SOLAR SYSTEMS MANUFACTURER

GB

INSTALLATION MANUAL

&

USERS MANUAL

DOMESTIC SOLAR WATER HEATER

SOLE EUROSTAR

THERMOSIPHON SYSTEM

CLOSED CIRCUIT

MODELS EUROSTAR :

120-1-A175/120-1-A200/150-1-A200/150-1-A250/200-1-A200/200-1-A250/200-1-A270/200-2-A175/200-2-A200/300-2-A200/300-2-A250
120-1-T200/150-1-T200/150-1-T250/200-1-T200/200-1-T250/200-1-T270/200-2-T175/300-2-T200/300-2-T250

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1. Observance of the instructions and standards.

1.1. It is very important to follow these installation, operating and maintenance instructions, in order to avoid danger of death, injury, property damages, and to have your device functioning properly in the long run.
The company that manufactured and/or supplied this solar system has no liability for the installer and/or the user in case these instructions have not been followed carefully.

1.2. Whether further information or clarifications are needed, please contact the supplier of the product.

1.3. This solar system has been manufactured and tested under the European standards:

EN 12975-1: Thermal solar systems and components – Solar collectors -part 1: General requirements.
EN 12975-2: Thermal solar systems and components – Solar collectors – part 2 : test methods.
EN 12976-1: Thermal solar systems and components – Factory made systems - part 1: General requirements.
EN 12976-2: Thermal solar systems and components – Factory made systems – part 2: Test methods.

2. Description of solar system and components

2.1 General Description

This solar system is a closed loop thermosiphon unit which delivers hot water for domestic use. It consists from the collector, the accumulation tank, the support system, the hydraulic accessories and the thermo-convention liquid.
Four nominal sizes of accumulation tanks are combined with four different sizes of collectors as the table below:

MODEL	TANK NOMINAL SIZES				COLLECTOR NOMINAL SIZES			
	120 ltrs	150 ltrs	200 ltrs	300 ltrs	1,75m^2	2,00m^2	2,50m^2	2,70m^2
120-1-175	1				1			
120-1-200	1					1		
150-1-200		1				1		
150-1-250		1					1	
200-1-200			1			1		
200-1-250			1				1	
200-1-270			1					1
200-2-175			1		2			
300-2-200				1		2		
Other combinations are available upon request								

2.2. Collector

The collectors are manufactured in 4 sizes with nominal area of 1,75m^2 -2, 00m^2-2.50m^2 -2,70m^2. The absorbers of the collectors are made by copper tubes and the fins area by copper or aluminum fins selective or non selective. The fins are welded to the tubes by ultrasonic or laser welding. The frame of the collector is made by extruded aluminum epoxy oven painted to resist ambient conditions.
The glass cover is a “prismatic securit” glass of 4mm thickness for maximum penetration of solar irradiation. At the back and sides of the absorber there is sufficient insulation of rock wool and glass wool to minimize heat loses and to resist stagnation temperatures.

Technical data of collectors as the table below:

	Nominal size (m^2)			
	1,75	**2,00**	**2,50**	**2,70**
Length (mm)	1760	1970	1970	2145
Width (mm)	1000	970	1175	1248
Depth (mm)	86	86	86	86
Weight (kg)	38,0	41,0	49,0	55,1

Stagnation temperature: 100-140^{o}C (depending on selected by client type of absorber’s fins)
Test pressure: 10 bar
Operating pressure: 6 bar
The safety valve only opens the discharge when the system pressure exceeds 2.5bar in the form of hot water and/or steam.

2.3. Accumulation tank (cylinder)

The solar accumulation tank is an indirect (double circuit) hot water horizontal cylinder. The inner surface is enameled at 850^{o}C to guarantee potable sanitary water for long life. Additionally it is protected against rusting with a large magnesium anode.
The ecologic polyurethane foam insulation guaranties minimum thermal loses even at very low ambient temperatures. The external cover of the tank can resist any extreme weather conditions for life. The internal jacket-type heat exchanger with large surface guaranties the energy transfer to the domestic hot water.
The hot water exits from the hottest zone (level) of the tank. At the same time equal quantity of cold water enters the tank at the coldest zone (level). The solar tank can be optionally (accessory) equipped with immersion electric heater (electric element) for use only for emergency situations. The immersion electric heater is available in 2 kW or 3kW or 4 kW at 230 Volt. It is equipped with control thermostat set at 60^o C and safety thermostat (thermal cut out) manually reset.
The safety valve only opens the discharge when the system pressure exceeds 10bar in the form of water.

Technical Data of tanks as table below:

	Nominal size			
	120	**150**	**200**	**300**
Length (mm)	1070	1320	1320	2080
Diameter (mm)	500	500	530	530
Weight (kg)	53	59	67	106
Capacity (ltr) (Incl. h.exchanger)	115	143	179	290
Test pressure (bar)	15	15	15	15
Operating pressure (bar)	10	10	10	10
Max temperature (ºC)	90 ºC	90 ºC	90 ºC	90 ºC
Cold & hot water connectors (male)	½″	½″	½″	½″

2.4 Support system

The support system is made from galvanized pressed steel. It is designed for flat roof installation as well as for inclined tiled roof. It can be installed at 4 different inclinations. 18º-25º-32º-40º, so it can meet any roof slope.
The support system can withstand wind velocity up to 97,2 km/hr. and weight of snow up to 64cm height.

In order to assembly the support system the following tools are needed.

- Spanner 10mm 1 X 
- Spanner 13mm 1 X 
- 2 Spanners 17mm 2 X 
- Screwdriver 1 X 
- Drill Ø10 (for fastening the system on the roof) 

The material list for each set of support system is:

	Part	MODEL								
		120-1-175	120-1-200	150-1-200	150-1-250	200-1-200	200-1-250	200-1-270	200-2-175	300-2-200
SET OF SUPPORT FRAME PARTS										
01	**A1 profile in Π section 1465mm**	2	2	2	2	2	2	-	2	2
02	**A2 profile in Π section 1570mm**	-	-	-	-	-	-	2	-	-
03	**Tank support 280x195mm**	2	2	2	2	2	2	2	2	2
04	**D1 profile in Π section 2192mm**	2	2	2	2	2	2	-	2	2
05	**D2 profile in Π section 2370mm**	-	-	-	-	-	-	2	-	-
06	**X1: bracket 1248mm** (*)	4/-	4/-	4/-	4/-	4/-	4/-	4/-	4/-	2/-
07	**X2:bracket 1667mm** (*)	-	-	-	-	-	-	-	-	2/-
08	**E1 :angle Z shape 2000mm**	-	-	-	-	-	-	-	2	2
09	**Stainless steel strips 670mm (for inclined roof)** (*)	-/4	-/4	-/4	-/4	-/4	-/4	-/4	-/4	-/4
10	**Insulated copper pipe Ø15mm (for close loop cold water)**	2.12m	2.30m	2.27m	2.37m	2.27m	2.37m	2.57m	2.56m	2.49m
11	**Insulated copper pipe Ø 15mm (for close loop hot water)**	0.43m	0.42m	0.39m	0.48m	0.39m	0.48m	0.52m	0,895m	0.60m
SET OF FITTINGS										
12	**Compression Elbow Male ½˝ x Ø15**	2	2	2	2	2	2	2	2	2
13	**Compression Elbow Ø22 x Ø15**	2	2	2	2	2	2	2	2	2
14	**Compression End Cap Ø22**	2	2	2	2	2	2	2	2	2
15	**Compression Connector Ø22 x Ø22**	-	-	-	-	-	-	-	2	2
16	**Pressure Safety Valve 8 bar (for open loop)**	1	1	1	1	1	1	1	1	1
17	**Pressure Safety Valve 2,5 bar (for closed loop)**	1	1	1	1	1	1	1	1	1
SET OF BOLTS AND NUTS										
18	**Bolt M10x16 (DIN 933/8.8)** (*)	16/12	16/12	16/12	16/12	16/12	16/12	16/12	16/12	16/12
19	**Nut M10 (DIN 934/8)** (*)	17/12	17/12	17/12	17/12	17/12	17/12	17/12	17/12	17/12
20	**Bolt M10x20 (DIN 933/8.8)** (*)	1/-	1/-	1/-	1/-	1/-	1/-	1/-	1/-	1/-
21	**Washer Ø10 (DIN 125)** (*)	1/-	1/-	1/-	1/-	1/-	1/-	1/-	1/-	1/-
22	**Bolt M6x20 (DIN 933/8.8)**	4	4	4	4	4	4	4	8	8
23	**Washer Ø6 (DIN 9021)**	4	4	4	4	4	4	4	8	8
24	**Anchored Bolt M8x60 (DIN 571)**	4	4	4	4	4	4	4	4	4
25	**Plastic Rawlplugs D10** (*)	4/-	4/-	4/-	4/-	4/-	4/-	4/-	4/-	4/-
26	**Cross Recess Counter Sunk Head Bolt M8x20 (DIN 7969)**	-	-	-	-	-	-	-	4	4
27	**Washer Ø 8 (DIN 9021)**	-	-	-	-	-	-	-	4	4
28	**Nut M8 (DIN 934/8)**	-	-	-	-	-	-	-	4	4
29	**St. steel angles 32 x 45 x 45mm (for inclined roof)** (*)	-/2	-/2	-/2	-/2	-/2	-/2	-/2	-/2	-/2
OPTIONAL										
30	**Decorative cover 990mm**	1	1	1	-	1	-	-	-	-
31	**Decorative cover 2000mm**	-	-	-	-	-	-	-	-	1
32	**Decorative cover 1250mm**	-	-	-	1	-	1	1	1	-

