LATENTO®

Technical Documentation

WÜRTH GROUP

Contents

General information

LATENTO all-season solar system – new efficiency "Made in Germany"

Shaping the future considerably
In a very few years, fossil fuels will either be exhausted or totally uneconomical to use for heat generation purposes. At the same time, every year the sun radiates an amount of energy which corresponds to about 10,000 times the world's primary energy demands, free of charge. Without question, the sun is the "fuel of the future".

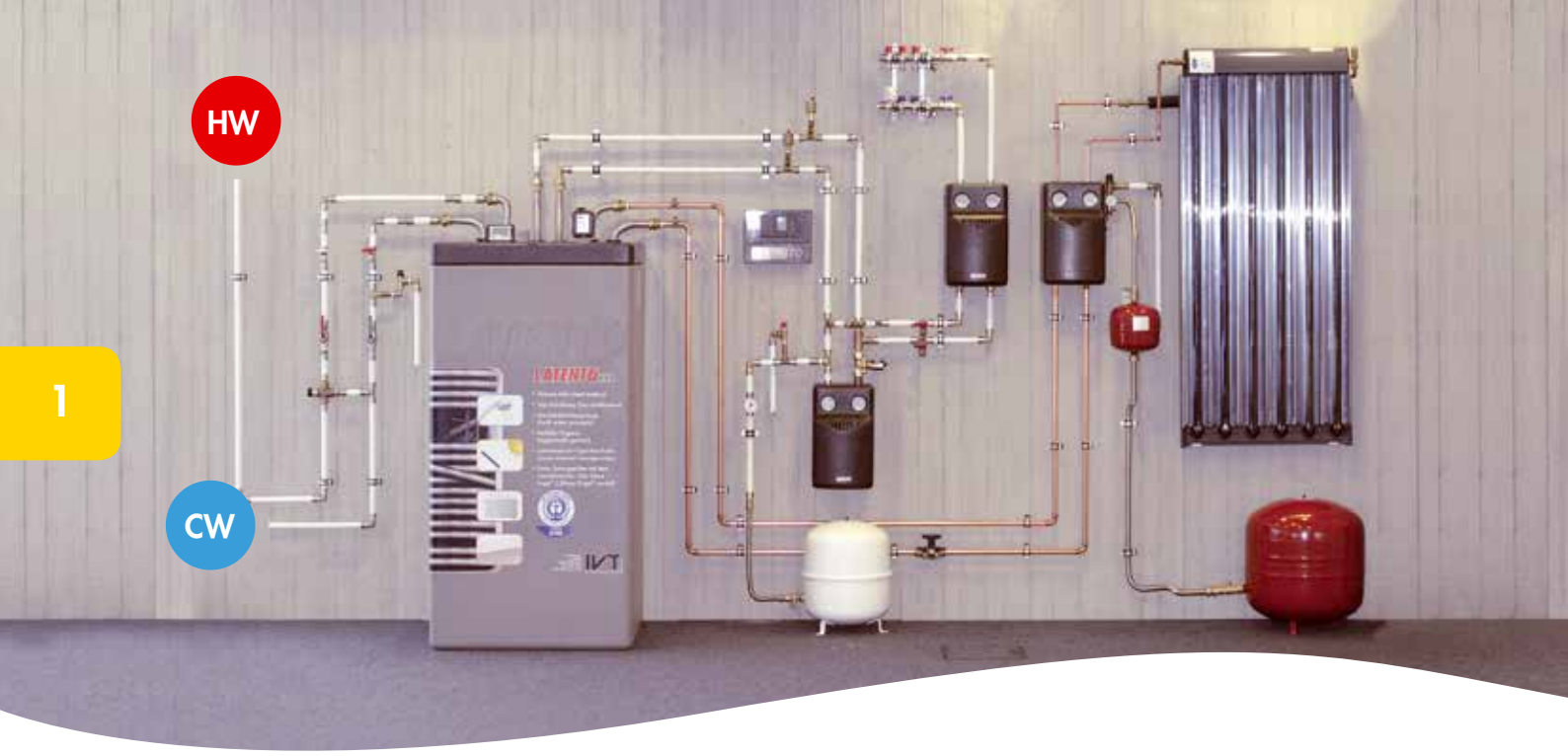
The design of modern low-energy and passive houses requiring little heat makes it possible to utilise solar energy for heating living areas as well as for pre-heating swimming pools in addition to heating for the hot water system.

Modern systems have to be compatible with fossil-fuel and regenerative fuel systems (solar, pellets, heat-pumps etc.) and ensure the existing resources are optimally usable for all energy supplies. A decisive factor in the quality of a solar system is how much annual oil or gas usage it can replace by solar energy. A ***LATENTO*** all-year solar system sets standards in that field.

Optimally utilise the power of the sun – _LATENTO_ All-season solar system
An efficient solar heating system not only takes care of hot water supplies during the summer, it also converts solar energy in the winter and the transitional months.

With many solar systems, however, on cool days the warmth of the sun never even reaches the solar storage because the collector promptly reflects the sun's heat it receives away again, or it loses the energy in the pipework and storage system. These "apparent" yields then have to be raised to usable temperatures with expensive supplementary energy – which is not the case with a ***LATENTO*** solar system.

It is not the size of the collector units or the storage volume which is decisive regarding the effectiveness of a solar heating system, but the efficiency of its components and how well they are tuned to the demands of the consumers. With a larger collector surface, the yield would certainly be greater, but the solar utilisation rate would deteriorate. The larger the collectors, the more frequently the system is inactive in summer – the sun delivers far more energy than residents can possibly use. Especially in winter and in the transitional periods, when supplementary heating is most in demand, a ***LATENTO*** solar system makes its mark with high solar yields and extremely low levels of heat loss. ***LATENTO*** uses solar output large and small for heating water and utilises it even during frosty weather to supplement the heating. That means the highest possible level of efficiency for maximum solar warmth all the year round.



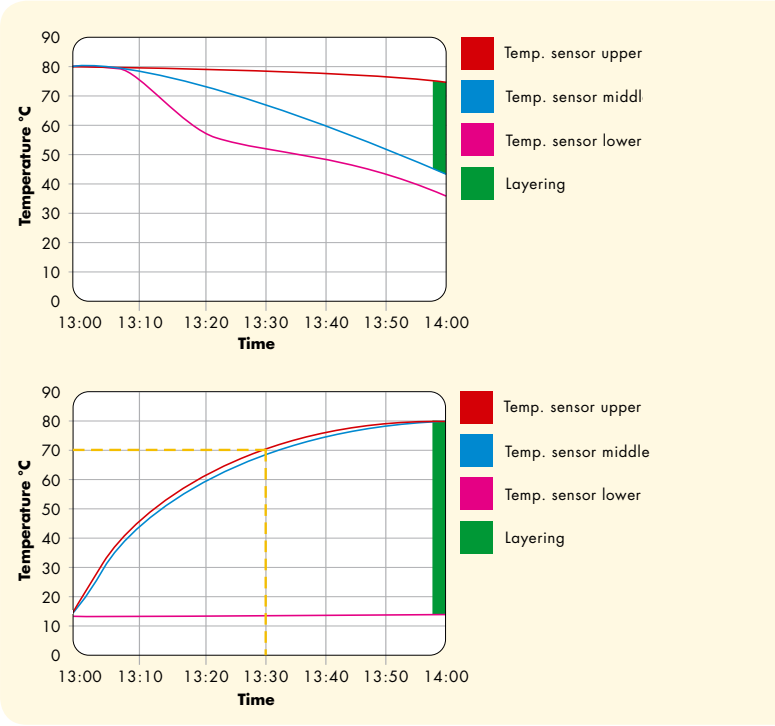
Heat accumulator with boost charge – *LATENTO* XXL Solar layered storage tank
To what extent the heating power and the "solar yield" can be optimized depends mainly on the design of the storage tank.

Due to the special XXL stainless steel heat exchanger with coils also in the lower part of the storage tank, the hot water is preheated (20 % higher extraction volume) and at the same time the lower solar area of the storage tank is cooled. This means, even the lowest amount of solar radiation, e.g. during the winter months, can be effectively used. The XXL technology also makes this ***LATENTO*** ideal for connecting power generators with low charge temperatures, e.g. heat pumps.

The special ***LATENTO*** layering device enables the upper area of the storage tank (hot water heat exchanger) to reach a usable temperature level of more than 45 °C in only a few minutes when charged. The stratification (temperature difference between the upper hot water heat exchanger and bottom solar heat exchanger provides for fast and then efficient utilization of solar energy as long as the storage tank is completely heated up to 85 °C.

Optimal stratification over many days (DIN tested HVAC)
The heating and reheating heat exchangers dissipate or absorb heat following the continuous flow heater principle. Hence no fluid flows will develop in the ***LATENTO*** XXL which may cause turbulences and as a result, no merging of the thermal layers.

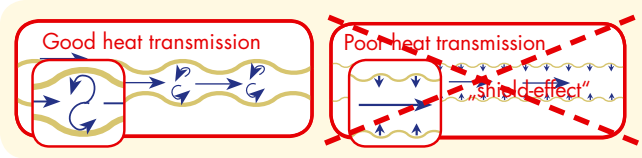
Fig.: *LATENTO* XXL temperature stratification during operation for heating support (top) and during charging (bottom)



Outstanding heat insulation
The ***LATENTO*** XXL was developed to primarily store free solar yields over many days to keep them at best possible temperature level for later usage. The tank has received a high thermally insulating hard PUR foam core to minimize outward heat losses and heat transfer within the stratification. By this, a mean hourly temperature decrease of our "heat accumulator" amounting to only 0.1 K/h (63 W) is achieved.
For comparison: the best steel storage tank tested by the consumer magazine Stiftung Warentest 03/2009 demonstrated a heating power loss of 130 W. All ***LATENTO*** storages do not need additional insulation and are maintenance-free thanks to the employment of non-corroding materials.

The continuous flow heater principle for fresh water
Your DHW will always stay fresh thanks to the continuous flow heater principle. Feared Legionella growth is prevented, lime scale deposits reduced, which can shorten the service life of the storage system. Moreover, the ***LATENTO*** storages have no temperature limit at 60/70 °C (Legionellae, furring up). The content of the corrugated stainless steel tube heat exchanger is exchanged at least once a day at normal use, e.g. taking a shower would consume approx. 25-40 liter hot water. The increase up to max. 85 °C results, furthermore, in an additional power output of up to 22 kWh by the ***LATENTO*** XXL 500.

