

# THERMOSIPHON SYSTEM

**RTS 150 and RTS 300**

TECHNICAL INFORMATION & INSTALLATION INSTRUCTIONS



**ENERGY AND SANITARY SYSTEMS**

# Material overview

## ■ Components of the RTS 150 and RTS 300 thermosiphon systems

- 1. Solar collector**  
Roth F2 S4 flat collector
- 2. Storage tank**  
Storage tank with double-wall for 150 or 300 litres, depending on the model
- 3. Collector structure**  
Easily installable collector structure onto which the solar collector and the storage tank are placed.
- 4. Connection tubes and accessories**  
2 connection tubes for connecting the solar collector and storage tank.  
2 fittings 90° 1" FT/¾" MT  
2 fittings 90° 1" FT/1" MT  
Flat gaskets for the fittings  
2 fixing devices for the F2 S4 solar collector  
1 fixing device for the storage tank  
(only for RTS 150)  
1 expansion tank (component supplied with the RTS 300 and optional for the RTS 150)
- 5. Solar fluid**  
Container with 3 litres for the RTS 150  
Container with 5 litres for the RTS 300



# General information

The heat storage tank must be installed by an authorised professional according to the instructions enclosed. The system will only function properly and correctly if the instructions are complied with. A warranty is only accepted for installation if it has been carried out by a professional company in compliance with the installation instructions.

The storage tank is indirectly heated via the solar collector. The inside tank is used for storing domestic hot water.

The storage tank has been provided with a double-wall. An outside and an inside tank for the domestic hot water guarantee good heat transfer and avoid any loss of heat.

The maximum permissible connecting pressure for the domestic water section is 10 bar, for the double-walled 3 bar.

The heat storage tank is connected to the water supply inlet and to the domestic hot water line. If hot water is used, the water runs out of the water mains into the storage tank and is heated there by the solar system. The water then runs via an

If the storage tank is equipped with an electric immersion heater, the water flowing from the water mains is heated via the solar system and the immersion heater is activated when necessary.

Roth assumes no liability in the event of damages or shortcomings which arise as a result of non-compliance with the installation instructions. The unit must be inspected once a year by an expert. If damages are found on the unit, these must be remedied immediately. **The end user must be informed about the servicing instructions.**

**Important! The solar circuit must be filled after the domestic hot water circuit.**

The following regulations in particular must be observed during set-up and installation of the system: DIN 1988, DIN 18160, DIN 4753, DIN 4109, EnEV VDE regulations. Apart from this, the pertinent regulations of the utility company and buildings regulations must also be observed. The system must be installed as close as possible to the place of use to minimise heat losses.

auxiliary system where heating is stopped if necessary. The system is fitted with safety valves to avoid excess pressures.

The system is fitted with safety valves to avoid excess pressures.

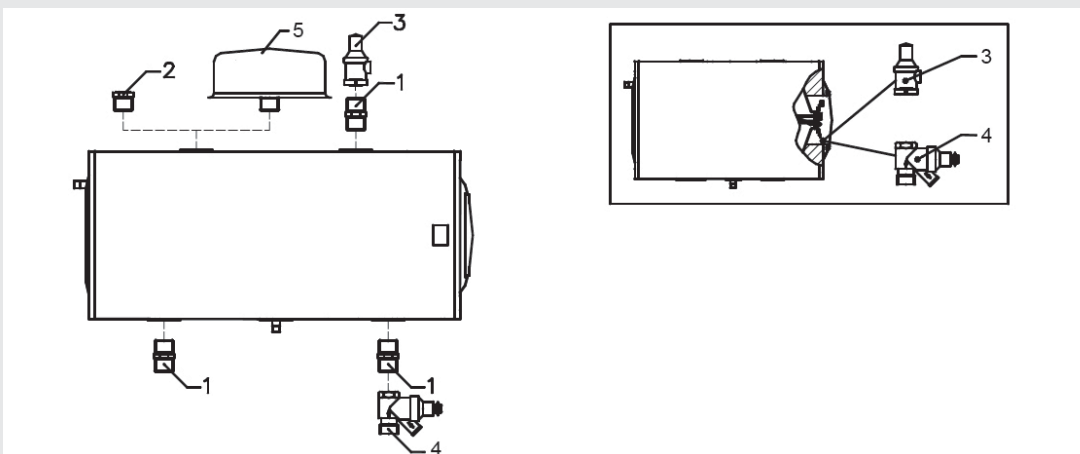
■ **The heat storage tank must be installed by a professional according to the instructions enclosed**

■ **General**

■ **Function without electrical resistance (Technical buildings regulation - HE4)**