(*) Required quantities for: *flat roof / inclined roof (tiles)*

(All the other quantities are the same for flat roof or inclined roof installation)

2.5. Thermo convention liquid

The thermal energy collected from the solar irradiation by the collector/s is transferred to the heat – exchanger of the tank by the thermo convention liquid, which is naturally re circulated by the thermosiphonic principle in the closed loop -system. The jacket-type heat exchanger is heating the domestic consumption water. The solution contains inhibitors for antirust protection and propylenoglycol for antifreeze protection up to -15^{o}C. If lower temperature protection is needed please consult your supplier.
The solution is a non toxic, non-flammable chemical liquid; however normal protection measures should be taken during handling. Keep it away from children.
Eyes protection: Protective glasses must be used.
Skin protection: PVC or rubber gloves must be used.

- In case of contact with eyes, wash eyes with plenty of water for 15 minutes (with open eyelids)
- In case of contact with skin simply wash with water and soap.

Physical Properties:

Phase: liquid
Color: Light red
Odor: nearly odorless
Specific gravity at 20^{o}C : 1,03g/cm^{3}
Freezing point: -15^{o}C
Boiling point: 106^{o}C
Packing: Containers of 12 ltr for 120 and 150 ltr tanks
18 ltr for 200 ltr tanks
25 ltr for 300 ltr tanks

2.6. Packaging, Transport and Storage

The solar collectors and the solar tanks are supplied individually packaged, the collectors in carton boxes and the tanks with stretch film and expanding polystyrene. The collector model is indicated on the outside of each box and the tank model is indicated outside of each package. Depending on the number of units ordered, collectors can be supplied palletised in groups of up to 10 units. Collectors should always be during transport and storage placed in horizontal position with the glass facing on top, otherwise there is danger of water entering in the collectors from the ventilation holes at the back of the collector. They should not be stored or transported in piles of more than 12 units. The tanks can be supplied palletised in groups of up to 10 units. Alternatively, under request, the whole system can be palletised in individual pallets. The tanks should be always in vertical position during transportation and should not be stored or transported in piles of more than 2 units. It is recommended to use special safety belts during transportation in order to avoid movements and/or falling.

3. Warnings

Before starting installation, the installer should read and observe carefully the following warnings in order to avoid danger of death, injury or property damages.

3.1. You may elevate on roof the parts of the solar system, ONLY when an internal staircase of enough width, exists in the building reaching the roof. Otherwise you must use a proper CRANE to elevate the parts. It is not allowed to stand at the edge of any roof (flat or inclined) and pull by ropes any part. DANGER OF DEATH.
3.2 The collectors have a large surface exposed to wind. NEVER install a system with strong winds. Choose a calm day. DANGER OF DEATH or heavy injury.
3.3. If the installation will be on an inclined roof (tiles), there is danger of slipping. Use always SAFETY BELTS (securely fastened) from a higher position of roof. DANGER OF DEATH.
3.4. After completion of the installation make sure that all bolts and nuts are fastened well and the whole system is securely fastened to the roof. The support system can withstand air velocities up to 120 km/hr. Make sure that the fastening on roof can withstand as well at least same air velocity. DANGER OF DEATH.

3.5. Frequently some parts of the support systems have sharp edges. Use always gloves when you are handling the support system, in order to avoid danger of injuring the hands. DANGER OF INJURY.
3.6. The collectors when exposed to solar irradiation during installation get very hot; above 120^{o} C in 2-3 minutes. There is danger of burning the hands when touching the copper piping outlets. You must leave the carton package cover ON the glass until completion of the installation, or you must use thermo resistance gloves. DANGER OF INJURY.
3.7. If you are using hands to position the tank on the support system at least 2 people are needed for systems 120-150-200 and 4 people for 300 ltr.
It is preferred to use a crane. In this case make sure that the pulling belts are on each side between the piping outlets of the boiler so that it cannot slip.
3.8. In cases where the solar system is large and the hot water consumption is low, the hot water in the solar tank may reach temperatures up to 90^{o}C. In this case there is danger of burns for the user, especially for children.
It is strongly recommended to install a thermostatic mixing valve set at 55-60^{o}C anywhere at the hot supply piping and before the hot outlets of the building (before taps, showers, e.t.c.)
3.9. If the solar system is equipped with the (optional) electric immersion heater, the electrical connection should be done by a fully licensed electrician following the national rules for electric installation.
The immersion heater is single phase 230 Volt of 2kW or 3 kW or 4 kW power.
There is an “earth point” on the flange of the heater which must be connected to the central “earth” of the building. In any case the support of the solar system must be “earthed” with copper wire of 16 mm^2 to the earthing grid of the building. This will also serve as lightning protection.
3.10 In a solar system equipped with the optional electric heater, after completion of electrical and plumbing installation test the operation of the electric heater and thermostat, ONLY AFTER FILLING the tank with city water. Otherwise the electric heater will be fused out. (destroyed)
3.11 Make sure that before filling the tank with city water the pressure safety non-return valve has been installed on the cold water inlet with the arrow pointing to the tank. This valve will open and release the pressure when by overheating or other reason it has exceeded 10 bar.
3.12. When handling the thermo-convention liquid make sure that you wear protective glasses for the eyes and gloves for the skin.
3.13. When temporarily leave the collectors on the roof during installation ALWAYS position them with glass facing the sky. Otherwise there is danger that water from rain may enter the collector from the back side through the ventilation holes. If this happens the insulation will be wet and the glass will have humidity on inside surface. Drying will take a very long time.
3.14. During stagnation periods there is a probability of steam escape from the closed loop security valve at the top of the tank, and the non return valve at the bottom of the tank in line with the cold water inlet. Do not touch, remove or look closely to these valves. There is danger of injury or harm.