Large surface heat exchanger made from long-corrugation, corrugated stainless steel pipe
The ***LATENTO*** XXL has efficient heat exchangers consistently adjusted to the use range to enable low quantities to be integrated with the greatest possible spread and effectiveness (solar collectors). All heat exchangers are manufactured with long-wave stainless steel corrugated pipes for improved heat yield. This discourages the "shield effect" (flow-past) which is experienced with a narrow-waveband pipe. The result of many years development work on the solar heat exchanger of DN 25 ribbed copper tube with connected stratification device, is excellent temperature transport behavior ensuring outstanding solar charging. The stainless steel drinking water heat exchanger has been designed with a large surface reaching its operating temperature range at 50 °C top charge already (storage tank temperature in the upper region of the storage tank defined via the hot water sensor). You may already draw heat, take a bath or shower from this temperature on. If the solar system produces more energy than necessary, the storage tank may be operated up to 85 °C thus saving an enormous amount of energy.



Latent material as additional heat store
Latent material is located in the upper region of the ***LATENTO*** to increase the heat storage capacity. When in the temperature range between 60–70 °C, the latent material floating on the storage water changes its physical state from solid to liquid thereby absorbing additional heat of fusion. When excess energy is introduced into the storage tank system at extended sunshine for instance, the latent material will melt absorbing the excess energy on reaching the melting temperature (approx. 65 °C), melting heat storage). When energy is withdrawn from the ***LATENTO***, the energy additionally stored in the latent material will be immediately delivered to the storage water without the latent material changing its temperature (solidification enthalpy). The storage water will be reheated on the latent material solidification. This means an extension of the storage capacity at excessive performance without storage losses. This will increase the storage capacity in the decisive upper region (DHW heat exchanger) of the storage tank or the total output (by approx. 1.1 kW at the ***LATENTO*** XXL 500).

Advantages of latent operation:

- Extended storage of free solar energy
- Coasting effect of latent material temperature to the storage water
- Shorter boiler cycle times
- Reduction of water losses in the ***LATENTO*** XXL through evaporation
- Latent material functions as additional effective heat insulation in the upper (hot) region of the ***LATENTO*** XXL

1

High output and compact dimensions

With tapping capacity of240 l (65 °C storage temperature, without back-up heating), a continuous output of 1220 l/h (85 °C reheating) and nominal power rating of NL 7,3, the ***LATENTO*** XXL 500 guarantees a high level of comfort and is ready to use quickly. On account of its dimensions (e.g. ***LATENTO*** 500: only 78 x 78 x 155 cm, standing area 0.64 m², diagonal measurement 1.766 cm), the ***LATENTO*** is ideal for refurbishing old buildings and for installation in small spaces. Thanks to this compactness and the integral carrying handles, the ***LATENTO*** is no problem for transport and negotiates all standard sizes of doors.

Ideal for combination with heat pumps

The ***LATENTO*** WP-S is an unpressurised layer storage unit that has been specially developed for use in conjunction with heat pumps up to 15 kW capacity. The heat exchangers, which have been specially adapted to the low energy level of heat pumps, allow optimum storage and use of the energy from the heat pump for water heating and to back up the heating system. At the same time, there is sufficient storage capacity available in the upper temperature range (up to 85°C) for solar energy on sunny days.

Lasting power – *LATENTO* XW hot water storage

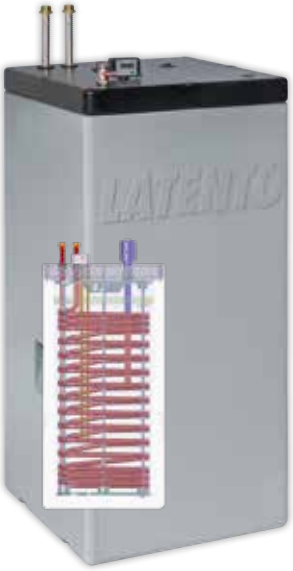
The ***LATENTO*** XW is used to heat water, e.g. in industrial shower facilities, sports facilities and hotels. The ***LATENTO*** XW hot water storage tank works on the continuous-flow heater principle and has heating and discharge heat exchangers of long-wave stainless steel corrugated pipes for a very high continuous rating of 1350l/h at 85 °C re-heating, and 277l bulk volume (65 °C storage temperature without reheating - XW 500). In addition, the heat loss is absolutely marginal. The ***LATENTO*** XW is suitable for combination with all heat generators – solar as well. Latent material ensures additional increase in output.

The long-term heat store – *LATENTO* XP Buffer storage

The ***LATENTO*** XP buffer storage for long-term heat storage can, e.g. be used as (additional) buffer storage for wood-fired boilers and solar systems. The XP has a large heat exchanger of long-wave stainless steel pipe for very good heat transmission. Its insulating plastic tank loses virtually no stored heat (0.1 K/h). Latent material makes sure of an additional output.

LATENTO XXL 500

LATENTO XW 500



LATENTO XP 500

* DIN 4708-3 (heating output 60 kW)

High yields all year round – *LATENTO* CPC Vacuum tube collector
The ***LATENTO*** vacuum tube collectors perform convincingly at all times, having a very low heat loss and thus a very high efficiency, resulting in high solar yields even in transitional and winter months. A highly-reflective, weather-resistant CPC mirror makes sure that the sun's rays from almost every direction and even at unfavourable angles of incidence are directed onto the absorber. Arrangement of the vacuum tubes to face in a particular direction is not necessary.

Intelligent regulation technology
All ***LATENTO*** regulators are fitted with the same, simple operator guidance in full-text menu and graphical animations.
The ***LATENTO*** system regulator can be adapted individually to the heating system and the personal requirements of the user. With a total of 24 pre-programmed hydraulic systems and a start up wizard, it is possible to quickly and simply start up the system.
Thanks to the self-explanatory menu guidance with help texts, regulation is easy to understand even for a layperson.

The ***LATENTO*** solar pump with regulator is a completely pre-assembled and insulated pump station for installation in the solar circuit. The L solar regulator is pre-wired and space-saving thanks to its integration in the insulation and is thus ideal for retrofitting to solar systems on existing heating systems.

The ***LATENTO*** L solar regulator has 36 pre-programmed hydraulic variations and connection options for flow rate and pressure sensors as well as outputs for controlling extremely efficient pumps and makes it possible to efficiently regulate and monitor even complex solar systems.
The ***LATENTO*** S solar regulator represents a cost effective alternative for the regulation of simple solar systems.
A solely temperature-difference regulation for differing application situations can be implemented using this method.

LATENTO Solar regulator L

LATENTO Solar regulator S

The *LATENTO* system eases the burden on the environment and health
Responsibly taking care of the environment without any limitation of personal comfort. Unthinkable a couple of years ago – modern technology makes it real. The ***LATENTO*** XXL is an exactly matched, integrated system for more safety: fast and clean heat generation, germfree and healthy DHW handling. One thing is for sure: the ***LATENTO*** XXL is a sustainable investment for many years of wellbeing and living comfort.

2. Product Overview

Content

Solar stratified storage tanks

LATENTO XXL/WP-S Solar stratified storage

Figure below: 878 702 211

Pressure-free plastic solar storage according to DIN 4753 and DIN 4708, in particular suitable for operation with regenerative systems (for low subsequent heating performance, e. g. with heat pumps),with integrated PUR insulation, with drinking water, heating and solar heat exchange from long-wave stainless steel corrugated pipe, exterior thread connection G 1 1/4 including latent material.

	XXL/WP-S 500
Gross content (l)	536
Measure hxdxw (cm)	158x78x78

Description	**Item no.**	**Unit**
500 Solar stratified storage tank	878 702 211	1
XXL 500 Solar stratified storage tank	878 702 210	1
WP-S 500 Heat pump solar stratified storage tank	878 702 240	1

LATENTO XW Hot water storage tank

Figure below below: 878 702 221

Unpressurized plastic solar storage tank for hot water generation in single and multiple-occupancy buildings. Integrated PUR insulation, gross volume 540 litres, with hot water heat exchanger and heating heat exchanger of long-wave stainless steel corrugated pipes for improved heat yield, external thread connector G 1¼.

	XW 500
Gross content (l)	536
Measure hxdxw (cm)	158x78x78

Description	**Item no.**	**Unit**
500 Hot water storage tank	878 702 221	1
XW 500 Hot water storage tank	878 702 220	1

LATENTO XP Buffer storage tank

Figure below: 878 702 231

Unpressurized plastic storage tank as a buffer for recharging the boiler from different heat generating units. With integrated PUR insulation, gross volume 540 litres, with heat exchanger of long-wave stainless steel corrugated pipes for improved heat yield, external thread connector G 1¼.

	XP 500
Gross content (l)	536
Measure hxdxw (cm)	158x78x78

Description	Item no.	Unit
500 Buffer storage tank	878 702 231	1
XP 500 Buffer storage tank	878 702 230	1

LATENTO electric heating cartridge

For electrical storage heating, output 3, 6 and 9 kW, 230/400 V, with adjustable 3-pin. temperature controller (0–85 °C)/and limiter (110 °C), protection class IP 45, screw-in thread G 1½, plastic cap, black. Total length: 125 cm, heater coil length 112 cm, upper unheated part of heater coil approx. 42 cm.

Description	Item no.	Unit
Electric heating cartridge 3/6/9 KW	878 700 039	1

LATENTO Connection bracket Rp1 - G1 1/4 - Rp 1/2

LATENTO connection bracket for mounting to ***LATENTO*** holder for connection bracket stepped (878700093), sound-proofed installation thanks to poly-amidewashers on securing screws of type M 5 suitable for sanitary, heating sectors as well as solar, material: brass, polyamide, steel, annealed cast iron.

Description	Item no.	Unit
Connection bracket Rp1 - G1 1/4 - Rp 1/2	878 700 091	2
Holder for connection bracket	878 700 093	1

Vacuum tube collector CPC/accessories

LATENTO vacuum tube collector CPC

2

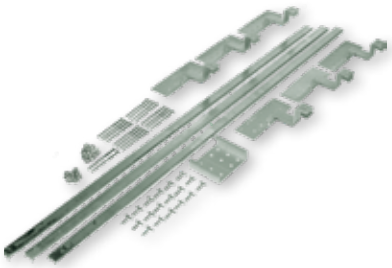
High-duty collector with CPC mirror, break-resistant glass tubes with vacuum insulation, highly selectively coated, including 2 cutting ring couplings at copper pipe 15 x 1 mm, completely premounted, connections top right and left.