■ **Function with electrical resistance**

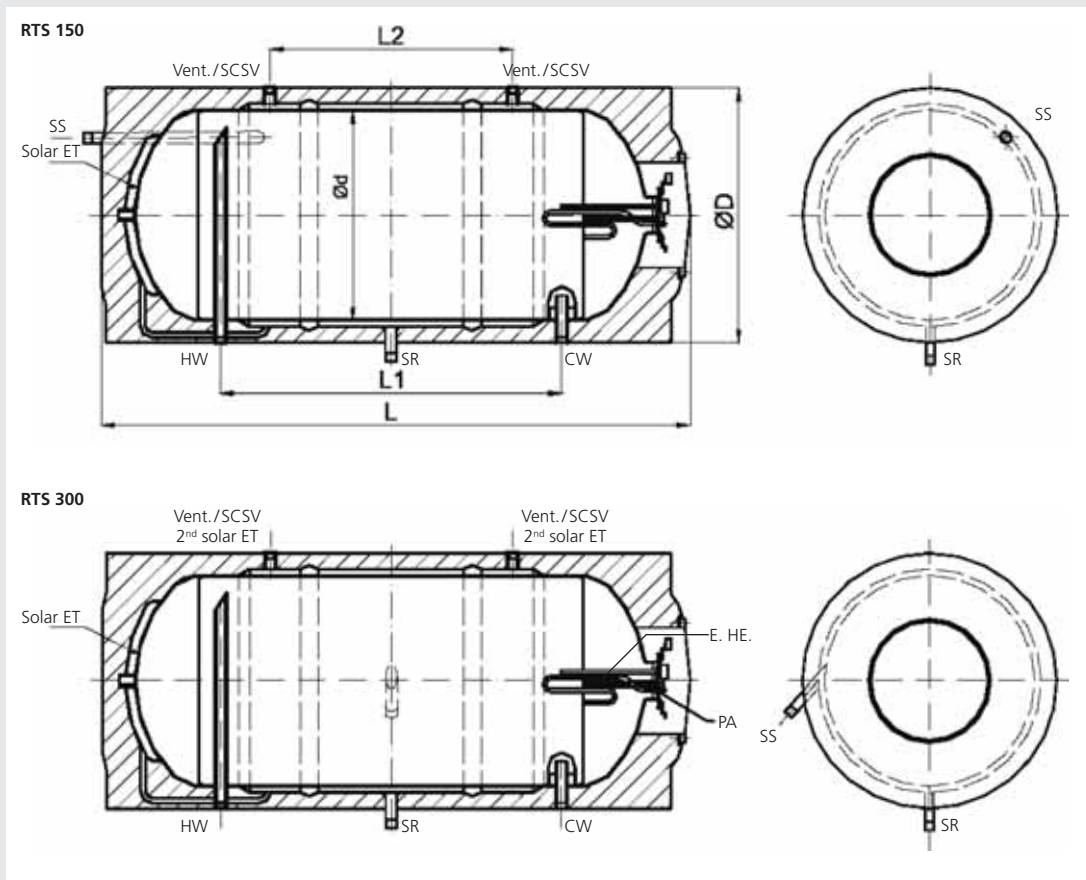
■ **Storage tank accessories**



		RTS 150	RTS 300
1	Double nipple, brass 1/2"	mounted	mounted
2	Plug, brass 1/2"	x	x
3	Solar safety valve 2.5 bar (yellow marking)	x	x
4	Safety valve 10 bar, domestic water end	x	x
5	2 <sup>nd</sup> solar circuit expansion tank	optional	included

# General information

## ■ Dimensions and connections



## ■ Dimensions



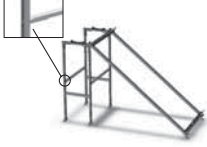

















	RTS 150	RTS 300
D	520	580
d	400	480
L	1.340	1.850
L1	815	1.180
L2	535	760

## ■ Connections

HW	Hot water outgoing section	Rp ½
CW	Cold water incoming section	Rp ½
SS	Solar supply	R ¾
SR	Solar return	R ¾
Vent./SCSV	Air venting/solar circuit safety valve	Rp ½
2 <sup>nd</sup> solar ET	Connection for 2 <sup>nd</sup> solar circuit expansion tank	Rp ½
E. HE	Electronic heating element	
PA	Protective anode	

# General information

## ■ Components of the collector structure

	Preassembled side sections	2	
	Horizontal profile	4	
	Collector structure stabiliser for the storage tank on the ground	4	
	Collector structure stabilisers for the solar collector on the ground	2	
	Top solar collector attachment	2	
	Holding bracket to support the collector horizontally	4	
	Bolt M8x55	4	
	Bolt M8x55 Self-locking bolt M8	4 sets	
	Bolt M8x25 with semi-circular head	4 sets	
	Stud bolt M8	6	
	T-head screw	4	
	Fastening clip	2	

# Installation instructions

## ■ Installation of the collector structure

Before beginning assembly, make sure that you have all the supplied parts (see material list).

### 1. Preassembled side sections

Set up both preassembled side sections and tighten the bolts.



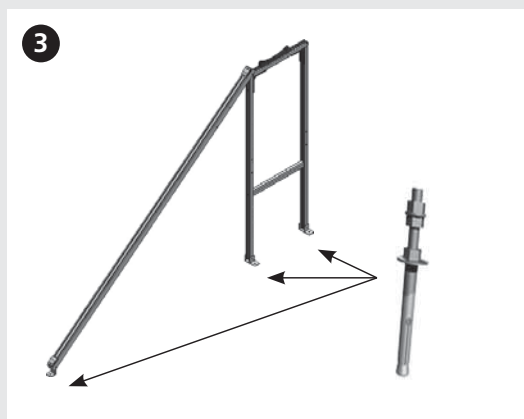
### 2. Connecting both preassembled side sections

Connect both preassembled side sections with the horizontal profiles.



### 3. Attaching the collector structure

Set up the collector structure at the installation site and mark the boreholes for the M8 fastening bolts. Remove the collector structure and drill the boreholes. Then finally secure the collector structure.

