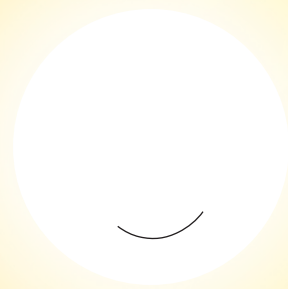


**SOLAR** 2013  
COLLECTORS





# Heat

The sun has provided energy and heat for millions of years and will continue to do so. Its unimaginable power is used in nearly every process of life. The sun's role cannot be overestimated in the production of energy. Annually up to 1000 kWh of solar energy falls on the earth's surface per square metre. It is enough to be converted efficiently into heat and even more importantly – solar energy is free of charge.



## FAKRO SOLAR SYSTEM



When planning a house, we consider not only the building costs but also the running costs. While designing, one should make sure that the design includes provision to apply natural renewable energy sources. One of the easiest and most popular ways of using solar energy is to install **solar thermal collectors**.

The FAKRO Solar System is an innovative application of solar collectors integrated into the roof which takes advantage of the sun's solar energy. The installation of solar collectors is directly into the roof slope and not as often happens above the roofing or adjacent to the building.

Such positioning ensures:

- hat solar collectors complement the building design
- better efficiency of solar collectors

Additionally, when roof windows are planned to be installed, the use of Fakro flashing kits makes it simple to combine them with solar collectors.



The certificate is a guarantee of quality and confirmation of compliance with European Standards.



**Solar Keymark** is a necessary criteria in order to attain grants in most European countries.





## SYSTEM PLANNING

When planning the solar thermal system, it is very important to specify the appropriate number of collectors. An accurately specified area of collectors will provide correct, efficient and reliable operation of the whole system. The optimum collector area is calculated assuming  $1\text{ m}^2 - 1.5\text{ m}^2$  of absorber per person. The heater size is calculated by multiplying the number of people using the water by the assumed average daily consumption of 50 litres per person. The resulting value is increased by 50% in order to allow for the fluctuations of hot water usage.

Complete your own solar set on [calculator.fakro.com](http://calculator.fakro.com)

Number of people			
Absorber area	2-3 [m <sup>2</sup> ]	3-4.5 [m <sup>2</sup> ]	4-6 [m <sup>2</sup> ]

### Example:

The calculation of the tank size for 4 person family:

$4 \text{ persons} * 50 \text{ l / person} * 1.5 = 300 \text{ l}$

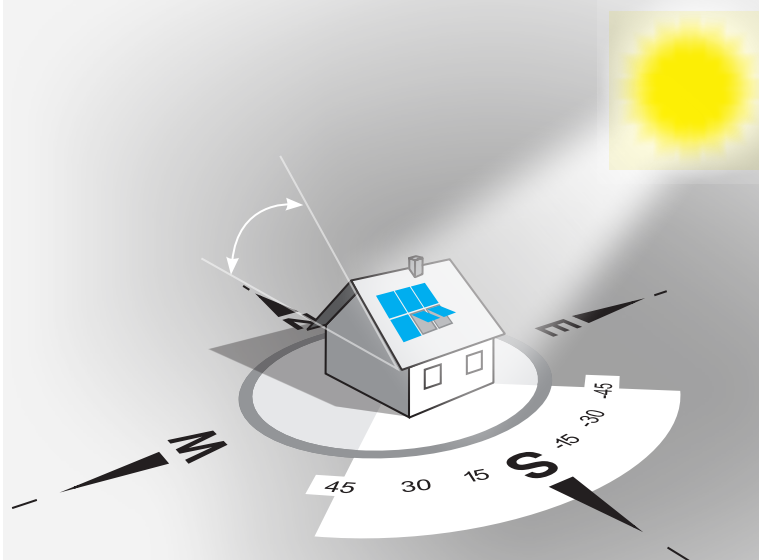
For a family of 4 people the tank of 300 l will be optimal

## Collectors installation position

Solar collectors should be installed in the roof slope facing south. However this is not always possible. Deviations of 45 degrees facing east or west, will reduce performance by approximately 10%.

