RUUKKI® SOLAR THERMAL PACKAGE

TECHNICAL BROCHURE

ruukki

LIVING. WORKING. MOVING.

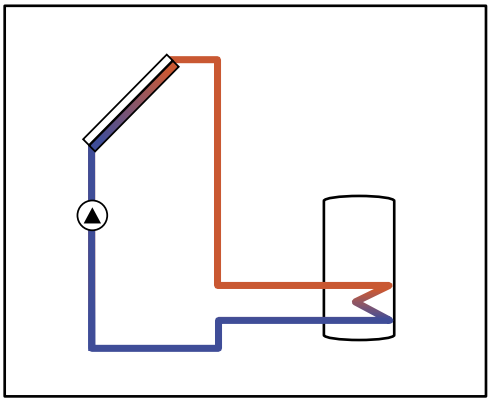
Tap into a free energy source with Ruukki solar thermal package

Ruukki solar thermal package is an easy and affordable solution for producing energy in a sustainable manner. Once the system is installed, you are tapped into a pure and free energy source. There is no need to worry about energy prices, or their increases. The operating principle is simple. Rooftop panels collect heat from sunrays and this heat is pumped into a water tank, from which it can be used for domestic water and space heating.

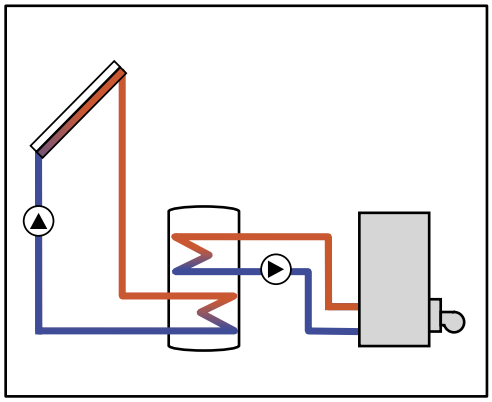
The add on type collectors fit all kinds of roofs, they can be retrofitted on an old roof or placed as the roof is constructed. We have paid extra attention to use, maintenance and installation, so you can be sure that using the system is easy and the mounting is quick and simple.

Ruukki solar thermal packages are easy to buy, install and use. The delivery includes everything that is needed to start enjoying the free energy. Pre-configured systems offer high efficiency solutions with easy and reliable deliveries from one partner, Ruukki.

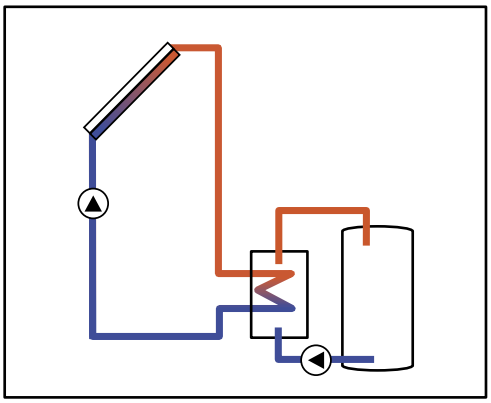
Application examples



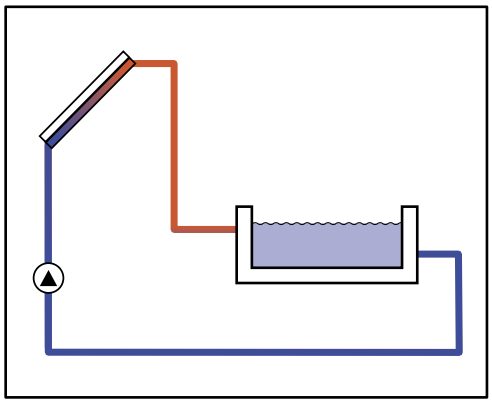
Solar system to water tank heat exchanger



