

SOLAR  
ENERGY  
SYSTEMS

# SOLAR COLLECTORS



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 **baymak**

BDR THERMEA GROUP

# SOLAR COLLECTORS



Solar collectors are divided into two categories as automation aided and natural circulation applications. There are single, double serpentine enamelled boilers and equipment in automation-aided system; 160/200 and 300 l horizontal type enamel coated storage models in natural circulation systems.

With increasing environmental pollution and global warming, the trend towards alternative sources is increasing and the increase in energy costs emphasizes correct use and saving of energy today. We protect the world we live in and provide advantage with low energy costs with eco-friendly product technologies that do not pollute the environment.

Baymak having been a pioneer in energy efficiency creates energy saving and profit opportunities for consumers and investors with its products that use energy correctly.

## **BAYMAK Solar Collectors**

Our solar collectors are produced with the highest efficiency and quality with laser welding technology. You may ensure more hot water production by using a small number of solar collectors thanks to its high efficiency with the advantage of absorber surface and used solar product equipment, whose welding technology provides maximum benefit from solar energy.

Baymak offers project based solutions in both natural circulation package solar energy systems and automated systems with solar collectors that produce hot water by saving heating costs.

Solar Collectors can be applied with boilers, condensing boilers, heat pumps, electric heaters, boiler and similar other products as well as they can work integrated with existing systems in the places.

## Solar Energy

Solar energy is a technology based on obtaining energy from sunlight. The world's largest energy source is the sun. Solar energy is the radiation energy released by the fusion process in the nucleus of the sun and is caused by the fusion process in which the hydrogen gas in the sun turns into helium. Radiation energy of the sun is main source of energy affecting physical formations in the ground and atmospheric system.

## Why Solar Energy?

Solar energy systems that we use in our homes, businesses and projects; are applications that increase the value of the places that show our importance to nature and our sensitivity to the environment.

### Solar Energy:

- Free of charge
- Infinite and non-consumable
- Clean and harmless to the environment as there are no environmental pollutants such as carbon monoxide, sulfur, smoke, gas and radiation
- Can be used anywhere where energy is needed, reduces external dependence on energy
- Low operating and maintenance costs

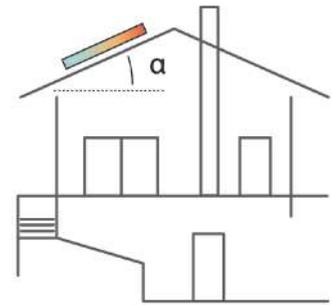
## Inclination Angle of Solar Collectors

The angle of inclination of solar collectors is angle formed between their surface and horizontal surface on which they are positioned. Angle between collector surface and incident rays should be 90 degrees to optimize efficiency of collectors. If collectors are to be located on a sloping roof, they are recommended to maintain the same slope as the roof.

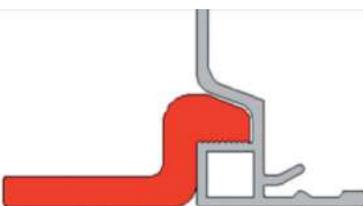
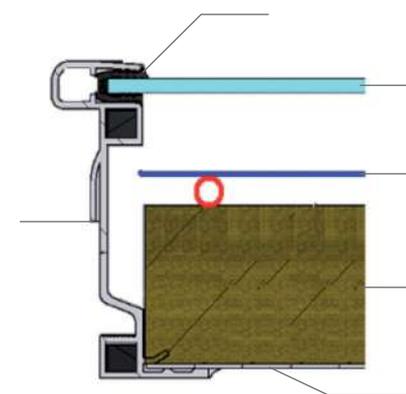
Inclination angles of 30° to 45° give optimal results in installations. In our country, inclination angles between 20° and 60° can be used according to different times of use from the sun and seasons.



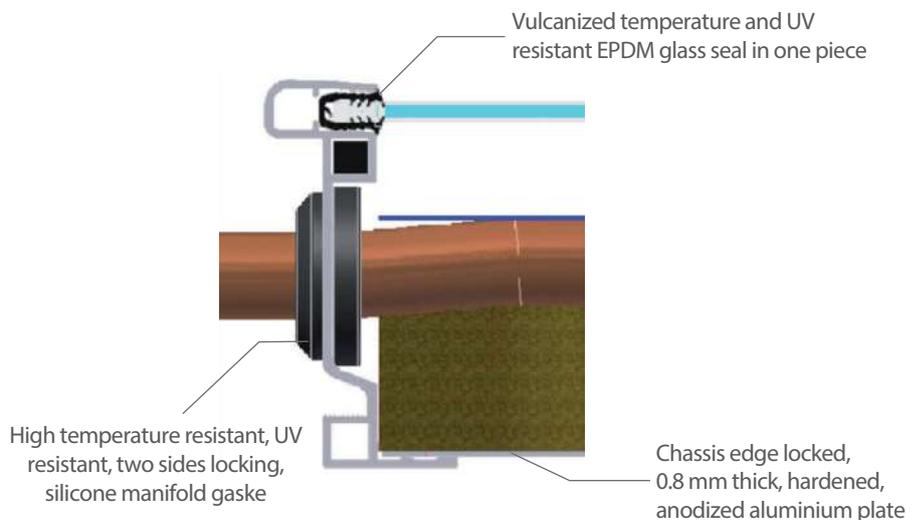
Inclination angle between collectors and horizontal surface



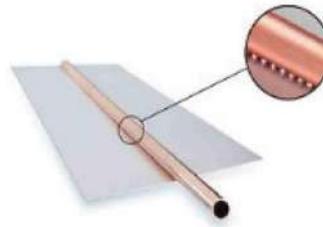
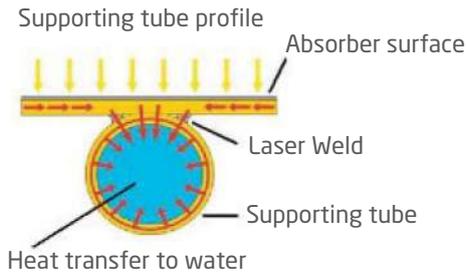
## Solar Collector Supplies



Flexible and easy installation with reinforced frame profile



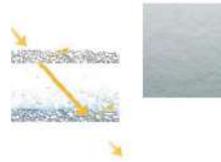
## Solar Collector Supplies



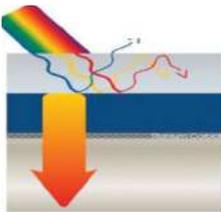
In the new series solar collectors, absorber surfaces and supporting tubes are combined with laser welding technology. The biggest advantage of the LASER welding method is that it welds without damaging selective surface of absorber plate and leaving no trace.



