FAKRO®

SOLAR COLLECTORS 2011

Heat

The sun has been providing energy and heat for millions of years and will continue do so. Its unimaginable power is used in nearly every process of life. The sun's role cannot be overestimated in the process of using its energy. 1000 kWh is an average energy portion which hits the earth's surface per square metre annually. It is enough to change it efficiently into heat and what is even more important – do it free of charge.

FAKRO SOLAR SYSTEM

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

FAKRO Solar System -is an innovative solution of solar collectors integrated into the roof which take advantage of the sun's solar energy.

The installation of solar collectors is into the roof slope and not as often happens above the roof covering or beside the building. Such positioning ensures:

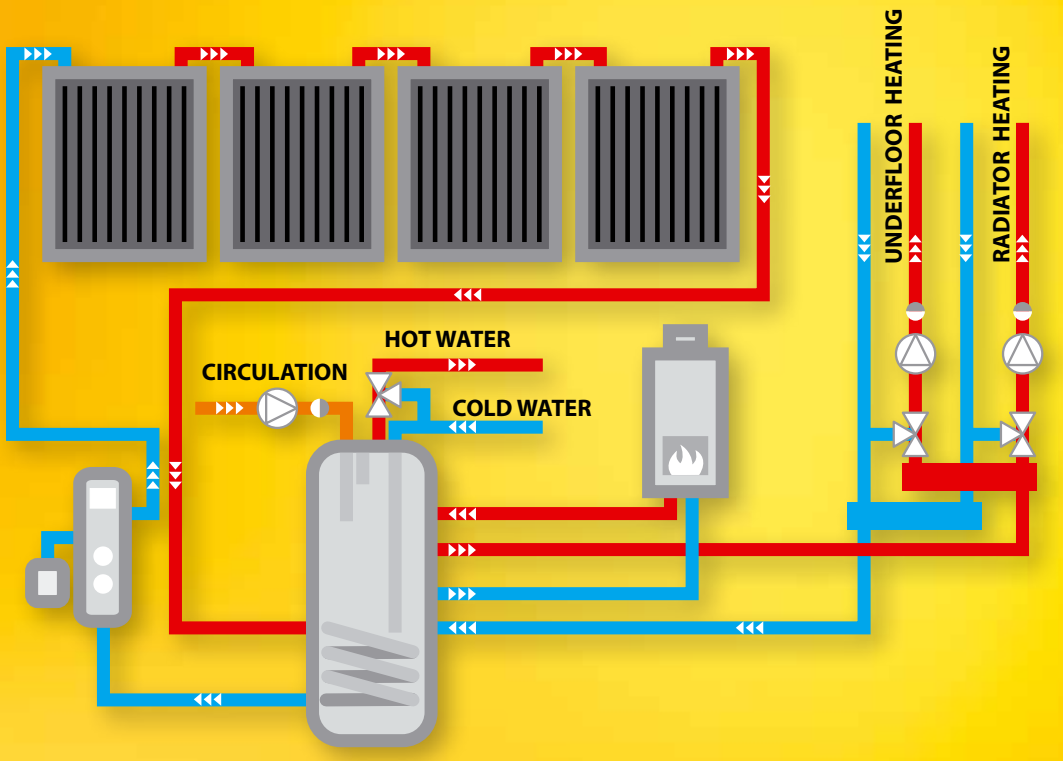
— **that solar collectors go well with the building design**
— **better efficiency of solar collectors**

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

The above 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.

FAKRO solar system- principle of operation

Solar systems change the sun's energy into heat, thus enabling **energy savings of up to 70% for** heating domestic water supplies.



FAKRO solar system means:

Energy savings

Investing in heating installations, one should make sure that their design makes allowances also for solar systems. By installing a solar system, it is possible to reduce energy consumption, to which financial savings directly refer translating into lower bills for electricity, gas or heating oil.

Environment protection

Installation of a solar system eliminates environmental pollution significantly reducing emissions of harmful substances such as CO_2, SO_2, NO_x and volatile dust.