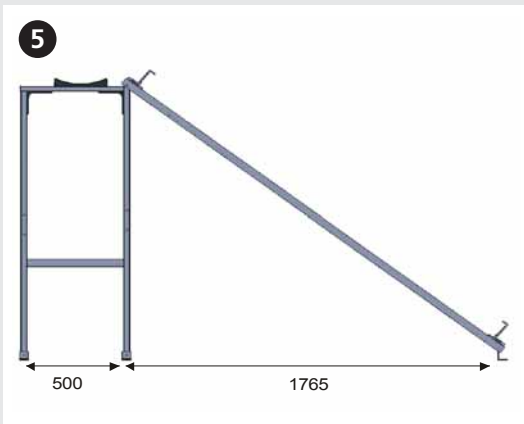


### 4. Attaching the horizontal guides

Mount on to the bottom profile and allow some clearance to the top profile so that the solar collector can be inserted.

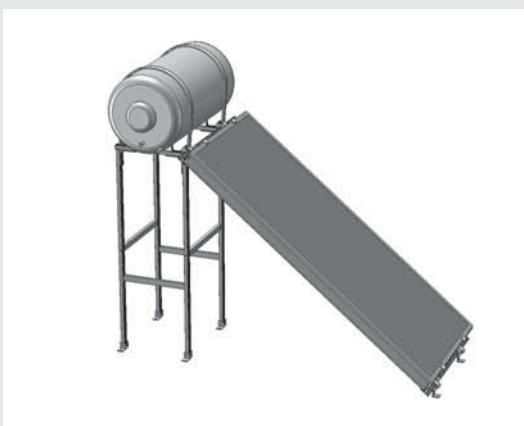


# Installation instructions



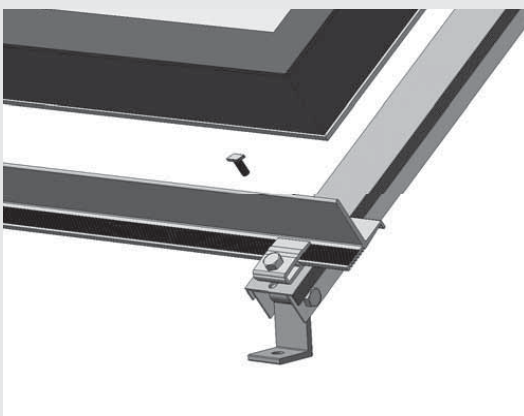
5. Install holding brackets without pressing them together so that the collector can be more easily inserted.
6. Check the stability of the collector structure and the dimensions to ensure that the collector structure is correctly installed.

## ■ Installation of the collector structure



1. Use T-head screws to insert the solar collector. The T-head is inserted into the lower guide rail of the solar collector. The horizontal profile has a milled slot to make it easier to insert the screw.
2. After assembling the solar collector, secure the horizontal guides and the holding brackets.
3. Then attach the storage tank. The receptacles for the domestic hot water must be attached pointing downwards to enable connection. After attaching the storage tank, it must be secured to the supplied metal devices.

## ■ Inserting the solar collector and the storage tank

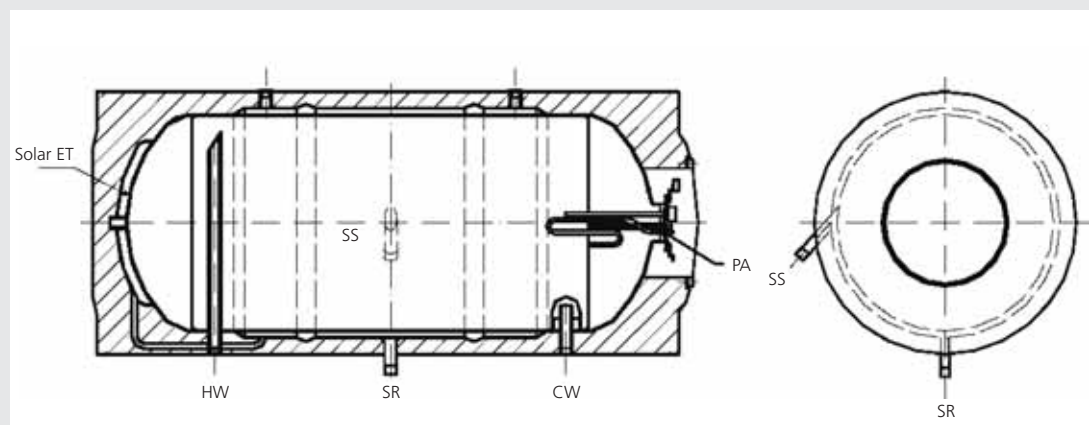


# Installation instructions

## ■ Connecting the fittings and connection tubes

1. Attaching the fittings to the the corresponding connections  
Insert the 1" MT/¾" FT fittings with flat gasket into the SS and SR inlets of the storage tank. Then insert the two other 1" MT/1" FT fittings into the lower right port and the upper left port of the solar collector.

**Important:** We recommend you use Teflon for all ports to increase the leak-tightness of the unit.



### Securely attach the connections to the collector.

2. Connecting the connection tubes  
After attaching the fittings, connect the storage tank to the solar collector with the help of connection tubes. The shortest connection tube (0,4 m for RTS 150 and 1,2 m for RTS 300) connects the upper part of the solar collector to the SS inlet on the storage tank. This is the circuit through which the solar collector's solar fluid rises. The longest connection tube (2,5 m on both models) runs from the fitting on the lower part of the solar collector to the fitting at the SR inlet. The solar fluid uses this circuit to flow back into the solar collector.