4. Recommendations

4.1 The cold water piping should withstand pressure of 10 bar. The hot water piping should withstand temperature of 95^{o} C at pressure 10 bar.
4.2. The cold and hot water piping should be well insulated to eliminate heat losses and prevent as possible freezing. The insulation material should withstand weather conditions like rains, snow and solar irradiation.
4.3. On the hot water supply piping, install a reliable thermostatic mixing valve set at 55^{o}C to 60 ^{o}C to prevent higher temperature hot water to reach the consumption points.
4.4. The system may only be installed in locations with lower values of s_K (snow load) 0.64m and v_m (average wind velocity) 97.2km/h
4.5. The required solar irradiation for which overheating will happen is shown on the table below. The system should not be used in climate zones with higher irradiation values than these.

SWH 200-2-T175	
Gd (MJm-2)	**ta (°C) (at solar noon)**
26.3	27.2
26.1	29.2
25.9	30.7
25.8	31.1
25.4	30.5

4.6. Thermal Performance of the System

Performance indicators of the system SWH 120-1-A200

Yearly for a demand volume of 80/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
4455	1637	36.7	
4272	1681	39.3	
4833	2562	53.0	
3282	2089	63.6	

Yearly for a demand volume of 110/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
6126	1804	29.5	
5874	1865	31.8	
6646	2791	42.0	
4566	2492	54.6	

Yearly for a demand volume of 140/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
7796	1907	24.5	
7476	1981	26.5	
8459	2930	34.6	
5811	2777	47.8	

Yearly for a demand volume of 170/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
9467	1977	20.9	
9078	2062	22.7	
10271	3023	29.4	
7056	2944	41.7	

Yearly for a demand volume of 200/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
11138	2027	18.2	
10681	2121	19.9	
12084	3090	25.6	
8301	3059	36.9	

Performance indicators of the system SWH 120-1-T200

Yearly for a demand volume of 50/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	2784	1626	58.4	
Wuerzburg	2670	1721	64.5	
Davos	3021	2645	87.5	
Athens	2052	1758	85.7	

Yearly for a demand volume of 80/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	4455	2056	46.1	
Wuerzburg	4272	2296	53.7	
Davos	4833	3309	68.5	
Athens	3282	2566	78.2	

Yearly for a demand volume of 110/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	6126	2250	36.7	
Wuerzburg	5874	2563	43.6	
Davos	6646	3620	54.5	
Athens	4566	3173	69.5	

Yearly for a demand volume of 140/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	7796	2367	30.4	
Wuerzburg	7476	2719	36.4	
Davos	8459	3808	45.0	
Athens	5811	3643	62.7	

Yearly for a demand volume of 170/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	9467	2446	25.8	
Wuerzburg	9078	2824	31.1	
Davos	10271	3934	38.3	
Athens	7056	4024	57.0	

Performance indicators of the system SWH 150-1-T200

Yearly for a demand volume of 80/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	4455	2138	48.0	
Wuerzburg	4272	2362	55.3	
Davos	4833	3459	71.6	
Athens	3282	2595	79.1	

Yearly for a demand volume of 110/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	6126	2347	38.3	
Wuerzburg	5874	2655	45.1	
Davos	6646	3800	57.2	
Athens	4566	3212	70.3	

Yearly for a demand volume of 140/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	7796	2473	31.7	
Wuerzburg	7476	2814	37.6	
Davos	8459	4007	47.4	
Athens	5811	3688	63.5	

Yearly for a demand volume of 170/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	9467	2558	27.0	
Wuerzburg	9078	2924	32.2	
Davos	10271	4145	40.4	
Athens	7056	4071	57.7	

Yearly for a demand volume of 200/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	11138	2619	23.5	
Wuerzburg	10681	3003	28.1	
Davos	12084	4244	35.1	
Athens	8301	4312	51.9	

Performance indicators of the system SWH 150-1-A250

Yearly for a demand volume of 110/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
6106	2174	35.6	
5855	2431	41.5	
6628	3335	50.3	
4541	3103	68.3	

Yearly for a demand volume of 140/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
7771	2327	29.9	
7450	2648	35.5	
8435	3533	41.9	
5782	3614	62.5	

Yearly for a demand volume of 170/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
9439	2404	25.5	
9045	2737	30.3	
10246	3646	35.6	
7019	3931	56.0	

Yearly for a demand volume of 200/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
11103	2468	22,2	
10643	2808	26,4	
12052	3738	31.0	
8260	4125	49.9	

Yearly for a demand volume of 250/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
13.881	2552	18.4	
13304	2901	21.8	
15067	3865	25.7	
10326	4281	41.5	

Performance indicators of the system SWH 200-1-A250

Yearly for a demand volume of 140/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
7796	2308	29.6	
7476	2400	32.1	
8459	3623	42.8	
5744	3207	55.8	

Yearly for a demand volume of 170/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
9467	2413	25.5	
9078	2518	27.7	
10271	3769	36.7	
7056	3512	49.8	

Yearly for a demand volume of 200/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
11138	2488	22.3	
10681	2604	24.4	
12084	3875	32.1	
8301	3710	44.7	

Yearly for a demand volume of 250/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
13922	2577	18.5	
13351	2705	20.3	
15105	3997	26.5	
10377	3917	37.8	

Yearly for a demand volume of 300/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
16706	2637	15.8	
16021	2775	17.3	
18126	4081	22.5	
12452	4062	32.6	

Performance indicators of the system SWH 150-1-T250

Yearly for a demand volume of 80/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	4455	2341	52.5	
Wuerzburg	4272	2527	59.2	
Davos	4833	3767	77.9	
Athens	3282	2685	81.8	

Yearly for a demand volume of 110/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	6126	2617	42.7	
Wuerzburg	5874	2957	50.3	
Davos	6646	4211	63.4	
Athens	4566	3408	74.6	

Yearly for a demand volume of 140/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	7796	2787	35.7	
Wuerzburg	7476	3180	42.5	
Davos	8459	4483	53.0	
Athens	5811	3969	68.3	

Yearly for a demand volume of 170/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	9467	2902	30.7	
Wuerzburg	9078	3332	36.7	
Davos	10271	4666	45.4	
Athens	7056	4427	62.7	

Yearly for a demand volume of 200/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	11138	2985	26.8	
Wuerzburg	10681	3442	32.2	
Davos	12084	4798	39.7	
Athens	8301	4812	58.0	

Performance indicators of the system SWH 200-1-T250

Yearly for a demand volume of 140/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	7771	3079	39.6	
Wuerzburg	7450	3479	46.7	
Davos	8435	4876	57.8	
Athens	5782	4329	74.9	

Yearly for a demand volume of 170/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	9439	3251	34.4	
Wuerzburg	9045	3745	41.4	
Davos	10246	5103	49.8	
Athens	7019	4840	68.9	

Yearly for a demand volume of 200/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	11103	3306	29.8	
Wuerzburg	10643	3825	36.0	
Davos	12052	5176	43.0	
Athens	8260	5220	63.0	

Yearly for a demand volume of 250/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	13881	3338	24.0	
Wuerzburg	13304	3865	29.1	
Davos	15067	5227	34.7	
Athens	10326	5574	54.0	

Yearly for a demand volume of 300/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	16655	3371	20.2	
Wuerzburg	15965	3902	24.5	
Davos	18079	5282	29.2	
Athens	12392	5683	45.9	

Performance indicators of the system SWH 200-1-A270

Yearly for a demand volume of 140/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
7796	2536	32.5	
7476	2622	35.1	
8459	3933	46.5	
5744	3386	58.9	

Yearly for a demand volume of 170/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
9467	2670	28.2	
9078	2772	30.5	
10271	4115	40.1	
7056	3769	53.4	