Solar system with alternative heating to water tank heat exchanger



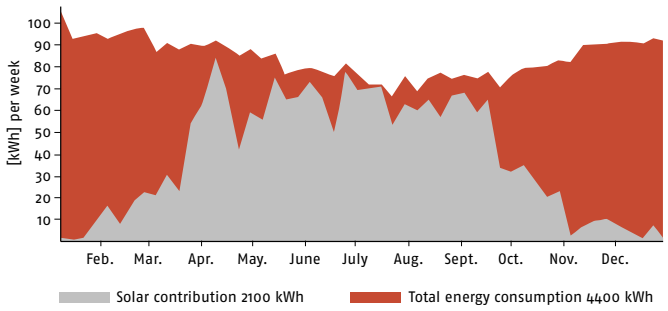
Solar system to water tank with external heat exchanger



Solar system to swimming pool

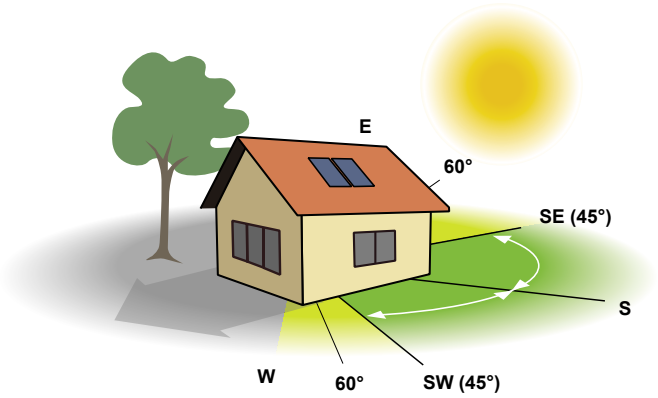
Introduction to solar energy

Solar contribution to domestic use water heating, example



- **Hot water production**

  Solar thermal systems produce hot water according to available solar radiation, or sunshine. Hot water production ability therefore differs by time of year and weather. In the summer time, a well sized system provides practically all domestic hot water and in the spring and autumn up to half of demand, whereas in winter the output is limited. On an annual level, a solar system can produce half of the required heating energy for domestic use water. The annual solar radiation in Helsinki is around 970 kWh/m² and in Berlin it is around 1020 kWh/m².



- **Collector alignment**

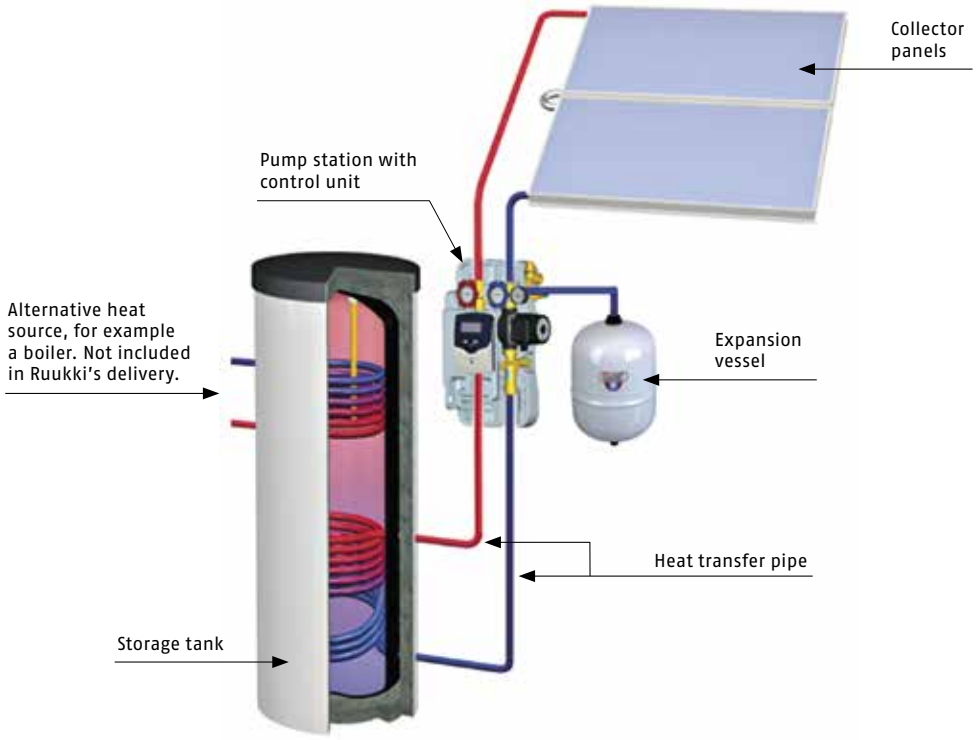
  The heat collection ability of the collectors is dependent on their orientation towards the sun. Any alignment between southeast and southwest at an inclination angle of between 20 and 60 degrees gives a high energy yield. The best orientation is 45 degrees south. Beyond these limits, a larger than usual field size should be used to achieve the same energy output. There should not be any objects near the collectors, which cause shadows, such as, trees or chimneys.

