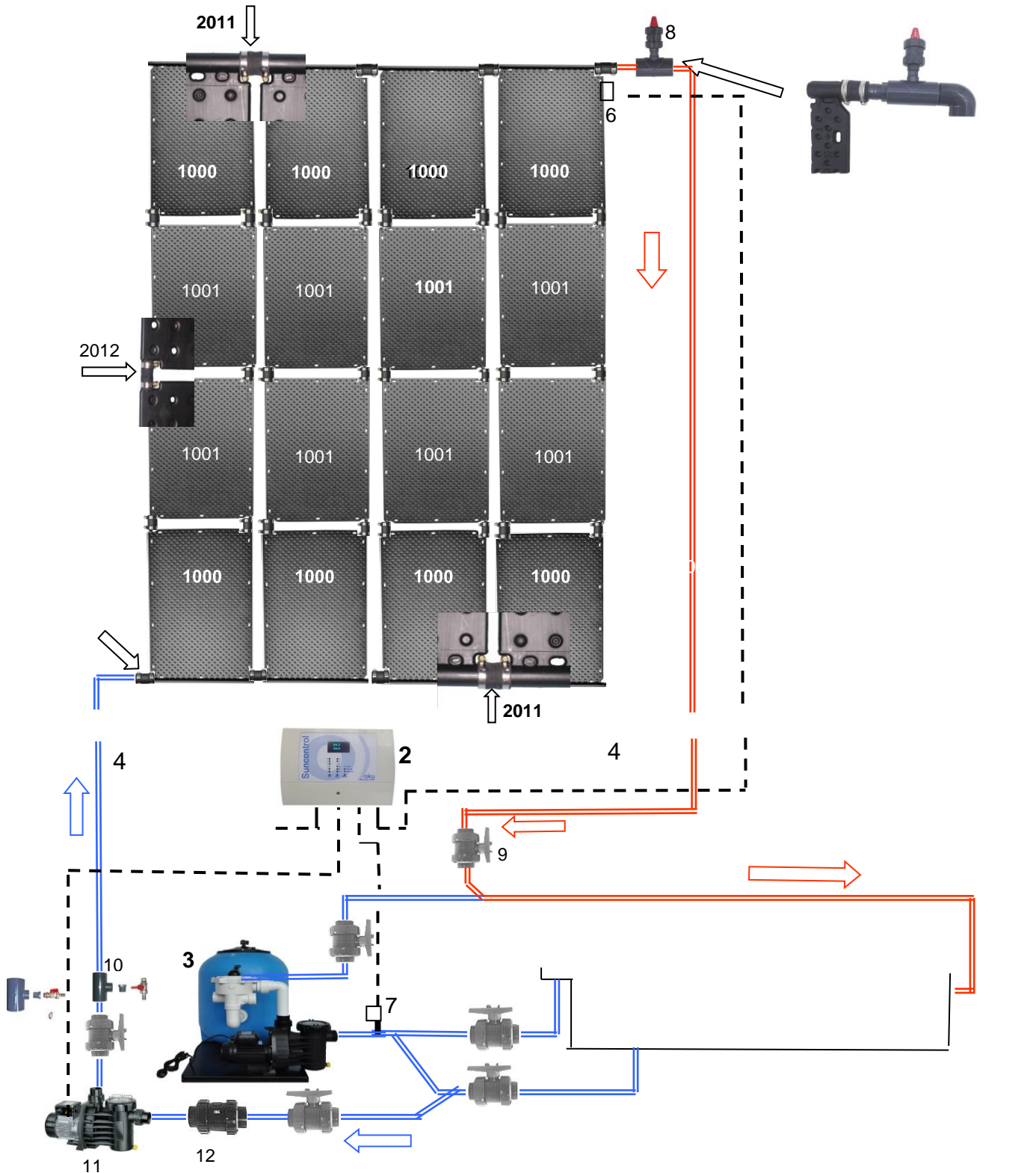
9) Stop cock (downdraft brake)

10) Drain cock

11) By-Pass

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

B) Operation with additional pump and difference-temperature regulator



1) OKU absorber

2) Difference-temperature regulator

3) Filter

4) Solar circuit forward and return

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

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

Dimensions	OKU-Absorber 1000 1.320 mm x 820 mm - 1,08 m ² OKU-Absorber 1001 1.280 mm x 820 mm - 1,05 m ² OKU-Absorber 1002 1.360 mm x 820 mm - 1,12 m ²
Material	HDPE (high density Polyethylene)
Pressure drop	approx. 003 bar at 200 l/h/m ²
Flow rate	150 - 250 l/h/m ²
Weight and water content	circa 5,8 kg m ² - water content circa 5,8 l/m ²
Working pressure	up to 1,2 up to 40° C
allowed snow load	up to 400 kg / m ²
allowed wind load	up to 350 kg / m ²
Lightning protection	is not necessary if the pipework is from plastic material

Warranty

OKU-solar panels produced from HDPE	5 years
Pumps	2 years
Controllers	2 years

under consideration of our technical datas and specifications and proper installation

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 L/h		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

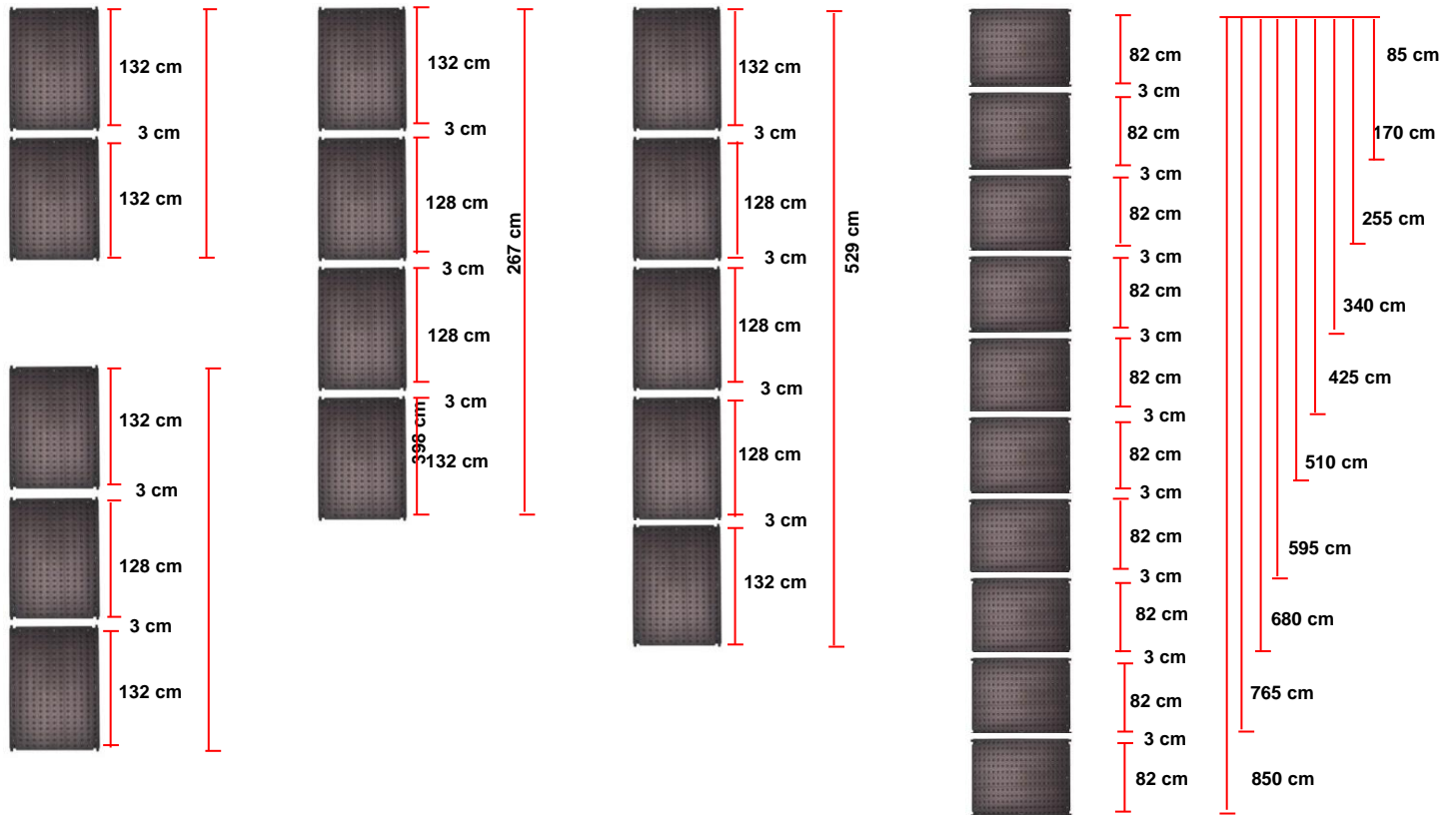
The values given are approximate values for a pipe diameter of DN 40 mm / d 50 mm. In individual cases such as especially long piping may require heavier pumps or a larger pipe dimension

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 circuit 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