**Manifold Seal:** In the new series solar collectors, UV resistant silicone is used as manifold retaining gasket to prevent water from entering inside the collector due to reasons such as rain and snow. The silicone seal provides full resistance to high temperatures in the manifold.



**Solar Glass:** Low-iron tempered Sandy patterned glass minimizes reflection of incoming sun lights and enables them to enter into the collector at maximum level. Thanks to this, it increases the collector efficiency. Sandy patterned glass is being produced in Turkey and is among the most highest performance solar collector glasses in Europe.



**Absorber Plate:** Titanium nitride coated on copper and aluminium used in the new series of solar collectors selective absorber surface transfers radiation heat from the sun to the plate at maximum rate and reflection losses that reduce efficiency are minimized.



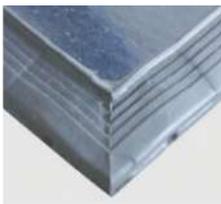
**Isolation:** In the new series solar collectors, 40 mm thick rock wool with high thermal insulation and high density has been used.



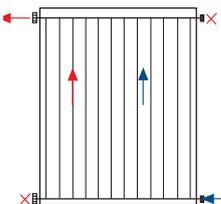
**Frame Profile:** It is specially designed as chassis used in the new series of solar collectors and thanks to its patented technology, it is formed by combining all building components in one.



**Lower Gasket:** The new series solar collectors are made of hardened anodized aluminium plate with a thickness of 0.8 mm resistant to external factors. Aluminium plate provides the highest resistance against physical factors such as handling, installation, rain, snow, wind and temperature.

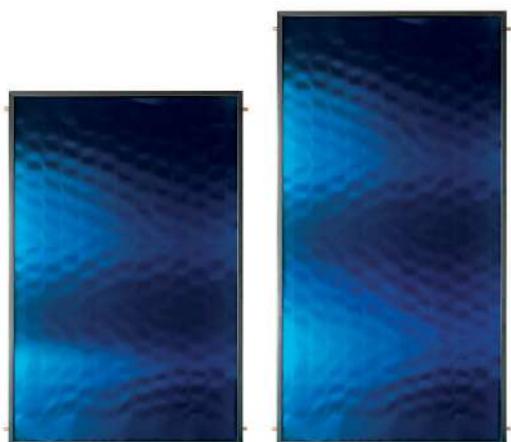


**Glass Seal:** In the new series solar collectors, vulcanized UV resistant EPDM is used as glass retaining gasket to prevent water from entering inside the collector due to reasons such as rain and snow. This glass seal ensures full sealing against leakage which may occur at corner points.



**Warfare System:** Copper supporting tube warfare system has been used to transfer the heat obtained from the high efficiency glass and selective surface used in the new series solar collectors to water completely.

# ADVANCED Series (X - XL)



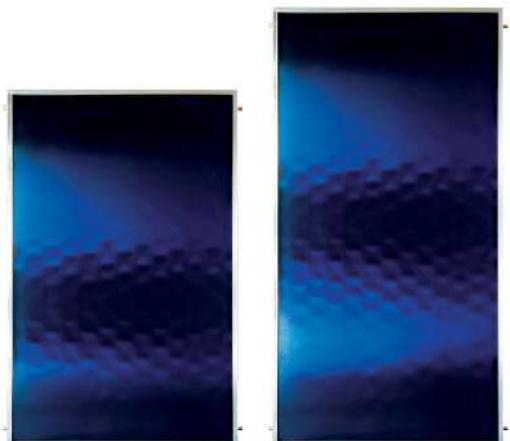
## Technical Specifications

- Long-lasting with the reinforced chassis
- Resistant to shocks with aluminum back plate
- Laser welded pipes provides higher heat transfer
- Special 40 mm thick rockwool insulation prevents heat loss
- 4 mm thick, sandy patterned solar collector glass has high transmittance of light
- Titanium coated absorber surface is made of copper
- Gross surface area: X-Series are 2,00 m<sup>2</sup> and XL series are 2.51 m<sup>2</sup>
- Provides safe working conditions up to 200°C and 10 bar
- ADVANCED X - XL collectors with their black anodized chassis present a stylish-image

## Technical Data Sheet

Package Systems	ADVANCED X	ADVANCED XL
Gross Area	2,00 m <sup>2</sup>	2,51 m <sup>2</sup>
Clearing	1,87 m <sup>2</sup>	2,34 m <sup>2</sup>
Absorbing Surface Area	1,87 m <sup>2</sup>	2,34 m <sup>2</sup>
Absorbing Surface Type	Cooper	Cooper
Absorbing Surface Coating Type	Selective	Selective
Transmittence	95 %	95 %
Emission / Reflection	5 %	5 %
Chassis	Black Anodized Aluminum	Black Anodized Aluminum
Glass Type	Low-Iron, Tempered, Sandy Patterned Solar Glass	Low-Iron, Tempered, Sandy Patterned Solar Glass
Glass Thickness	4 mm	4 mm
Daylight Transmittence Td65	91.6 %	91,6 %
Solar Energy Transmittence Tsol	90.5 %	90,5 %
Glass Seal	Vulcanized EPDM	Vulcanized EPDM
Isolation	RockWool (40 mm)	RockWool (40 mm)
Back Plate	Aluminum	Aluminum
Number of Riser Pipes	12	12
Riser Pipe Diameter Ø mm	10 mm	10 mm
Manifold Diameter Ø mm	18 mm (3/4")	18 mm (3/4")
Connection Type	Compression Fitting	Compression Fitting
Water Volume	1,8 liter	2,2 liter
Working Pressure	10 bar	10 bar
Test Pressure	15 bar	15 bar
Maximum Temperature	200 °C	200 °C
Stagnation Temperature	180 °C	180 °C
Length	1750 mm	2180 mm
Width	1150 mm	1150 mm
Height	80 mm	80 mm
Weight	41 kg	49 kg
Efficiency $\eta_0$	76,8 %	78 %