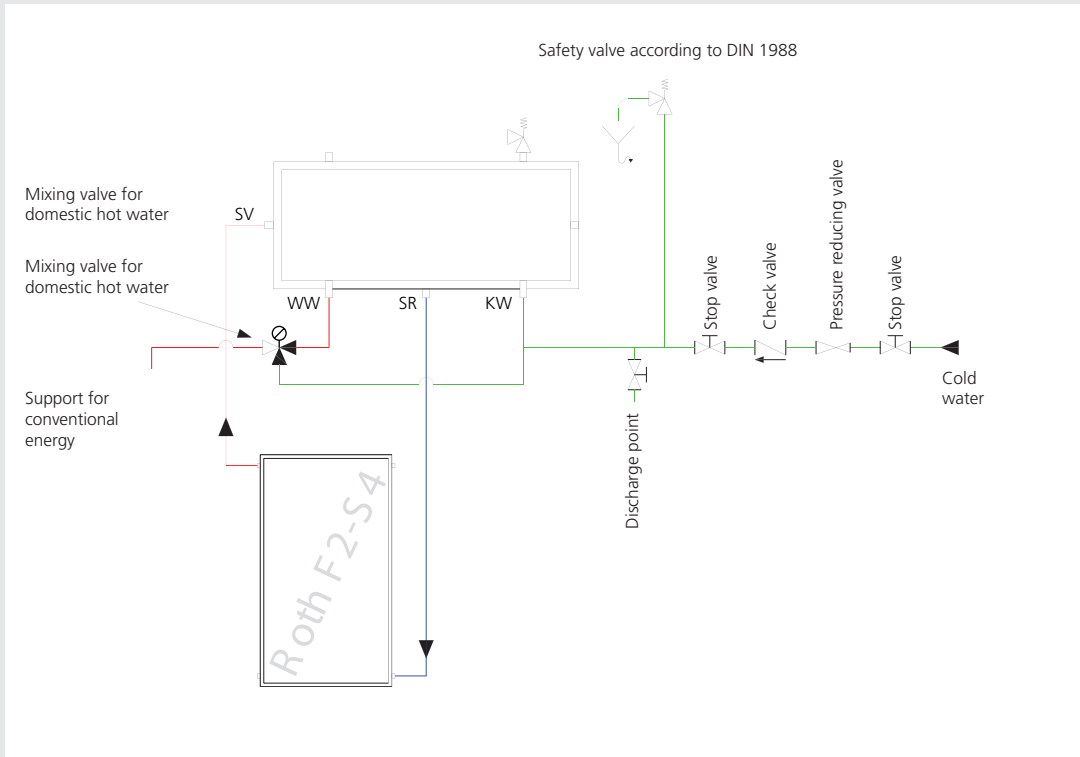
**Important:** As with the previous step, we again recommend that you seal off connections with Teflon tape.