Grants

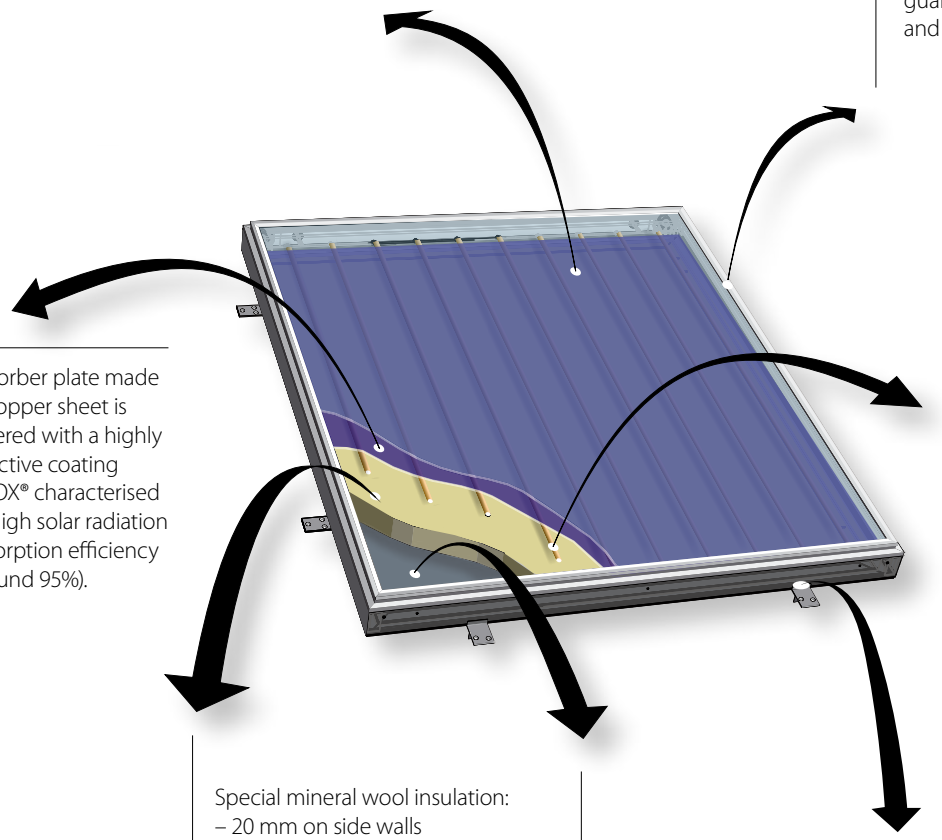
The possibility to obtaining solar grants allows faster return of purchase and installation costs. To find more information, contact your local authority.

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 passes 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 TINOX® 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.

Pierce-resistant perforated 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: 15º – 90º.
Advised installation pitch: 30º – 60º

SYMBOL OF SIZE	COLLECTORS' DIMENSIONS [mm]	ACTUAL COLLECTOR'S SIZE [mm]	COLLECTOR AREA [m^2]	ABSORBER AREA [m^2]	ABSORBER LIQUID VOLUME [l]	OPTICAL EFFICIENCY η_0 [-]	CO-EFFICIENT OF LINEAR LOSSES a_1 [W/m^2K]	CO-EFFICIENT OF LINEAR LOSSES a_2 [W/m^2K^2]
COLLECTORS **SKW**								
07	78 x 140	777 x 1400	1.09	0.91	0.6	PARAMETERS NOT TESTED		
10	114 x 118	1137 x 1180	1.35	1.13	0.9			
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 tight connection of SKW collectors with the roofing material:

- ESV for flat roofing
- EZV for profiled roofing
- EHV for high profiled roofing

FLASHINGS FOR SKW COLLECTORS

size [cm] symbol	114x140 **11**	114x206 **44**
ESV	+	+
EZV	+	+
EHV	+	+

* collectors tested under the certificate keymark

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: 30º – 90º.
Advised installation pitch: 30º – 60º