# APOLLO E Series (X - XL)



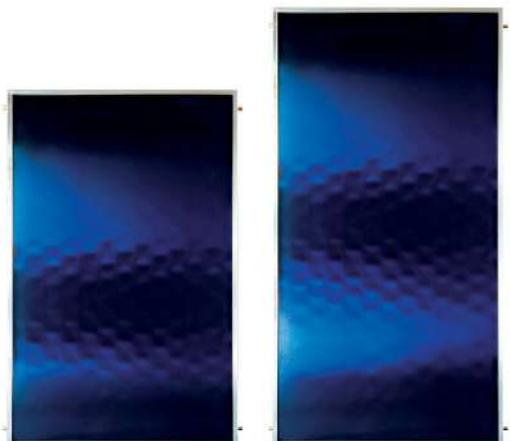
## Technical Specification

- Long life with reinforced chassis.
- Impact resistant with aluminium lower cover.
- Laser welded tubes provide high heat transfer.
- Special 40 mm thick glass wool insulation prevents heat loss.
- 3.2 mm thick sandy patterned solar collector glass has high light transmission.
- Titanium coated absorber surface is copper.
- Gross surface area: X series is 1,98 m<sup>2</sup>, XL series is 2,47 m<sup>2</sup>
- It provides safe working conditions up to 200 °C and 10 bar.
- APOLLO E series X-XL collectors with a grey aluminium frame display an elegant look.

## Technical Data Table

Package Systems	APOLLO E X	APOLLO E XL
Gross Area	1,98 m <sup>2</sup>	2,47 m <sup>2</sup>
Span Area	1,87 m <sup>2</sup>	2,34 m <sup>2</sup>
Absorber Surface Area	1,87 m <sup>2</sup>	2,34 m <sup>2</sup>
Absorber Surface Type	Aluminium	Aluminium
Absorber Surface Coating Type	Selective	Selective
Permeability	95 %	95 %
Emission/Reflection	5 %	5 %
Chassis	Aluminum	Aluminum
Glass Type	Tempered, Low Iron Sandy Pattern	Tempered, Low Iron Sandy Pattern
Glass Thickness	3,2 mm	3,2 mm
Daylight Transmittance Td65	91.60 %	91.60 %
Solar Energy Transmittance Tsol	90.50 %	90.50 %
Glass Seal	Vulcanized EPDM	Vulcanized EPDM
Isolation	Glass Wool (40 mm)	Glass Wool (40 mm)
Lower Cover	Galvanized	Galvanized
Number Of Supporting Tubes	10	10
Supporting Tube Diameter Ø mm	8 mm	8 mm
Manifold Diameter Ø mm	18 mm (3/4")	18 mm (3/4")
Connection Type	Ermeto Connection	Ermeto Connection
Water Volume	1,15 liter	1,3 liter
Operating Pressure	10 bar	10 bar
Test Pressure	15 bar	15 bar
Maximum Temperature	200 °C	200 °C
Stagnancy Temperature	179 °C	197 °C
Length	1740 mm	2170 mm
Width	1140 mm	1140 mm
Height	75 mm	75 mm
Weight	32 kg	40 kg
Efficiency $\eta_0$	74,4 %	76,1 %

