

CONUS 502

Solar Thermal Storage tank

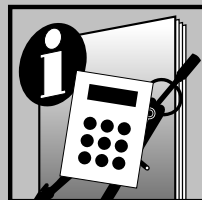


Application, use:

- ▶ Space heating support at low heating system temperatures, for example: under-floor heating
- ▶ Solar domestic hot water heating for 3 - 6 people
- ▶ Instant domestic hot water on demand
- ▶ One- to two family house (up to two showers simultaneously)

Features:

- ▶ Easy and fast installation through low weight, assembly-friendly pipes connection and omission of an expansion vessel
- ▶ Low installation and connection expenditure in particular also for heating support
- ▶ Low heating losses through optimised insulation
- ▶ Corrosion free tank, no silting up



Technical Documentation

Features:

CONUS 502

CONUS 502 has been designed especially for the efficient operation of solar systems. The maintenance-free synthetic tank contains water that is only used for storing heat. Heat exchangers from ribbed copper pipes with the patented Consolar stratification system allows layered loading and unloading guarantying domestic hot water preparation.

CONUS 502 is available in the following models:

CONUS 502 without boiler coil

CONUS 502 can be supplied without the middle boiler coil and heating heat exchanger. A possible application is the connection as a continuous flow pre-heater feeding a suitable instantaneous water heater (gas or electric).

NB: It is essential that any heater employed has a fully modulating heat input and is therefore able to accept pre-heated water.

Particular advantages

Domestic hot water preparation:

There is increasing concern over the health risk from legionnaire's disease in conventional solar heated hot water tanks. In the CONUS 502 hot water is heated on demand and is therefore free from health risks even at temperatures below 60 °C. The stores can therefore meet high demands for hot water with safety.

Consolar-stratification:

By optimising flow, heat transfer is achieved with low losses, in the patented counter flow thermosiphon-heat exchangers. The heat transfer is significantly better than in a conventional cylinder with freely surrounded heat exchangers of a similar area.

Fast accessibility through layer loading:

Using the Consolar-control logic high irradiation can heat up the solar circuit to its end temperature within one cycle. The tank water, too, is heated at the same time to a usable hot water temperature and is layered near the top. At low irradiation the middle tank area is loaded for heating support. Should the weather conditions be insufficient the available sun energy is used to pre-heat the lower tank area via an independent ball valve.

Layer-unloading:

Because of the layered unloading the heat capacity of CONUS 502 has been significantly raised compared to conventional tanks with standard heat exchangers. This results in less re-heating and longer availability.

Heating support through boiler coil:

The design of the boiler coil enables fast re-heating of the domestic hot water. Through a motorised valve in the heating return, water can flow through the heat exchanger in the opposite direction. This withdraws heat from the central tank area, thus solar heating support is possible with little additional cost.

Costructed from synthetic:

The un-pressurised store container is manufactured from polypropylene that has been proven in hot water applications for 40 years. Corrosion problems and maintenance (exchange of sacrificial anodes) are excluded. No scaling or silting up can occur in the enclosed tank water. Due to low heat conduction, the synthetic container allows stable temperature layering for far longer than steel or copper cylinders. Additionally the low weight is of advantage, easing transport, fitting and installation, especially in difficult to access locations.

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Minimised heat loss:

The insulation has a shape that is optimised to the temperature distribution in the tank. The upper tank area is insulated particularly well, as it is always kept hot. The heat loss of CONUS 502 is therefore low.

Environmental impact:

The components and materials used for CONUS 502 incorporate a high degree of re-cyclability and are chosen for their low environmental impact. All but a few synthetic tank components are made from polypropylene (PP) that is completely harmless in production, usage and recycling. The insulation is also a CFC-free PP-foam in a very stable form and with no PVC coating or other cover.

Reduced system costs:

Due to a reduced flow rate in comparison to conventional solar systems, pipe diameters in the solar system can be smaller. This not only reduces heat loss but also the installation cost of the solar system. Further there are cost advantages due to the omission of an expansion vessel and other components.

Planning help

Transport

Hand holds are moulded into the insulation for easy handling. The insulation can easily be removed when carrying the tank into location.

Always transport CONUS 502 upright in vehicles.