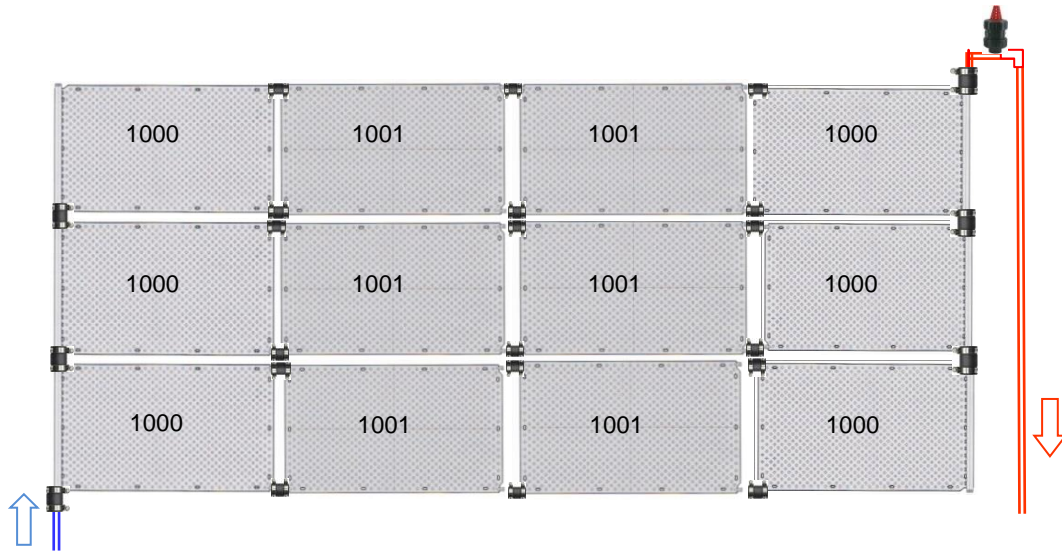


Thermal expansion of OKU-solar panels

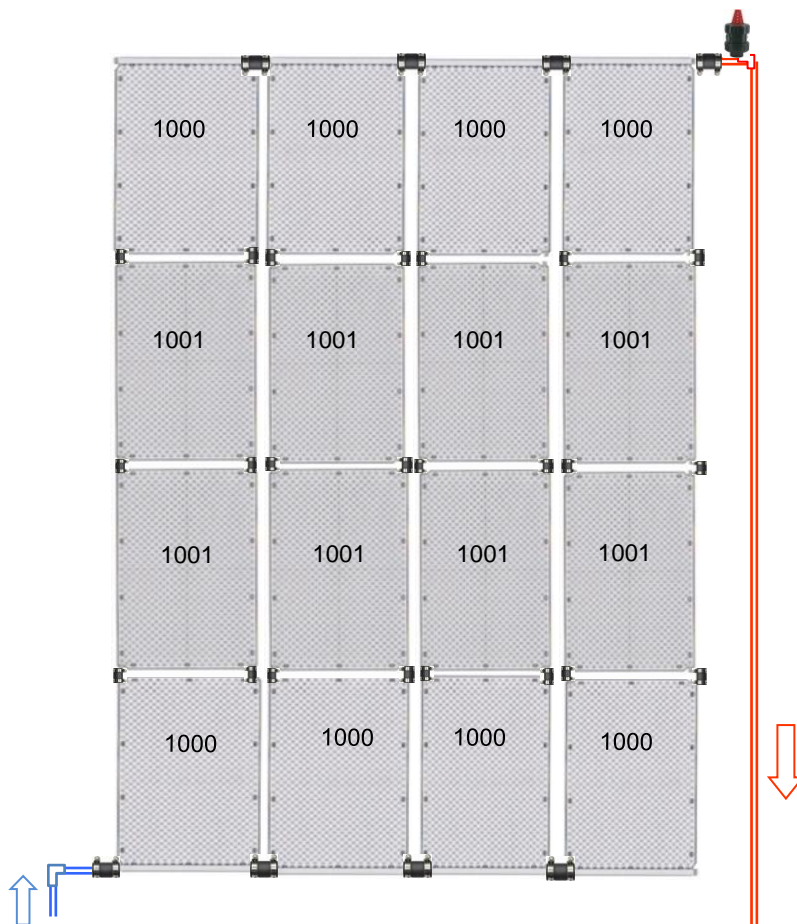
length	Delta T 40 °	Delta T 60 °
132cm	10,5mm	16,0mm
265cm	21,0mm	32,0mm
394cm	31,5mm	48,0mm
523cm	42,0mm	64,0mm
652cm	53,5mm	80,0mm
width		
85cm	6,8mm	10,2mm
170cm	13,6mm	20,4mm
255cm	20,4mm	30,6mm
344cm	27,2mm	40,8mm
425cm	34,0mm	51,0mm
510cm	40,8mm	61,2mm
595cm	47,6mm	71,4mm
680cm	54,4mm	81,6mm
765cm	61,2mm	91,8mm
850cm	68 mm	102 mm

OKU-solar panels - examples for layouts

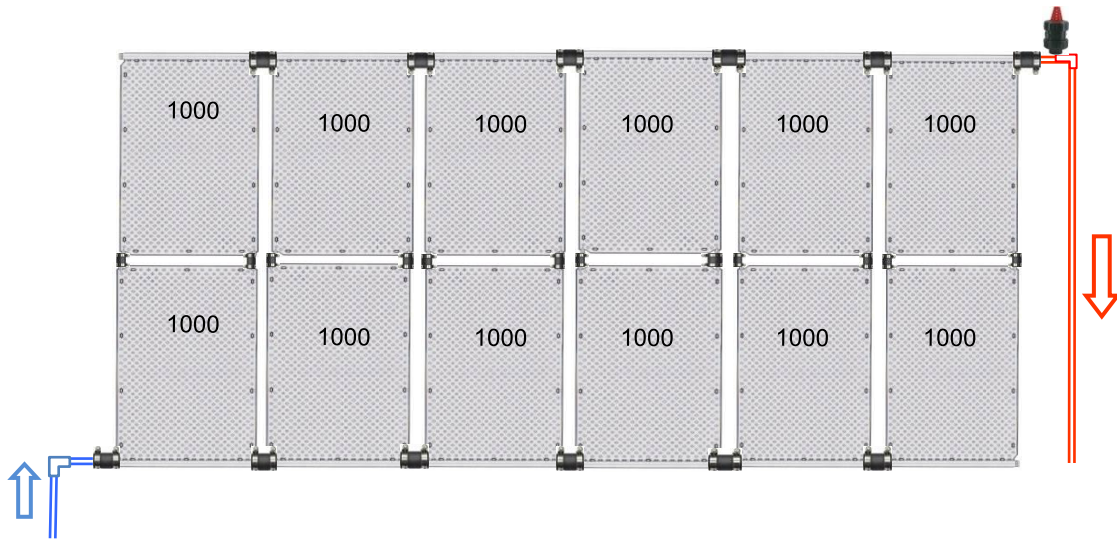
OKU-solar panels Art. N° 1000 und 1001 two or more rows mounted parallel lengthwise



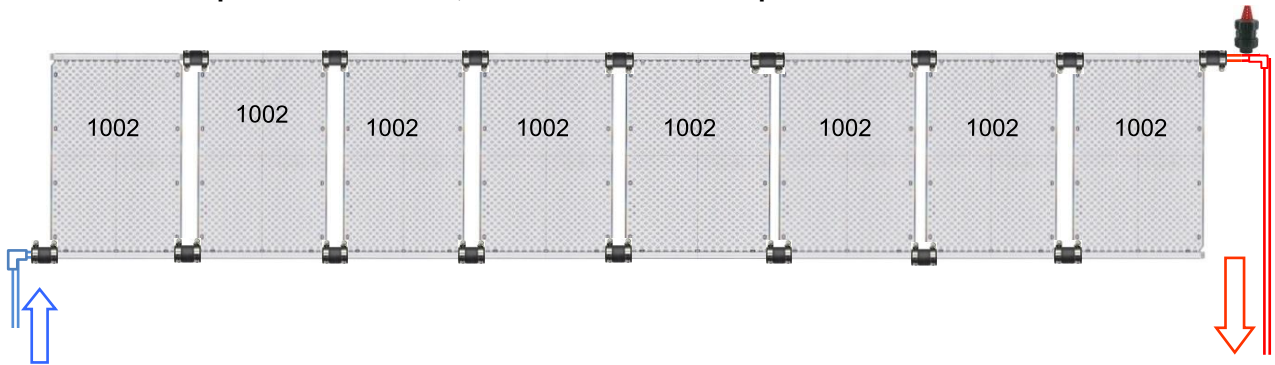
OKU-solar panels Art. N° 1000 und 1001 two or more rows mounted parallel upright