# APOLLO E CU Series (X - XL)



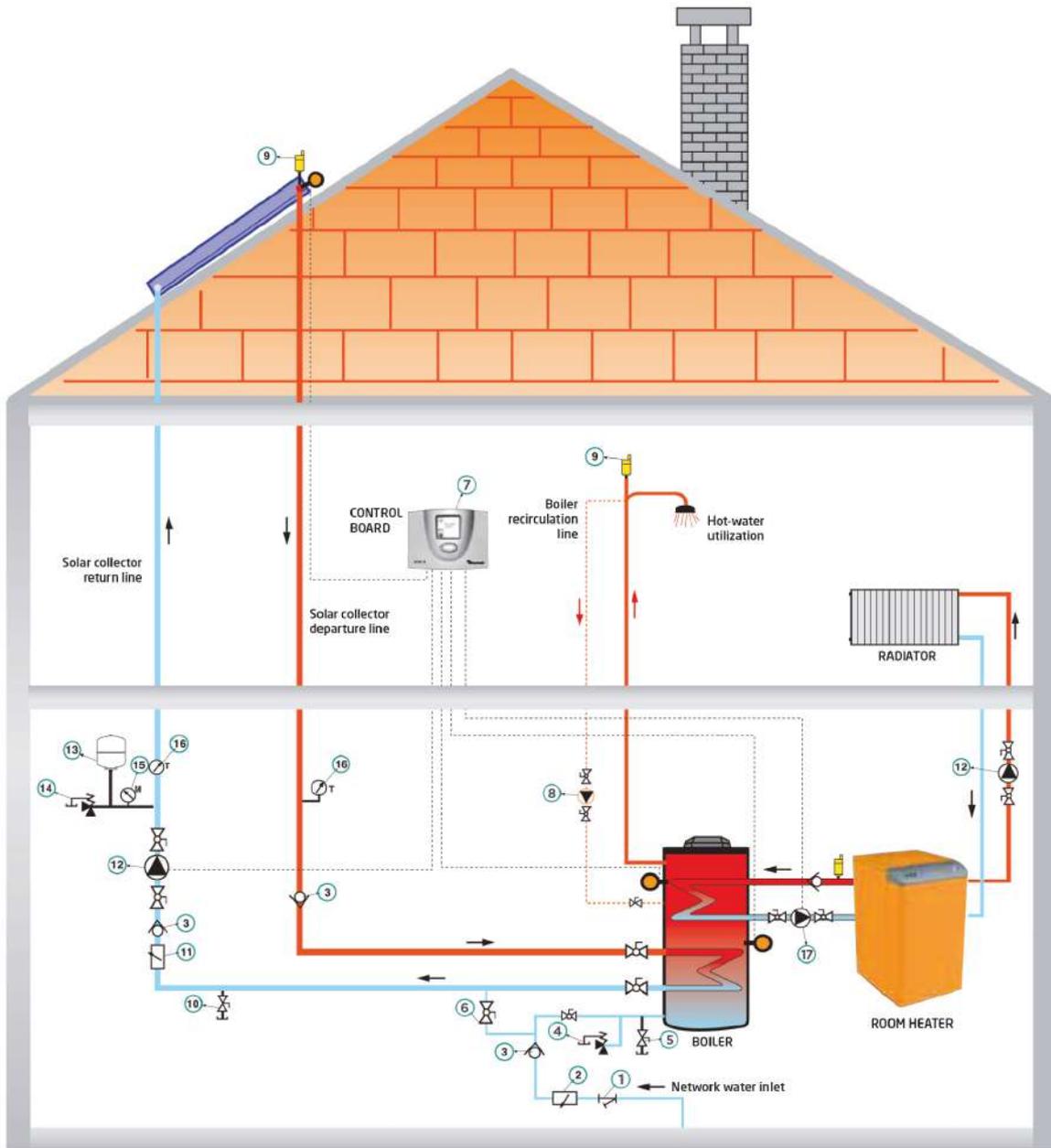
## Technical Specification

- Long life with reinforced chassis.
- Impact resistant with aluminium lower cover.
- Laser welded tubes provide high heat transfer.
- Special 50 mm thick glass wool insulation prevents heat loss.
- 3.2 mm thick sandy patterned solar collector glass has high light transmission.
- Titanium coated absorber surface is copper.
- Gross surface area: X series is 1,98 m<sup>2</sup>, XL series is 2,47 m<sup>2</sup>
- It provides safe working conditions up to 200 °C and 10 bar.
- APOLLO E CU series X-XL collectors with a grey aluminium frame display an elegant look.

## Technical Data Table

Package Systems	APOLLO E CU X	APOLLO E CU XL
Gross Area	1,98 m <sup>2</sup>	2,47 m <sup>2</sup>
Span Area	1,87 m <sup>2</sup>	2,34 m <sup>2</sup>
Absorber Surface Area	1,87 m <sup>2</sup>	2,34 m <sup>2</sup>
Absorber Surface Type	Copper	Copper
Absorber Surface Coating Type	Selective	Selective
Permeability	95 %	95 %
Emission/Reflection	5 %	5 %
Chassis	Aluminum	Aluminum
Glass Type	Tempered, Low Iron Sandy Pattern	Tempered, Low Iron Sandy Pattern
Glass Thickness	3,2 mm	3,2 mm
Daylight Transmittance Td65	91.60 %	91.60 %
Solar Energy Transmittance Tsol	90.50 %	90.50 %
Glass Seal	Vulcanized EPDM	Vulcanized EPDM
Isolation	Glass Wool (50 mm)	Glass Wool (50 mm)
Lower Cover	Galvanized	Galvanized
Number Of Supporting Tubes	10	10
Supporting Tube Diameter Ø mm	8 mm	8 mm
Manifold Diameter Ø mm	18 mm (3/4")	18 mm (3/4")
Connection Type	Ermeto Connection	Ermeto Connection
Water Volume	1,15 liter	1,3 liter
Operating Pressure	10 bar	10 bar
Test Pressure	15 bar	15 bar
Maximum Temperature	200 °C	200 °C
Stagnancy Temperature	179 °C	197 °C
Length	1740 mm	2170 mm
Width	1140 mm	1140 mm
Height	75 mm	75 mm
Weight	36 kg	44 kg

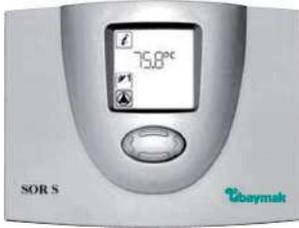
## Double Serpentine Boiler / Solar Collector Boiler Connection Diagram System Elements



In this system, domestic water is heated by using solar energy and boiler and double coil boiler. The primary heating source of domestic water is solar energy. In case of insufficient solar energy, the boiler is activated to heat the domestic water.

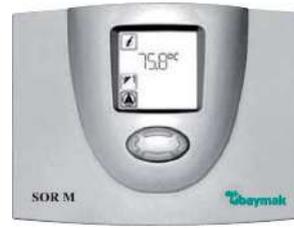
- |   |  |
|---|--|
| 1. Strainer   | 10. Closed circuit discharge line                    |
| 2. Pressure Regulator                               | 11. Flow regulating valve                            |
| 3. Check Valve                                      | 12. Circulating pump                                 |
| 4. Safety valve (opening pressure should be 8 bar). | 13. Closed expansion tank                            |
| 5. Boiler discharge line                            | 14. Safety valve (varies according to static height) |
| 6. Closed circuit pressurization line               | 15. Manometer  |
| 7. Automation board-Sor M Plus                      | 16. Thermometer                                      |
| 8. Service circulation line pump                    | 17. Circulating pump for boiler line                 |
| 9. Automatic air discharge device                   |  |

## Solar Energy Systems Control Panels



### SOR S Control Panel

- Simple and handy menu
- Digital temperature control
- 2 sensors connectivity
- Thermostat function
- Pump on / off control
- Memory protection against longterm power outages
- Temperature protection for instant collector inside and storage



### SOR M PLUS Control Panel

- Simple and handy menu
- Digital temperature control
- 6 sensors connectivity
- 3 programmable output
- Thermostat function
- Pump on / off control
- 3 level hourly adjustment on daily basis
- Maximum temperature protection
- Memory protection against long-term power outages
- Temperature protection for instant collector inside and storage

## Fernox S1 Solar Fluid

- High heat transfer performance fluid
- Active protection against frost up to -28 °C
- Closed circuit fluid to protect the system from high temperatures and and to prolong its service life
- Active protection against corrosion and calcification to occur in the installation
- Health-damaging and destructive properties such as antifreeze and alternative solar liquids used in the market
- Mixture ready to use in 10 l package fully compatible with all kinds of solar collector and vacuum tube collectors

Fernox S1 Solar liquid is a transparent, orange colored liquid with different odor. It is formulated to transfer heat at high temperatures.

Fernox S1 Solar liquid heat transfer fluid protects against corrosion even at temperatures above 180 °C, whether liquid or gas.



## Expansion Tanks

Expansion tanks with high temperature resistant membranes are recommended for solar systems. When the temperature in the primary circuit increases, it absorbs expansion of heat transfer fluid and ensures that the pressure in the circuit stays within the allowable pressure ranges and when it cools, prevents air from entering the circuit.