Connection to the main water supply

Hot water mixing valve:

In order to avoid scalding at high tank temperatures a hot water mixing valve has to be provided after the tank outlet. It is available as an accessory.

Hot water circulation

If hot water circulation is required, the circulation return pipe is connected to the cold water supply of the tank. Considerable heat losses appear due to hot water circulation, as in any hot water system, this slowly removes the layering. The circulation pump should not be operated permanently, as there is a danger of scalding at high temperatures. Therefore the pump should be controlled by the return temperature or run at intervals, (this function can be found in most CONTROL-controls).

Mixed installation

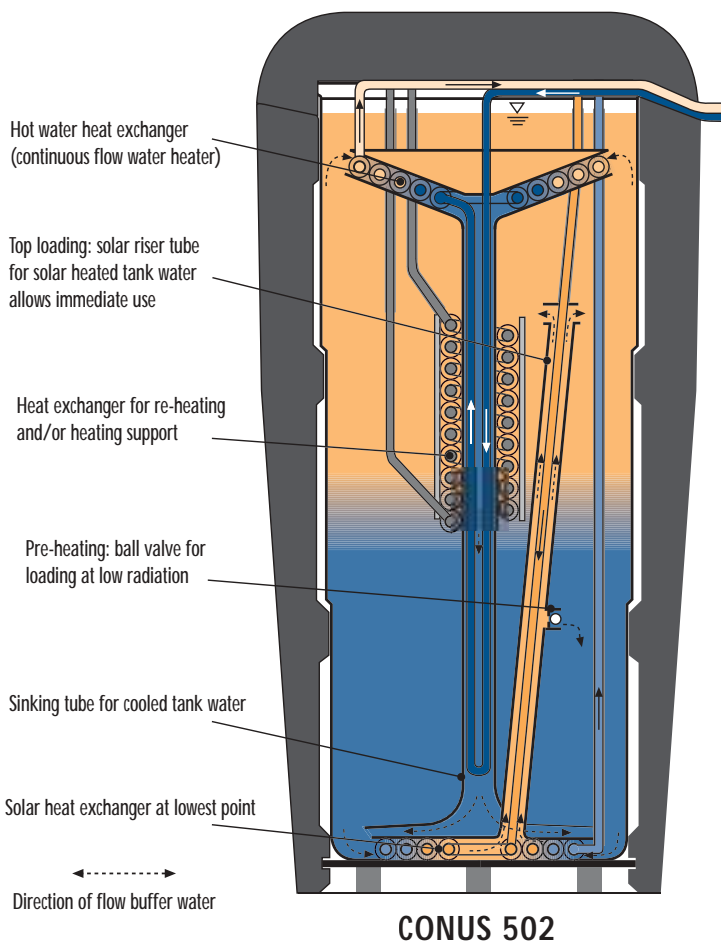
When connecting CONUS 502 to a galvanised steel pipe hot water system it can result in corrosion of the steel pipes because of the electro-chemical reaction, in particular at new installations. If in doubt consult the water board.

Water quality:

In hard water areas flushing points should be provided at coldwater inlet and hot water outlet during installation. This will allow subsequent easy descaling, should this be necessary. The inclusion of a water scale treatment device on the cold water feed is highly recommended.

Expansion vessel:

An expansion vessel is not needed for CONUS 502 because of the low hot water heat exchanger volume. A water hammer damper may be installed in order to avoid the dripping of the necessary safety valve. The tank itself has a variable filling level that allows for heat expansion.



Planning Help

Connection to other solar heating elements

Collector:

CONUS 502 can be used with flat or vacuum tube collectors. The technical data lists recommended values for collector areas. Smaller areas might not give full loading while larger areas may increase the solar yield on one hand, but on the other could more often result in system stagnation in summer.

Pipe diameter and pump

The circulation of the solar circuit operates at reduced flow in comparison to conventional solar systems. The necessary pipe diameter has to be established while considering the collector data and the chosen pump. Approximate values can be found in the table on page 8.

Control:

When operating CONUS 502 with a control of the CONTROL-range the layer loading is optimised. When using other controls it is important to observe the maximum allowed entrance temperature at the solar heat exchanger, which is 100 °C. The solar control then has to switch off at collector temperatures above 100 °C.