### Collectors installation pitch

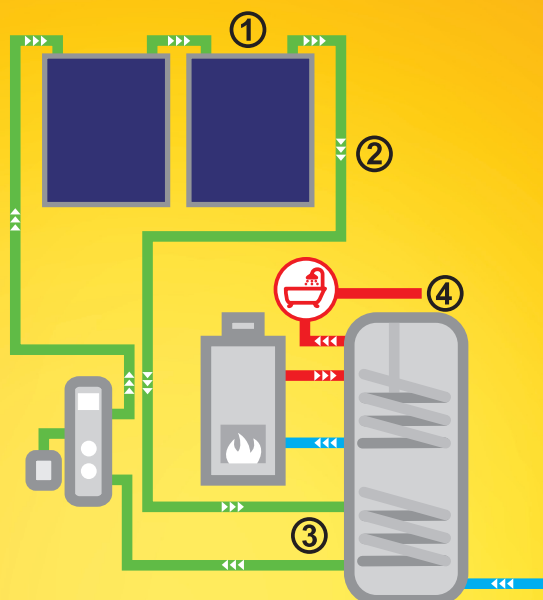
The collector's solar radiation absorption efficiency depends on the collector's inclination in the roof slope. The most effective solar energy absorption conditions are when the solar rays are perpendicular to the collector's surface pane. Due to the changes to the angle of the sun's rays at different times of the day and seasons of the year the recommended installation angle is  $30^\circ - 60^\circ$ .





## FAKRO solar thermal system-principle of operation

Solar radiation absorbed by the collector increases the temperature of the heat carrier in the system. Once the collector's heat carrier (usually antifreeze solution of propylene glycol) temperature is high enough, it flows in the system. The fluid circulates through the heat exchanger (in the form of coil) in the tank which gives up the heat to water ready for domestic purposes. If there is not sufficient solar radiation, the water must be heated by up a secondary heat source (e.g. gas or electric heater).



## FAKRO solar collectors – construction



Solar collectors can be joined in collector-collector combinations or combined in systems with roof windows in any possible combination.

Hailstone-resistant toughened prismatic pane (4 mm thick) increases light transmittance and allows the passage of low incidence angle rays.

Frame-shaped casing made of stiff aluminium profiles guarantees strong and durable structure.

Absorber plate made of copper sheet is covered with a highly selective coating characterised by high solar radiation absorption efficiency (around 95%).

The harp-like arrangement of the copper piping and its proper connection with the absorber plate (ultrasonic welding) ensure perfect collection of the heat energy from the whole absorber area.

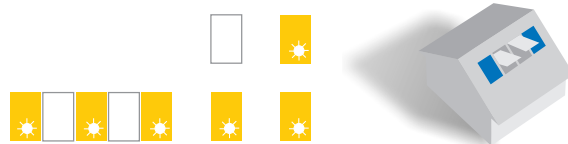
Special mineral wool insulation:  
– 20 mm on side walls  
– 50 mm underneath absorber.

The bottom part of absorber made of special texture, pierce-resistant aluminium sheet

Innovative system of installation brackets which can be moved during installation to fit any batten spacing.



## Collectors **SKW**



**SKW** solar collectors can be combined with FAKRO roof windows in any configuration. Quick, easy and tight connection with the roofing is ensured by standard flashings for FAKRO roof windows.

**SKW** solar collectors installation pitch: 15° – 90°.  
Advised installation pitch: 30° – 60°

SYMBOL OF SIZE	COLLECTORS' DIMENSIONS [mm]	ACTUAL COLLECTOR'S SIZE [mm]	COLLECTOR AREA [m <sup>2</sup> ]	ABSORBER AREA [m <sup>2</sup> ]	ABSORBER LIQUID VOLUME [l]	OPTICAL EFFICIENCY $\eta_0$ [-]	CO-EFFICIENT OF LINEAR LOSSES $a_1$ [W/m <sup>2</sup> K]	CO-EFFICIENT OF LINEAR LOSSES $a_2$ [W/m <sup>2</sup> K <sup>2</sup> ]
COLLECTORS <b>SKW</b>								
07	78 x 140	777 x 1400	1.09	0.91	0.6	0.747	4.44	0.0023
10	114 x 118	1137 x 1180	1.35	1.13	0.9	0.764	4.42	0.0027
11	114 x 140	1137 x 1400	1.61	1.36	1.0	0.780	4.370	0.0059
44	114 x 206	1137 x 2060	2.36	2.07	1.2	0.775	3.820	0.0035

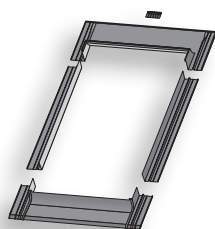
## Flashings for SKW solar collectors **SKW**

The SKW solar collectors are installed with standard flashings, the same as those used with roof windows.

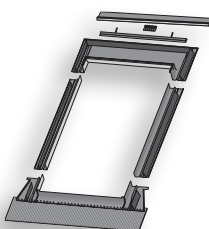
The main criterion for choosing a flashing is the roofing material type.