Yearly for a demand volume of 200/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
11138	2768	24.9	
10681	2883	27.0	
12084	4246	35.1	
8301	4036	48.6	

Yearly for a demand volume of 250/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
13922	2883	20.7	
13351	3013	2.6	
15105	4400	29.1	
10377	4317	41.6	

Yearly for a demand volume of 300/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
16706	2961	17.7	
16021	3103	19.4	
18126	4504	24.9	
12452	4502	36.2	

Performance indicators of the system SWH 200-1-T270

Yearly for a demand volume of 140/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	7771	3237	41.6	
Wuerzburg	7450	3632	48.7	
Davos	8435	5212	61.8	
Athens	5782	4485	77.4	

Yearly for a demand volume of 170/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	9439	3479	36.9	
Wuerzburg	9045	3975	44.0	
Davos	10246	5552	54.2	
Athens	7019	5041	71.8	

Yearly for a demand volume of 200/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	11103	3569	32.1	
Wuerzburg	10643	4132	38.8	
Davos	12052	5654	46.9	
Athens	8260	5471	66.2	

Yearly for a demand volume of 250/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	13881	3606	26.0	
Wuerzburg	13304	4179	31.4	
Davos	15067	5705	37.9	
Athens	10326	5942	57.6	

Yearly for a demand volume of 300/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	16655	3639	21.8	
Wuerzburg	15965	4219	26.4	
Davos	18079	5756	31.8	
Athens	12392	6165	49.8	

Performance indicators of the system SWH 200-2-A175

Yearly for a demand volume of 140/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
7796	2932	37.6	
7476	3005	40.2	
8459	4414	52.2	
5744	3717	64.7	

Yearly for a demand volume of 170/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
9467	3131	33.1	
9078	3222	35.5	
10271	4662	45.4	
7056	4138	58.6	

Yearly for a demand volume of 200/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
11138	3279	29.4	
10681	3385	31.7	
12084	4843	40.1	
8301	4523	54.5	

Yearly for a demand volume of 250/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
13922	3455	24.8	
13351	3586	26.9	
15105	5057	33.5	
10377	5004	48.2	

Yearly for a demand volume of 300/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
16706	3577	21.4	
16021	3729	23.3	
18126	5204	28.7	
12452	5302	42.6	

Performance indicators of the system SWH 200-2-T175

Yearly for a demand volume of 140/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	7796	3556	45.6	
Wuerzburg	7476	4000	53.5	
Davos	8459	5630	66.6	
Athens	5744	4488	78.1	

Yearly for a demand volume of 170/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	9467	3771	39.8	
Wuerzburg	9078	4313	47.5	
Davos	10271	5959	58.0	
Athens	7056	5141	72.9	

Yearly for a demand volume of 200/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	11138	3928	35.3	
Wuerzburg	10681	4524	42.4	
Davos	12084	6198	51.3	
Athens	8301	5697	68.6	

Yearly for a demand volume of 250/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	13922	4113	29.5	
Wuerzburg	13351	4775	35.8	
Davos	15105	6478	42.9	
Athens	10377	6470	62.4	

Yearly for a demand volume of 300/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	16706	4241	25.4	
Wuerzburg	16021	4948	30.9	
Davos	18126	6670	36.8	
Athens	12452	7108	57.1	

Performance indicators of the system SWH 200-2-A200

Yearly for a demand volume of 140/day				
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)	Location
7796	2932	37.6		Stockhlom
7476	3124	41.8		Wuerzburg
8459	4366	51.6		Davos
5744	3836	66.8		Athens

Yearly for a demand volume of 170/day				
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)	Location
9467	3131	33.1		Stockhlom
9078	3366	37.1		Wuerzburg
10271	4608	44.9		Davos
7056	4266	60.5		Athens

Yearly for a demand volume of 200/day				
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)	Location
11138	3279	29.4		Stockhlom
10681	3549	33.2		Wuerzburg
12084	4785	39.6		Davos
8301	4660	56.1		Athens

Yearly for a demand volume of 250/day				
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)	Location
13922	3455	24.8		Stockhlom
13351	3779	28.3		Wuerzburg
15105	4993	33.1		Davos
10377	5208	50.2		Athens

Yearly for a demand volume of 300/day				
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)	Location
16706	3577	21.4		Stockhlom
16021	3943	24.6		Wuerzburg
18126	5137	28.3		Davos
12452	5566	44.7		Athens

Performance indicators of the system SWH 300-2-A200

Yearly for a demand volume of 170/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
9439	3355	35.5	
9045	3741	41.4	
10246	5132	50.1	
7019	4851	69.1	

Yearly for a demand volume of 200/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
11103	3683	33.2	
10643	4150	39	
12052	5625	46.7	
8260	5468	66.2	

Yearly for a demand volume of 250/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
13881	4011	28.9	
13304	4581	34.5	
15067	6099	40.5	
10326	6300	61.0	

Yearly for a demand volume of 300/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
16655	4150	24.9	
15965	4749	29.8	
18078	6307	34.9	
12392	6840	55.2	

Yearly for a demand volume of 400/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
22210	4329	19.5	
21287	4949	23.2	
24108	6570	27.3	
16520	7326	44.3	

Performance indicators of the system SWH 300-2-T200

Yearly for a demand volume of 170/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	9467	4352	46.0	
Wuerzburg	9078	4854	53.5	
Davos	10271	7030	68.4	
Athens	6975	5441	78.0	

Yearly for a demand volume of 200/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	11138	4564	41.0	
Wuerzburg	10681	5146	48.2	
Davos	12084	7376	61.0	
Athens	8301	6077	73.0	

Yearly for a demand volume of 250/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	13922	4815	34.6	
Wuerzburg	13351	5466	40.9	
Davos	15105	7784	51.5	
Athens	10377	6965	67.1	

Yearly for a demand volume of 300/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	16706	4988	29.9	
Wuerzburg	16021	5691	35.5	
Davos	18126	8066	44.5	
Athens	12452	7672	61.6	

Yearly for a demand volume of 400/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	22275	5212	23.4	
Wuerzburg	21361	5983	28.0	
Davos	24167	8430	34.9	
Athens	16603	8661	52.2	

Performance indicators of the system SWH 300-2-A250

Yearly for a demand volume of 170/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
9467	3868	40.9	
9078	3982	43.9	
10271	6040	58.8	
6975	4758	68.2	

Yearly for a demand volume of 200/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
11138	4115	36.9	
10681	4241	39.7	
12084	6376	52.8	
8301	5247	63.2	

Yearly for a demand volume of 250/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
13922	4415	31.7	
13351	4570	34.2	
15105	6778	44.9	
10377	5952	57.4	

Yearly for a demand volume of 300/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
16706	4627	27.7	
16021	4807	30.0	
18126	7059	38.9	
12452	6572	52.8	

Yearly for a demand volume of 400/day			
Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
22275	4905	22.0	
21361	5122	24.0	
24167	7423	30.7	
16603	7298	44.0	

Performance indicators of the system SWH 300-2-T250

Yearly for a demand volume of 170/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	9467	4795	50.6	
Wuerzburg	9078	5240	57.7	
Davos	10271	7699	75.0	
Athens	6975	5859	81.1	

Yearly for a demand volume of 200/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	11138	5076	45.6	
Wuerzburg	10681	5693	53.3	
Davos	12084	8148	67.4	
Athens	8301	6400	77.1	

Yearly for a demand volume of 250/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	13922	5411	38.9	
Wuerzburg	13351	6158	46.1	
Davos	15105	8684	57.5	
Athens	10377	7440	71.7	

Yearly for a demand volume of 300/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	16706	5645	33.8	
Wuerzburg	16021	6467	40.4	
Davos	18126	9057	50.0	
Athens	12452	8318	66.8	