LATENTO CPC 12: collector area 2.28 m², absorber area 2.0 m², 12 tubes
LATENTO CPC 18: collector area 3.41 m², absorber area 3.0 m², 18 tubes

Dimensions CPC 12: 139 x 164 x 12 cm
Dimensions CPC 18: 208 x 164 x 12 cm

Description	Item no.	Unit
Vacuum tube collector CPC 12	878 700 054	1
Vacuum tube collector CPC 18	878 700 055	1
Spare tube ***LATENTO*** CPC	878 700 059	1

LATENTO roof mounting set CPC



For mountig of vacuum tube collector CPC 12 or CPC 18 on roof. This setup is designed for common roof tiles. It's applicable for superposition of max. 110mm and a total hight of max.90mm.
(tiled roofs only – others on request).

Description	Item no.	Unit
Roof mounting set CPC 12	878 700 056	1
Roof mounting set CPC 18	878 700 057	1

LATENTO flat-roof mounting set

For fastening CPC 12 and CPC 18 vacuum tube collectors to the ground or to buildings with flat roofs.

Description	Item no.	Unit
Flat roof 45° mounting set	878 700 067	1
Flat roof 30° / 60° mounting set	878 700 068	1

LATENTO Set of bearing rails

Set of bearing rails for on-roof installation of an individual CPC tube connector on pitched roofs. Preassembled together with attachment parts comprising a set of LATENTO retaining clips (Art. no: 878700004). No loose small parts. Statically tested system.

Description	Item no.	Unit
Set of bearing rails for CPC 12	878 700 000	1
Set of bearing rails for CPC 18	878 700 002	1

LATENTO CPC12 rail extension set

Set of rails for on-roof installation to extend each of the bearing rails with one additional CPC12 tube connector on pitched roofs. Preassembled together with attachment parts comprising a set of ***LATENTO*** retaining clips (Art. no: 878700004). No loose small parts. Statically tested system.

Description	Item no.	Unit
Extension-Set for CPC12	878 700 001	1

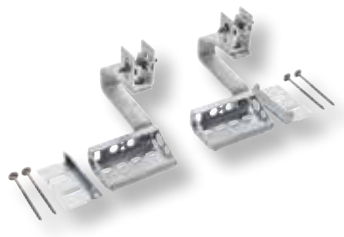
LATENTO CPC rail connecting set

Click-on connectors for connecting the horizontal rails when several CPC18 on-roof sets of bearing rails are used. Tool-free assembly. No loose small parts. Statically tested system.

Description	Item no.	Unit
CPC rail connecting set	878 700 003	1

LATENTO Set of retaining clips for tiled roofs

2



For fastening the sets of bearing rails to tiled roofs. Preassembled multi-head connector for simple fixing of the bearing rails on the roof hooks. Variable height adjustment. No loose small parts. Statically tested system.

Description	Item no.	Unit
Set of retaining clips for tiled roofs	878 700 004	1

LATENTO CPC12/18 flat roof installation set

Set for installing one CPC12 and one CPC18 tube connector on flat roofs with a variable installation angle of 30°/45°/55°, or on the wall with an installation angle of 45° or 60°. Statically tested system.

Description	Item no.	Unit
Flat roof installation set	878 700 005	1

Attachment components for various LATENTO CPC collector arrays

Article On-roof	Quantity of collectors									
Item.-No.	**Description**	**1xCPC 12**	**2xCPC 12**	**3xCPC 12**	**1xCPC 18**	**2xCPC 18**	**3xCPC 18**	**1xCPC 18 u. 1xCPC 12**	**1xCPC 18 u. 2xCPC 12**	**2xCPC 18 u. 1xCPC 12**
878 700 000	Set of bearing rails CPC 12	1x	1x	1x						
878 700 001	Extension-Set for CPC 12		1x	2x				1x	2x	1x
878 700 002	Set of bearing rails CPC 18				1x	2x	3x	1x	1x	2x
878 700 003	CPC rail connecting set					1x	2x			1x
878 700 004	Set of retaining clips for tiled roofs	2x	3x	4x	2x	4x	6x	3x	4x	5x
Article Flat roof/wall	**Quantity of collectors**									
878 700 005	Flat roof installation set 30°, 45°, 55° or wall-installation 45° oder 60°	1x	2x	3x	1x	2x	3x	2x	3x	3x

For each CPC12/18 set of bearing rails 2x sets of retaining clips are required, and 1x set of retaining clips for each CPC12 rail extension set. The CPC18 rail connecting set is required in order to connect several CPC18 sets of bearing rails. In the case of flat roof installation for CPC12/18, 1x the flat roof installation set is required for each collector. This can also be used for on-wall installation.
Additional accessories are available on request, such as a load extension set, pitch correction set, and additional retaining clips for plain tiles, slates and corrugated panels, as well as over-rafter insulation!

LATENTO connection set Speed CPC

For flexible collector connection through roof. Consisting of 2 flexible corrugated stainless steel pipes, 1.0 m each, with high-temperature resistant heat insulation, including cutting ring couplings at copper pipe 15 x 0,8 mm, completely premounted, additional 2 supporting sleeved 15 x 1 mm and 2 cutting ring transitions 18 to 15 x 1 mm.

Description	Item no.	Unit
Connection set Speed CPC	878 700 058	1

LATENTO bleeding valve

For manual ventilation of solar system on collector or under roof, consisting of 1 cutting ring Tee 15 x 1 for copper pipe, 1 nipple 15 Rp 1/2, 1 plug for manual draining. To be mounted between connection set speed CPC and Solar-Fix-pipe.

Description	Item no.	Unit
Bleeding valve	878 700 065	1

LATENTO filling and flushing device

Shut-off ball valve with a lateral connection for filling and flushing pipes; to be installed at the lowest part of the solar circuit.

Description	Item no.	Unit
Filling and flushing device	878 700 170	1
Compression fitting G 1–22 mm	878 700 171	2
Gasket insert	878 700 172	1

LATENTO heat carrier liquid Solar 20

For the frost and corrosion protected filling of the solar circuit, recommended for vacuum tube collectors, readily mixed to freezing protection –28 °C, volume 20 litres.

Description	Item no.	Unit
Solar 20	878 700 061	1

Regulation/pump groups/accessories

2

LATENTO System regulator

Heating regulator for efficient regulation of weather-lead heating systems with different heat sources and solar system. Switchable functions for unused relays. Optional flow measurement by means of VFS sensor. With 11 preprogrammed hydraulic variations in accordance with the IVT assembly suggestions, 13 preprogrammed basic systems with heating circuit, solar and heat generation functions, self-explanatory operation via 4 input buttons, integrated start-up wizard, RTC Real Time Clock with > 24 h power reserve, 8 sensor inputs for PT 1000 sensor, 2 electronic outputs for revolution regulation of standard pumps, 2 PWM / 0-10 V
Connections for high-efficiency pumps, 2 connectors for VFS or RPS sensors, 2 connectors for CAN, 4 relay outputs 230 V AC mechanical, 1 relay output of potential-free changer, connector for RC21 room controller, Slot for Micro SD including 2 GB card.
Sensors have to be ordered separately.

Dimensions H = 228 mm, W = 180 mm, D = 53 mm
Colour of housing: White, RAL 9003
High-contrast, illuminated display

Description	Item no.	Unit
System regulator	878 700 182	1

LATENTO Solar regulator L

Temperature difference regulation for efficient use and function control of complex solar, storage or heating systems. Optional flow measurement via VFS sensor. With 36 preprogrammed hydraulic versions with solar or solid fuel boiler, self-explanatory operation via 4 operating buttons, integrated start-up wizard, RTC Real Time Clock with > 24 h power reserve, 6 sensor inputs for PT 1000 sensor, 2 electronic outputs for revolution regulation of standard pumps, 2 PWM / 0-10 V Connections for high-efficiency pumps, 2 connectors for VFS or RPS sensors 2 connectors for CAN, 1 relay output 230 V AC mechanical, changer.
Sensors have to be ordered separately.

Dimensions: H = 163 mm, B = 110 mm, T = 51 mm
Colour of housing: White, RAL 9003
High contrast, illuminated display.

Description	Item no.	Unit
Solar regulator L	878 700 181	1

LATENTO Solar regulator S

Temperature difference regulation for efficient use and function control of simple solar, storage or heating systems. With 9 preprogrammed hydraulic versions with solar or solid fuel boiler, self-explanatory operation via 4 input buttons, integrated start-up wizard, RTC Real Time Clock with > 24 h power reserve, 3 sensor inputs for PT 1000 sensor, 1 electronic output for revolution regulation of standard pumps, 1 PWM / 0-10 V connection for high-efficiency pumps.
Sensors have to be ordered separately.

Dimensions H= 115 mm, W= 86 mm, D= 45 mm
Colour of housing: White, RAL 9003
High contrast, illuminated display.

Description	Item no.	Unit
Solar regulator S	878 700 180	1

LATENTO VFS combination sensor 1-12 l/min.

Sensor for recording flow and temperature (return) in solar and heating systems. Suitable for simple, but not officially calibrated, heat quantity counts. Can be used with ***LATENTO*** solar regulator L and ***LATENTO*** system regulator.

Description	Item no.	Unit
VFS-combination sensor 1-12 l/min	878 700 183	1

LATENTO Temperature sensor

Temperature sensor with PT 1000 sensor element, to degree accuracy according to DIN EN 60751, ensures for precise recording of the temperature to be measured. Suitable for ***LATENTO*** solar regulator S and L as well as the ***LATENTO*** system regulator.

Description	Item no.	Unit
Pipe collector sensor PT 1000	878 700 184	1
Temperature immersion sensor PT 1000	878 700 185	1
Exterior sensor PT 1000	878 700 186	1
Pipe system sensor PT 1000	878 700 187	1

LATENTO solar pump with regulation

Fully premounted and insulated pump station for installation in the solar circuit,with pump WILO Yonos Para ST 25/7 PWM including wall mounting equipment, ***LATENTO*** solar regulator L including 1 collector sensor and 3 reference sensors cable ready for connection and tested, flow gauge 2 - 12 L/ min with lock, safety component with manometer 0-10 bar, safety valve 6 bar and 3/4" outlet for expansion tank, 2 KFE taps for easily filling and drainage, 2 switch off taps with integrated thermometers and 2 gravity brakes, Supply and return G 3/4" connection thread.