The basic and the most common types of flashings are:

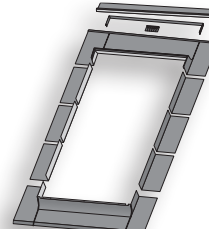
for flat roofing (ESV)



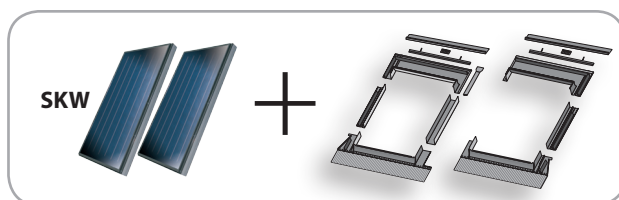
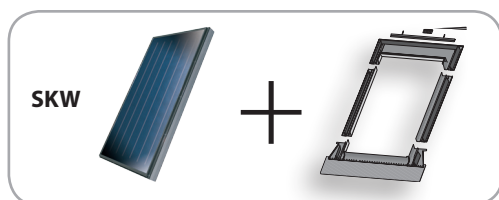
for profiled roofing (EZV, EHV)



for slate (ELV, EGV)



The modular system of flashings for FAKRO windows and SKW solar collectors allows for any combination or configuration of roof windows and SKW solar collectors.



## Collectors **SKC**



**SKC** solar collectors, thanks to the application of special flashings can be installed in combinations retaining a distance of only 3 mm between individual solar panels. The acquired homogeneous surface, perfectly fits with the applied roofing material.

SKC solar collectors can be connected only in horizontal combinations: collector- collector

Quick and easy collector connection with the roofing is secured by special flashings.

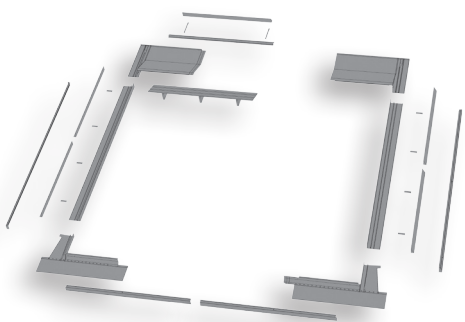
**SKC** solar collectors installation pitch: 30° – 90°.

Advised installation pitch: 30° – 60°

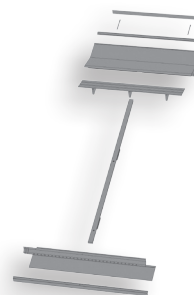
SYMBOL OF SIZE	COLLECTORS' DIMENSIONS [cm]	ACTUAL COLLECTOR SIZE [mm]	COLLECTOR AREA [m <sup>2</sup> ]	ABSORBER AREA [m <sup>2</sup> ]	ABSORBER LIQUID VOLUME [l]	OPTICAL EFFICIENCY $\eta_0$ [-]	CO-EFFICIENT OF LINEAR LOSSES $a_1$ [W/m <sup>2</sup> K]	CO-EFFICIENT OF LINEAR LOSSES $a_2$ [W/m <sup>2</sup> K <sup>2</sup> ]
COLLECTORS <b>SKC</b>								
44	114 x 206	1137 x 2220	2.54	2.07	1.2	0.775	3.820	0.0035

## Flashings for **SKC** collectors

- basic module CZV



- additional module MZV

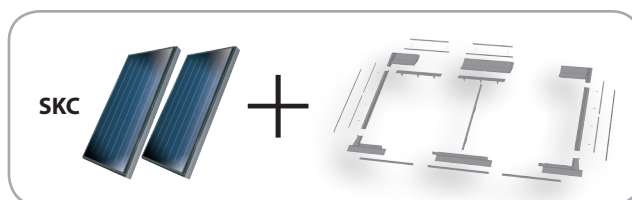
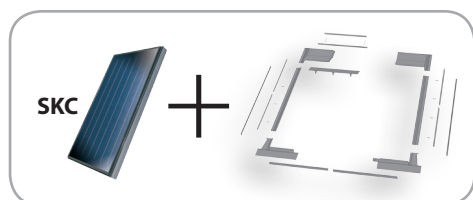


CZV –A module for opening and closing each combination of SKC collectors.

MZV –A module to expand combinations by adding another collector.

For example, the combination which consists of two collectors SKC will require the use of one module CZV -A and one MZV -A. Expansion of the combination with an additional collector will involve adding another module MZV -A.

With these two modules it is possible to create horizontal combinations limited only by the amount of available space on the roof.



## SMK and SMB hoses

For connecting individual elements of the system DN16 flexible hoses are used which are made of stainless steel, coated with 13x22 insulation resistant to UV rays ended with 3/4" brass nuts.