Yearly for a demand volume of 400/day				
Location	Q_d (MJ)	Q_L (MJ)	F_{sol}	Q_{par} (MJ)
Stockhlom	22275	5949	26.7	
Wuerzburg	21361	6871	32.2	
Davos	24167	9540	39.5	
Athens	16603	9672	58.3	

5. Flat roof

Assembly instructions for systems with 1 collector:

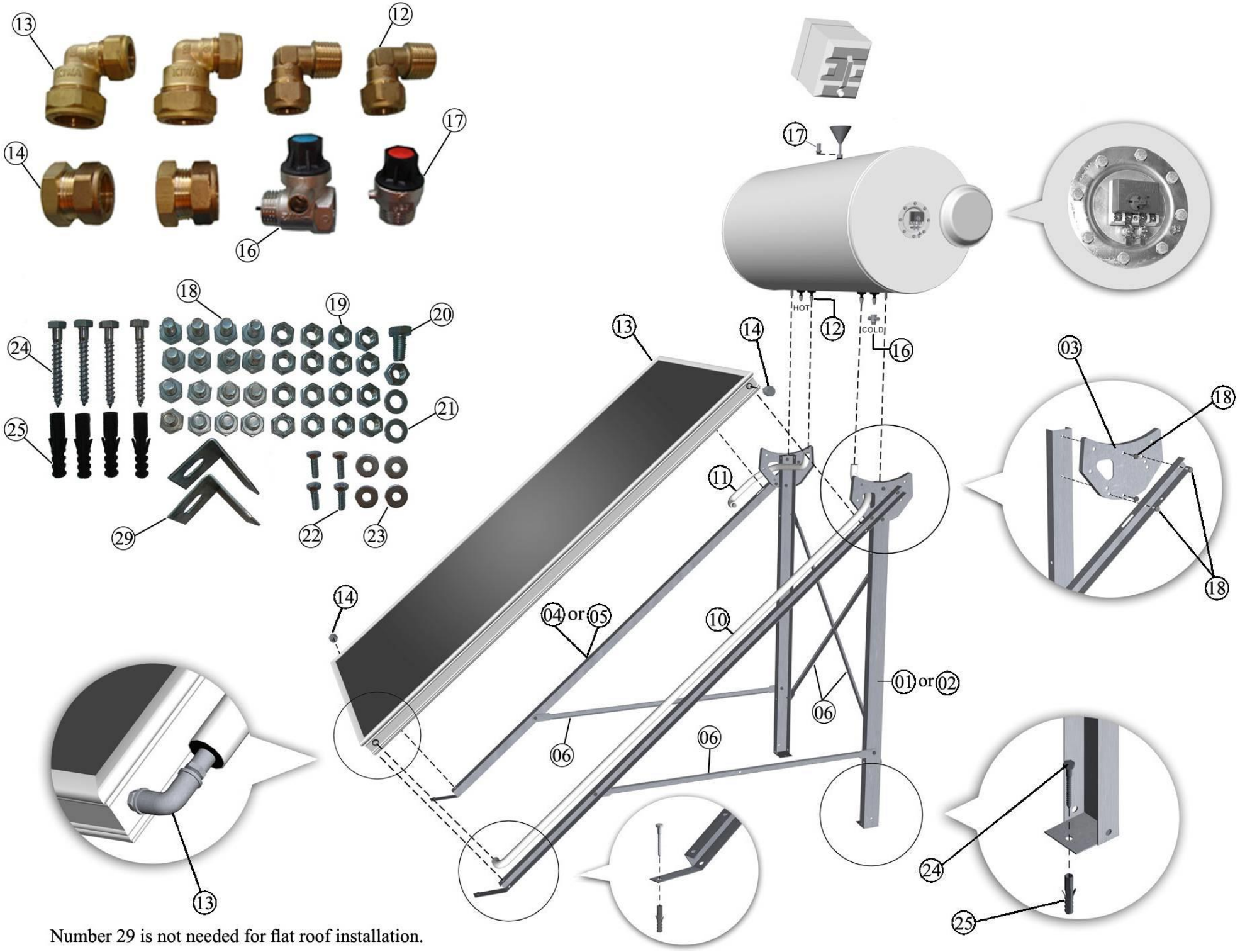
Models: 120-1-175/120-1-200/150-1-200/150-1-250/200-1-200/200-1-250/200-1-270

Assembly steps:

5.1. Open the pack of the support system. Identify the items from table (page 5) and the drawing next page.
5.2. Assembly the parts between themselves using the set of bolts and nuts included in the pack. At this stage do not fasten tight the bolts.
5.3. Fix collector on support as shown on drawing using the M6X20mm bolts and washers. Do not fasten tight yet.
5.4. Position the tank on supports. Two people are needed to handle it from each end. Fasten well with the 2 bolts M10X30 the tank on the support system. (The 2 bolts are already mounted on the tank and have to be temporarily removed before placing the tank on the support).
5.5. Now, fasten well the collector on support and then fasten well all the parts of the support system among themselves.
5.6. Drill the "floor" with 10mm drill at the 4 fixing points, insert the raw-plugs provided, and fasten well the whole support system to the "floor". Make sure that the material of "floor" is suitable (concrete) for this kind of fixing, in order to withstand at least 120 Km/hr wind speed. If in doubt, consult your supplier, or your engineer for possible alternative way of fixing.
5.7. Connect the insulated copper (or plastic) pipe at closed loop system. The long pipe is for cold return to bottom of collector. The short pipe is for hot supply from top of collector. Make sure that you fasten well the "compression" fittings in order to tight the closed loop. Fix and fasten well the 2 compression end caps on the 2 remaining open ends of the collector.
5.8. Connect the non-return pressure safety valve on the cold water inlet of tank, making sure that the arrow is pointing towards the tank (upwards) and the escape outlet is facing sideways parallel to the tank, in order to prevent harm or burning during steam escape.
5.9. Connect cold water supply using always a shut-off water valve. (Make sure the pipes are well insulated)
5.10. Connect hot water outlet piping to consumption points. It is strongly recommended to install a thermostatic mixing valve set at 50-55^{o}C on the hot water piping anywhere before the consumption points. (Make sure the pipes are well insulated).
5.11. Fill the tank with cold water. Leave open one "tap" of hot water, so that air will be flushed out and the tank will be completely filled up.
5.12. Fill up the closed loop system with thermo-convention liquid from the top pipe of tank. Make sure that no air-bubbles are coming out so filling is completed.
5.13. Screw pressure relief valve 2,5 bar for closed loop system to the top pipe of the tank and make sure that the escape outlet is facing sideways parallel to the tank, in order to prevent harm or burning during steam escape.
5.14. Check for leakages on open or closed loop system.
5.15. The (optional) electric heater should be connected by a fully licensed electrician following the national standards for electric installations.

Connections points on thermostat: No 1 : Line (220 volt)
No 4 : Neutral

On metal flange :  earth



Number 29 is not needed for flat roof installation.

6. Flat roof

Assembly instructions for systems with 2 collectors:

Models: 200-2-175/300-2-200

Assembly steps:

6.1. Open the pack of the support system. Identify the items from table (page 5) and the drawing next page.

6.2 Assembly the parts between themselves using the set of bolts and nuts included in the pack. At this stage do not fasten tight the bolts.

6.3. Fix collectors on support as shown on drawing using M6X20 bolts and washers (No 21 &22 at table) Do not fasten tight yet.

6.4. Position the tank on supports. Two people for 200 ltr and four people for 300 ltr are needed to handle it from each end. Fasten well with the 2 bolts M10X30 the tank on the support system. (The 2 bolts are already mounted on the tank and have to be temporarily removed before placing the tank on the support).

6.5. Now, fasten well the collectors on support and then fasten well all the parts of the support system among themselves.