SYMBOL OF SIZE	COLLECTORS' DIMENSIONS [cm]	ACTUAL COLLECTOR SIZE [mm]	COLLECTOR AREA [m²]	ABSORBER AREA [m²]	ABSORBER LIQUID VOLUME [l]
		COLLECTORS **SKC**			
44	114 x 206	1137 x 2220	2.54	2.07	1.2

.The SKC collectors differ from SKW collectors only in flashing type which integrates them into the roof. The SKC efficiency parameters are identical to the SKW efficiency parameters.

Flashing for tight SKC collectors connection with roofing material
The SKC solar collector flashing consists of 2 modules: basic module CZV and additional module MZV. The CZV and MZV modules are as standard applied in horizontal combinations which consist of 2 collectors SKC. When additional collector is added, extra flashing module has to be added: MZV(2xSKC=CZV+MZV, 3xSKC=CZV+2xMZV).

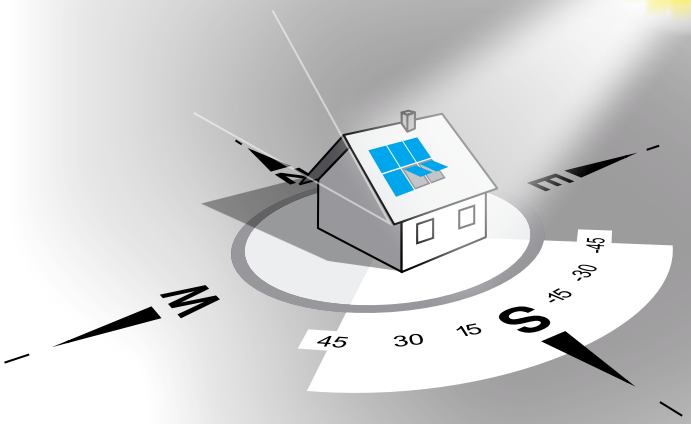
FLASHINGS FOR SKC COLLECTORS

Size [cm] symbol	114x140 **11**	114x206 **44**
CZV	–	+
MZV	–	+

Collectors installation position
Solar collectors should be installed in the roof slope facing south. In real life it is not always possible. Deviations of 45 degrees facing east or west, will reduce performance by approximately 10%.

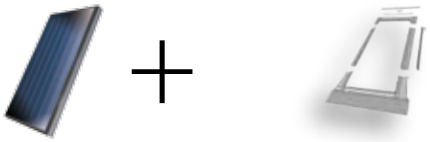
Collectors installation pitch
Collector's solar radiation absorption efficiency depends on the collector's inclination in the roof slope.
The most effective solar energy absorption conditions are found when solar rays operate perpendicular to the collector's pane surface.

Because of the changes of sun's rays operation angle in connection with day's time and the seasons of the year, recommended installation angle is 30° – 60°.



ELEMENTS IN THE ROOF

SKW



SKC

STS Temperature sensor

SMK pipes for connections between collectors

ELEMENTS IN THE BUILDING

SBW boiler for heating usable water

SCB pump unit

SBV expansion tank

SGL glycol

SMB pipes for connections between collectors and boiler

ACCESSORIES

SBF manual pump

SEH electric heater

STS temperature sensor

SAS air separator

SWM water mixing valve

SPC flashing for solar pipe

Pipes SMK and SMB

For connecting individual elements of the system there are used DN16 flexible pipes made of stainless steel, coated with 13x22 insulation resistant to UV rays ended with ¾" brass nuts.

Pipes 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

Pipes for connections between collectors and boiler

SMB	ZPB	ZPC	ZPD5	ZPE	
	5 m	10 m	15 m	20 m	
	ZBC	**ZBD**	**ZBE**		
	10 m	15	20		

Note: – ZKA pipe -0.21 m is designed to connect SKC collectors
The ZBC, ZBD and ZBE pipes are available in sets with cables for connecting the temperature sensor.