- Suitable for Solar Power Systems
- Electrostatic powder painted
- Has CE European Certificate
- Optimum operating temperatures are 0-90°C.



CODE	CAPACITY
17100018	TM 7,5 /
17100015	TM 18 /
17100017	TM 25 /
17100012	TM 40 /
17100002	TM 50 /
17100003	TM 80 /
17100004	TM 100 /
17100005	TM 200 /
17100006	TM 300 /
17100007	TM 500 /
17100008	TM 750 /
17100009	TM 1000 /

## Hydraulic Assembly Kit Parts for Solar Collectors

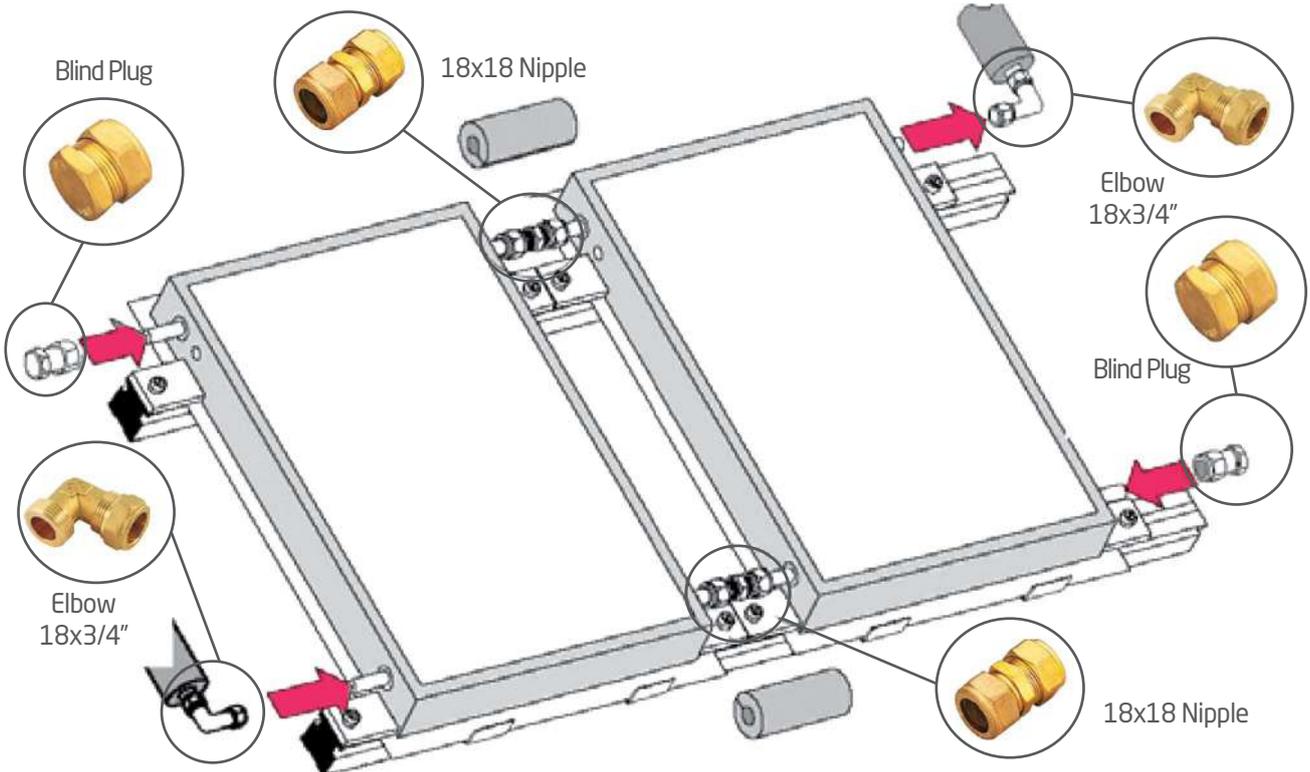
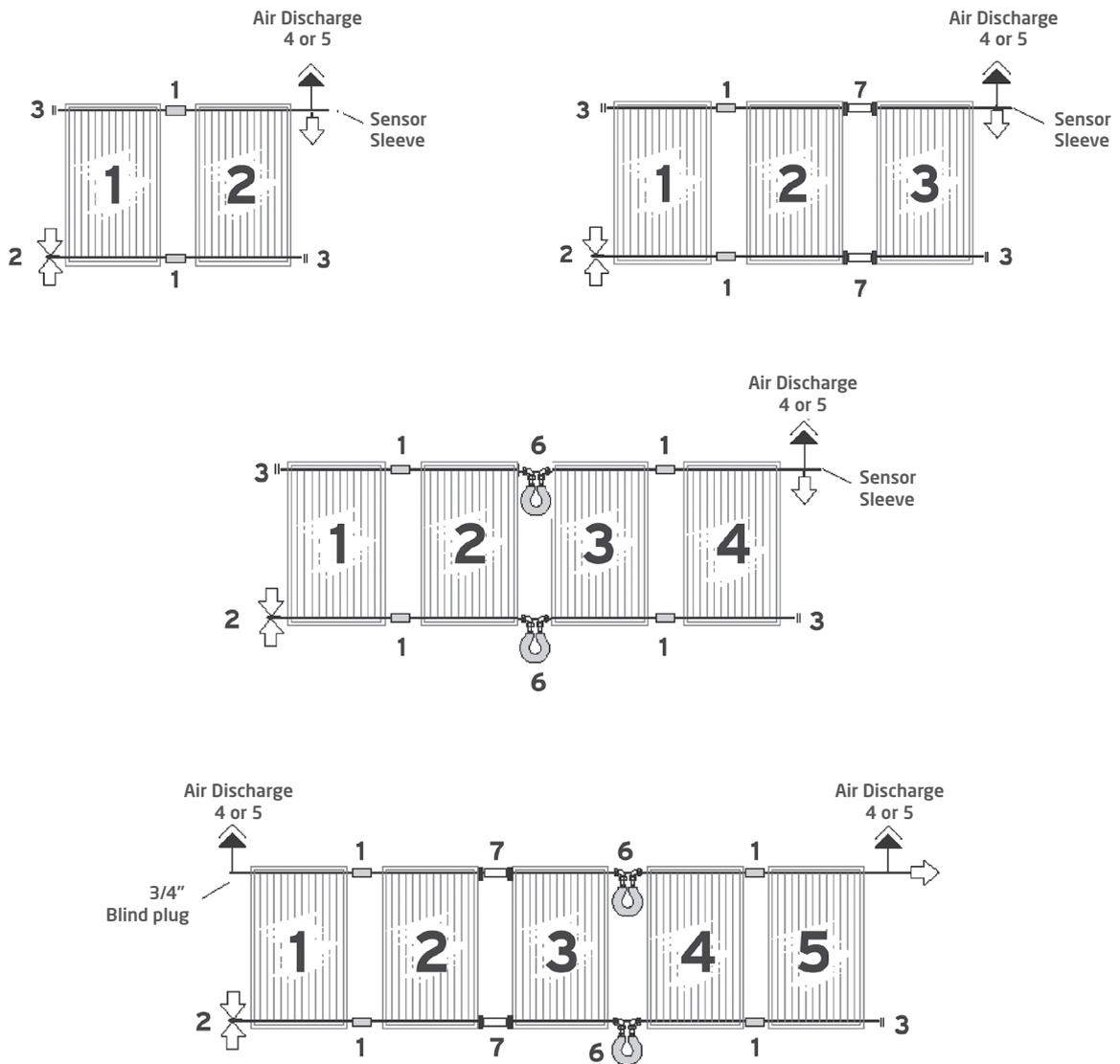