Description	Item no.	Unit
High efficiency solar pump with regulator L	878 700 026	1

LATENTO pump group solar

Completely insulated, for installation in the solar circuit, flow- meter for glycol 1,2–14l/min and water 1,7–16l/min, safety valve 6 bar, 2 filling valves, 2 non return valves, 2 shut-off valves with thermometers, flow and return IG ¾", connecting thread G ¾" flat sealing for the connection of an expansion tank, with integrated permanent breather valve.

Description	Item no.	Unit
Solar pump group with energy-saving pump Grundfos Solar PM 2 25-85, PWM Signal	878 700 078	1

LATENTO pump group heating with energy-saving pump

Fully insulated, for a mixed heating circuit, with 3-way mixing valve, with high-efficiency pump Grundfos Alpha 2 25–60, non-return valve in the return pipe, 2 shut-off valves with thermometers, flow and return connector below G 1 ½" AG, connector above IG 1".

Description	Item no.	Unit
Pump group heating with Alpha 2	878 700 079	1

LATENTO pump group boiler

Boiler charging kit for integration between solid fuel boilers and heating circuits and/or heat storage with self-adjusting bypass valve for the return heat retention, opening temperature selectable from 40 °C to 70 °C, with with energy-saving pump Grundfos Alpha 2 L 25-60, 2 shut-off valves with thermometers, non-return valves in the flow pipe, connector above G 1½" includes retainer nut, connector below G 1" IG.

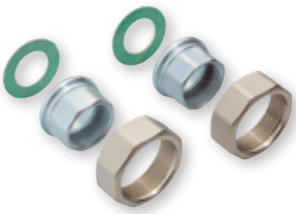
Description	Item no.	Unit
Pump group boiler	878 700 084	1

LATENTO pump group circulation

Completely insulated pump assembly for an unmixed heating circuit or for storage charging, with energy-saving pump Grundfos Alpha 2 L 25-60, 2 shut-off valves with thermometers, non-return valves in the flow pipe, connector above G 1", connector below G 1½" AG flat sealing.

Description	Item no.	Unit
Circulating pump assembly	878 700 082	1

LATENTO screwed-joint set



Amendment to external screw connection G 1½ to pump group heating circuit, connection screw Rp 1.
Material: brass

Description	Item no.	Unit
Screwed-joint set	878 700 086	2

LATENTO Circulation lance

For energy-efficient connection between circulation pipes and LATENTO tanks. The circulation return pipe is guided through inner pipe in the upper layer of the tank. Lance body with securing sleeve, inner pipe 3m, with transition G 1 ¼-R1. Material: Cuphin, brass, PE-X

Description	Item no.	Unit	VE
Circulation lance ***LATENTO***	0,700	878 700 064	1
Circulation lance universal	0,539	878 700 063	1

LATENTO thermostatic domestic water – mixing valve

To set a constant hot water temperature at the outlet of the storage tank (50°–75°C), setting of warm water temperature via handwheel with temperature scale, asymetric flow pattern, scade safe function, with screwed joints on male thread R ¾ and gaskets, pressure range PN 10, working pressure: 10 bar (1.0 MPa), pressure difference max. 3 bar (0.3 MPa), max. temperature 95°C (short-term 100 °C), Kvs-value: 3.0 m³/h, weight: 1.3 kg, suitable for water and frost protection (Glykol level up to 50% dezincification-resistant brass.

Description	Item no.	Unit
Mixing valve	878 700 021	1

LATENTO servo motor 3 way mixing valve

For installing with the 3-way mixing valve of the ***LATENTO*** pump group heating circuit, for weather-reactive regulation, electrical connection 230 V, power consumption 2.5 W, torque 6 Nm, IP 40, with 2 m connection cable.

Description	Item no.	Unit
Servo motor for 3-way mixing valve	878 700 087	1

LATENTO solar expansion vessel

Diaphragm-type expansion vessel (MAG) for solar systems acc. to EU Directive 97/23/EG, DIN 4757 and prEN 13831, pre-pressure 2,5 bars, max. operating over-pressure 10 bars, G ¾ or G 1 threaded connector.
Colour: * white or ** red

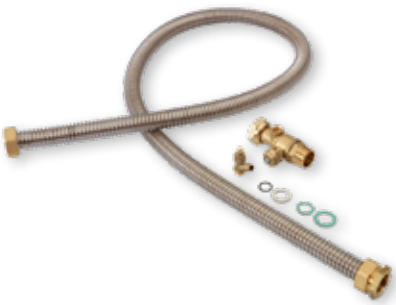
Description	Item no.	Unit
Solar expansion vessel 25l *	878 700 025	1
Solar expansion vessel 35l *	878 700 138	1
Solar expansion vessel 50l **	878 700 139	1
Solar expansion vessel 80l **	878 700 140	1
Solar expansion vessel 100l **	878 700 141	1
Solar expansion vessel 140l **	878 700 142	1

LATENTO intermediate solar vessel

According to the VDI Guidelines 6002, intermediate solar vessels are to be employed, "… when the content of the pipe work between the collector panel and the MAG is less than 50 % of the fluid carrying capacity of the accurately measured MAG". This minimum requirement is difficult to comply with, especially with roof heating centres which have short pipe runs. The intermediate solar vessel reliably protects the membrane of the MAG from excessive temperatures, which could destroy the membrane. Maximum operating pressure 10 bar, threaded connector R ¾".
Colour: red

Description	Item no.	Unit
Intermediate solar vessel 6l	878 700 136	1
Intermediate solar vessel 12l	878 700 137	1

LATENTO connection kit MAG for expansion vessel



For connection of the membrane pressure expansion vessel (MAG) to the solar pump group. Consisting of:
a flexible stainless steel corrugated pipe DN 16, 1.5 m in length, with connections to ¾" or 1" and cap valve in ¾" or 1" design, incl. seals

Connection kit MAG ¾" for use with solar expansion vessels 25 L - 50 L
Connection kit MAG 1" for use with solar expansion vessels from 80 L

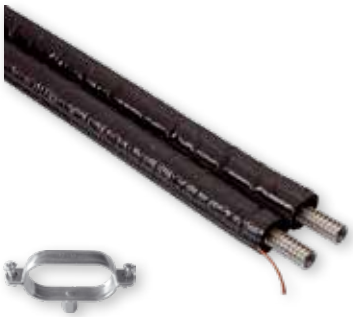
Description	Item no.	Unit
Connection set MAG 3/4"	878 700 146	1
Connection set MAG 1"	878 700 147	1

LATENTO Solar-Fix

Quick-action piping system to connect the pump group and collector in a time and room saving manner, 2 x 15 m soft copper pipe 15 x 0,8 mm and 18 x 1 mm (supply piping marked) as ring, with silicone cable 2 x 0,75 mm², completely weather and UV resistant, insulated with high-temperature resistant EPDM rubber foam, 13 mm.

Description	Item no.	Unit
Solar-Fix CU 15	878 700 150	1
Solar-Fix CU 18	878 700 151	1
Oval screwed pipe clips 15/DN 16	878 700 154	1
Oval screwed pipe clips 18/DN 20	878 700 155	1

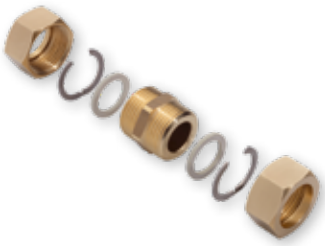
LATENTO Solar-Fix flex



Quick-action piping system for a time-saving and space-saving connection between the pump group and the collector, 2 x 15 m of long-wave stainless steel corrugated pipes DN 16 and DN 20 (supply piping marked) as a bundled coil, with integrated feeder cable, completely weather and UV resistant, insulated with high-temperature resistant EPDM rubber foam, 13 mm.

Description	Item no.	Unit
Solar-Fix Flex DN 16 stainless steel	878 700 152	1
Solar-Fix Flex DN 20 stainless steel	878 700 153	1
Oval screwed pipe clips 15/DN 16	878 700 154	1
Oval screwed pipe clips 18/DN 20	878 700 155	1

LATENTO screw connector



For a removable connection to the stainless steel corrugated pipe, including connecting nut, flat gasket and washer.

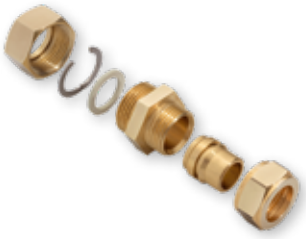
Description	Item no.	Unit
Screw connector DN 16	878 700 157	2
Screw connector DN 20	878 700 158	2

LATENTO screw connector with insertion end

For a removable connection of the stainless steel corrugated pipe to the collector and the solar pump, including connecting nut, nipple, flat gasket and washer.

Description	Item no.	Unit
LATENTO screw connector DN 16–Cu 15 S	878 700 160	1
LATENTO screw connector DN 20–Cu 15 S	878 700 161	1

LATENTO screw connector with sleeve



For a removable connection of the stainless steel corrugated pipe to the copper pipe, including connecting nut, clamp ring 18/22, spacer ring 15, flat gasket and washer.

Description	Item no.	Unit
LATENTO screw connector DN 16–Cu 15/18 M	878 700 163	1
LATENTO screw connector DN 20–Cu 15/22 M	878 700 164	1

LATENTO screw connector with external thread

For a removable connection of the stainless steel corrugated pipe to the solar pump, with an internal thread G ¾ including connecting nut, external threaded neck G ¾, flat gasket and washer.

Description	Item no.	Unit
LATENTO screw connector DN 16–G ¾ AG	878 700 165	1
LATENTO screw connector DN 20–G ¾ AG	878 700 166	1
LATENTO screw connector DN 25–G ¾ AG	878 700 167	1

LATENTO screw connector nut

For a removable connection of the stainless steel corrugated pipe to the ***LATENTO*** heat exchanger, with an external thread G 1¼ and flushing device with external thread G 1, including connecting nut, flat gasket and washer.