Suitable package size according to the number of permanent residents					
Permanent residents	2	3	4	5	≥ 6
Collector area (m²)	4	4	6	6	8
Storage tank size (l)	300	300	300	400	400

- **Field sizing**

  Solar thermal collector field sizes are selected according to the collector orientation and the hot water demand. An average person uses 50 liters of hot water daily. A rule of thumb is that 1.5 m² effective collector area is needed per person for standard hot water production. If collectors' orientation is beyond applicable limits, larger field sizes should be used. The storage capacity of the water tank should be large enough to reserve hot water for later use.

Ruukki solar thermal package, delivery content



	Solar thermal package						
	4m²	6m²	8m²	4m² with 300 l tank	6m² with 300 l tank	6m² with 400 l tank	8m² with 400 l tank
Collector panel 2.3/2.0m²	2	3	4	2	3	3	4
Panel connection set	1	1	1	1	1	1	1
Panel connection extension set	0	1	2	0	1	1	2
Roof foot set (4 pcs/panel)	2	3	4	2	3	3	4
Lead-in	1	1	1	1	1	1	1
Transfer liquid 10 l in 25 l canister	1	1	1	1	1	1	1
Sensor connection box	1	1	1	1	1	1	1
Pump station with control unit	1	1	1	1	1	1	1
Heat transfer pipe DN16 15 m	1	1	1	1	1	1	1
Heat transfer pipe hanger set	1	1	1	1	1	1	1
Expansion vessel 18 l	1	1	0	1	1	1	0
Expansion vessel 25 l	0	0	1	0	0	0	1
Expansion vessel accessory set	1	1	1	1	1	1	1
Fitting DN16 1/2"F, panel connection	2	2	2	2	2	2	2
Fitting DN16 22MM, connection to pump	2	2	2	2	2	2	2
Fitting 3/4"M 22MM, pump connections	4	4	4	4	4	4	4
Fitting sealant 1/2"	2	2	2	2	2	2	2
Water tank 300 l 2 coils	0	0	0	1	1	0	0
Water tank 400 l 2 coils	0	0	0	0	0	1	1
Water tank electrical imm. heater 6 kw	0	0	0	1	1	1	1

Note: Roof foot sets and the lead-in are to be ordered separately as they are configured according to the roof type.