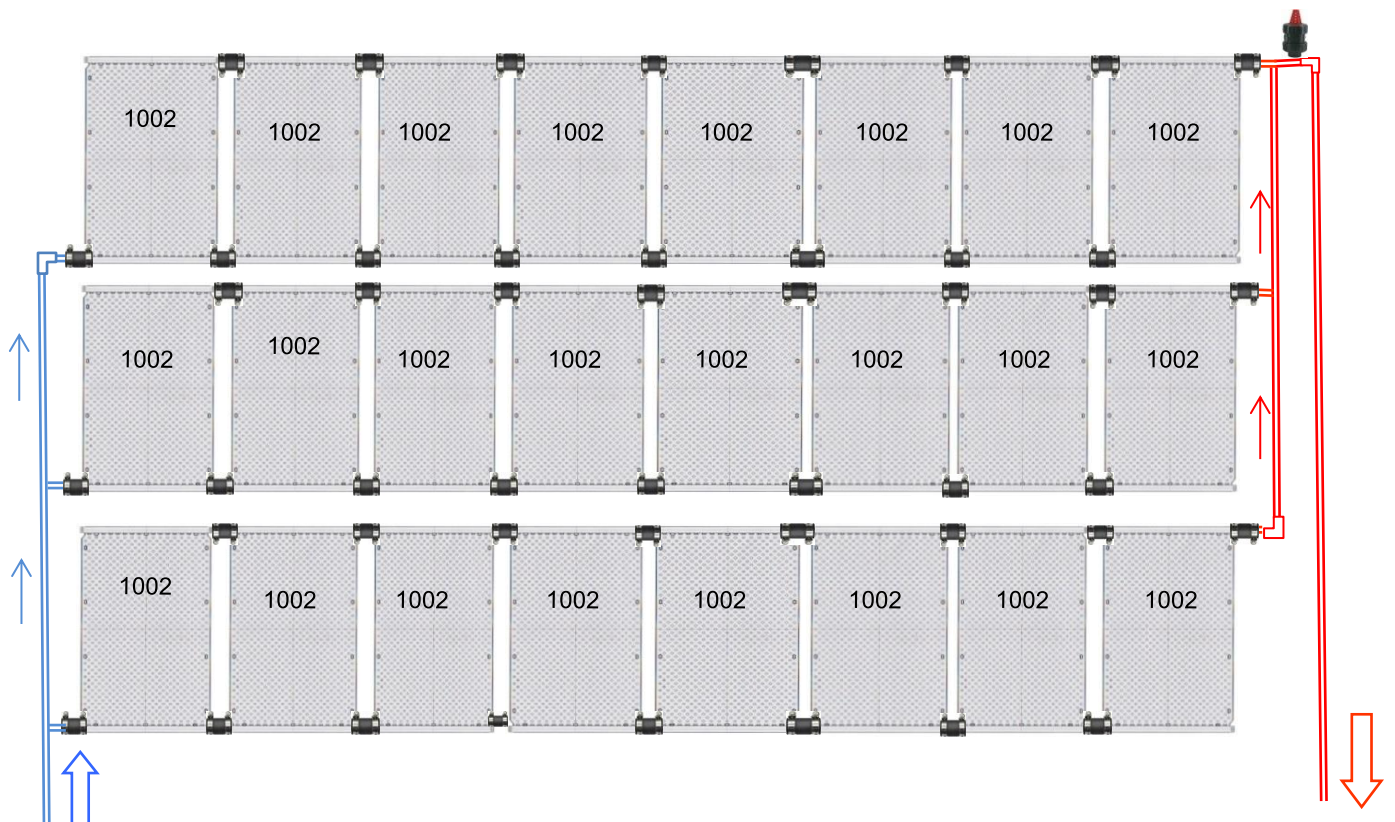
OKU-solar panels Art. N° 1000, two or more rows, mounted upright one above the other



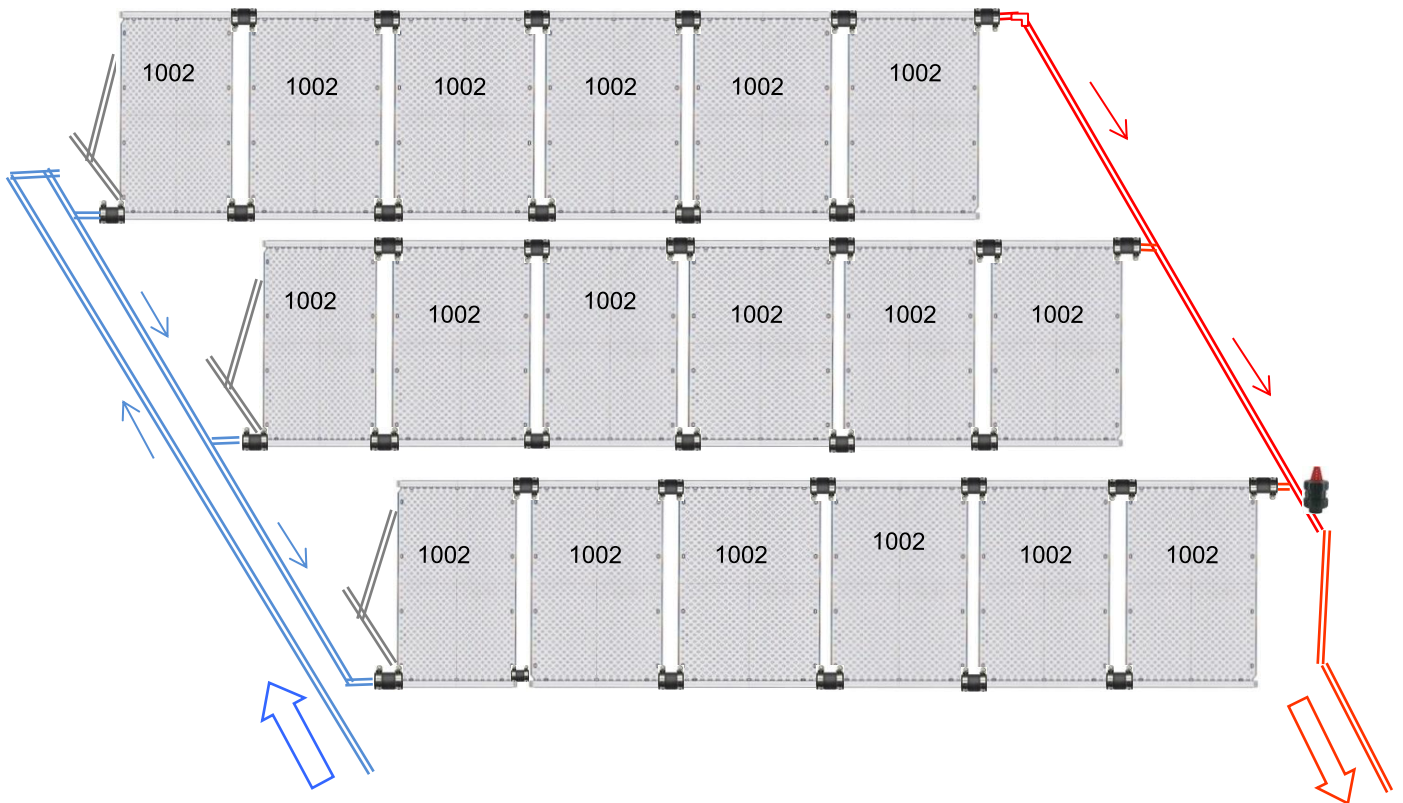
OKU-solar panels Art. N° 1002, two or more mounted parallel in one row