Description	Item no.	Unit
Screw connector nut DN 20–G 1	878 700 175	1
Screw connector nut DN 25–G 1	878 700 168	1
Screw connector nut DN 25–G 1¼	878 700 169	1

LATENTO Transition G 1 1/4

LATENTO Transfer G 11/4 for connecting the ***LATENTO*** heat exchanger for hot water, heating and solar. Material: Brass, VE 2

Description	Item no.	Unit
Transition G 1 1/4 – R 1	878 700 048	2
Transition G 1 1/4 – R 3/4	878 700 049	2

LATENTO 3-way valve

Fur use in underfloor-heating, heating, heat pump, ventillation and air condition systems, for quick changing of the flow direction (change from A to B in only 3 seconds), because of possible change of flow direction espacially suited for use in return pipes, integrated board with microprocessor, integrated connector block protection (complete change cycle min. all 7 days), actuator removable. A and B after removing of actuator simultaneously open, valve position apparent via display-window, inc. removable wire (lenght 1.6 m), connection G1", pressure range: PN 6, medium temp.: 5°C-95 °C (short term 100°C), surrounding temp.: 0°C-60°C, 230 VAC power consumption 50 Hz, protection class IP 20, running time 3 seconds, Kvs value: 6.5 m³/h, weight: 0.5 kg, medium: water or waterglycol mixture, in accordance with VDI 2035 (glycol proportion max. 50%).

Description	Item no.	Unit
3-way valve	878 700 220	1

LATENTO motor ball valve

Motorised 2-way ball valve For automatic shut-off of individual system circuits in heating and cooling systems (e.g. to prevent circulation through the heating appliance during heating support). Bubble-tight in accordance to EN 12266-1. 2-point-actuator with On-/Off-function and additional switch. Length of wire: 0,85 m. In rest position closed. Anti condensation resistor to avoid condensation on the the board. The actuator is simply fixed in the ball valve schnell, einfach und sicher by a forelock. Turning angle: 90°

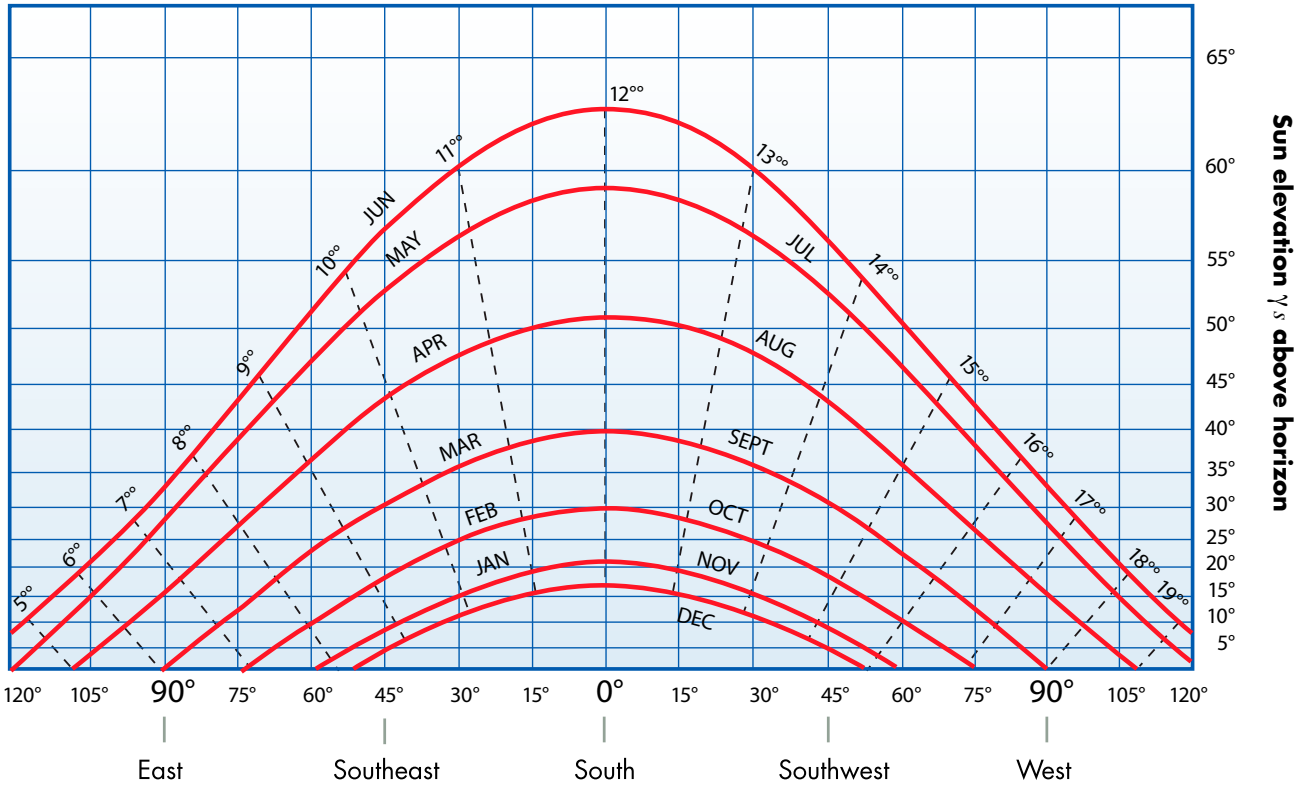
Description	Item no.	Unit
Motor ball valve	878 700 223	1

3

3. Design principles (standards)

Stratified storage tank ***LATENTO*** XXL and vacuum tube collectors CPC

Note the following points for solar systems and their components as described on the following pages.



Sun's orbit diagram 50° N.L.

Factors influencing the solar yield and the size of the collector surface to be installed:
The following factors influence the number of collectors:

- Main utilization of the solar energy (hot water/heating backup)
- Heating system (e.g. surface heating) and the heated area
- Orientation of the collectors, e.g. south
- Positioning angle of the collectors e.g. 60°

The best usage factor is achieved when the sunrays would impinge on the collector field at an angle of 90°. Hence a flat positioning angle would yield less during the winter months because the sun would shine at a flat angle against the collector during these months.
A steeper positioning angle has the consequence that the sun would not directly impinge upon the collector in summertime. During this period, however, less energy at more solar radiation is needed.

If solar systems are dimensioned such that they exceed the hot water requirement in summer, for instance to have more solar energy during the transitional period or winter months, one should see to it that there will be excess in solar energy during the summer months that cannot be utilized for hot water heating. This will cause overheating and system standstill.

NOTE

Overheating does not constitute any malfunction of the solar system.

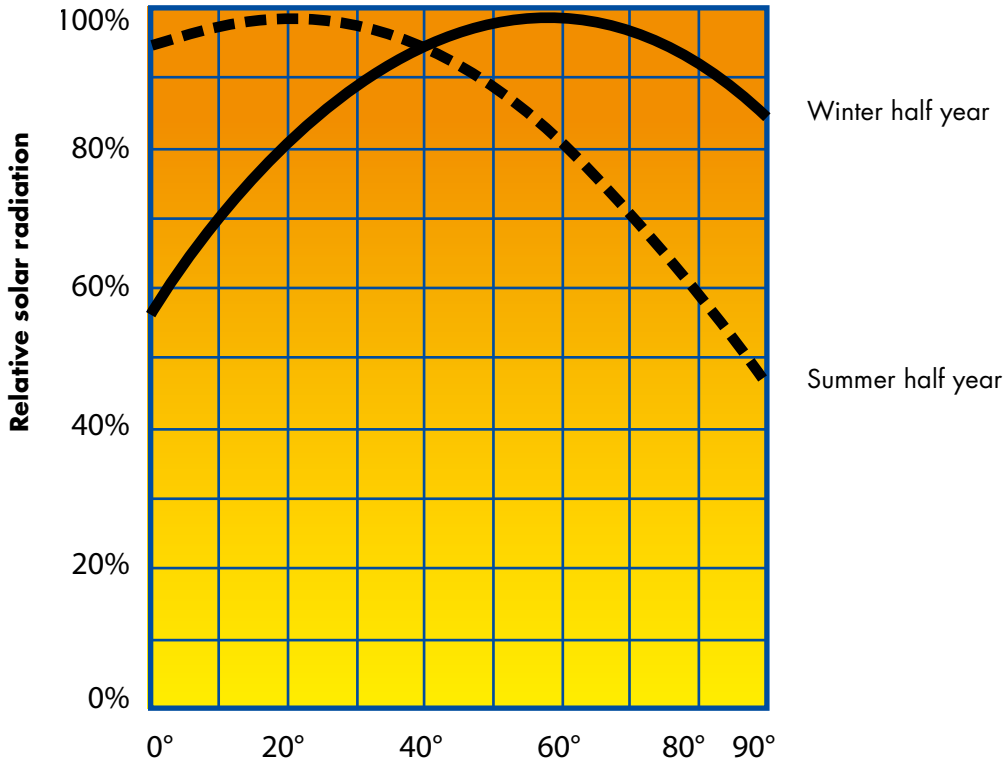


Diagram 1: Solar radiation to collector angle of inclination for summer and winter months 50th parallel north