IMAGE	DESCRIPTION	CODE
	Ø18 mm x Ø18 mm Nipple	09140098
	Ø18 mm x 3/4" Elbow	09140099
	Ø18 mm x Blind Plug	09140100
	Ø18 mm x 3/4" Nipple	09140097
	Short Connection Flex GK	09140116

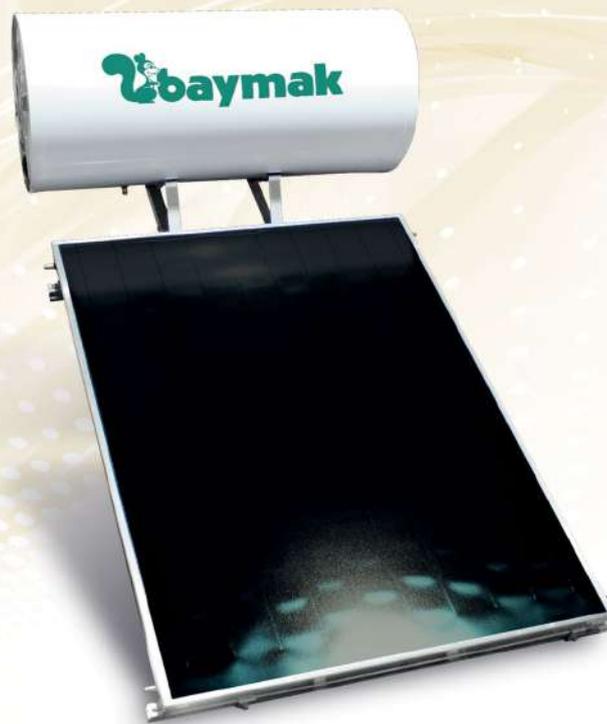
IMAGE	DESCRIPTION	CODE
	Automatic Air Relief Cock 1/2"	09140096
	Manual Air Vent Sensor Sleeve Ø18 mm	09140074
	Automatic Air Discharge Sensor Sleeve Ø18 mm	09140075
	U flex pipe HMF-05/09-011/16-HB-İZL-L400	09140101
	Straight flex pipe HMF-05/09-011/16-3/4N-HB-İZL-L160	09140102

## Hydraulic Assembly Kit Parts for Solar Collectors



NO	IMAGE	CODE	DESCRIPTION	Unary	Binary	1 K	2 K	1 K	2 K
				Collector	Collector	Collector Kit	Collector Kit	Collector Kit	Collector Kit
				System	System	(Manuel	(Manuel	(Automatic	(Automatic
				09140080	09140081	air discharge	air discharge	air discharge	air discharge
						sensor sleeve)	sensor sleeve)	sensor sleeve)	sensor sleeve)
						09140082	09140083	09140084	09140085
1		09140098	Ø18 mm x Ø18 mm Nipple	-	2	-	2	-	2
2		09140099	Ø18 mm x 3/4" Elbow	2	2	1	1	1	1
3		09140100	Ø18 mm x Blind Plug	2	2	2	2	2	2
4		09140074	Manuel Air Vent Sensor Sleeve Ø18 mm	-	-	1	1	-	-
5		09140075	Automatic Air Vent Sensor Sleeve Ø18 mm	-	-	-	-	1	1
6		09140101	HMF-05/09-011/ 16-HB-İZL-L400	-	-	-	-	-	-
7		09140102	HMF-05/09-011/16-3/4N- HB-İZL-L160	-	-	-	-	-	-

# BAYMAK AQUA ELEGANT



- Continuous distribution
- Unpressurised tank, pressurized hygienic domestic water
- Produced with Stainless Steel 316 L flex pipe and its durability has been increased and reinforced for being long-life
- Lightweight Tank and easy installation
- Long life solar collectors with selective surface
- With Baymak quality and assurance

## Technical Data Table

	Elegant 120	Elegant 170	Elegant 200	Elegant 300
Capacity	120 L/day	170 L/day	200 L/day	300 L/day
Heat Exchanger	Stainless Steel (316L) Flex Pipe			
Isolation	Polyurethane 50mm (40kg/m <sup>3</sup> )			
Tank Coating Sheet	Electrostatic Powder Painted Galvanized Steel	Electrostatic Powder Painted Galvanized Steel	Electrostatic Powder Painted Galvanized Steel	Electrostatic Powder Painted Galvanized Steel
In-Tank Sheet	ST 37	ST 37	ST 37	ST 37
Tank Sizes	Ø560 x 950 mm	Ø560 x 950 mm	Ø560 x 1200 mm	Ø560 x 1750 mm
Solar Collectors	1 piece 2.0 m <sup>2</sup>	1 piece 2.0 m <sup>2</sup> or 2.5 m <sup>2</sup>	2 piece 2.0 m <sup>2</sup> or 2.5 m <sup>2</sup>	2 piece 2.0 m <sup>2</sup> or 2.5 m <sup>2</sup>
Absorber Surface	Al or Copper Selective	Al or Copper Selective	Al or Copper Selective	Al or Copper Selective
Glass Material	Low Iron Tempered Sandy Glass			
Pipe Material	Copper	Copper	Copper	Copper
Weld Type	Laser	Laser	Laser	Laser
Sealant	EDPM-Silicone	EDPM-Silicone	EDPM-Silicone	EDPM-Silicone

\* Capacities vary according to the flex pipe length in the tank.