6.6. Drill the “floor” with 10mm drill at the 4 fixing points, insert the raw-plugs provided, and fasten well the whole support system to the “floor”. Make sure that the material of “floor” is suitable (concrete) for this kind of fixing, in order to withstand at least 120 Km/hr wind speed. If in doubt, consult your supplier, or your engineer for possible alternative way of fixing.

6.7. Connect the insulated copper (or plastic) pipe at closed loop system. The long pipe is for cold return to bottom of collector. The short pipe is for hot supply from top of collector. Make sure that you fasten well the “compression” fittings in order to tight the closed loop. Fix and fasten well the 2 compression end caps on the 2 remaining open ends of the collectors.

6.8 Connect the non-return pressure safety valve on the cold water inlet of boiler making sure that the arrow is pointing towards the tank (upwards) and the escape outlet is facing sideways parallel to the tank, in order to prevent harm or burning during steam escape.

6.9 Connect cold water supply using always a shut-off water valve. (Make sure the pipes are well insulated).

6.10 Connect hot water outlet piping to consumption points. It is strongly recommended to install a thermostatic mixing valve set at 50-55^{o}C on the hot water piping anywhere before the consumption points. (Make sure the pipes are well insulated).

6.11 Fill the tank with cold water. Leave open one “tap” of hot water, so that air will be flushed out and the tank will be completely filled up.

6.12 Fill up the closed loop system with thermo-convention liquid from the top pipe of tank. Make sure that no air-bubbles are coming out so filling is completed.

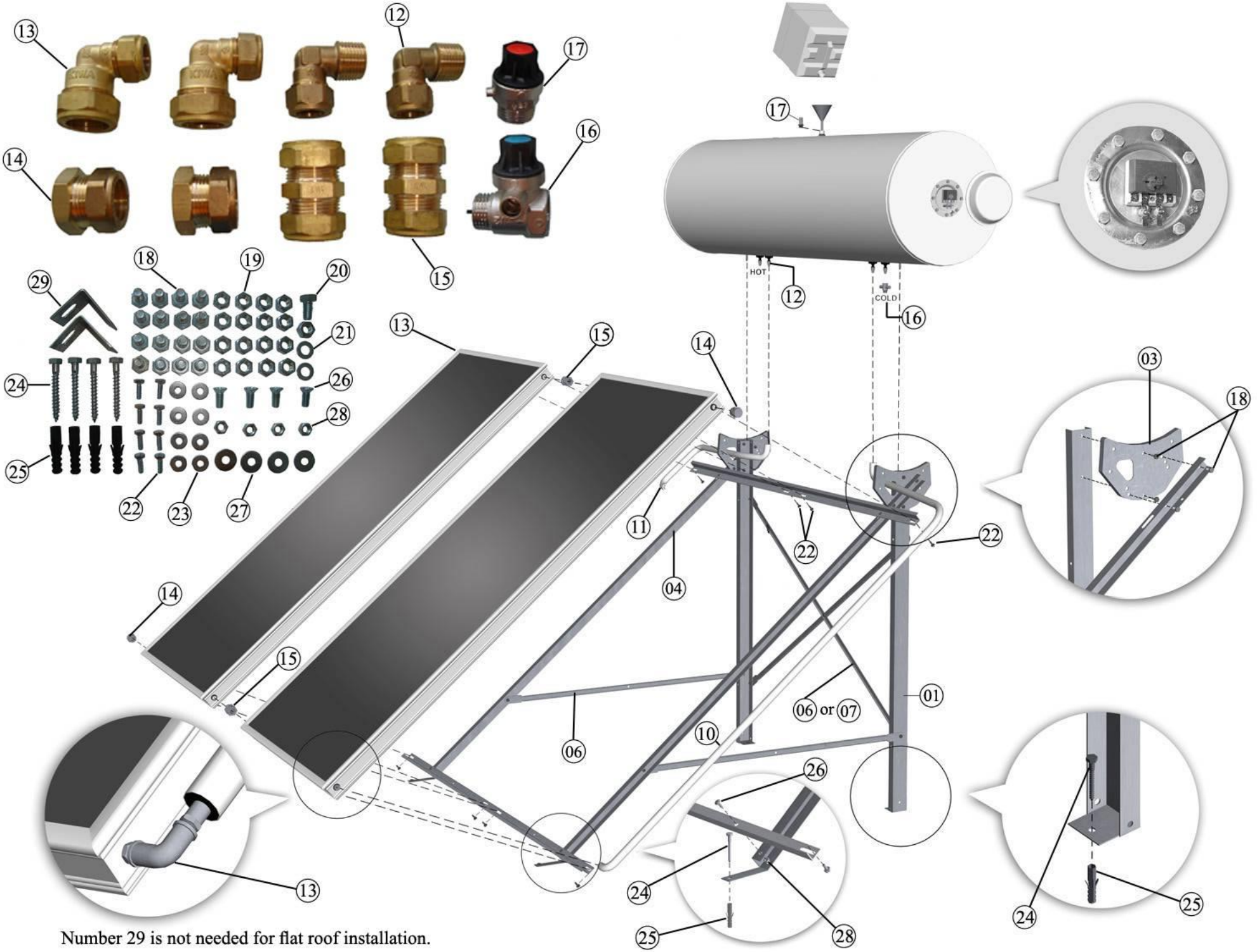
6.13 Screw pressure relief valve 2,5 bar for closed loop system to the top pipe of the tank and make sure that the escape outlet is facing sideways parallel to the tank, in order to prevent harm or burning during steam escape.

6.14 Check for leakages on open or closed loop system.

6.15 The (optional) electric heater should be connected by a fully licensed electrician following the national standards for electric installations.

Connections points on thermostat: No 1 : Line (220 volt)
No 4 : Neutral

On metal flange : ⏚ earth



Number 29 is not needed for flat roof installation.

7. Inclined roof - Tiles

Assembly instructions for systems with 1 collector:

Models: 120-1-175/120-1-200/150-1-200/150-1-250/200-1-200/200-1-250/200-1-270

Assembly steps:

7.1 Open the pack of the support system. Identify the items from table (page 5) and the drawing next page.

7.2 Assembly the parts among themselves using the set of bolts and nuts included in the pack. When assembling the tank supports to the profiles D1 (or D2), pay attention to use the proper pair of holes to match the roof inclination, so that the tank would remain (as close as possible) vertical. Make sure to use the 2 angles (part 29) for fastening the tank. At this stage do not fasten tight the bolts.

7.3 Fix the support system on the roof structure as shown on drawing. Make sure that this kind of fixing is suitable to withstand at least 120 Km/hr wind speed. If in doubt, consult your supplier, or your engineer for possible alternative way of fixing.

7.4 Fix collector on support as shown on drawing using the M6X20 bolts and washers. Do not fasten tight yet

7.5 Position the tank on supports. Two people for 200 ltr and four people for 300 ltr are needed to handle it from each end. Fasten well with the 2 bolts M10X30 the tank on the support system. (The 2 bolts are already mounted on the tank and have to be temporarily removed before placing the tank on the support).

7.6 Now, fasten well the collector on support and then fasten well all the parts of the support system among themselves.

7.7 Connect the insulated copper (or plastic) pipes at closed loop system. The long pipe is for cold return to bottom of collector. The short pipe is for hot supply from top of collector. Make sure that you fasten well the "2 compression" fittings in order to tight the closed loop. Fix and fasten well the 2 compression end caps on the 2 remaining open ends of the collector.

7.8 Connect the non-return pressure safety valve on the cold water inlet of tank making sure that the arrow is pointing towards the tank (upwards) and the escape outlet is facing sideways parallel to the tank, in order to prevent harm or burning during steam escape.