Separation of solar circuit and drinking water

The un-pressurised tank together with the heat exchanger for domestic hot water guarantees that under no circumstances can heat carrier fluid enter the domestic hot water circuit. The solar circuit can therefore be safely operated with a pressure above that of the drinking water.

Connection to boiler and heating circuit

Hot water support via conventional boiler:

For support the CONUS 502 can be connected to a boiler in the conventional way. The boiler coil-temperature sensor in the temperature probe tube can be positioned at varying heights, thus allowing for individual adjustment of the capacity for domestic hot water. When using CONUS 502 for heating support the sensor should be no lower than indicated in the installation manual (thus smaller hot water volume).

The target temperature set at the boiler- or solar-control of the domestic hot water should, depending on the withdrawal rate, be selected 10–15 K higher than the actual preferred delivery temperature.

Hot water support via continuous flow water heater:

It is possible to support the CONUS 502 pre-heated water via a continuous flow water heater. In this case the continuous flow water heater should be able to accept pre-heated water and deliver at a set target temperature.

Heating support:

In order to be able to use solar heat for heating support the boiler return pre-heat connection is useful. After reaching a set tank temperature, the boiler coil of the CONUS 502 is integrated via a 3-way-valve into the return of the heating system.

It has to be considered in the planning stage that there will be an increased pressure loss in the heating circuit during the flow through the heat exchanger. When using boiler return pre-heat, ensure that the sensor for DHW is above the heating support volume. Refer to the Installation & Operating Manual for details.

In order to guarantee hot water availability a boiler is necessary. This should be part of a sealed and pressurised system. An uncontrolled solid fuel boiler is not suitable.

Compared to conventional buffer tanks, the coupling with the heating system does not require a larger expansion vessel. Problems through cavitations in the heating pump, as they can appear in pressure-less tanks directly coupled with the boiler, are excluded with CONUS 502 through the usual system pressure in the boiler circuit.

Heating support temperatures

Storage temperature upper edge heat exchanger	70 °C
Storage temperature lower edge heat exchanger	57 °C
Heating supply (from store)	62 °C
Heating return (to store)	44 °C
Output	10.8kW

Parallel connection

Two CONUS 502 units may be connected in parallel. Through parallel connection of the heat exchanger connections the storage capacity, as well as the performance of the heat exchanger, can be doubled while the pressure loss is halved. A single hot water mixing valve must be provided after the connection point of the two hot water outlets. When parallel connecting two CONUS 502 with a common hot water mixer the temperatures in the tanks will not be the same.

Further information and diagrams for suggested connections can be found under connection information (from page 5). The appropriate control connections can be found under control connection information in the CONTROL-range documentation.

Materials

In order of their weight proportions, the materials used are: polypropylene, copper, brass, polyethylene and EPDM. CONUS 502 does not contain any PVC, CFCs, FCS, Isocyanine or glass fibre insulation materials.

Regulations

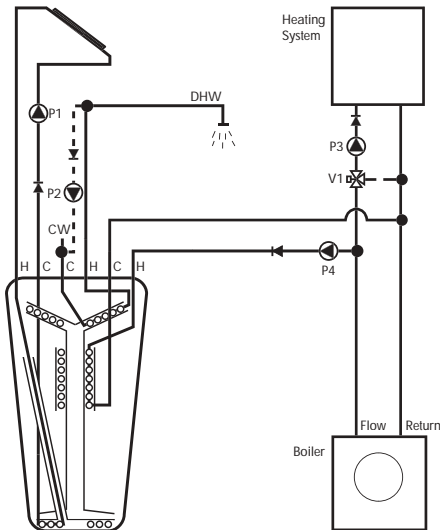
Because the CONUS 502 is open vented, the tank does not require a license.