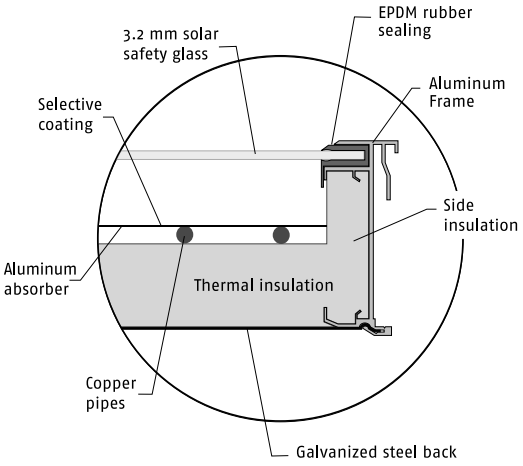
Flat plate collector

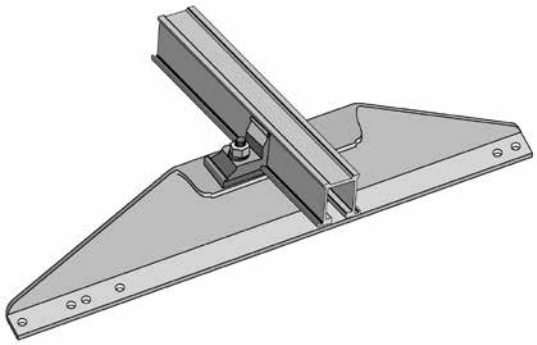
- Efficient, high quality collector
- Durable material and outstanding workmanship ensure high solar yields
- The stable aluminum frame, the laser-welded copper and aluminum absorber and the high-grade EPDM glass sealing ensure a long performance life
- Collector cover with highly transparent solar-safety glass and 91 % light transmission
- Tailor-made racking system, quality certified by TÜV (Technischer Überwachungs-Verein), makes it especially easy to rack securely and quickly
- Single-plate aluminum absorber sheet
- 30 mm back side insulation

SolarKeymark
011-7S1510 F

Technical data	Flat Plate Collector, one unit
Collector area / format	Gross area 2.25 m²; aperture area 2.01 m²
Collector dimensions (L x W x H)	1 933 x 1 163 x 80 mm
Glass cover	3.2 mm solar safety glass, τ = 91 %
Absorber	Laser-welded single plate absorber with highly selective vacuum coating; α = 95 %; ε = 5 %
Collector efficiency (acc. to EN12975)	η0 = 78.0 %; a1 = 3.95 W/m²K; a2 = 0.0139 W/m²K²; annual yield: 441 kWh/m² (ITW 5 m²) *
Weight	33 kg

*) Yield based on the data of the ISFH (Institute For Solar Energy Research) on 5m² aperture area.





- Basic principle: The roof foot (chosen according to the roof type) carries the aluminum racking system securely and firmly and the collector plates are placed on top of the adjustable aluminum beams. The distance between the roof material and the bottom of the collector is about 10 cm
- Tailor-made racking system makes it especially easy to install the collectors securely and quickly
- Suitable for basically all roof materials, shapes and sizes
- The racking system allows to obtain roof foot displacements
- All bolts to mount the collector have a 13 mm spanner width
- The parts come pre-assembled so that the installer can perform the installation quickly
- No special tools needed

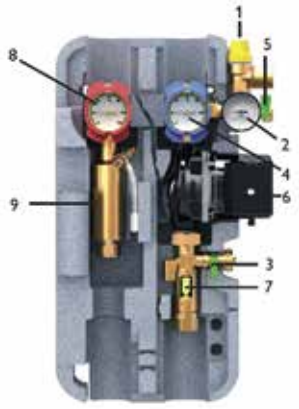
Pump station with integrated control unit

- **User-friendly pump station and controller unit**
  Ruukki solar thermal package is equipped with a pre-assembled twin-line pump station, including a top of the line integrated controller. The system is particularly easy to install and use. The controller provides a clear operating concept and is equipped with an illuminated combined display with system monitoring. Flashing symbols for sensors, pumps and valves enable an immediate allocation of temperatures, temperature differences and active actuators. Thus, adjusting and monitoring the solar system is quick and easy.

- **Pre-assembled twin-line pump station:**
  - Integrated controller
  - Design insulation casing
  - Innovative hinged controller panel for quick and easy access to the hydraulic components
  - Safety assembly with connection for the diaphragm-type expansion vessel, safety valve and pressure gauge
  - Fill and drain valves
  - Wall mounting bracket with mounting material

- **Integrated controller:**
  - Heat quantity measurement
  - Thermal disinfection function
  - User-friendly and versatile
  - Illuminated System Monitoring Display
  - Easy adjustment and control
  - Easy installation, operation, and service

Technical data	
Safety valve	6 bar
Pressure gauge	0 ... 10 bar
Flowmeter	1 ... 13 l/min
Non-return valves	Opening pressure 20 mbar, openable
Connection to diaphragm-type expansion vessel	¾'' ET, flat sealing
Outlet safety valve	¾'' IT
Connections to the solar pipes	¾'' IT
Maximum temperature flow / return	120 °C / 95 °C
Maximum pressure	6 bar
Medium	Water with max. 50 % glycol
Dimensions	Approx. 481 × 320 × 190 mm (with insulation)
Distance centres	100 mm
Distance centre / wall	67 mm
Material	Fittings: brass, Seals: AFM 34
Insulation	EPP foam