7.9 Connect cold water supply using always a shut-off water valve. (Make sure the pipes are well insulated).

7.10 Connect hot water outlet piping to consumption points. It is strongly recommended to install a thermostatic mixing valve set at 50-55^{o}C on the hot water piping anywhere before the consumption points. (Make sure the pipes are well insulated).

7.11 Fill the tank with cold water. Leave open one "tap" of hot water, so that air will be flushed out and the tank will be completely filled up.

7.12 Fill up the closed loop system with thermo-convention liquid from the top pipe of tank. Make sure that no air-bubbles are coming out so filling is completed.

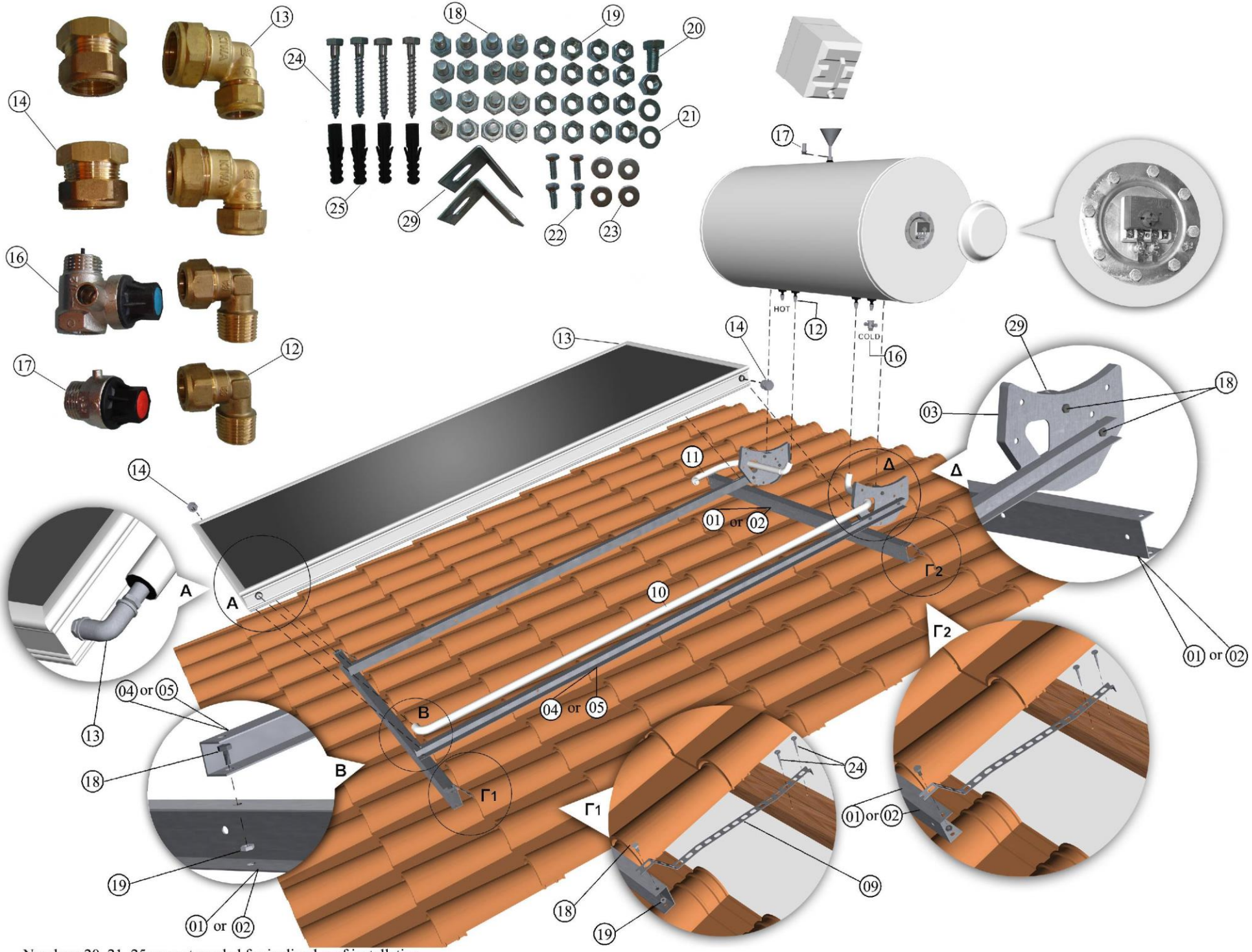
7.13 Screw pressure relief valve 2,5 bar for closed loop system to the top pipe of the tank and make sure that the escape outlet is facing sideways parallel to the tank, in order to prevent harm or burning during steam escape.

7.14 Check for leakages on open or closed loop system.

7.15 The (optional) electric heater should be connected by a fully licensed electrician following the national standards for electric installations.

Connections points on thermostat: No 1 : Line (220 volt)
No 4 : Neutral

On metal flange :  earth



Numbers 20, 21, 25 are not needed for inclined roof installation.

8. Inclined roof - Tiles

Assembly instructions for systems with 2 collectors:

Models: 200-2-175/300-2-200

Assembly steps:

8.1 Open the pack of the support system. Identify the items from table (page 5) and the drawing next page.

8.2 Assembly the parts among themselves using the set of bolts and nuts included in the pack. When assembling the tank supports to the profiles D1 (or D2), pay attention to use the proper pair of holes to match the roof inclination, so that the tank would remain (as close as possible) vertical. Make sure to use the 2 angles (part 29) for fastening the tank. At this stage do not fasten tight the bolts.

8.3 Fix the support system on the roof structure as shown on drawing. Make sure that this kind of fixing is suitable to withstand at least 120 Km/hr wind speed. If in doubt, consult your supplier, or your engineer for possible alternative way of fixing.

8.4 Fix collectors on support as shown on drawing using the M6X20 bolts and washers. Do not fasten tight yet.

8.5 Position the tank on supports. Two people for 200 ltr and four people for 300 ltr are needed to handle it from each end. Fasten well with the 2 bolts M10X30 the tank on the support system. (The 2 bolts are already mounted on the tank and have to be temporarily removed before placing the tank on the support).

8.6 Now, fasten well the collectors on support and then fasten well all the parts of the support system among themselves.

8.7 Connect the insulated copper (or plastic) pipe at closed loop system. The long pipe is for cold return to bottom of collector. The short pipe is for hot supply from top of collector. Make sure that you fasten well the “compression” fittings in order to tight the closed loop. Fix and fasten well the 2 compression end caps on the 2 remaining open ends of the collectors.

8.8 Connect the non-return pressure safety valve on the cold water inlet of tank making sure that the arrow is pointing towards the tank (upwards) and the escape outlet is facing sideways parallel to the tank, in order to prevent harm or burning during steam escape.

8.9 Connect cold water supply using always a shut-off water valve. (Make sure the pipes are well insulated).

8.10 Connect hot water outlet piping to consumption points. It is strongly recommended to install a thermostatic mixing valve set at 50-55^{o}C on the hot water piping anywhere before the consumption points. (Make sure the pipes are well insulated).

8.11 Fill the tank with cold water. Leave open one “tap” of hot water, so that air will be flushed out and the tank will be completely filled up.

8.12 Fill up the closed loop system with thermo-convention liquid from the top pipe of tank. Make sure that no air-bubbles are coming out so filling is completed.