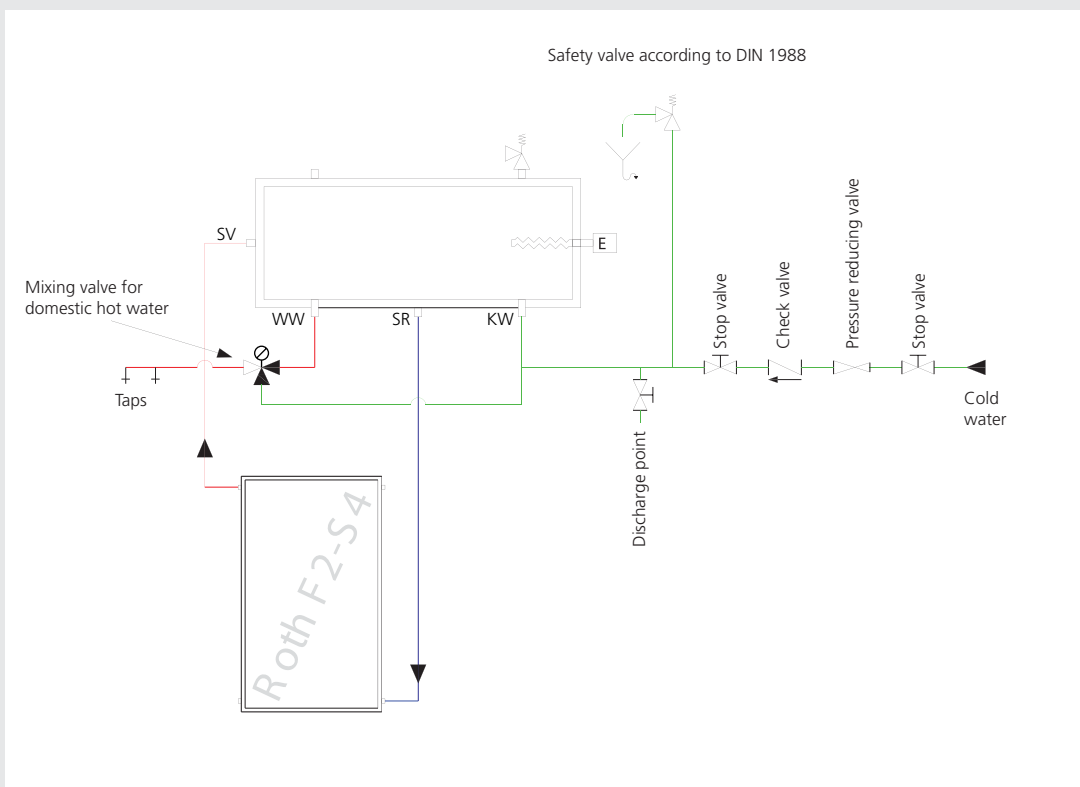
# Installation instructions

## 1. Installation diagram without electronic immersion heater

## ■ Installation diagram



## 2. Installation diagram with electronic immersion heater



# Installation instructions

## ■ Installation of circuits

### 1. Installation of the hot water circuit

The water line is connected using safety valves in the storage tank. If necessary, the water line is fitted with a filter. The safety valve, which also functions as a check valve, is designed for pressures of 10 bar and protects the system against pressure increases in the domestic hot water section. The safety valve for the solar section is designed for a maximum pressure of 2,5 bar. If the pressure in the hot water pipe rises above 10 bar, a pressure reducing valve must be

installed. The safety valve's pipe must be sufficiently dimensioned and the valve must be visibly attached to enable tests for leaks. The pipe line must be at least as big as the valve diameter, have a length of maximum 2 metres and may not have more than 2 bends. Since there are no specifications at all for installation, a safety valve must be installed before the procedure to prevent overheating.

### 2. Circulation

If the unit is intended for circulation, the pipe line must be well insulated to avoid any heat losses.

### 3. Installation of a solar circuit

The solar circuit is installed according to the diagram shown. A leak test is required. The safety valve is installed at the corresponding location of the storage tank and has an outflow for the liquid. The chemical composition of the liquid does not present any danger to persons. In spite of this, the temperature must be carefully monitored.

# Commissioning the unit

1. The system must be thoroughly cleaned before operating it for the first time. Any foreign bodies can influence the function of the system and cause corrosion.

3. **Important! The solar circuit must be filled after the domestic hot water circuit.**

5. The solar circuit can be filled via each of the two inlets which are located in the upper part of the storage tank (outflow to the safety valve and to the optional expansion tank). For this purpose, the container for the solar fluid is filled with water and mixed well (3 litres in a 10 litre container for the RTS 150 and 5 litres in a 10 litre container for the RTS 300).

6. After installation and after filling the system, the unit is commissioned and all system parts are checked. When the unit is heated for the first time, the expansion water flows through the safety valve. For this reason, the safety valve may not be closed until the unit is fully operational.

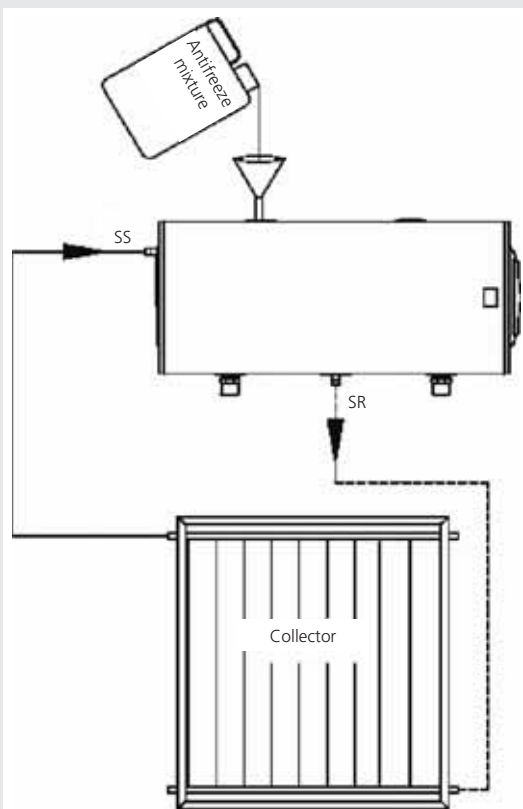
2. Fill the inside of the storage tank (consumer circuit) via the cold water supply. Open all water connections. The system is full when water runs out of all ports. Close all water connections.

4. Before filling the solar circuit, make sure that the solar collector is not warm. If the solar collector is warm and the system is filled, steam can be generated and damage the solar collector.

This mixture can then be filled into the circuit and the container can be filled again with water to finish filling the unit. The solar circuit is full when no more air exits. At this point in time, all inlets are closed, one with a safety valve and the other with a lock screw or with a second expansion tank.

7. Once the unit and system function has been examined by the fitting technician, the features of the unit and its function as well as the servicing intervals will be explained to the user.

## ■ Commissioning



# Operation, maintenance and servicing

## ■ Operation

1. Always open a tap before heating up to check whether the reservoir is filled with water and whether the stop valve in the cold water supply line is open. The safety valve vent pipe must always remain open.
2. The functioning capacity of the safety valve must be checked by venting from time to time.
3. If there is a risk of frost, use the electronic immersion heater to keep the storage tank at a temperature above freezing or discharge the system.
4. If the domestic water in the boiler does not heat up sufficiently in spite of sunlight exposure, check there is enough heat transfer liquid. Refill any missing liquid.

## ■ Maintenance and servicing

Regular maintenance and servicing increase the service life and operating safety of the system. Depending on the water quality, we recommend flushing through the storage tank with fresh water at regular intervals. If the water contains high quantities of lime, then we recommend delimiting

at particular intervals. Any faults or deficiencies in the system must be remedied as soon as possible. Servicing and repair work may only be carried out by a registered professional.