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

SBW boilers

The SBW boilers 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.

The SBW boilers are made of high-quality steel. Protection against the corrosive action of hot water and microbes is ensured by vitreous enamel coating (coating applied as per DIN 4753 requirements). Additionally, the boiler is protected against corrosion with magnesium anode and its efficient coils heat up water quickly and evenly. The boiler is insulated with a layer of polyurethane foam and from the outside it is lined with artificial leather.

NAME		BOILER CODE	NOMINAL VOLUME [l]	TRADE VOLUME [l]
Boiler for heating water 200l.	**SBW**	**V20**	192	200
Boiler for heating water 300 l		**V3P**	295	300
Boiler for heating water 400l.		**V40**	380	400

In order to facilitate installation of the solar system, there has been introduced SBW V3P boiler, integrated with the following elements specified below:
- pump unit
- controller
- expansion vessel 18 l

SCB pump unit

The SCB pump unit forces solar liquid to circulate around the system enabling effective solar heat transfer.

NAME	UNIT CODE		FLOW [l/min]
Pump unit with flow controller 6 l/min	**SCB**	**Q06**	6
Pump unit with flow controller 16 l/min		**Q16**	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	**18L**	18
Expansion vessel 24 l		**24L**	24
Expansion vessel 35 l		**35L**	35
Expansion vessel 50 l		**50L**	50

SGL Glycol

The SGL glycol is a heat carrying agent in the system, used for sending the heat energy from collectors to the cylinder.

NAME		LIQUID CODE	CAPACITY [l]	TEMPERATURE RANGE
Glycol Ergolid Eko 05 l	SGL	**05L**	5	from -25°C to +130°C
Glycol Ergolid Eko 20 l		**20L**	20	
Glycol Ergolid Eko 30 l		**30L**	30	

Solar system accessories

In the Fakro product range besides elements comprising solar system, there are accessories as well.

SPC FLASHING FOR SOLAR PIPE

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 suppy and return pipes in non-insulated roofing. In case of insulated roofing two packages are necessary (two flashings for each pipe).

SEH ELECTRIC HEATER

SEH electric heater is used as an auxiliary heater for bringing water to the required temperature in case of insufficient amount of solar energy.

STS TEMPERATURE SENSOR

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

SAS AIR SEPARATOR

The **SAS** air separator enables bleeding the solar systems. **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). What is more, it maintains constant temperature at the output. Working temperature range from 30 °C to 60 °C. 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

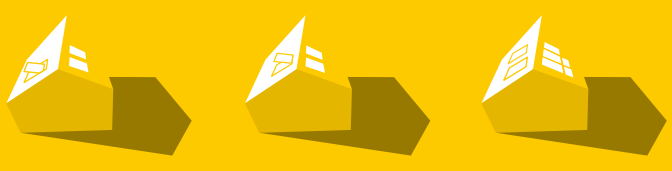
number of people	2 people	3 - 4 people	5 people
Boiler	 SBW V20	 SBW V3P	 SBW V40
Expansion vessel		integrated	
Pump unit		integrated	
Glycol*	 5 l	 10 l	 20 l
Collector			
Absorber area	2.07 m^2	4.14 m^2	6.21 m^2
Flashing	EZV	B2/1 combination (KZV-1 + KZV-3)	B3/1 combination (KZV-1 + KZV-2 + KZV-3)
Pipe connecting ZKB collectors (0.33 m)	—		
Pipe connecting ZKC collectors (1.8 m)**	 2 pieces	 2 pieces	 2 pieces

NUMBER OF COLLECTORS IN THE SET DEPENDING ON BOILER CAPACITY

	Boiler 200 litres	Boiler 300 litres	Boiler 400 litres
number of collectors [units] **SKW 11**	2	3	4
number of collectors [units] **SKW 44**	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.

**Due to different distances between the tank and collectors, the sets do not include SMB pipes.
Installation of the solar system must be completed by a qualified fitter only.



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