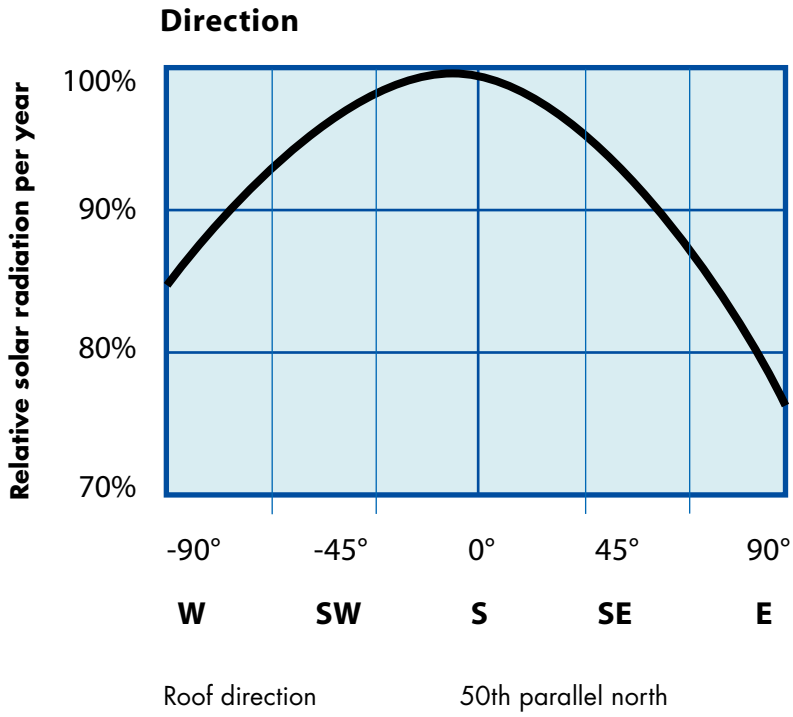


Diagram 2: Solar radiation in connection with the roof direction

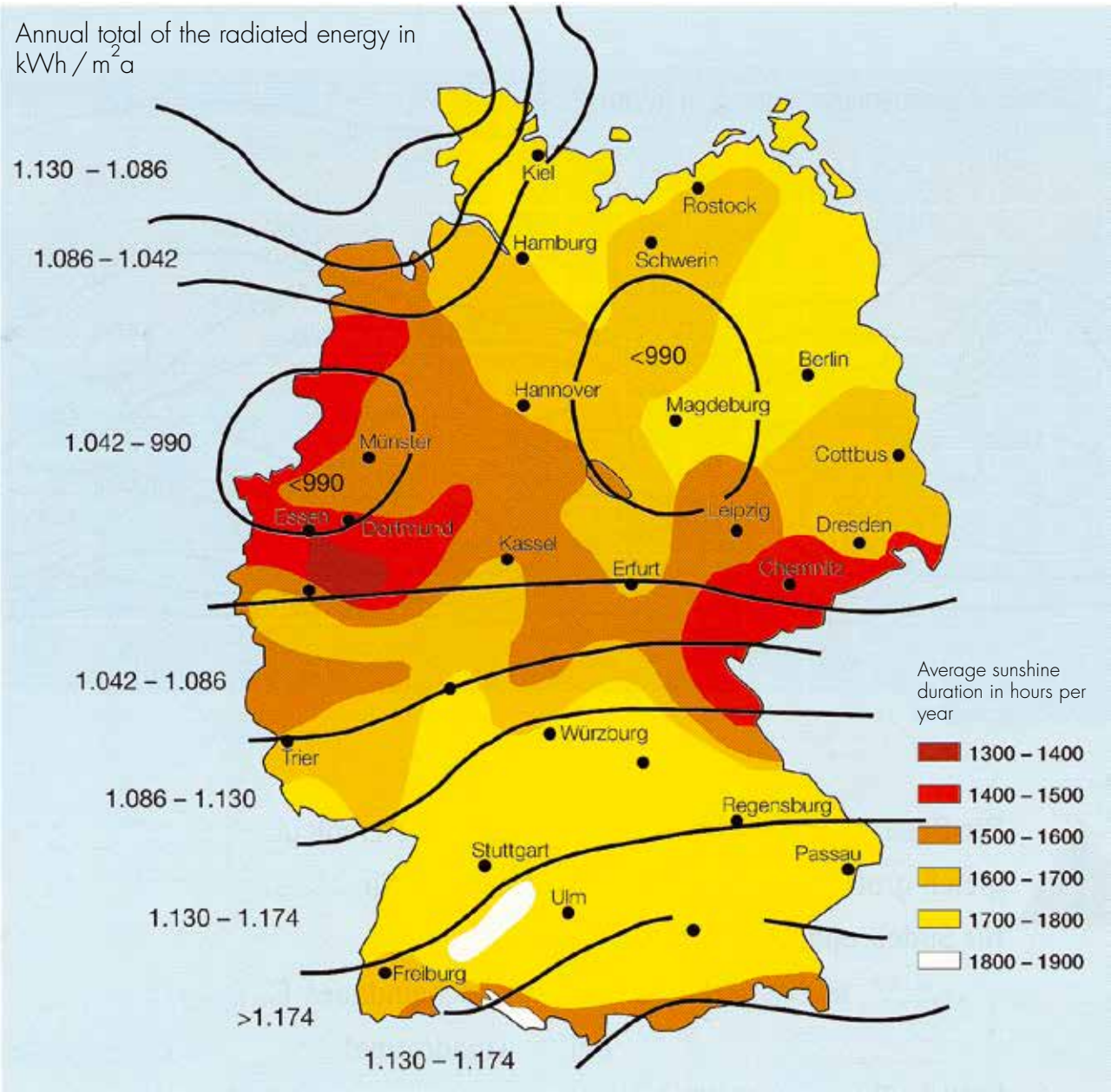
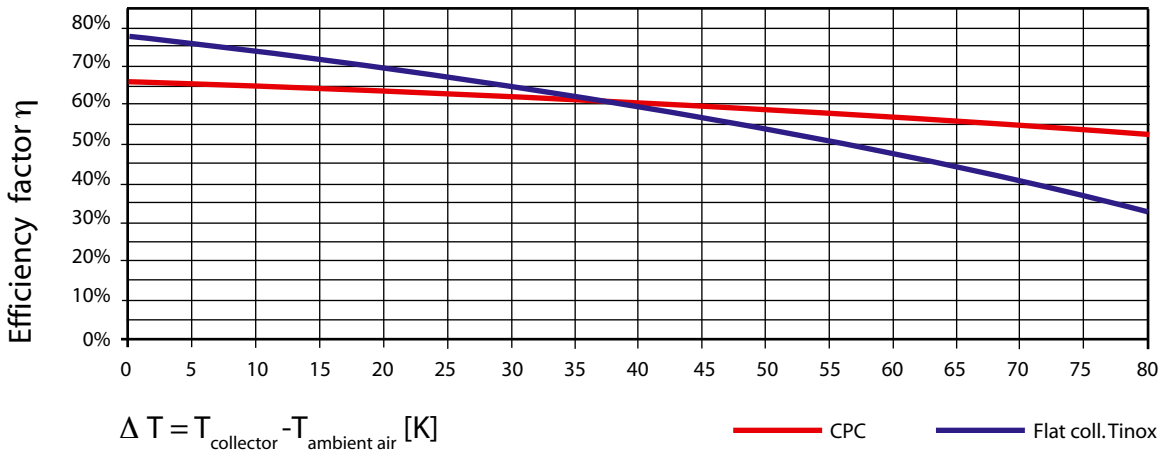


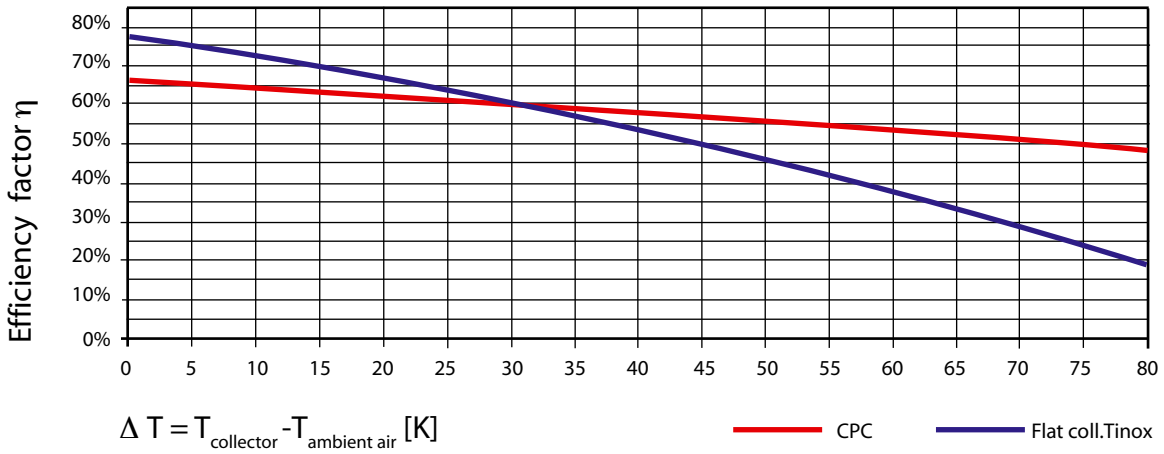
Diagram 3: Mean annual totals of radiated energy

Efficiency curves at different Solar Radiation levels

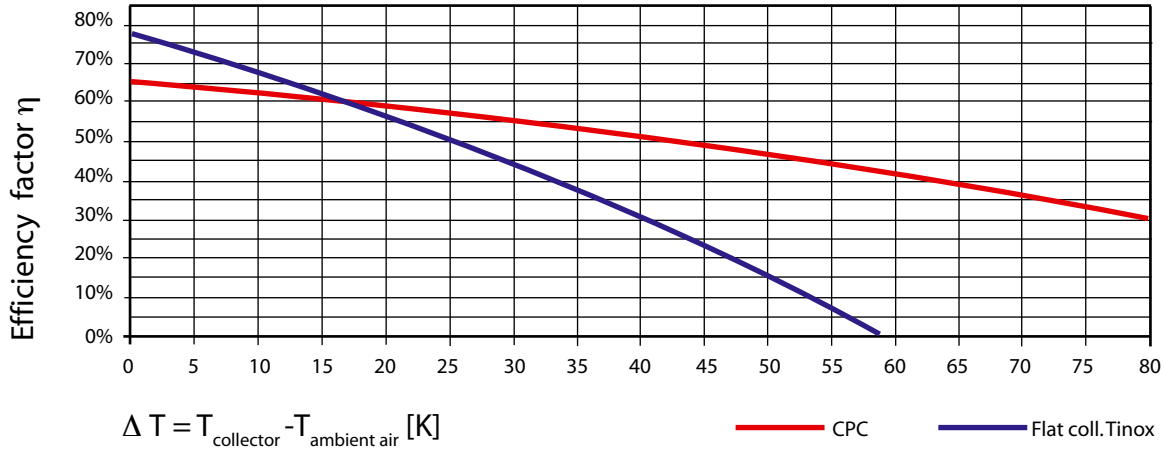
Comparison of the efficiency characteristics of the CPC collector and a flat collector at 800 W/m² radiation