**Disconnect from the power supply before doing any work on the system. Life hazard!**

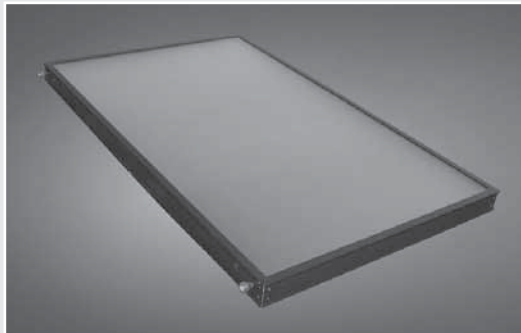
1. Close the cold water stop valve and discharge the storage tank via the cold water connection to check the inside tank and the optional electronic heating element. After opening the flanged covering, the flanged cover with the electronic element can be unscrewed and removed. Lime deposits and coarse lime residue in the storage tank can be pulverised with a wooden rod and sucked out.
2. Remove lime deposits on the electronic immersion heater carefully. The radiator must not be damaged by cleaning. Only use approved delimiting agents for delimiting. Check the setting and function of the temperature control unit and the safety temperature limiter on the heating element. Make sure that the safety valve has not been activated.
3. The domestic water tank is equipped with a protective magnesium anode to protect the tank. It is screwed to the flanged plate of the heating element. The element's wear depends on the local water quality. According to DIN 4753, Part 6, this sacrificial anode has a minimum life of 2 years. It should be checked once a year for wear in the context of general servicing.
4. After cleaning the flanged cover, screw down tight again. A new flange seal must definitely be used for this. Then fill the tank and check all connections for leak-tightness. Afterwards professionally re-attach any cables that have been removed and screw the flanged covering down tightly again. After first heating and cooling of the storage tank, the flange bolts must be retightened using a 24 Nm torque wrench and the flange must be checked for tightness.
5. The safety valve is intended to protect the hot water storage tank against excess pressure. For this reason, the functioning capacity of the valve must be checked at regular intervals by venting. The safety valve is not used with expansion tanks. Consequently it can seize up over a longer period of time and may be unable to work should the need arise.

The diameter must still be at least 10 mm and the length 200 mm; the surface must still be sufficient homogenous. If necessary, replace it with an original anode to protect the tank against corrosion. Attention! Neglecting to service the protective anode can lead to early corrosion damage.

# Technical information for the unit components

6. The heat transfer liquid in the solar circuit must be checked at particular intervals for its composition. Refill any missing liquid.
7. If there is a risk of frost the storage tank must be heated up or completely discharged.
8. A damp cloth suffices for cleaning external parts. Avoid using abrasive and solvent cleaning agents.

Features	Data
Length	1.820 mm
Width	1.200 mm
Height	95 mm
Gross surface area	2,18 m <sup>2</sup>
Aperture surface area	1,98 m <sup>2</sup>
Weight	38 kg
Collector housing	corrosion protected aluminium frame with structured back panel insulation, 50 mm back panel insulation, mineral wool
Glass covering	low-iron solar safety glass, structured and prismatic, transmission $\tau = 91\%$
Absorber	vacuum, highly selectively coated full-area absorber
Absorption	$\alpha = 95\%$
Emission	$\epsilon = 5\%$
Fluid capacity	1,6 l
Heat transfer medium	Heliostar®
Operating pressure (max.)	10 bar
Solar sensor sleeve	inside $\varnothing = 6$ mm
Collector connections	4 x 1" MT flat-sealing
Collector yield, per annum	over 525 kWh/m <sup>2</sup> a
Area of application	for preparing hot water and heating support



■ Collector



Reg. No. 011-75295 F

Storage tank for 150 and 300 litres for different levels of consumption.

Both storage tanks are fitted with a double-wall, an internal tank for domestic hot water and an external tank through which the solar section water (with added glycol) flows. Both tanks have been coated with glass enamel and insulated. A corrosion-protected stainless steel casing is attached to the outside.

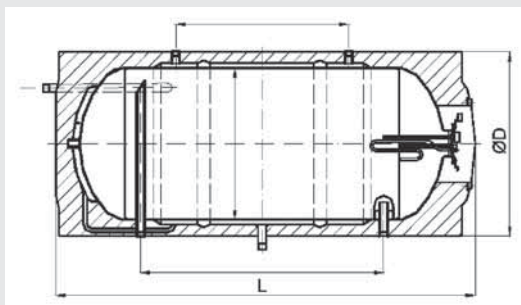
## 1. External dimensions

	RTS 150	RTS 300
D (diameter)	520	580
L (length)	1.340	1.850

The storage tanks have been fitted with an anode to protect against lime deposits.