# AQUASOLAR Series Package Systems



- It has characteristic of storing hot water with its 160, 200, 300 litres tank.
- Economical thanks to natural system cycle
- They are easy to install due to the fact that they are compact systems.
- It is safe by using closed expansion tank.
- Hygiene is provided in the domestic water with double storey enamel coated inner tank.
- Titanium coated copper / aluminium absorber surfaced solar collectors provide high heat transfer with laser welded pipes.
- Robust and durable with galvanized coating feet.
- Provides ease of assembly in installation.
- AquaSolar tanks have domestic water hygiene certificate (PZH).
- AquaSolar tanks are protected against corrosion with Mg Anode.
- It has plastic covers reinforced against high density polyurethane insulation and UV rays.
- Electrical additional heater can be connected (Optional) thanks to auxiliary heater coupling sleeve.

## Package System Contents

- 1- Collector
- 2- Tank
- 3- Chassis
- 4- Hydraulic Connection Elements
- 5- Tank Accessories
- 6- Expansion Tank
- 7- Solar Fluid



## Technical Specification

Your home meets hygienic, quality and free hot water with Baymak Solar Energy Package Systems making life easier with expensive anti-energy, pro-saving products.

Comfortable hot water can be reached easily and practically with Baymak solar energy tank and assembly chassis and the image pollution on the roofs comes to an end with Aquasolar Solar Energy Systems.

Aquasolar Solar Energy Systems has an electric auxiliary heater coupling sleeve. Thus, even in cold regions, an additional electric heater can be connected to produce more hot water during transition seasons. Entire range of high efficiency Baymak Solar Collector may be used in Aquasolar GESs and 160 L, 200 L and 300 L capacity and high density polyurethane insulated tanks provide comfortable hot water.

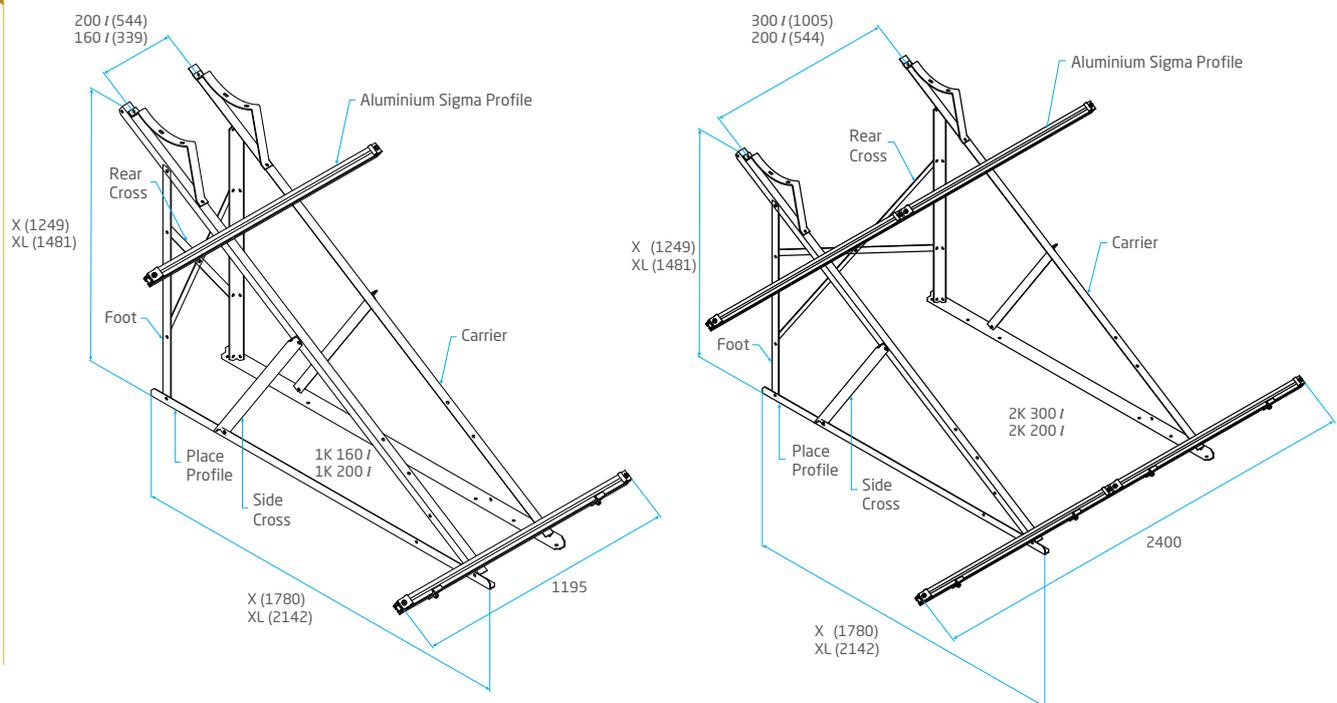


Since Baymak Aqua Boiler Series Solar Energy Tanks are coated with titanium-reinforced enamel such as other products produced, tanks keep the water clean and hygienic. Aquasolar Series has hygiene certificate (PZH) from international organizations which are valid all over Europe. AQUASOLAR, like all Baymak hot water tanks, is protected against corrosion by Magnesium alloy anodes. Thus, it provides the comfort of consuming healthy hot water with peace of mind at any moment.

The new stylish plastic covers reinforced against UV rays provide ease of installation in tanks.

Baymak Aquasolar Series Solar Energy Package Systems; offer practicality, comfort and hygiene all together.