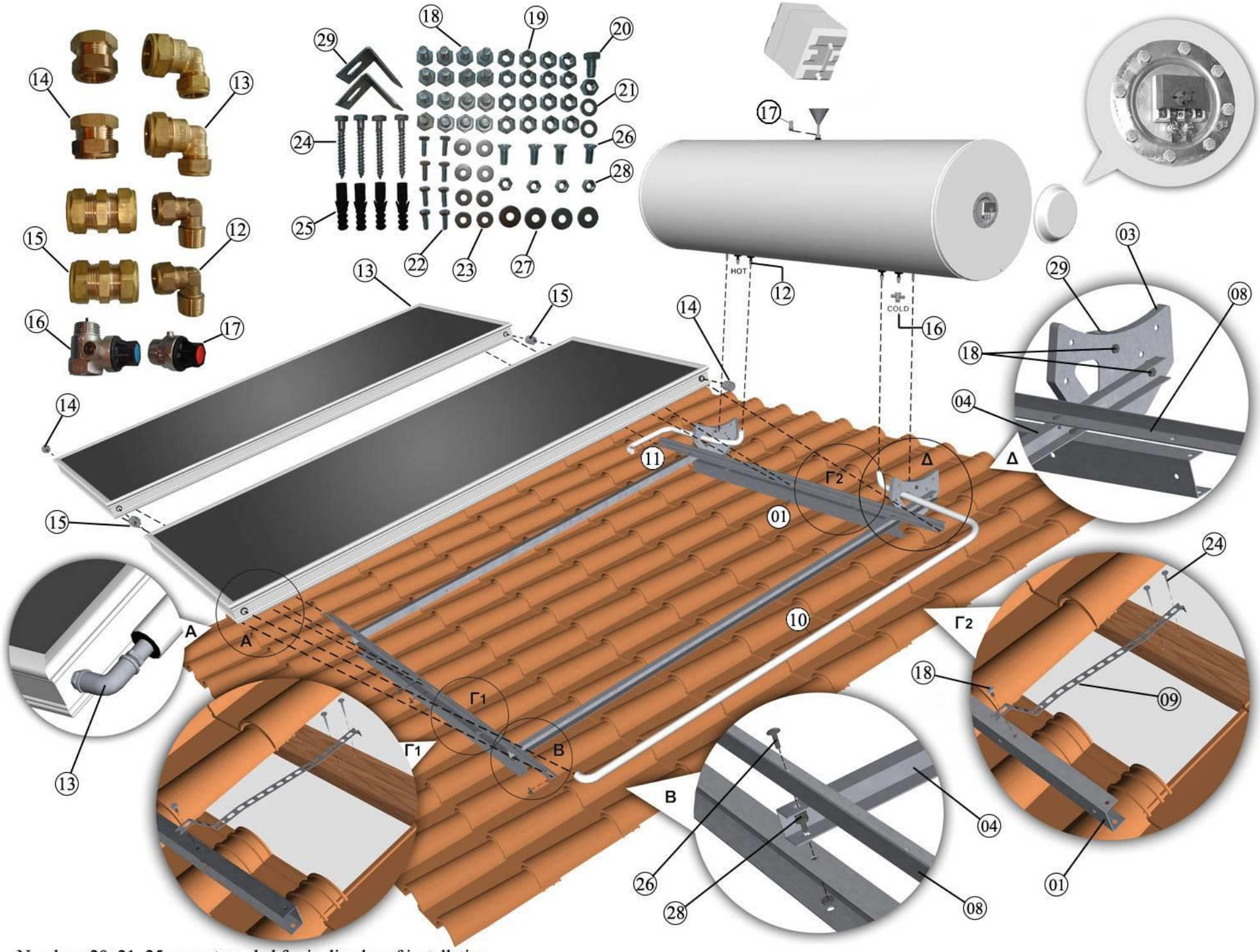
8.13 Screw pressure relief valve 2,5 bar for closed loop system to the top pipe of tank and make sure that the escape outlet is facing sideways parallel to the tank, in order to prevent harm or burning during steam escape.

8.14 Check for leakages on open or closed loop system.

8.15 The (optional) electric heater should be connected by a fully licensed electrician following the national standards for electric installations.

Connections points on thermostat: No 1 : Line (220 volt)
No 4 : Neutral

On metal flange :  earth



Numbers 20, 21, 25 are not needed for inclined roof installation.

9. Check list for installer

Before leaving from the installation, make sure that:

1. Cold and hot insulated pipes of closed loop system have a continuous ascending slope to the tank. Small partitions of the piping are allowed to be horizontal, but never descending to the tank. This will allow the air bubbles to move towards the tank, in the internal expansion tank and would not obstruct recirculation.

2. The closed loop system is operating properly. This can be identified, after one hour of sun shine by touching the hand on the hot inlet of tank (from top of collector) and at the same time on the cold outlet (to bottom of collector). There must be a significant temperature difference which means that the natural recirculation is functioning.

3. There is no leakage at the closed loop or open loop circuit.

4. All bolts and nuts of the support system have been tightened very well and that the fixing on roof is made properly to withstand strong winds.

5. Cold supply and hot return piping are properly installed and secured so that the wind will not move them. They should be properly insulated with a certified insulation material of minimum thickness 9mm and maximum thermal conductivity of 0.037 W/m°K, and well finished in order to be resistant against rain and moisture.

6. The (optional) electric heater is functioning properly and the thermostat is set maximum at 55^{o}C to 60^{o}C

7. You have explained to the users the operation of their solar system and the capabilities of the installed model.

8. You have signed and delivered to the owner the guarantee.

10. Operation instructions

- Your solar heater is a two circuit system. The primary circuit re circulates from collectors to a heat exchanger inside the tank, thus transferring solar energy to the domestic water.
- Primary system contains antifreeze glycol for frost protection of collectors.
- Temperature of hot water depends on solar irradiation of the day, season of year, ambient temperature, cold water inlet temperature, time of day using hot water, quantity used.
- Best timing for use: 12.00 noon – 3.00p.m. and 5.00 p.m. to 8.00 p.m.
- If you need hot water early in the morning, avoid excess consumption previous evening.
- For a shower, 30-60 ltr hot water is needed.
- For filling bathtub, 120-150 ltr hot water is needed.
- If your solar system is equipped with the optional electric heater, switch on only when needed for emergency situations and for 1 to 2 hours. NEVER leave electric heater permanently ON. The thermostat is adjusted to 55^{o}C-60^{o}C.
- In the event of any failure condition a specialist should be called in.

11. Maintenance instructions

For long-life of your solar heater follow below given instructions:

- At least once a year check for excessive dust on collectors. Wash with cold water at early morning before 10.00 a.m.
- Every two years replace magnesium protection anode. (contact your installer)
- Every 4 years check and paint if necessary with grey color primer the support frame.
- When away from home for long period in summer it would be better to cover the collectors with white cloth (or similar) to prevent overheating.
- At extremely cold winter nights (below 0^{o}C) leave a hot water tap inside house slightly open to prevent pipe freezing.
- If solar heater doesn't warm up with sunshine, check for leakage in primary circuit. Restore the leakage, add antifreeze. Check also for leakages in domestic hot water piping network. Restore if needed.
- When by any reason glass is broken, replace the soonest possible.
- When electric heater is not functioning check for burned fuse or for "safety" contact of thermostat activation. Press inside the button with the mark ▼ to restore and adjust thermostat lower.

12.Decommissioning of the system

- If your product has electric backup, please turn off its power supply before dismantling the solar water heater.
- Drain down the hot water cylinder
- Cut the inlet pipe to the panel first and then the outlet pipe from the top of the panel to the top of the cylinder
- Remove the tank from supports. Two people for 200 ltr and four people for 300 ltr are needed to handle it from each end.
- Unfasten the collectors of support and then unfasten all the parts of the support system among themselves.
- Release collectors from support and disassemble the parts among themselves, remove the support system from the roof.

Recommendations:

- Recycle or reuse its component materials if possible.
- Protect your hands and eyes
- Avoid decommissioning during sunlight
- If you need further technical support contact your local distributor

NOTES:

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