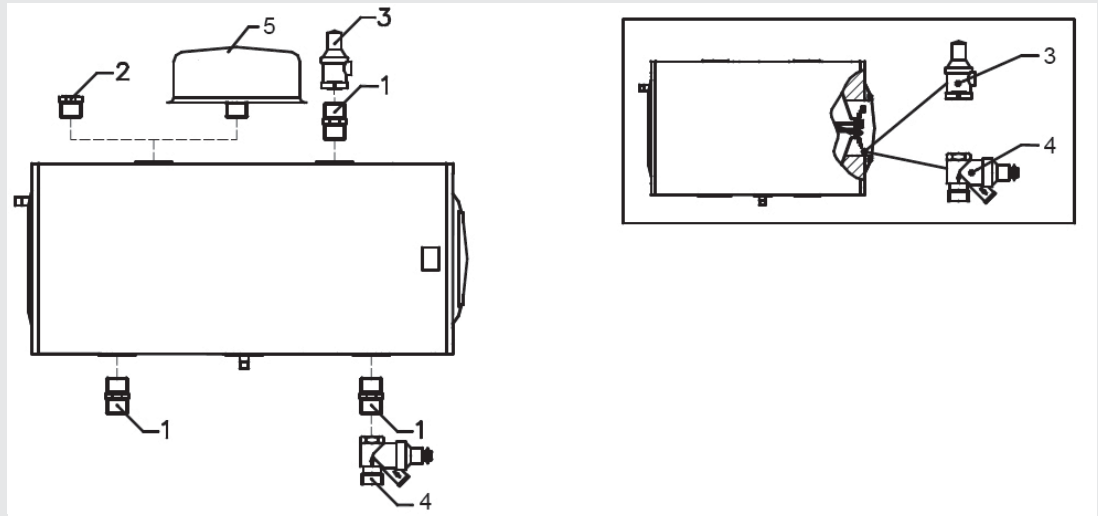
■ Storage tanks

The working pressure is 3 bar, although working pressures of maximum 10 bar are permissible.



# Technical information for the unit components

## ■ Accessories



		RTS 150	RTS 300
1	Double nipple, brass ½"	mounted	mounted
2	Plug, brass ½"	x	x
3	Solar safety valve 2,5 bar (yellow marking)	x	x
4	Safety valve 10 bar, domestic water end	x	x
5	2. Expansion tank	optional	included

## ■ Connection tubes

### 1. Insulating material

Flexible AEROFLEX tube made from EPDM: Synthetic rubber, light, flexible with closed cells, PVC-free and manufactured without CFCs. Insulation layer thickness: 27 mm (for corrugated pipes DN 20) The AEROFLEX insulating material corresponds to building materials class B2 according to DIN 4102 and may be used for copper pipes and stainless steel pipes (tested according to DIN 1988, Part 7).

Constant resistance at temperatures of up to 125 °C, short-term resistance up to standstill temperature of collectors (+175 °C)

Thermal conductivity coefficient

$$+40\text{ °C } \lambda_R = 0,040\text{ W/mK}$$

High ozone resistance, UV resistance.

### 2. Corrugated pipe made of stainless steel

Material No. 1.4404 with a temperature range from -270 °C to +600 °C.

Maximum pressure at a temperature of 200 °C: 10 bar (for DN 20 corrugated pipe)

The connection tubes meet the requirements of the norm in all points.



# Technical information for the unit components

## 1. Description and applications:

Antifreeze based on propylene glycol for use in solar thermal systems for which a low toxicity is required.

The antifreeze meets the requirements of the new technical buildings regulation in all points. This product concentrate is an antifreeze based on propylene glycol with a percentage of more than 90 %. It also contains other antifreeze and stabilising solar liquids. For each mixing ratio, it has minimal volatility and is easily mixed with water.

## 2. Properties:

- Prevents damage in the circuit caused by icing.
- Increases the boiling point and helps to avoid overheating.
- Protects against corrosion (including corrosion caused by static electricity) so that even the most sensitive of metals do not corrode.

## 3. Use:

A sufficiently large container with water and antifreeze is filled and stirred until the mixture is homogenous in order to create a mixture with the corresponding proportions, depending on the temperature protection required.

After filling the system and completely emptying the container, rinse it through well to remove any leftover deposits.

A minimum antifreeze concentration of 30 % must be used to guarantee the product's corrosion protection. Systems that are already corroded can lower the lifespan of the product.

## 4. Type of application:

The product is completely water soluble. Its corrosion protection is shown for orientation using the following list of freezing points:

Due to the efficient technology and the organic composition of the solar liquid, the circuit remains in a better functioning condition over longer periods of time than is the case with conventional solar liquids.

Special protection for alloys with aluminium, copper, brass, steel and iron.

The blue colouration makes it possible to detect leaks in the circuit.

Contains no nitrite or amines which can lead to the formation of nitrosamine, so-called carcinogenic substances. Contains no phosphate which is being called into question due to its harmful effects on the environment.

## ■ Antifreeze

- Avoids deposits in the cooling circuit.
- Biologically degradable.
- Non-toxic.

Minor damages potentially caused by corrosion become even more visible after filling as the product has a lower surface tension in comparison to water.

Avoid mixtures with other antifreeze products as any incompatibility between the products can lead to the product life being reduced.

Both the prepared mixtures and the concentrate are absolutely stable and can be stored for longer periods without them changing.

When filling the product into another container, make sure that the container does not contain any zinc as zinc is incompatible with the product.

Volume (%)	Freezing temperature (°C)
30	-13
35	-16
40	-20
45	-25
50	-31
55	-40
60	< -50

# Technical information for the unit components

## ■ Antifreeze

### 5. Chemical safety data sheet (according to 2001/58/EC)

**Corrosion table:** Comparison of the degree of metal corrosion by antifreeze agents and its solar fluids in the form of antioxidants with individual liquids. Comparison in milligrams per square centimetre of material.

#### Caution:

Since the product is neither flammable nor corrosive, there are no special precautionary measures for handling the product.

Avoid product contact with eyes. Wash with plenty of water if sprayed by the product. Do not ingest

and store the product or any mixtures thereof out of the reach of children.