Hoses for connections between collectors	ZKA	ZKB	ZKC	ZKD	ZKE
SMK	0,21 m	0,33 m	1,8 m	2,5 m	2,7 m

Hoses for connections between collectors and boiler

SMB	ZPB	ZPC	ZPD	ZPE	
	5 m	10 m	15 m	20 m	
	ZBC	ZBD	ZBE		
	10 m	15 m	20 m		

Note: – ZKA hose -0.21 m is designed to connect SKC collectors

The ZBC, ZBD and ZBE hoses sets of flow and return pipes with additional wire for connecting the temperature sensor.

Application of the original FAKRO pipes is a guarantee of reliable solar installation performance. Connecting of the solar panels using non-original pipes will lead to the loss of warranty for collectors.

## SBW storage tanks

SBW tanks are used for heating usable water with the heat from the solar collectors or central heating boiler. They are equipped with two coils. The lower one is intended for the solar collector and the upper one for the central heating boiler. SBW tanks are made of high-quality steel. Protection against the corrosive action of hot water and microbes is ensured by a vitreous enamel coating (coating applied as per DIN 4753 requirements). Additionally, the tank is protected against corrosion with magnesium anode and its efficient coils heat up water quickly and evenly. The tank is insulated with a layer of polyurethane foam and externally lined with artificial leather.

NAME		BOILER CODE	NOMINAL VOLUME [l]	TRADE VOLUME [l]
Storage tank 200l.	SBW	<b>V20</b>	192	200
Storage tank 300 l.		<b>V3P</b>	295	300
Storage tank 400l.		<b>V40</b>	380	400

In order to facilitate the installation of the solar system the SBW V3P tank has been introduced which is integrated with the following elements:

- pump unit
- controller
- expansion vessel 18 l

## SCB pump unit

The SCB pump unit forces heating liquid to circulate around the system enabling effective solar heat transfer. The pump group as standard is equipped with four temperature sensors.

NAME		UNIT CODE	FLOW [l/min]
Pump unit with flow controller 6 l/min	SCB	<b>Q06</b>	6
Pump unit with flow controller 16 l/min		<b>Q16</b>	16



## SBV expansion vessels

The SBV expansion vessel compensates for changes in glycol volume as a result of variations in its temperature. For example in case of an emergency situation in the solar system – glycol boiling, it accepts the liquid pushed out from the solar collectors by steam.

NAME		CODE	VOLUME [l]
Expansion vessel 18 l *	SBV	<b>18L</b>	18
Expansion vessel 24 l *		<b>24L</b>	24
Expansion vessel 35 l		<b>35L</b>	35
Expansion vessel 50 l		<b>50L</b>	50

\*Expansion vessel 18 l and 24 l are provided in package with holder and connecting hose. For other expansion vessels sizes, the holder and the connecting hose have to be bought additionally.

## SGL Heat carrier

Glikor EKO is a heat carrying agent within the system, used for transferring heat energy from collectors to the cylinder.

NAME		LIQUID CODE	CAPACITY [l]	TEMPERATURE RANGE
Glikor EKO 05L	SGL	<b>05L</b>	5	from -25°C to +130°C
Glikor EKO 20L		<b>20L</b>	20	
Glikor EKO 30L		<b>30L</b>	30	

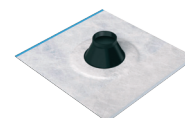
## Solar system accessories

The Fakro solar system includes a range of accessories.

### SPC - 2 PIECE SEALING SET

Flashing SPC is used to seal the solar pipe passage through the roof membrane.

The package contains two pieces of the flashing which are sufficient for sealing the passage of supply and return pipes in non-insulated roofing. In case of insulated roof two packages are necessary (two flashings for each hose).



### SEH ELECTRIC HEATER

The **SEH** electric heater is used as an auxiliary heater for bringing water to the required temperature due to insufficient levels of solar energy.



### STS TEMPERATURE SENSOR

The **STS** sensor is used for measuring the temperature of the collector, boiler or glycol (depending on the fitting location). The sensor is connected directly to the pump unit controller.



### SAS AIR SEPARATOR

The **SAS** air separator enables the bleeding the solar system. **Recommended for systems using many collectors.**



### SWM WATER MIXER

The **SWM** water mixer protects against scalding with hot water (in case of a cold water failure, hot water supply is blocked automatically). It also maintains a constant temperature at the output with a working temperature range from 30°C to 60°C. It is installed in the usable hot water circuit.



### SBF MANUAL PUMP FOR FILLING THE SYSTEM

The SBF solar pump is used for filling the system with glycol and creating required overpressure (max. 3 bar). After filling the system, it can be used as an overflow vessel for the safety valve.