1. Safety valve
2. Pressure gauge
3. Drain valve
4. Ball valve (return) with thermometer and integrated non-return valve
5. Fill valve
6. Pump
7. Flowmeter
8. Ball valve (flow) with thermometer and integrated non-return valve
9. Air separator

High performance water storage tank

The hot water storage tank is used for domestic hot water systems. The hot water storage tank has set benchmarks in solar storage technology. Its storage concept and reduction of heat losses rank as exemplary.

- High-value hot water tank of steel with two welded-in plain pipe heat exchangers for solar and backup heating circuits.
- Corrosion protection by durable high-quality enamel coating and magnesium protection anode
- Electric immersion heater (6 kW).
- Maximum operating pressure 10 bar.
- Small heat losses due to 55 mm thick, glued-on PU foam with a PVC wrapping.

Storage tank with heat exchangers for solar and backup heating circuits

Technical information	300 l	400 l
Volume, litres	286	394
Diameter with insulation, mm	610	710
Height with insulation, mm	1697	1660
Tilted dimension with insulation, mm	1827	1816
Total weight with insulation, kg	114	166

Expansion vessel

The expansion vessel is a component that is installed in connection with the pumping unit. The expansion vessel ensures that the solar system can work safely (DIN 4757 and EN 12997) inside the solar circuit, particularly during the standby phase. When inactive, modern solar collectors may reach temperatures up to 200°C (392°F) and consequently the fluid within the system can either evaporate or reach levels that can damage all the elements in the solar energy system over time. In order to be able to resist the highest possible inactivity temperatures, a proper expansion vessel must be used. The membrane pressure expansion vessel ensures that the system pressure does not exceed or does not go below the limits set in the planning phase.

Technical specifications of the expansion vessel: membrane expansion vessels manufactured under the PED 97/23/EC and EN 13831 Directives, suitable for closed solar energy heating systems according to DIN 4757 and EN 12977. The vessel is equipped with a special solar membrane designed as a diaphragm that separates the gas from the solar liquid.

Accessories included with the expansion vessel:
- Safety valve
- Outlet hose
- Fixing kit for wall mounting

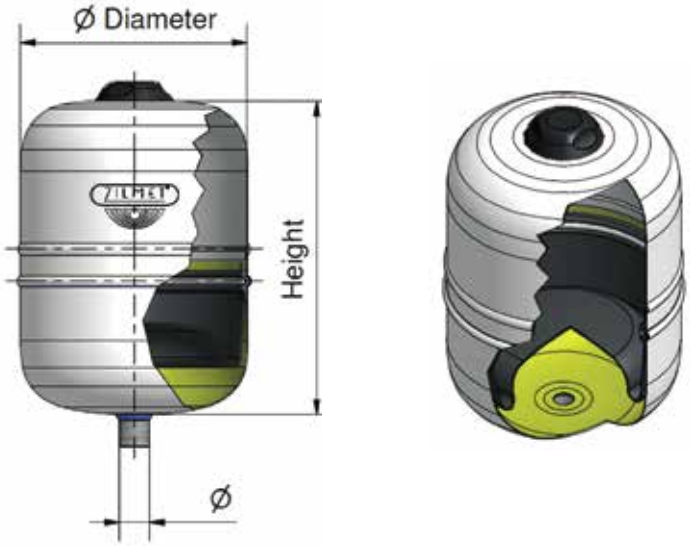
Material description

Description	Material
Shell	Carbon steel
Connections	Carbon steel
Membrane	Special solar membrane
Colour	White

Operating conditions

Description	Value
Max. working pressure	10 bar
System operating temperature	–10 ÷ 110 °C
Membrane operating temperature	–10 ÷ 110 °C
Factory precharge	2.5 bar

Capacity litres	ø Diameter mm	H Height mm	Connection
18	270	349	3/4"G
25	300	392	3/4"G



Heat transfer pipe to ensure efficient functioning and easy installation

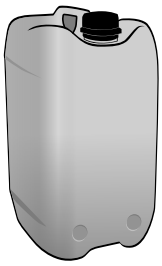
Ruukki solar thermal package is equipped with a highly flexible and insulated stainless steel double corrugated tube with integrated 2-thread sensor cable. The product is especially easy to work with.