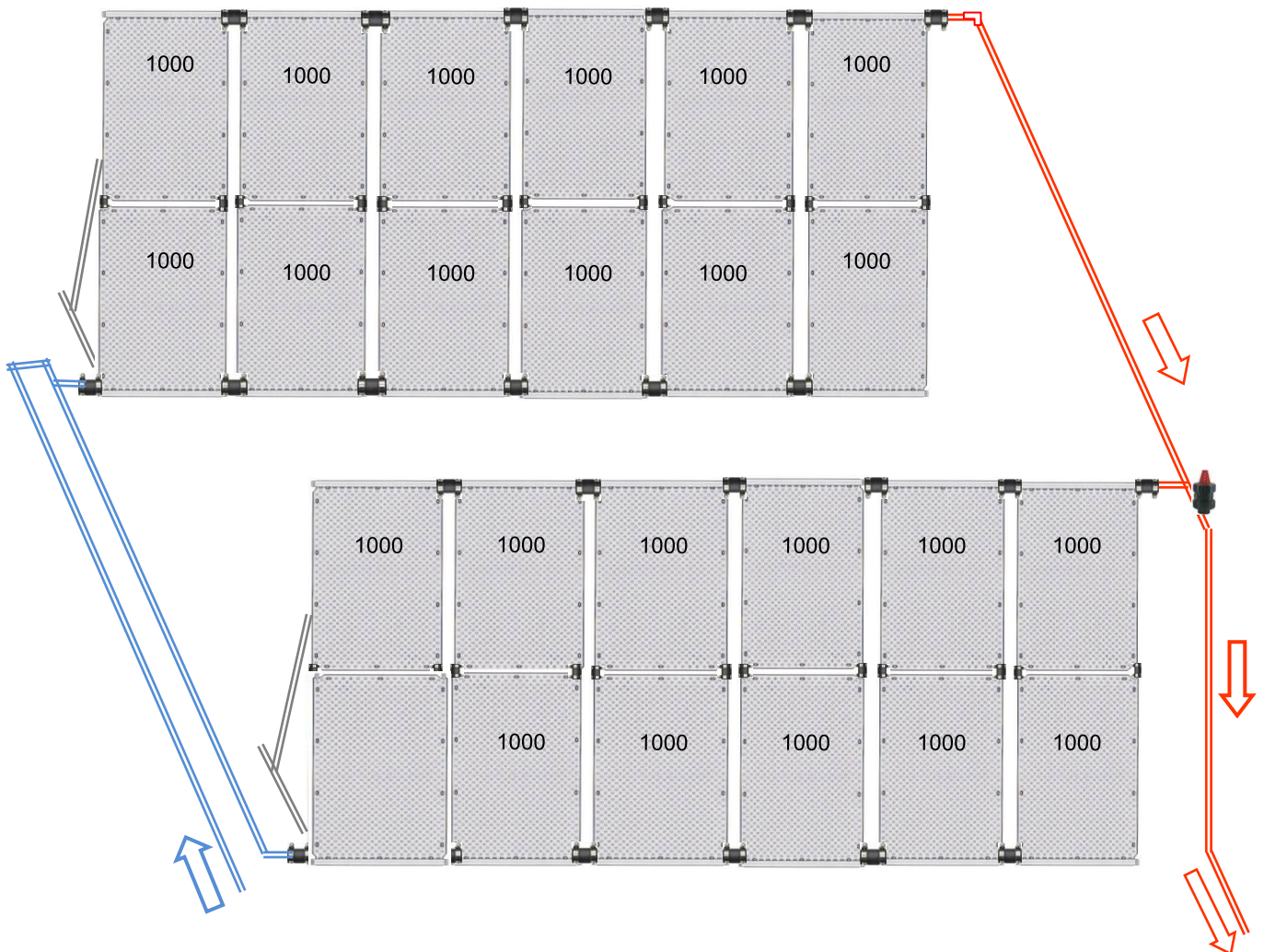
OKU-solar panels Art. N° 1002, mounted parallel in two or more rows



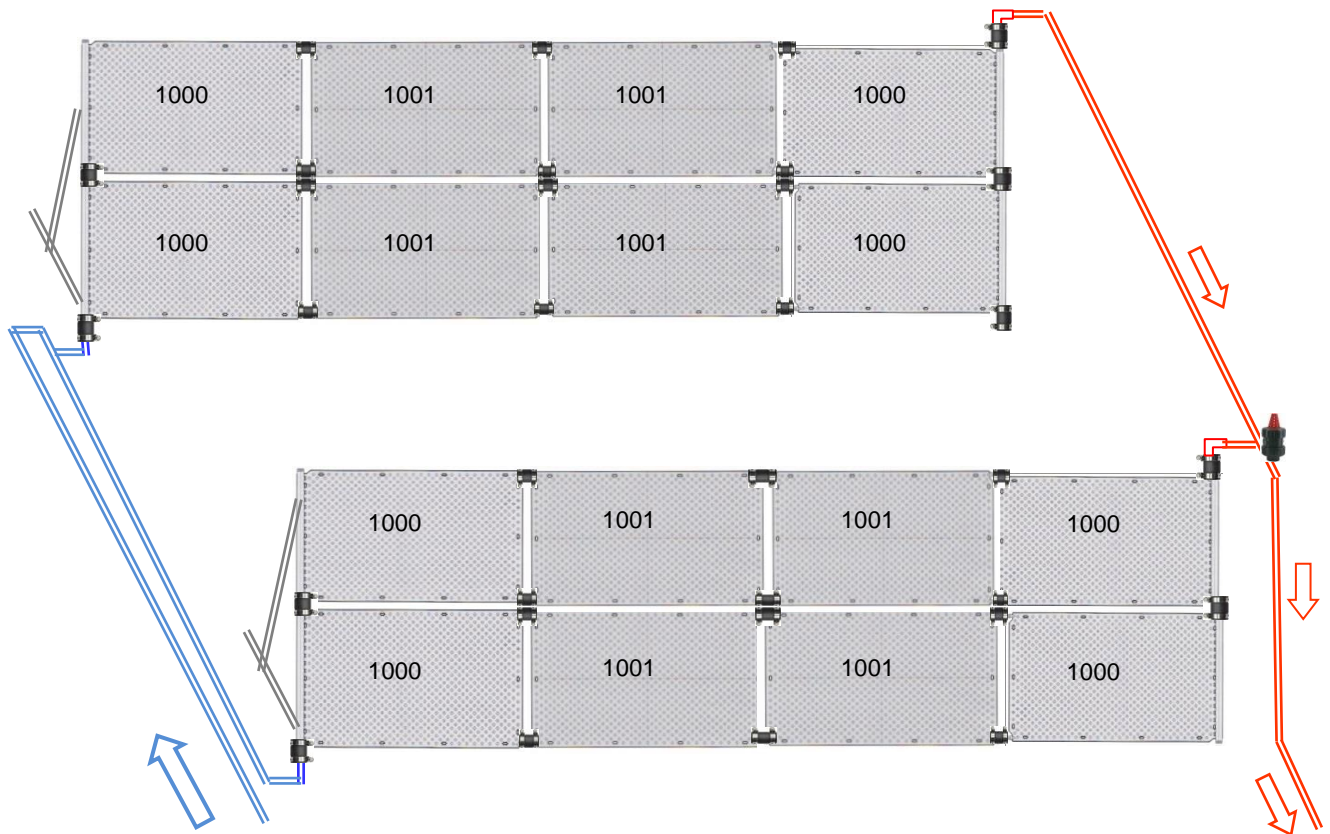
OKU-solar panels Art. N° 1002, two or more rows one behind the other with mounting frames



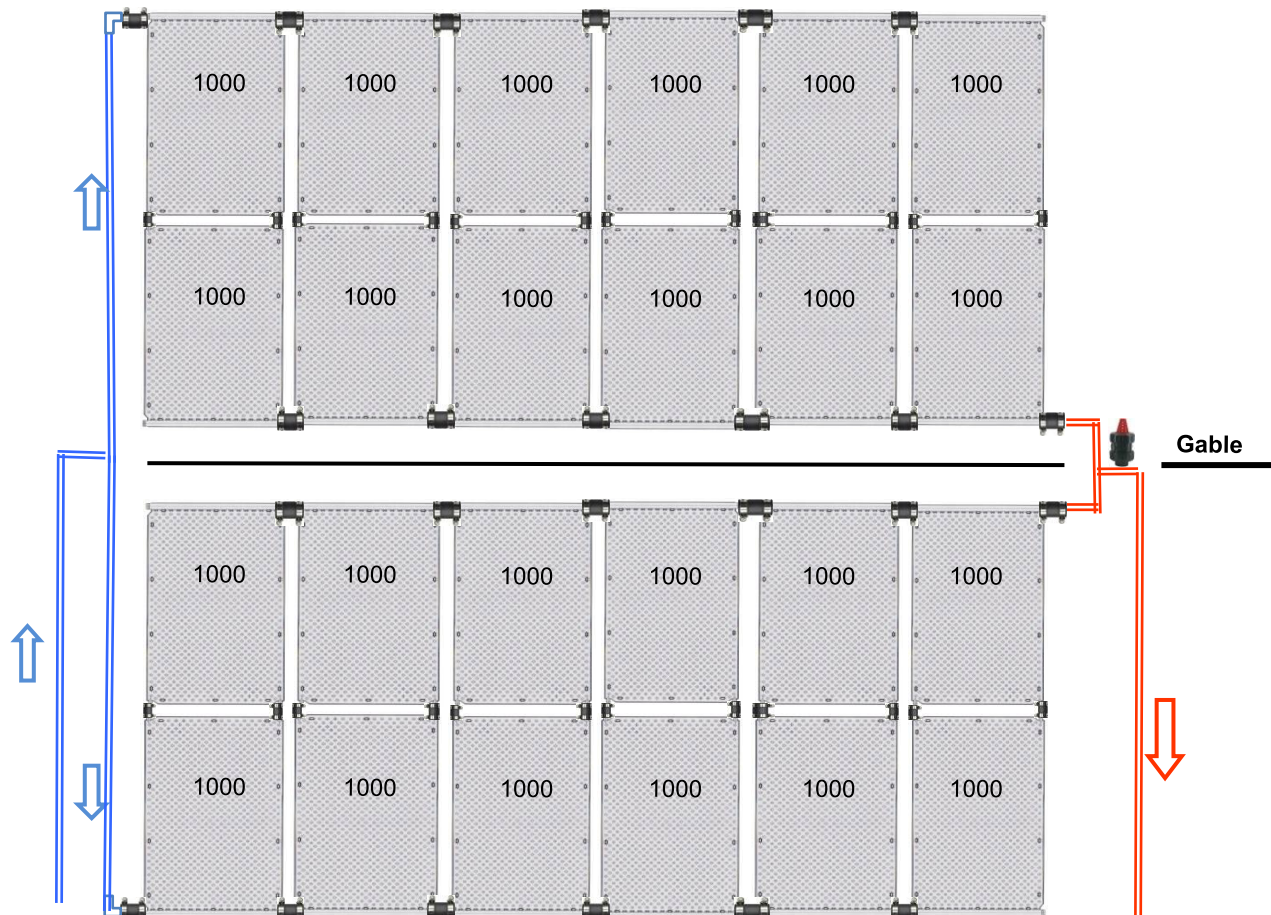
OKU-solar panels Art. N° 1000, two or more rows one behind the other with mounting frames