Solar hot water production

Application

- ▶ Solar hot water heating for 3-6 people
- ▶ Domestic hot water using continuous flow water heater principle
- ▶ One to two family home (up to 2 showers at the same time)

1. Hot water preparation, support via boiler:



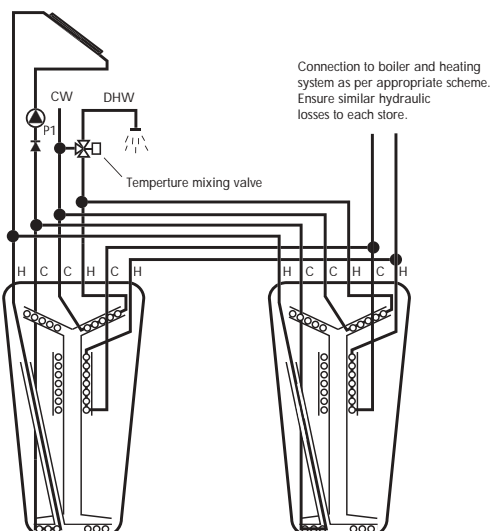
Example 1

2. Hot water production, support via continuous flow water heater:

Subsequent to the connection of CONUS 502 a continuous flow water heater can be connected that is bypassed if flow from the CONUS 502 is high enough. This heater must be able to accept pre-heated water and deliver it at a set safe temperature.

3. Hot water production, parallel connection:

All connections should be designed in such a way that roughly the same pressure loss arises in both tanks. Attention: Install only one hot water mixing valve for both tanks.



Example 2

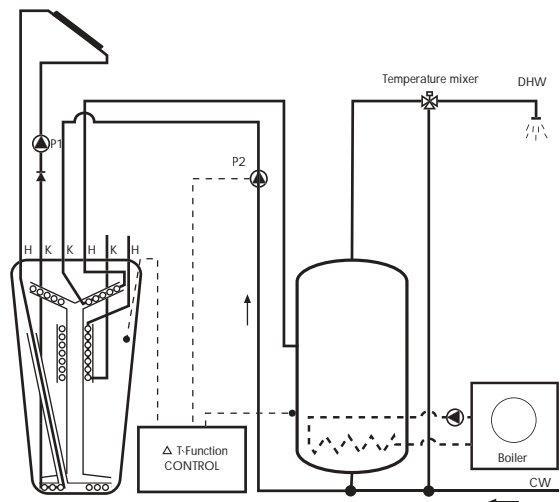
Connecting to another domestic hot water tank

Application

- ▶ High bulk performance possible (houses for several families) at restricted hot water volume (example 3)
- ▶ Existing tank can be used

In both examples the CONUS 502 is connected with an external temperature mixing valve. When re-heating the domestic hot water tank CONUS 502 can be operated without a boiler coil. Connection of the heating system as with "Solar hot water production" or "Solar space-heating support" is also possible.

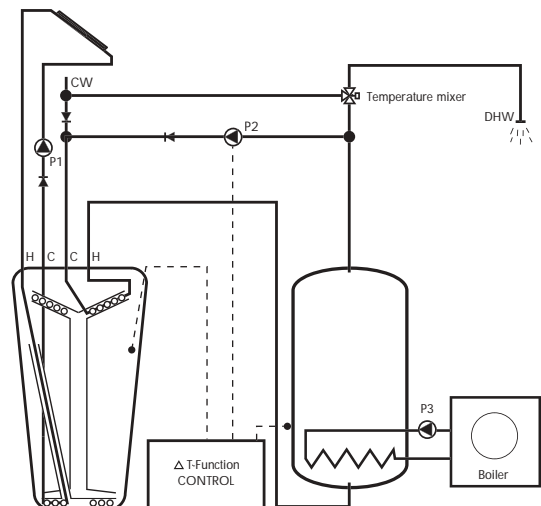
1. CONUS 502 with domestic hot water tank for high bulk performance



Example 3 Advantage: high bulk performance

In the case where a domestic hot water tank is re-heated, and not the CONUS 502, a motorised valve, U, is necessary to re-route the CONUS 502 pre-heated water to the central part of the domestic hot water tank, should it fall below the target temperature.