- Low heat losses due to efficient 20 mm thick insulation
- Quickly installable double tube
- Flow and return pipe can be easily divided into 2 individual tube legs for separate installation (e.g. for collector connection)
- Multiple separation and re-connection of tube legs possible
- Robust and tear-resistant outer skin
- UV- and temperature resistant
- Sensor line 2 x 0.75 mm²
- DN16 pipe is suitable for up to 15 meter installations
- Comes with a pipe hanger set

Heat transfer liquid

The solar thermal system needs proper liquids to work efficiently and safely. Ruukki solar thermal package includes the suitable heat transfer liquid – it includes reliable frost protection for solar thermal energy systems.

- The liquid is odourless antifreeze composed of non-hazardous propylene glycol and corrosion inhibitors
- Highly efficient heat transfer
- Reliable corrosion protection
- Compatible with plastics
- Non-hazardous for persons and the environment
- Delivery includes a 25 liter canister with 10 liters of heat transfer liquid (100 % concentrate)



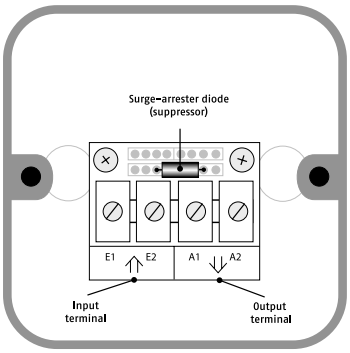
Physical properties	100 %	50%	40%	35%	30%
Minimum frost protection level (crystal formation point)		-29°C	-19°C	-15°C	-12°C
Density at 20°C (g/cm³)		1.035	1.028	1.024	1.021
Heat conductivity at 20°C (W/mK)	0.22				
Kinematic viscosity at 20°C (mm²/s)	70				
Boiling point at 1.013 bar (°C)	> 150				
pH-value (1:1 mix with neutral water)	7.5 – 8.5				

Sensor connection box with integrated surge arrester

- **Function**

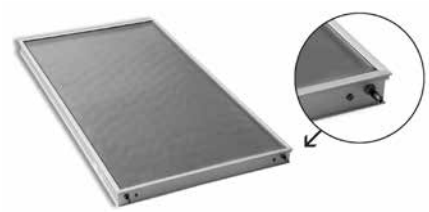
The integrated surge arrester filters out a certain fraction of the excess atmospheric voltage. This allows for a better protection of sensor and downstream electronics. The connection box also functions as an extension of the collector sensor cable. Low voltage is applied to the sensor cables; therefore they must be laid separately from 230 V cables to avoid interferences.

Technical data	
Encasing	plastic, grey
Wall mounting ears	
Protection class of encasing	IP 65
Dimensions	80 x 80 x 50 mm
Ambient temp.	-25°C up to +70°C



Connections

The connections in Ruukki solar thermal package are easy, secure, and fast to connect. No special tools are needed for installing the fittings. There are separate connection parts for connecting the collectors together. Here are short descriptions of the parts that you will need while installing the rest of the system. You will find them included in the delivery. *)



For the connection between the heat collectors and the heat transfer pipe, use the Fitting DN16 to 1/2"F. First you need to fix the Fitting DN16 to 1/2"F to the corrugated stainless steel tube. After that it is easy to fix the tube to the collectors. Remember to make the connection properly by using the provided heat resistant Fitting seal 1/2" between the collector tube and the connector.

Note. It is important to secure the connection nozzle when tightening to avoid damage to connection or absorber (two open spanners must be used)

For the connection between the heat transfer pipe and the pump unit, use the multi-purpose connection part Fitting DN16 to 22MM, which allows you to easily fix the corrugated tube to the Fitting 3/4" 22MM that you will need in the pump unit. First, fix the Fitting DN16 to 22 MM to the corrugated tube.