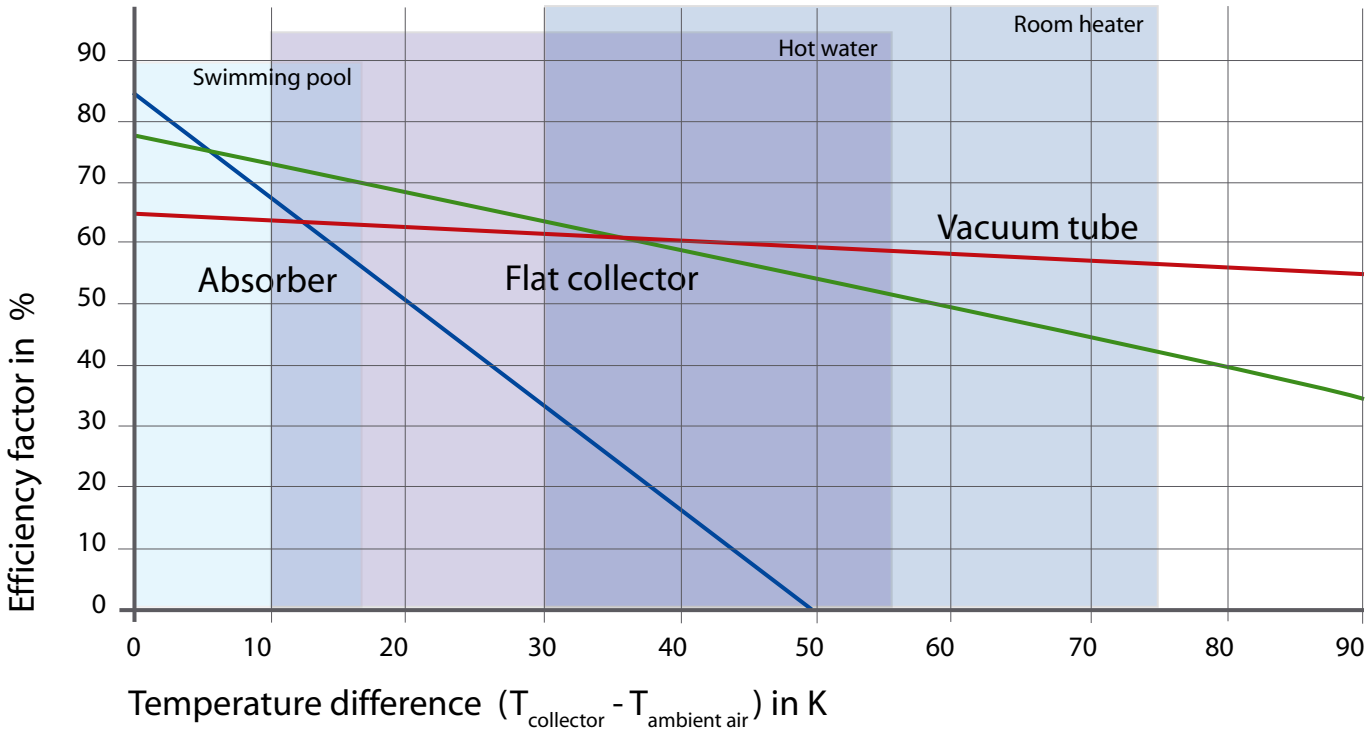
Comparison of the efficiency characteristics of the CPC collector and a flat collector at 600 W/m² radiation



Comparison of the efficiency characteristics of the CPC collector and a flat collector at 300 W/m² radiation



Solar Radiation 800 W/m²



System planning

Basis for calculation

The solar system should be optimally adapted to your intended use. On the one hand, the heat energy absorbed should largely be completely used up so that the investment can be used as intensively as possible. Therefore, the system should not be too big. On the other hand, the solar system should provide the majority of the necessary heat for the hot water supply or another planned use. So it should not be designed too small.

In addition, the selected system concept should achieve an optimum of benefit, convenience and reliability in interaction with the existing or planned investments.

High-performing computer programs that support the expert in his work have been developed to design solar systems. The input data for these computer programs are:

- The expected consumption structure, i.e. when will how much hot water be needed at what temperature
- The climatic situation. For this, the program has the climate data for the installation location or comparable locations over many years
- The specific situation at the installation site: Roof direction, roof pitch, shadows, available areas, etc.. This information will be included in the planning sheet at the customer's
- The thermodynamic data of the collector. These were identified by the Testing Institute during certification and are already available in the computer program

With the specific data of your project we can draw up a model design for you with the expected system performance.

Table 1 quickly provides a rough estimate for the collector surface required for planning the system for hot water heating and heating backup. However, it must be pointed out that the optimum size of a solar system can only be identified exactly if the installation site, usage conditions and consumption profiles of the user are known. The values in the table are therefore only rough estimates. Table 1 cannot replace expert design, e.g. with a PC program.

Guideline for Collector surface

Number of persons Hot water	Number of persons Hot water and heating	Vacuum tube collector Qty./type IVT CPC	Aperture area
2	-	1 x IVT CPC 18	3 m²
2–4	-	1 x IVT CPC 18 or 2 x IVT CPC 12	3–4 m²
4–6	up to 3 persons + heating	2 x IVT CPC 12 or 1 x IVT CPC 18 + 1 x IVT CPC 12	4–5 m²
5–8	up to 4 persons + heating	2 x IVT CPC 12 + 1 x IVT CPC 18 or 4 x IVT CPC 12	7–8 m²

Table 1

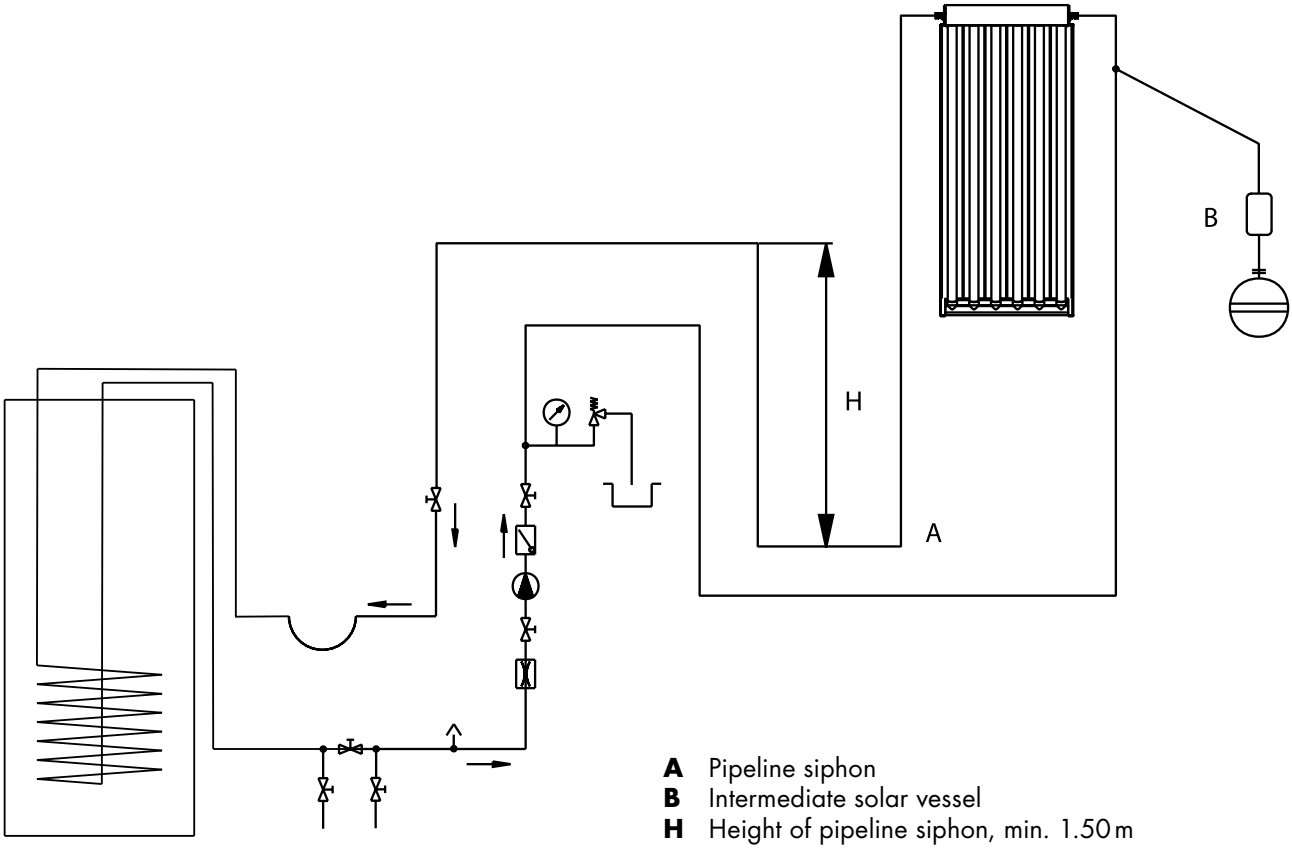
Correction factors DHW (main use April to September)

		Roof pitch (Collector pitch)									
Angular deviation from south		0°	10°	20°	30°	40°	50°	60°	70°	80°	90°
South	0°	1,2	1,1	1,0	1,0	1,0	1,1	1,2	1,3	1,6	2,0
	15°	1,2	1,1	1,0	1,0	1,0	1,1	1,2	1,3	1,5	1,9
	30°	1,2	1,1	1,0	1,0	1,0	1,1	1,2	1,3	1,5	1,8
Southeast / Southwest	45°	1,2	1,1	1,1	1,1	1,1	1,1	1,2	1,3	1,5	1,8
	60°	1,2	1,1	1,1	1,1	1,1	1,2	1,3	1,4	1,6	1,9
	75°	1,2	1,1	1,1	1,2	1,2	1,3	1,4	1,5	1,7	2,0
East / West	90°	1,2	1,2	1,2	1,3	1,3	1,4	1,6	1,7	2,0	2,4

Solar roof heating center
If storage tank and solar station are accommodated in the roof, then this is termed as solar roof heating center. Then the collector is level or even lower than the solar station in the majority of cases. The following measures are required to prevent the solar station from overheating at standstill and steam formation in the collector:

Pipeline siphon
A tubeline siphon acc. to the hydraulic diagram below prevents steam getting from the collector to the solar station at solar station standstill. For this purpose, a pipeline siphon of min. H=1.5 m has been designed.

Intermediate solar vessel
The expansion tank is installed into the vertical pipeline between pipeline siphon and collector. Protecting the expansion tank diaphragm from overheating, a buffer vessel in a "cold state" is upstream-connected on site.