Store in cool, well ventilated rooms; avoid extreme heat.

#### Corrosion comparison of different materials and products (mg/cm<sup>2</sup>)

Metals	Water	Propylene glycol	(33 %V/V)	ASTM D 1384
Steel	21,0	44,2	0,02	0,3
Copper	1,5	0,2	0,04	0,3
Iron	23,0	74,2	0,02	0,3
Brass	0,4	0,2	0,03	0,3
Welded metal	2,7	6,9	0,07	0,6

#### a) Composition/component information

Propylene glycol and inhibitors.

Chemical name  
1,2-propanol

N° CAS  
57-55-6

#### b) Possible hazards

Non-hazardous product according to the 67/548/EC directive.

Physical-chemical hazards:  
Hazards to human health:  
Hazards to the environment:

Not classified as hazardous.  
Harmful to health on ingestion.  
Not classified as hazardous.

#### Effects and symptoms

Eyes:  
Skin:  
Inhalation:  
Ingestion:

No significant risks have been identified for health.  
No significant risks have been identified for health.  
No significant risks have been identified for health.  
Harmful to health on ingestion.

#### c) First aid

On contact with eyes:

Rinse eyes immediately for at least 15 minutes while keeping eyelids open. Consult a doctor if irritations occur.

Skin contact:

Wash immediately with plenty of water. Wash clothing before using again. Consult a doctor if skin irritations occur.

Inhalation:

If the product is inhaled, immediately go outside to breathe in fresh air. Consult a doctor if symptoms occur.

Ingestion:

Do not induce vomiting unless explicitly advised by a doctor. Do not give medication orally if the person is unconscious. Consult a doctor immediately if larger quantities have been ingested.

# Technical information for the unit components

## d) Fire-fighting measures

If fires occur, use water spray, foam, dry chemical products or carbon dioxide.

Do not extinguish with a water jet.

You may only stay in the danger zone if you are wearing a respiratory mask and full fire-protection clothing.

■ Antifreeze

## e) Measures in the event of unintentional spillage

Precautionary measures for persons:  
Measures to protect the environment:

Cleaning measures:

Do not inhale any potentially occurring vapours. Do not allow the spilt liquid to enter the sewage system or the open water circuit. Remove using absorbent materials and dispose off according to legal stipulations.

## f) Transport and storage

Transport:

Storage:

Wash hands and face after handling the product. Avoid any contact with eyes, skin or clothing. Keep the container tightly closed. Store the container in a cool, well ventilated room.

## g) Exposure control/personal protection

Hygienic measures:

After handling the product or the product mixture, wash lower arms, hands and face thoroughly before eating, smoking and going to the toilet.

### Personal safety equipment

Respiratory protection:

Skin and body:

Hands:

Eyes:

Not required. However, the product should only be handled in well ventilated rooms. Not required. In spite of this, the use of protective clothing is common practice in industry. No protective clothing required. Wear safety goggles to protect against spray.

## h) Physical and chemical properties

Physical condition:

Appearance:

Odour:

pH:

Boiling point:

Steam pressure:

Melting point:

Density:

Solubility:

liquid  
blue  
hardly noticeable, typical  
7-9  
approx. 150 °C  
0,1 mbar at 20 °C  
< -50 °C  
1,04-1,06 g/cc at 20 °C  
water soluble

## i) Stability and reactivity

Circumstances to avoid:

Materials to avoid:

Hazardous substances released on decomposition:

Extreme heating during storage. Concentrated mineral acids, strong oxidants and alkali metals. Unknown

# Technical information for the unit components

## ■ Antifreeze

### j) Toxicological information

Sensitization:	Negative
Carcinogenic effects:	Unknown. Neither the International Cancer Research Authority nor the European Commission specified components as carcinogenic in a concentration below 0,1 %.
Prolonged skin contact:	Slight skin irritations.
Oral toxicity with rats (LD50):	>15.000 mg/kg

### k) Ecological information

Biologically degradable:	Easily biologically degradable.
Hazards to the environment:	Not classified as hazardous.
Behaviour in the eco-system:	Not bioaccumulative.

### l) Instructions for waste disposal

Avoid contact with expired material; use appropriate absorbent materials to remove. Consult an expert in environmental issues to find out whether expired or contaminated materials are classified as hazardous waste according to local, regional or national regulations.

### m) Instructions for transport

There are no special instructions for transport.

### n) Labelling obligation

Labelling according to European Union regulations:

Pictogram  
Risk phrases  
Security phrases

### o) Other information

Measures have been met to guarantee that the safety data sheet and the information contained therein about health, safety and environmental protection are as exact as possible on the day of writing. We accept no explicit or implicit warranty or liability for the accuracy or completeness of the data and the information contained in the norm safety data sheet. Data and advice apply for the purchase of the product and its specified use. The product may only be used for the purposes stated here and not for any other applications.

# Warranty

All measures have been met to guarantee that the safety data sheet and the information contained therein about health, safety and environmental protection are as exact as possible on the day of writing. We accept no explicit or implicit warranty or liability for the accuracy or completeness of the data and the information contained in the norm safety data sheet.

Data and advice apply for the purchase of the

product and its specified use. The product may only be used for the purposes stated here and not for any other applications.

It is the responsibility of the user to assess the product, to use it safely and to adhere to pertinent laws and regulations.

## ■ Product warranty



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