## Package System Schemes



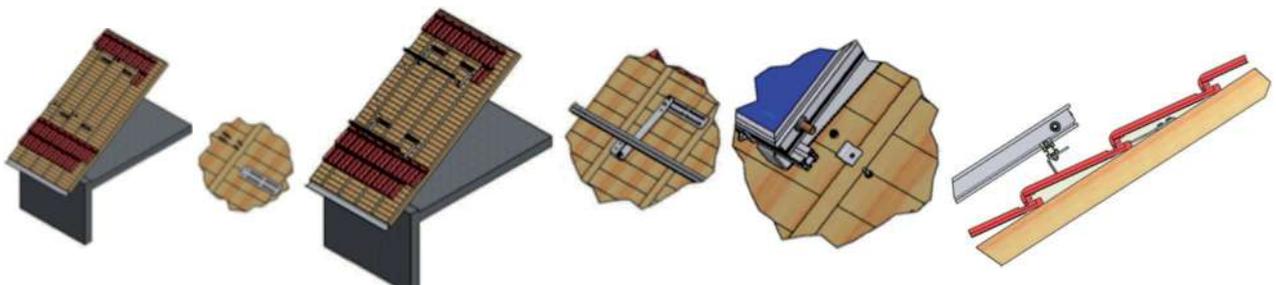
## Technical Data Table

Package Systems	AQUASOLAR 1K 160 L	AQUASOLAR 1K 200 L	AQUASOLAR 2K 200 L	AQUASOLAR 2K 300 L
Tank Volume	160 l	200 l	200 l	300 l
Number of Collectors	1 piece (2/2,5m <sup>2</sup> )	1 piece (2,5m <sup>2</sup> )	2 piece (2/2,5m <sup>2</sup> )	1 piece (2/2,5m <sup>2</sup> )
Collector Type	X / XL	XL	X / XL	X / XL
Tank Heat Transfer Area	1,0 m <sup>2</sup>	1,3 m <sup>2</sup>	1,3 m <sup>2</sup>	2,15 m <sup>2</sup>
Mg Anode Quantity	475 gr	475 gr	475 gr	750 gr
Outer Coating Material	Electrostatic Powder Painted Galvanized Steel			
Inner Tank Coating	Titanium-reinforced Enamel	Titanium-reinforced Enamel	Titanium-reinforced Enamel	Titanium-reinforced Enamel
Water Inlet-Outlet Connection	R 3/4"	R 3/4"	R 3/4"	R 3/4"
Collector Tank Connections	Stainless Flex /Copper	Stainless Flex /Copper	Stainless Flex /Copper	Stainless Flex /Copper
Optional Heater Connection	G 1 1/4"	G 1 1/4"	G 1 1/4"	G 1 1/4"
Expansion Tank	7,5 l Closed Type with Membrane			
Tank Isolation	Water-Based Polyurethane (40 gr / cm <sup>3</sup> )	Water-Based Polyurethane (40 gr / cm <sup>3</sup> )	Water-Based Polyurethane (40 gr / cm <sup>3</sup> )	Water-Based Polyurethane (40 gr / cm <sup>3</sup> )

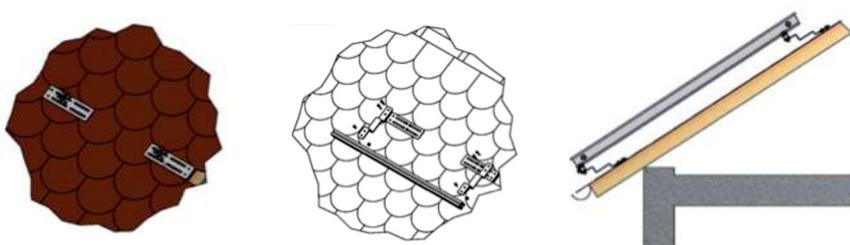
## Roof Assembly Kit Parts for Solar Collectors

Image	Code	Baymak Product Description	Color	1K AL Collector Roof Kit 'Z' Profile-Silver 09140070	1K AL Collector Roof Kit 'Z' Profile-Black 09140071	1K AL Collector Roof Kit 'L' Profile-Silver 09140072	1 K AL Collector Roof Kit 'L' Profile-Black 09140073	2 K AL Collector Roof Kit 'Z' Profile-Silver 09140076	2 K AL Collector Roof Kit 'Z' Profile-Black 09140077	2 K AL Collector Roof Kit 'L' Profile-Silver 09140078	2 K AL Collector Roof Kit 'L' Profile-Black 09140079
	63 1024 0247	Roof Mounting Bracket	Black Powder Paint	4	4	4	4	4	4	4	4
	63 1024 0248	Z Mounting Bracket / shingling *	Black Powder Paint	4	4	-	-	6	6	-	-
	63 1024 0255	L Connection Bracket / Tile *	Black Powder Paint	-	-	4	4	-	-	6	6
	63 1050 0098	Sigma Profile-L 1195	Silver Grey Anodized Aluminium	2	-	2	-	-	-	-	-
	63 1050 0112	Sigma Profile-LG: 2400	Black Anodized Aluminum	-	2	-	2	-	-	-	-
	63 1050 0113	Sigma Profile-LG: 2400	Silver Grey Anodized Aluminium	-	-	-	-	2	-	2	-
	63 1050 0114	Sigma Profile-LG: 2400	Black Anodized Aluminum	-	-	-	-	-	2	-	2
	63 1050 0099	L Collector Bottom Support	Silver Grey Aluminium	2	-	2	-	4	-	4	-
	63 1050 0108	L Collector Bottom Support	Black Anodized Aluminum	-	2	-	2	-	4	-	4
	63 1050 0100	Z Collector Bottom Support	Silver Grey Aluminium	4	-	4	-	8	-	8	-
	63 1050 0109	Z Collector Bottom Support	Black Anodized Aluminum	-	4	-	4	-	8	-	8
	63 0541 0002	T Bolt For Sigma Profile	Nickel Plating	12	12	12	12	20	20	20	20
	05 9921 0014	Lock washer	Black	12	12	12	12	20	20	20	20
	05 9930 0079	3/8" Whitworth Nut	Silver Grey	12	12	12	12	20	20	20	20
	05 9912 0114	Long Wood Bolt M8x70	Galvanized	16	16	16	16	36	36	36	36
	05 9912 0112	Short Wood Bolt M8x30	Galvanized	8	8	8	8	12	12	12	12
	09140088	Adjustable Roof Connection Bracket	316 L Unpainted Stainless Steel	Optional for special roofs. Must additionally be ordered.							

## Tile Roof Connection Kit



## Shingle Roof Connection Kit





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