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°



Warning:

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

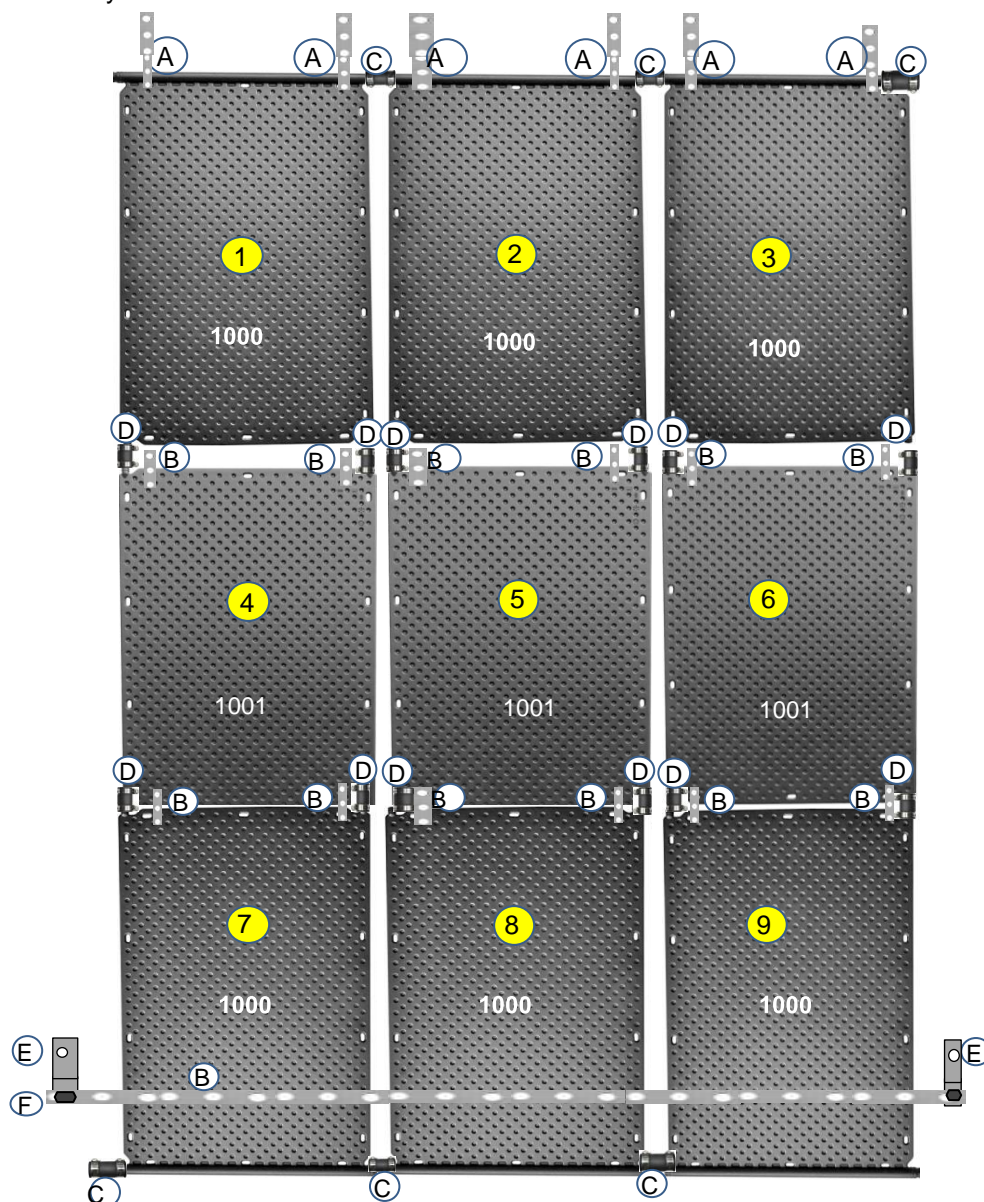
Thermoplastic material (HDPE) in comparison to metal and duroplastic proves to have a higher coefficient thermal expansion. For this reason, the fastening of the panels must be done in a flexible manner. In extreme cases temperature differences of up to 100° C may occur. For example, in summer as high 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
 $0,20 \times 1,3 \text{ m} \times 30^\circ \text{ C} = 7,8 \text{ mm}$

OKU-Absorber mounted vertically (headers at the top and below)

The piping must be designed in Tichelmann System

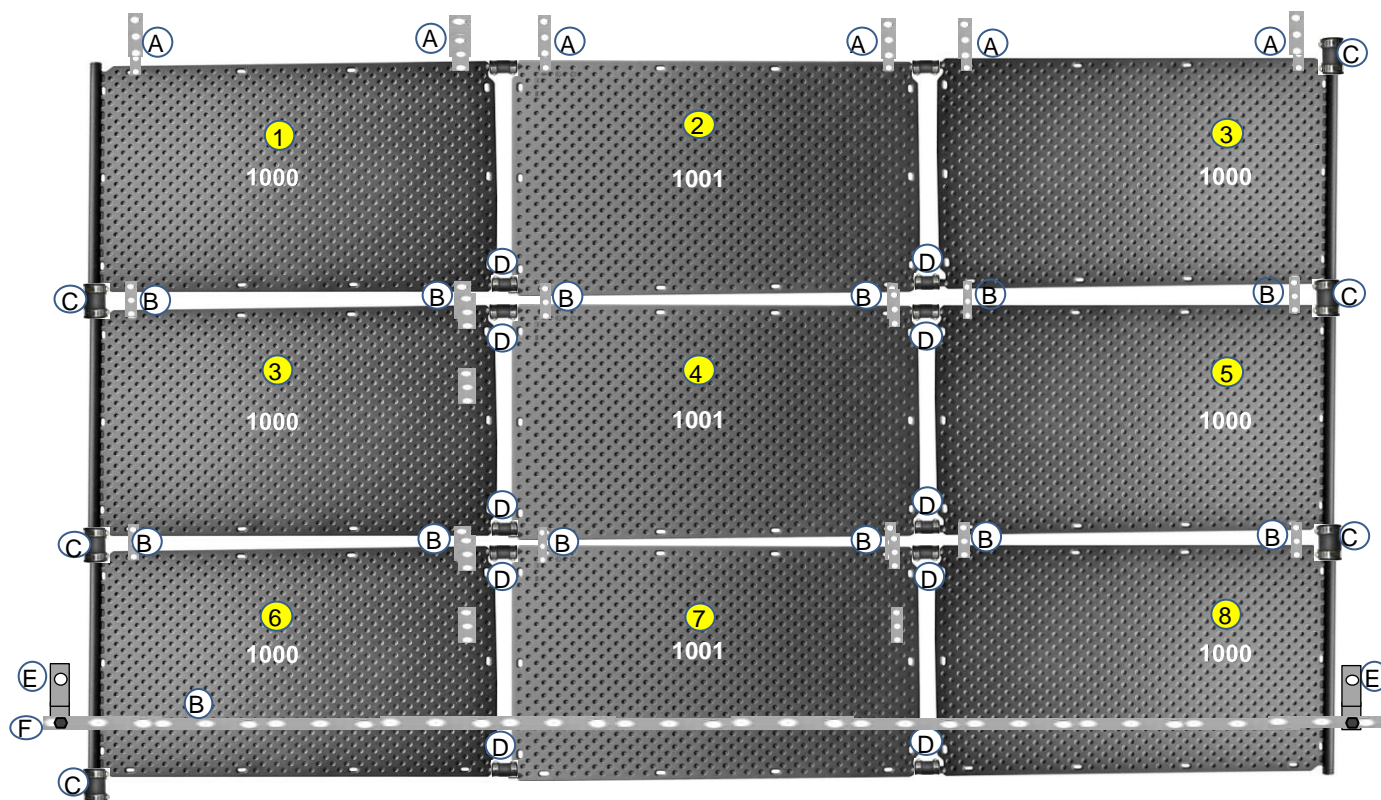
**Roof fixation with
universal mounting strap
Art. N° F3217**