2. CONUS 502 with existing domestic hot water tank



Example 4 Advantage: storage loading pump P_{sl} is only required to operate occasionally

Use with a buffer tank

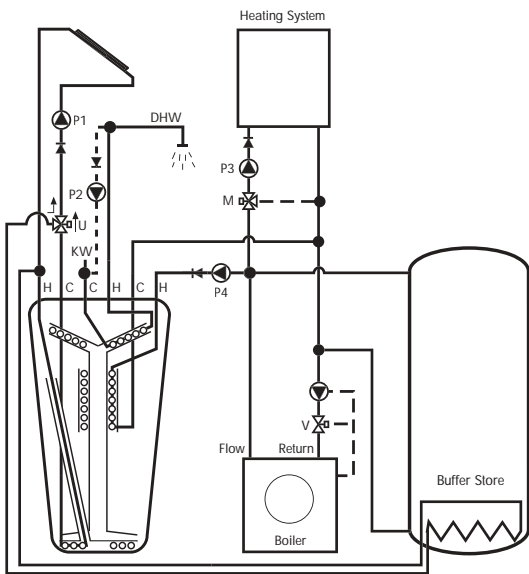
Application

- ▶ Solar heating support via buffer tank
- ▶ Buffering of boiler
- ▶ Domestic hot water production

1. CONUS 502 with buffer tank and one boiler:

The boiler is operated with a hydraulic switch with the buffer tank, hence excess boiler heat is stored in the buffer tank.

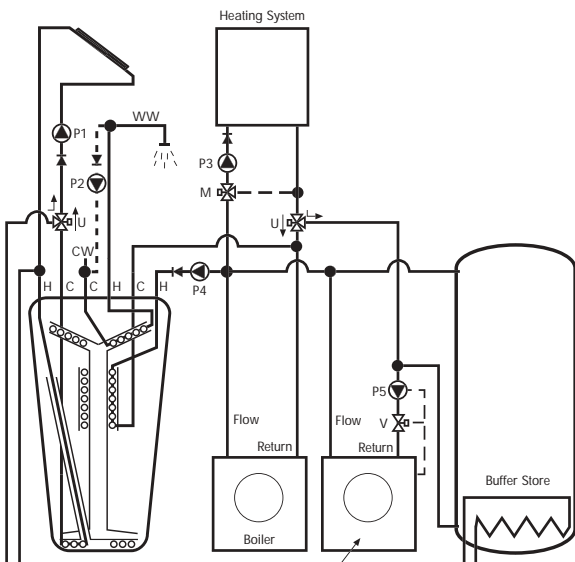
CONUS 502 can be re-heated via the boiler as well as via the buffer tank.



Example 5

2. CONUS 502 with buffer tank and two boilers:

Connection as above. The boiler will only start up when the solid fuel boiler is not running and the buffer tank is not loaded. The motorised valve then switches to the oil/gas boiler.



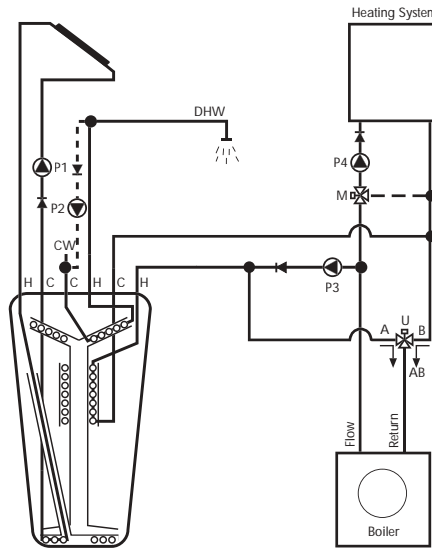
Example 6

Solar space heating support

Application

- ▶ Solar heating support at low heating system temperatures
- ▶ Extension of an existing system without considerable changes in hydraulic and control of the heating.

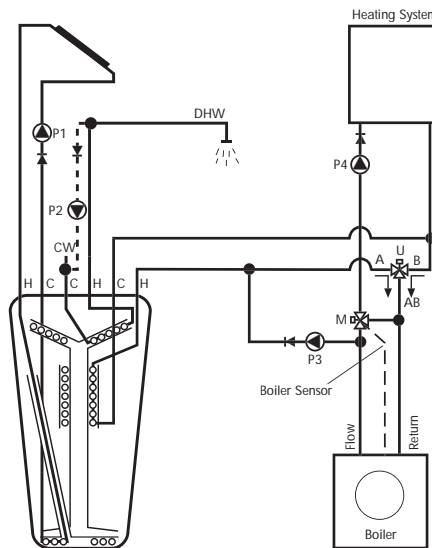
1. Boiler return pre-heat with boiler:



Example 7

2. Boiler return pre-heat with automatic boiler bridging *:

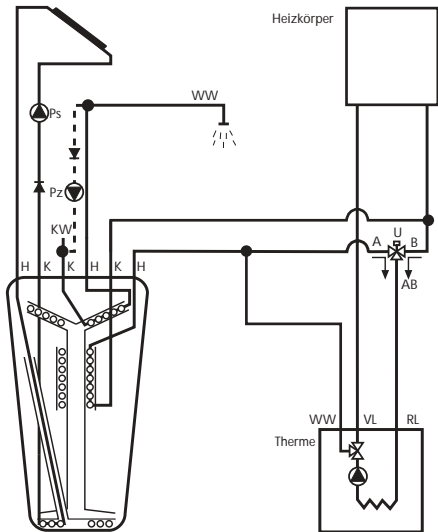
In order for the boiler not to start up when CONUS 502 is heated sufficiently, the external boiler sensor has to be connected directly at the 3-way-mixing valve.



Example 8

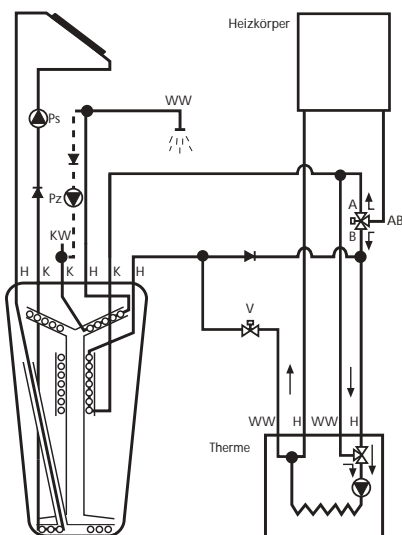
Solar space heating support

3. Boiler return pre-heat for (electric boiler?) with integrated pump and motorised valve in supply*:



Example 9

4. Boiler return pre-heat for (electric boiler?) with integrated pump and motorised valve in return*:



Example 10

Control logic:

Heating operation with boiler return pre-heat: V=off (no current); U: AB-A

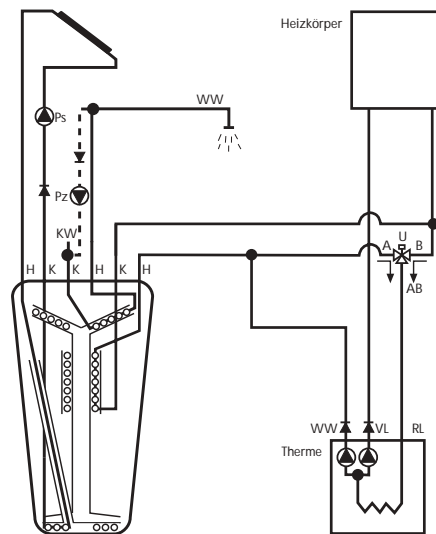
Heating operation without boiler return pre-heat: V=off; U: AB-B

Boiler coil: V=on; U: AB-B

*) With these hydraulic connections possible high supply-temperatures from the tank can only be compensated for with thermostatic valves at the radiators. Other effects of possible high temperatures must be considered e.g. with synthetic under-floor-heating.

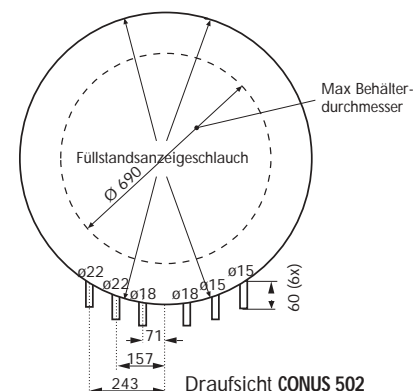
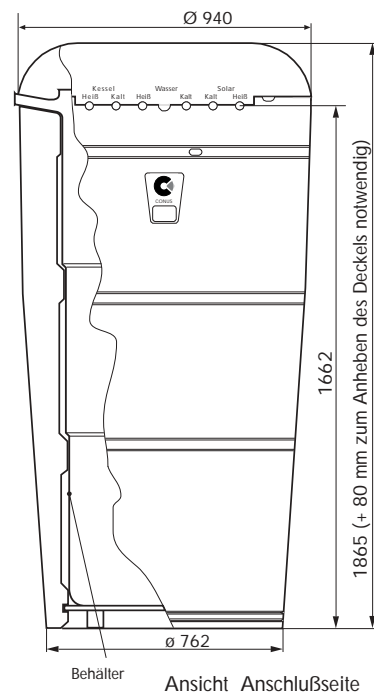
Solar space heating support/dimensions