In the pump unit, you will need the Fitting 3/4"M 22MM that is also included in the delivery. This fitting is tailor-made to the pump unit and it is equipped with a secure sealing, so there is no need to use extra sealing materials in this connection. All you need to do is fix this part to the pump unit lines, and then make the compression fitting between these two parts and you are ready to go.

There will be two additional Fitting 3/4"M 22MM parts in the delivery, to ensure that it is easy to continue the piping work from the pump unit to the storage tank. You may continue with a copper pipe or use the corrugated stainless steel tube as between the collectors and the pump.

*) In case you choose to use the corrugated tube between the pump unit and the storage tank, you will need similar Fitting DN16 to 22MM parts as in the upper part of the pump unit, between these components. You can order these parts from Ruukki.

In case you have also invested in the new water tank from Ruukki, you can choose an optional multi-functional connection kit. These parts fit to your new storage tank connections. Therefore it is easy to join the connecting copper pipes to these ready 18 mm pipe heads. You can use this set to connect your new storage tank to the DHW net, the backup heater (for example an oil boiler) and the solar circuit. This kit includes six (6) multi fittings with gaskets and one (1) cap ¾".

- **NOTICE!**
  - The heat transfer pipe and the fixing accessories required for fixing the pipe are included in the delivery. Ruukki recommends that you use the provided materials for the system installation. While connecting the system from the pump unit to the storage tank, you may use, for example, 18 mm copper pipe or the corrugated stainless steel tube.
  - If you take the storage tank from Ruukki, you can add an optional connection kit for the storage tank. With this kit, it is easy to connect the storage tank to other parts of the system (DHW net, the backup heater, etc.). For other storage tanks, the plumber (installer) should follow the instructions of the relevant storage tank.
  - Use the provided safety accessories to ensure safe operation during the system lifetime and make sure that the system is properly maintained and used. Sensor connection box should be installed every time to ensure stabile functioning of the sensor cable. Also, it is very important to install the safety accessories to the pump unit (safety valve equipped with an outlet hose). The system must be earth bonded.
  - All components installed within the solar thermal system, such as gaskets and insulation materials, must be heat-resistant.

- **Before ordering and installing the solar thermal system, check at least the following things:**
  - Please fill out the "Object survey" form and send it to the sales representative. Make sure that all requested information is filled in and correct. Any misinformation given in the form may result in sub-optimal designs and cause set-backs in installation. It is recommended to consult a sales representative (Ruukki's or retailer's) to find out the information required (system configuration, collector alignment, etc.)
  - Collectors should be placed on the southern face of the roofing pane and as near as possible to the technical room for wiring and plumbing. The distance between the collectors and the technical room should be less than 15 meters, to reduce heat losses. 15 meters of heat transfer pipe is included in the delivery.
  - Ensure that there is sufficient clearance for sunlight. For instance, avoid installing near structures such as chimney, ventilation pipes etc.
  - Sufficient structural diagonal support underneath; one collector weighs 35 kg with assembly parts.
  - You have considered the overall solution to be suitable for your needs (there is sufficient consumption and storage for the heated water).

- **Safety notice**
  - Use only professional installers in every step of the project. Roof installation, plumbing, and electrical installations should be done by qualified professionals with knowledge of local regulations. Every component must be installed according to the separate detailed instructions.

	**WARNING!** Risk of serious injury. Follow the instructions during the system installation and use.
	**WARNING!** Risk of damaging the products. Misuse may damage the components, devices, building, or persons.
	**WARNING!** The surface temperature of the collectors may get dangerously hot. Must be handled with caution.
	**WARNING!** Too much snow may cause damage to the collector and / or prevent the operation of the collector.
	**WARNING!** The collectors should not be installed in strong winds. Negligent collector installation may cause a risk for collectors to fall in strong wind conditions.
	**READ INSTRUCTIONS!** Read the installation, operating and maintenance instructions carefully.
	**WARNING!** Professional installers must be used.

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Ruukki provides its customers with energy-efficient steel solutions for better living, working and moving.

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