① — ⑨ recommended assembly sequence of the OKU panels

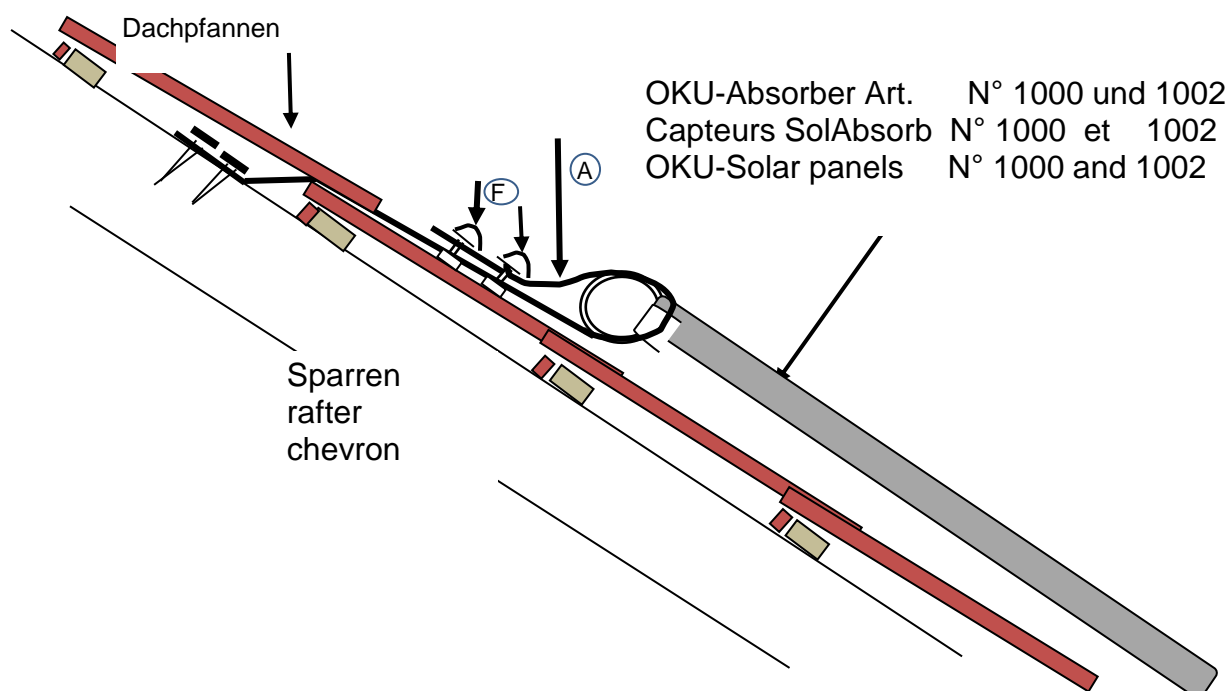
- Ⓐ F 3217 universal mounting strap
- Ⓑ F 3210, 3210- 1 perforated tape
- Ⓒ F2011 hose coupling 38x5x60 mm
- Ⓓ F2012 hose coupling 25x3x63 mm
- Ⓔ F3212/15/16 roof hook

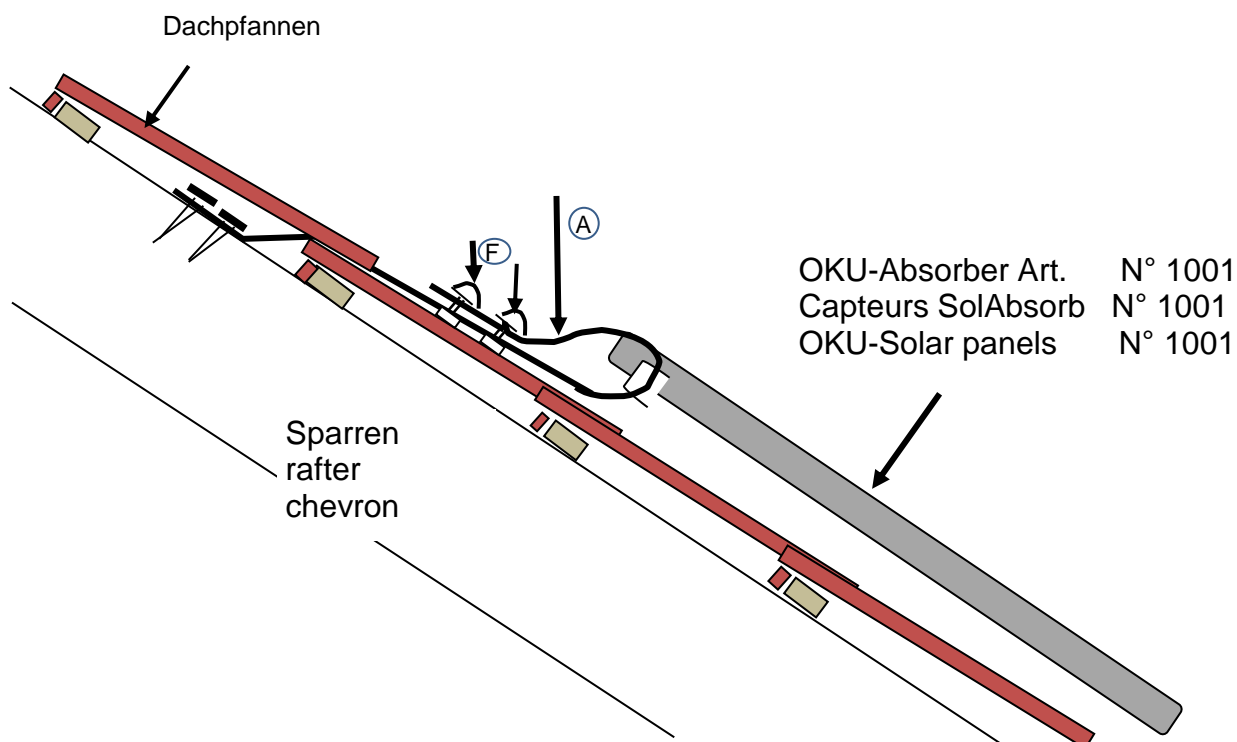




① — ⑨ recommended assembly sequence of the OKU panels

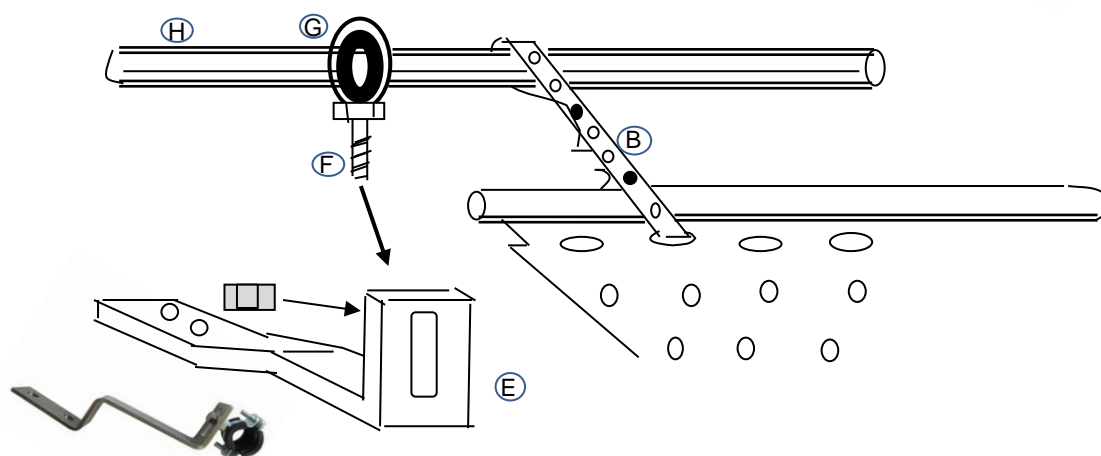
- Ⓐ F 3217 universal mounting strap
- Ⓑ F 3210, 3210- 1 perforated tape
- Ⓒ F2011 hose coupling 38x5x60 mm
- Ⓓ F2012 hose coupling 25x3x63 mm
- Ⓔ F3212/15/16 roof hook
- Ⓕ F3211 screw with nut M 5x16 mm