5. Boiler return pre-heat for thermal with two integrated pumps*:



Example 11

Dimensions



Technical Data

Storage volume, Weight:	Unit	CONUS 502
Container material	-	Polypropylene
Total weight (inc. insulation)	kg	68
Volume	l	490
Max. permitted temperature	°C	90
Max. permitted tank pressure	bar	none (N/A)

Solar heat exchanger:	Unit	CONUS 502
Material	-	Cu
Area	m ²	2
Volume	l	0.8
k x A - value	kW/K	0.4 ¹⁾
Specific volume flow ²⁾	l/m ² h	25
Minimum flow solar	l/min	1,7
Pressure loss (water)	mbar	19 ¹⁾
kvs	m ³ /h	1
max. permitted temperature	°C	100
max. permitted pressure	bar	8

¹⁾ 2,3 l/min, ²⁾ in relation to collector area & 40 % water/glycol mixture

Hot water heat exchanger:	unit	CONUS 502
Material	-	Cu
Area	m ²	3.1
Volume	l	2.2
k x A - value	kW/K	1.7 ¹⁾
Performance scale	kW	30-45
Pressure loss (inc. HW-mixer)	mbar	500 ¹⁾
kvs (inc. hot water mixer)	m ³ /h	0.8
max. permitted temperature	°C	90
max. permitted pressure	bar	8

¹⁾ bei 10 l/min

Boiler coil:	unit	CONUS 502
Material	-	Cu
Area	m ²	2
Volume	l	1.15
k x A - value	kW/K	1.1 ¹⁾
Pressure loss	mbar	110 ¹⁾
kvs	m ³ /h	1.8
max. permitted temperature	°C	90
max. permitted pressure	bar	8

¹⁾ at 10 l/min, even when supporting heating

table 1

NOTE:

Any statements and references given in the technical documentation are for guidance only and do not replace professional planning. Subject to alterations. Errors and omissions excepted.

Insulation:	unit	CONUS 502
Material	-	EPP
Thickness on sides; top / bottom	cm	13 cm/7 cm
Thickness on lid	cm	15 cm
λ-value (40 °C)	W/mK	0.038
Heat losses ¹⁾	W/K	2.3
Losses working system ²⁾	W/K	0.65
Cooling 24 h ²⁾	K	3.7

¹⁾ measured when heated through to the bottom
²⁾ calculated values, tank 60 °C, room 20 °C

Dimensions:	unit	CONUS 502
Max. withdrawal rate at 45 °C ¹⁾	l/min	15
NL-number (11 kW-boiler)	-	1.0
NL-number (22 kW-boiler)	-	1.4
Apartments ²⁾	-	1 - 1.5
Collector area (flat) ²⁾	m ²	4.5 - 10
Collector area (vacuum) ²⁾	m ²	4.0 - 9
Diameter solar-pipe ²⁾	mm	12 - 15
max. boiler output	kW	25

¹⁾ working system 60 °C, ²⁾ recommended guidance values

Sensor:	unit	CONUS 502
"Hot water sensor"		
Insersion depth normal/max	mm	430/490 ¹⁾
DHW volume normal/max	l	125/165
Sensor "top tank" ²⁾	mm	1500
Sensor heating support ²⁾	mm	850
"middle tank"		
Sensor electric heating element ^{3) 2)}	mm	min 830
Sensor "tank bottom" ²⁾	mm	175

¹⁾ only without heating support, ²⁾ measured from the floor
³⁾ only with CONUS 502 E

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