# SOLAR SETS

number of people	 2 people	 3 - 4 people	 5 people
Boiler	 SBW V20	 SBW V3P	 SBW V40
Expansion vessel	 integrated	integrated	 integrated
Pump unit	 integrated	integrated	 integrated
Glycol*	 5 litres	 10 litres	 20 litres
Collector	 2.07 m <sup>2</sup>	 4.14 m <sup>2</sup>	 6.21 m <sup>2</sup>
Absorber area	2.07 m <sup>2</sup>	4.14 m <sup>2</sup>	6.21 m <sup>2</sup>
Flashing	EZV	B2/1 combination (KZV-1 + KZV-3)	B3/1 combination (KZV-1 + KZV-2 + KZV-3)
Pipe connecting ZKB collectors (0.33 m)	—		
Pipe connecting ZPC collectors (10 m)	 2 pieces	 2 pieces	 2pieces

## Number of collectors in the set depending on boiler capacity

	Boiler 200 litres	Boiler 300 litres	Boiler 400 litres
number of collectors [units] <b>SKW 11</b>	2	3	4
number of collectors [units] <b>SKW 44</b>	1	2	3

\* The amount of glycol required to activate the solar system depends on the capacity of the entire installation (capacity of collectors, pipes, heat exchanger in the boiler, expansion tank). The amount of glycol in sets is not equivalent to the capacity of the installation, so depending on the system capacity it may be necessary to buy the missing amount of glycol.

In case the actual distance between the collectors and the storage tank is bigger, it may be necessary to buy longer hoses as well.

FAKRO solar sets are complete packages with all necessary elements for the installation of solar panels in the roof. The size and quantity of solar panels in the sets has been calculated to match the absorber area for most popular sizes of hot water storage cylinders.

#### Every set consists of:

solar panels, flashings, hoses used for connections between the collectors and SPC flashing to seal the passage of hoses through the roof membrane. When installing the collectors on the roof, the temperature sensor responsible for the system control is to be installed as well. The sensor must be compatible with the applied controlling device which is usually provided in the package. It is recommended that customers who do not have a controller with sensors in the package should buy also the SCB pump unit which is equipped as standard with a sensor.

## Set with **SKC** collectors

COLLECTORS	WORKING AREA [m <sup>2</sup> ]	COMBINATION	HOSES	ADVISED TANK CAPACITY [l]
2 x SKC 114x206	4,14	B 2/1	1 x ZKA, 2 x ZKC	300
3 x SKC 114x206	6,21	B 3/1	1 x ZKA, 2 x ZKC	400

## Set with **SKW 114x206** collectors

COLLECTORS	WORKING AREA [m <sup>2</sup> ]	COMBINATION	HOSES	ADVISED TANK CAPACITY [l]
1 x SKW 114x206	2,07	-	2 x ZKC	200
2 x SKW 114x206	4,14	B 2/1	1 x ZKB, 2 x ZKC	300
3 x SKW 114x206	6,21	B 3/1	2 x ZKB, 2 x ZKC	400

## Set with **SKW 114x140** collectors

COLLECTORS	WORKING AREA [m <sup>2</sup> ]	COMBINATION	HOSES	ADVISED TANK CAPACITY [l]
2 x SKW 114x140	2,72	B 2/1	1 x ZKB, 2 x ZKC	200
4 x SKW 114x140	5,44	B 4/1	3 x ZKB, 2 x ZKC	300
4 x SKW 114x140	5,44	B 2/2	2 x ZKB, 3 x ZKC	300

## Set with **SKW 114x118** collectors

COLLECTORS	WORKING AREA [m <sup>2</sup> ]	COMBINATION FLASHINGS	HOSES	ADVISED TANK CAPACITY [l]
2 x SKW 114x118	2,26	B 2/1	1 x ZKB, 2 x ZKC	200
4 x SKW 114x118	4,52	B 4/1	3 x ZKB, 2 x ZKC	300
4 x SKW 114x118	4,52	B 2/2	2 x ZKB, 3 x ZKC	300
6 x SKW 114x118	6,78	B 6/1	4 x ZKB, 4 x ZKC	500
6 x SKW 114x118	6,78	B 3/2	4 x ZKB, 4 x ZKC	500

## Set with **SKW 78x140** collectors

COLLECTORS	WORKING AREA [m <sup>2</sup> ]	COMBINATION	HOSES	ADVISED TANK CAPACITY [l]
3 x SKW 78x140	2,73	B 3/1	2 x ZKB, 2 x ZKC	200
5 x SKW 78x140	4,55	B 5/1	4 x ZKB, 2 x ZKC	300





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