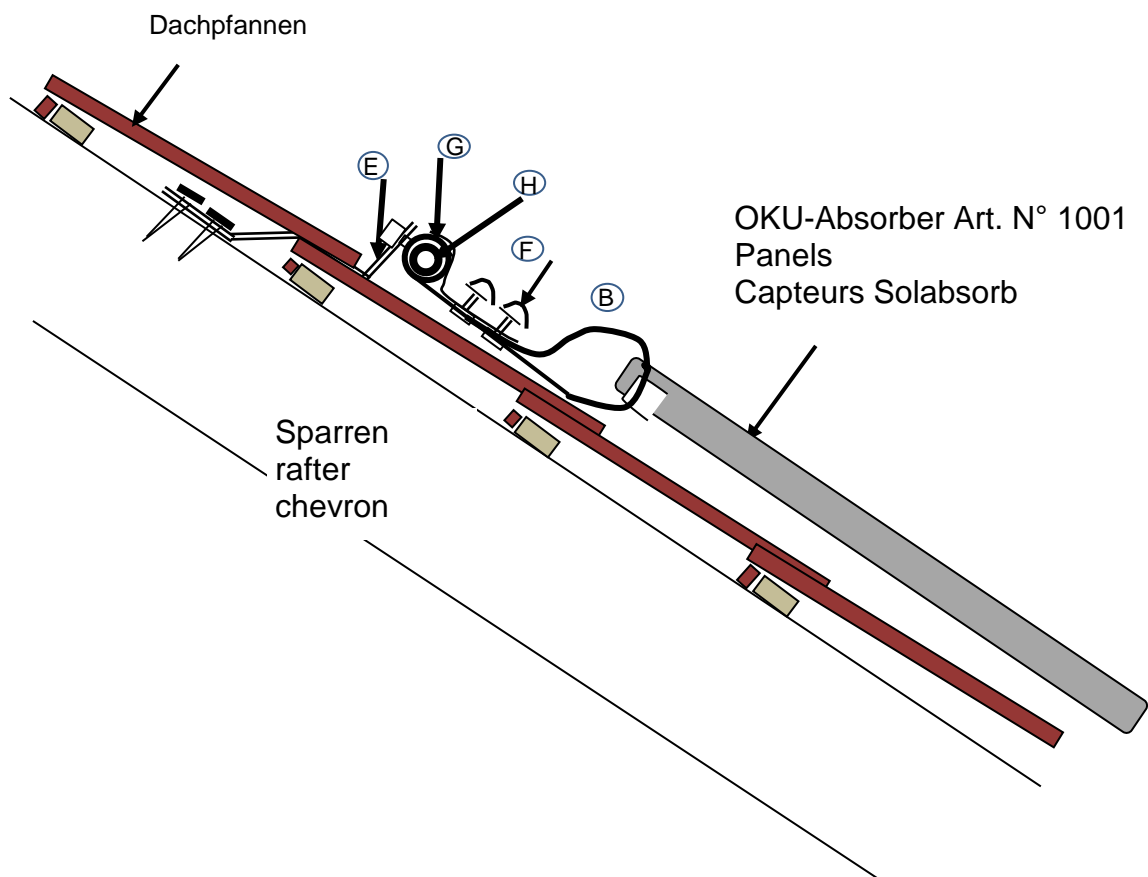
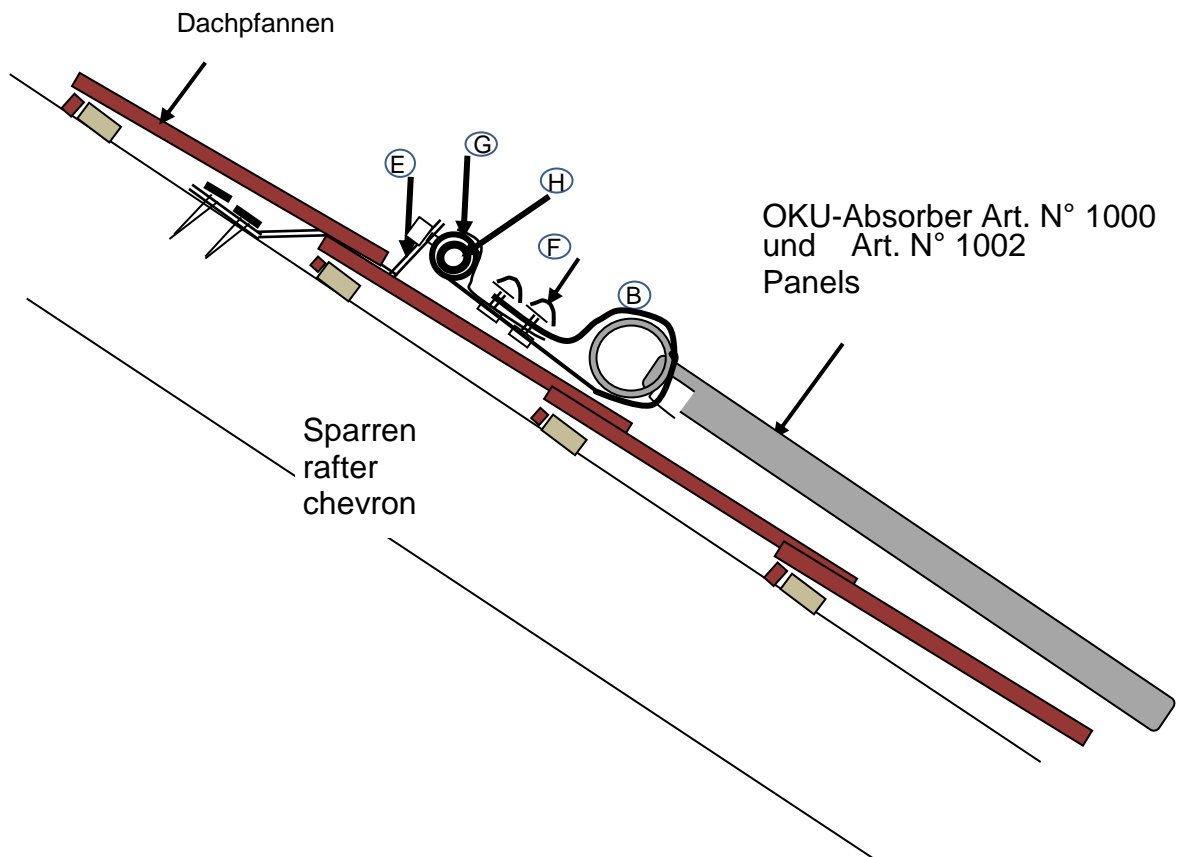




Roof fixation with roof hooks Art. N° F3212 or F 3215 or F3216 depending on the tiles

- (B) F 3210, 3210- 1 perforated band
- (E) F3212/15/16 roof hook
- (F) F3211 screw with nut M5x16
- (G) F3213 Pipe clamp with screw M 8x25 mm
- (H) F3214 pipe steel gavanized or inox 1/2 "





On flat roofs, the panels must be protected against wind. This can be done by stretching wire or nylon rope in a distance of about 1 to 1.4 m over the panels, fastened at the edge of the roof.

It is also possible to weight the OKU-panels by example with garden slabs or with garden slabs and U-profiles
See drawing below

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

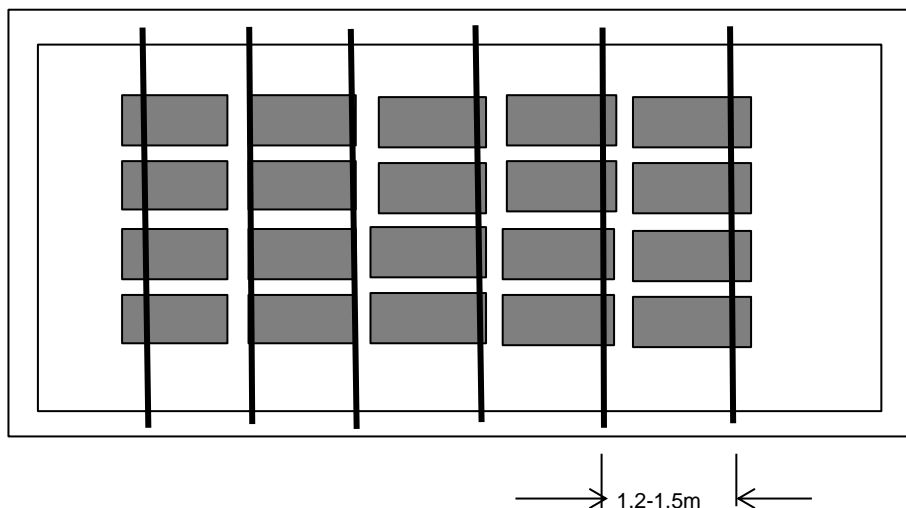
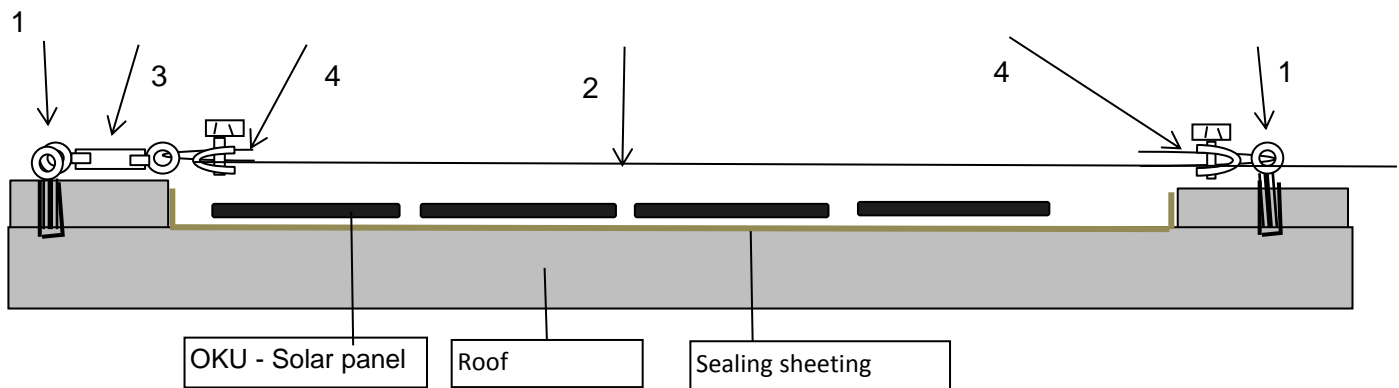


1 Ringschraube Edelstahl
ring bolt inox
piton acier inoxydable
Tornillo con anillo inox

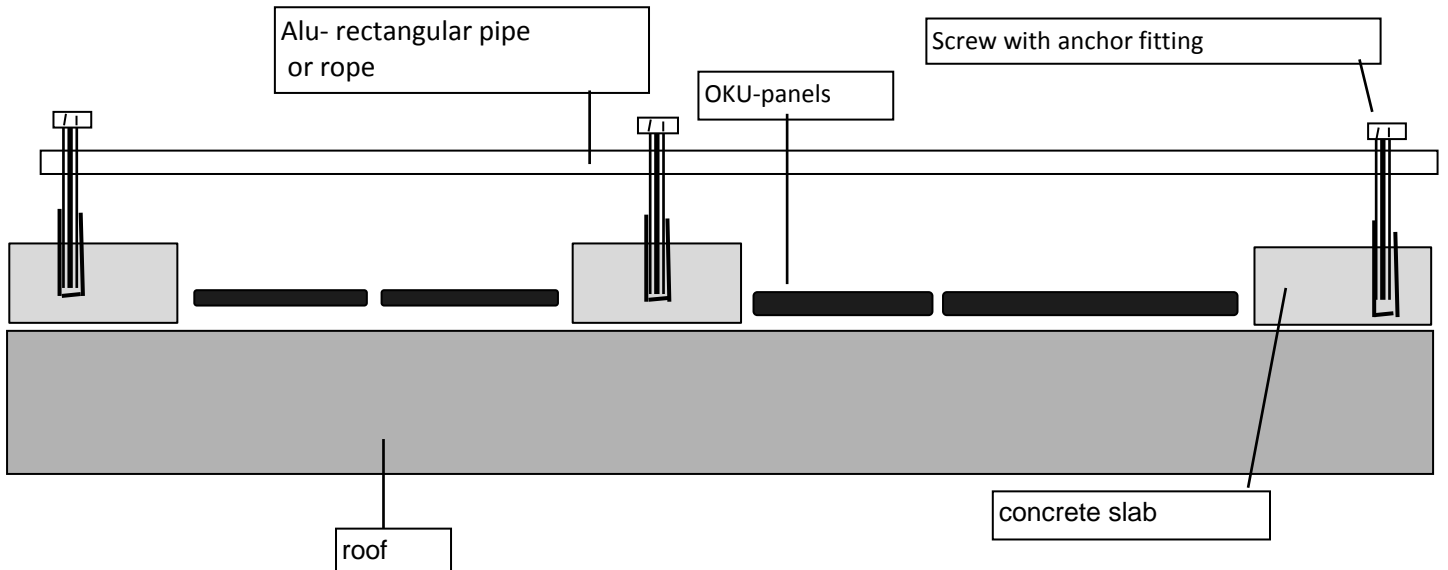
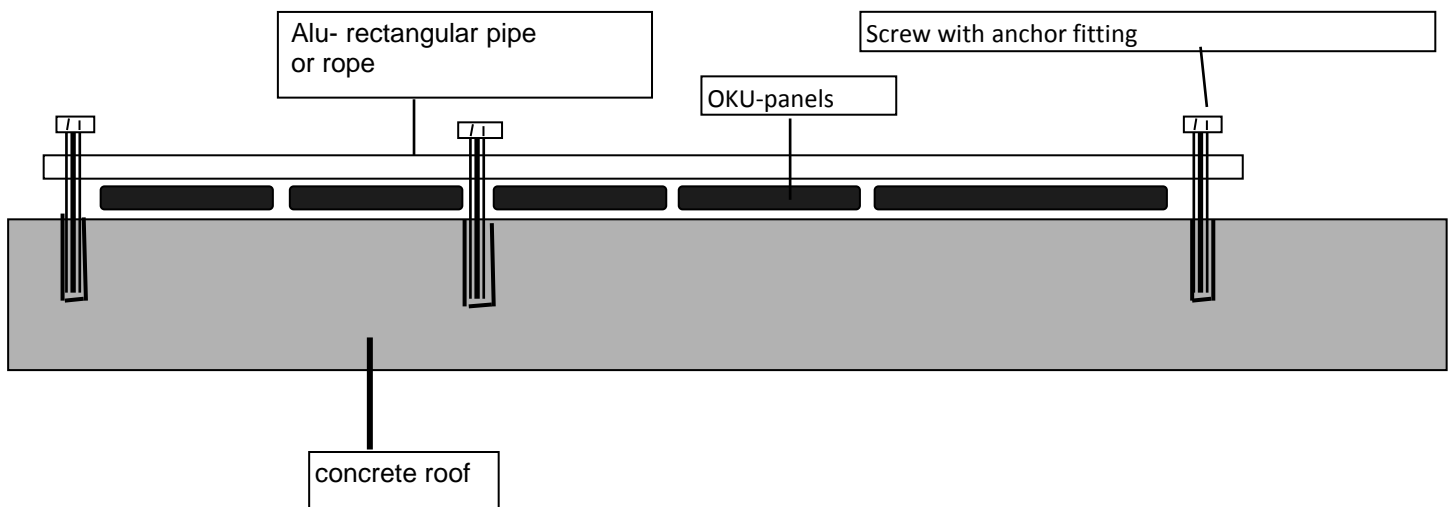
2 Edelstahlseil
steel rope inox
cable d'acier inoxydable
cable de acero inox

3 Spanner
tightener inox
minahouet acier inoxydable
Tensor inox

4 Klemmen
rope clamp inox
serre-cable acier inoxydable
abrazadera inox



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

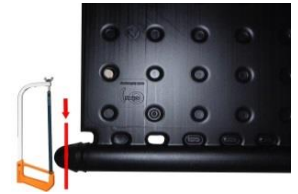


Roof fastening on sloped roofs of slate or cement asbestos

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.

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.

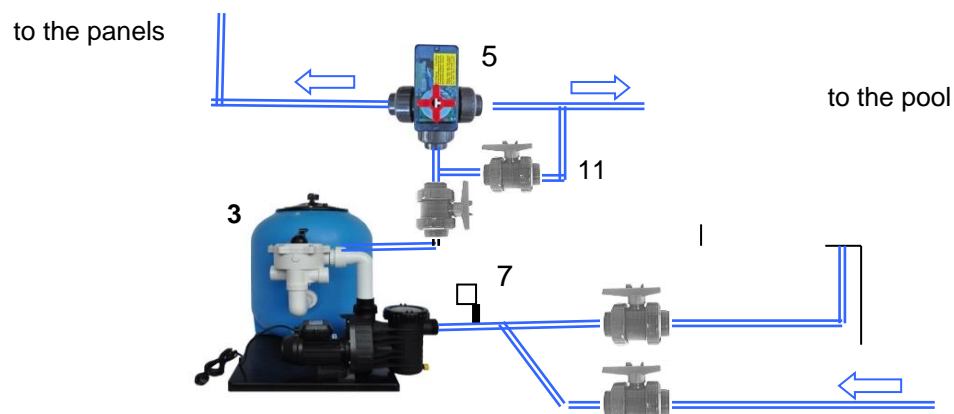
panels mounted vertical



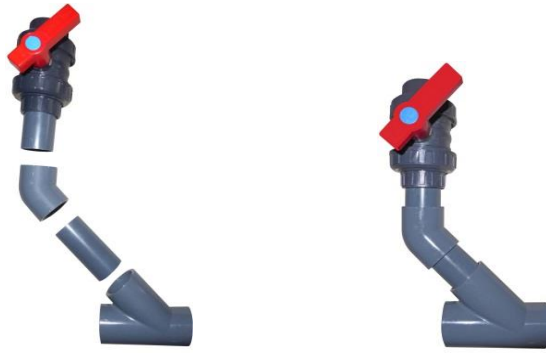
panels mounted horizontal



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 $2 \times 1 \text{ mm}^2$ to lengthen sensor adaptors.

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

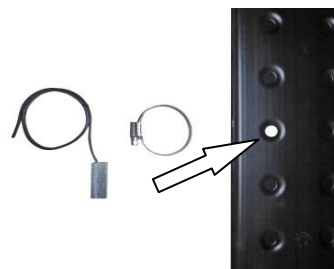
Suncontrol



Suncontrol

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

Minisol, Solax, Digisol, Kombisol

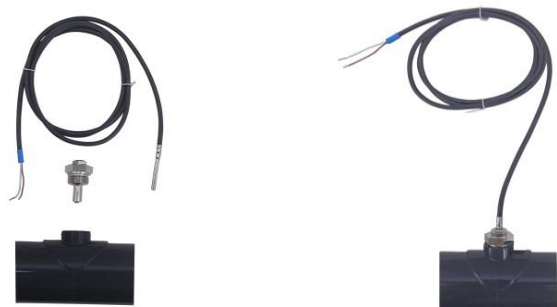


Minisol, Solax, Digisol, Kombisol

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.

Uplift loadings of OKU-solar panels subject to the wind speed

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

OKU Obermaier GMBH
Dieselweg 14

DE- 82538 Geretsried

Tel. +49 (0) 8171 93520
Fax +49 (0) 8171 909295
mail info@okuonline.com
www.okuonline.com