A Pipeline siphon
B Intermediate solar vessel
H Height of pipeline siphon, min. 1.50 m

Pipework to collector

Conditions for the installation of the solar circuit

- The solar system must be configured as an sealed system, as the inhibitors of the anti-freeze would be used up more quickly if oxygen from the air were to enter the system
- The system may not be fitted with galvanised heat exchangers, heat stores, containers or tubes on the primary side since zinc can be removed by the solar liquid
- Make sure that in solar systems all of the sealing and connecting materials are resistant up to the maximum standstill temperature (approx. 270 °C)
- Metal hoses should preferably be used as flexible connecting elements
- It must be ensured that there is no electrical external potential between system parts that are in contact with each other. However, there may be limited external potential (approx. 1.5 Volt) between system parts made of copper materials
- All lines must be laid such that no circulation disruptions can be caused by gas cushions or deposits
- The circuit system must be permanently filled to the highest point with the heat carrier liquid. At the highest point, a bleeding point must be fitted to liberate the gases
- When laying the pipework for the collectors, the feed and return tubes are fed through the roof membrane into the roof space. Thereby make sure that the bleeding pot is fitted to the highest point to ensure perfect bleeding of the system

Hard-soldering

Solder connections with Ag or Cu hard solder should be used. No fluxing agents containing chloride should be used.

Dirt in the pipelines

During assembly and prior to filling, the system and its components must be protected against the entry of dirt and water.
After the system has been built, it must be cleaned inside (rinsed) in order to remove solids (metal chips, packaging residue, sawdust, etc.) and fitting aids.
Cf. Chapter 6 “Commissioning”.

Expansion tank

Membrane pressure compensators must comply with DIN 4807 and 4757.

NOTE

Important:
Use of soft solders will cancel all warranties.

Determining the solar expansion tanks for ***LATENTO*** XXL and IVT CPC 12/18

The solar expansion tank must be big enough so as to accept the expansion volume of the heat transfer medium and the complete internal volume of the collector when in the state of overheating.

This should be for the following reasons:

The pressure in the solar system will increase through steam formation in the case of overheating. By this, the safety valve may pick up. Loss of the heat transfer medium may be given as a result.

Once correctly dimensioned, the expansion tank would not be exposed to heavy strain that much in case of overheating.

In the case of roof heating centers you would need an intermediate tank to protect the solar expansion tank.

3

Volume of the expansion tank at 20 m single solar pipeline length Cu 15; 1 *LATENTO* XXL

CPC 12 pc/s.	CPC 18 pc/s.	Collector surface m² total	MAG size in liters	Order no.	Qty. "Solar 20"* pc/s.
1	0	2.0	25	878 700 025	2
0	1	3.0	35	878 700 138	2
2	0	4.0	50	878 700 139	2
1	1	5.0	50	878 700 139	2
0	2	6.0	80	878 700 140	2
3	0	6.0	80	878 700 140	2
2	1	7.0	80	878 700 140	2
1	2	8.0	80	878 700 140	2
4	0	8.0	80	878 700 140	2

Volume of the expansion tank at 20 m single solar pipeline length Cu 18; 1 *LATENTO* XXL

CPC 12 pc/s.	CPC 18 pc/s.	Collector surface m² total	MAG size in liters	Order no.	Qty. "Solar 20"* pc/s.
3	1	9.0	80	878 700 140	2
0	3	9.0	80	878 700 140	2
2	2	10.0	100	878 700 141	2
1	3	11.0	100	878 700 141	2
0	4	12.0	100	878 700 141	3

Volume of the expansion tank at 20 m single solar pipeline length Cu 18; 2 *LATENTO* XXL

CPC 12 pc/s.	CPC 18 pc/s.	Collector surface m² total	MAG size in liters	Order no.	Qty. "Solar 20"* pc/s.
4	2	14.0	140	878 700 142	3
3	3	15.0	140	878 700 142	3
2	4	16.0	140	878 700 142	4
0	6	18.0	200	999 999 642	4
4	4	20.0	200	999 999 642	4

* for static height 5–10 m; operating pressure 3.0 bar ; admission pressure MAG 2.5 bar

Volume of the expansion tank at 20 m single solar pipeline length DN 16; 1 LATENTO XXL

CPC 12 pc/s.	CPC 18 pc/s.	Collector surface m² total	MAG size in liters	Order no.	Qty. "Solar 20"* pc/s.
1	0	2.0	35	878 700 025	2
0	1	3.0	35	878 700 138	2
2	0	4.0	50	878 700 139	2
1	1	5.0	50	878 700 139	2
0	2	6.0	80	878 700 140	2
3	0	6.0	80	878 700 140	2

Volume of the expansion tank at 20 m single solar pipeline length DN 20; 1 LATENTO XXL

CPC 12 pc/s.	CPC 18 pc/s.	Collector surface m² total	MAG size in liters	Order no.	Qty. "Solar 20"* pc/s.
2	1	7.0	80	878 700 140	3
1	2	8.0	80	878 700 140	3
4	0	8.0	80	878 700 140	3
3	1	9.0	100	878 700 140	3
0	3	9.0	100	878 700 140	3
2	2	10.0	100	878 700 141	3
1	3	11.0	100	878 700 141	3
0	4	12.0	140	878 700 141	3

Volume of the expansion tank at 20 m single solar pipeline length DN 20; 2 LATENTO XXL

CPC 12 pc/s.	CPC 18 pc/s.	Collector surface m² total	MAG size in liters	Order no.	Qty. "Solar 20"* pc/s.
4	2	14.0	140	878 700 142	4
3	3	15.0	140	878 700 142	4
2	4	16.0	200	999 999 642	4
0	6	18.0	200	999 999 642	4
4	4	20.0	200	999 999 642	4

* for static height 5–10 m; operating pressure 3.0 bar ; admission pressure MAG 2.5 bar

Design of the expansion vessel size

Basis of calculation for determining the expansion vessel size
The formulae given in the following are based on a 6 bar safety valve. For precise calculation of the expansion vessel size, the volumetric capacity of the following system parts must be determined first in order to then calculate the vessel size using the formulae given below.

Formula: $V_{nom} \geq (V_{system} \times 0.1 + V_{steam} \times 1.25) \times 4.8$

V_{nom} = nominal size of the expansion vessel
V_{system} = capacity of the whole solar circuit
V_{steam} = capacity of the collectors and pipes which lie within the steam area

3

Example of calculation of the individual volumes:
Requirement: 2 collectors CPC 12 OEM/INOX pipe: CU 15 mm, 2 x 15 m long static height H: 9 m capacity of the ***LATENTO*** solar heat exchanger: 11.9 l pipes in the steam area: CU pipe 15 mm, 2 x 2 m

Please refer to the respective data tables of the product description for the individual capacities of the system components. The capacities of the standard sizes of CU pipes and the CPC tubular collectors are given on the following page.

V_{system} = capacity of: heat exchanger of the store + pipes + collectors
= 11.9 l + 30 m x 0.133 l/m + 2 x 1.6 l = 18.1 l

Pipes above or at the same level as the collector collection box (if there are several collectors on top of each other, the bottom collector collection box applies), can be filled with steam if the solar system is at a standstill. The steam volume Vsteam therefore includes the capacities of the pipes concerned and the collectors.

V_{steam} = 2 x 1.6 l + 4 m x 0.133 l/m = 3.73 l (capacity of 2 x CPC 12/+ 4 m pipe CU 15 mm)

Calculation of the expansion vessel size:

$V_{nom} \geq (V_{system} \times 0.1 + V_{steam} \times 1.25) \times 4.8$
$V_{nom} \geq (18.1\,l \times 0.1 + 3.73\,l \times 1.25) \times 4.8 = 31.1\,l$

Selected expansion vessel: 35 l

Determination of the capacity of the system, admission pressure & operating pressure:

To determine the necessary quantity of solar liquid, in addition to the system capacity, the buffer of the relevant expansion vessel must also be added.
The buffer in the expansion vessel is produced by filling the solar system from the admission pressure to the operating pressure (depending on the static height "H"). The percentage buffer, based on the selected nominal vessel size and the pressure requirements are given in the following table. For a static height of 9 m (see table on following page):

$V_{buffer} = V_{nom} \times 12.5\,\% = 35\,l \times 0.125 = 4.4\,l$

Necessary quantity of solar liquid V_{tot}:

$V_{tot} = V_{system} + V_{buffer} = 19\,l + 4.4\,l = 23.4\,l$

Result:
Expansion vessel with 35 l is sufficient, admission pressure 2.5 bar, operating pressure 3.0 bar, volume of solar liquid 22.5 l.

Static height H between highest point of the system and expansion vessel	Buffer in the expansion vessel as % of the GG nominal vessel size	Admission pressure	Operating pressure
0 … 10 m	12.5	2.5 bar	3.0 bar
10 … 15 m	11.0	3.0 bar	3.5 bar
15 … 20 m	10.0	3.5 bar	4.0 bar

Capacity of solar components

Copper pipe					
Type	Cu 12	Cu 15	Cu 18	Cu 22	Cu 28
Capacity in l/m	0.079	0.133	0.201	0.314	0.491

Stainless steel corrugated pipe		
Type	DN 16	DN 20
Capacity in l/m	0.25	0.39

Collectors		
Type	CPC 12	CPC 18
Capacity in l/m	1.6	2.4

Heating powers of ***PRINETO*** pipes

When including heaters, we recommend to consider the following table which contains guide values for approximate tube dimensioning.

NOTE

However, this table does not replace tube dimensioning acc. to DIN EN 12828 and the professional pump design.

3

Maximum heating powers of the pipes

Spreading	10 K	15 K	20 K	25 K	m	R	w
Tube dimension	max. heating power Q [KW]				[kg/h]	[Pa/m]	[m/s]
14 x 2,0 (Stabil)	1,1	1,7	2,3	2,8	97	200	0,34
16 x 2,2 (Nanoflex, PE-X & Stabil)	1,7	2,6	3,4	4,3	146	201	0,38
20 x 2,8 (Nanoflex, PE-X & Stabil)	3,1	4,6	6,1	7,6	262	200	0,45
25 x 3,5 (Nanoflex, PE-X & Stabil)	5,6	8,4	11,2	14,0	481	201	0,53
32 x 4,4 (Nanoflex, PE-X & Stabil)	11,1	16,7	22,2	27,8	955	200	0,63
42 x 4,6 (Stabil)	29,0	43,5	58,0	72,5	2.493	200	0,81
52 x 5,6 (Stabil)	51,8	77,7	103,6	129,5	4.454	200	0,94
63 x 6,0 (Stabil)	86,0	129,0	172,0	215,0	7.395	170	1,00

Approximate determination of warm water consumption

Determination of the hot water consumption can be made using a water meter in the cold water supply of the storage tank. You can average by day when reading the consumption over several weeks daily.

When planning new buildings, you should try to compare the consumption values with those of preferably similar or equal user groups and adapt these values to the expected consumer behavior.

Where practicable, one should raise the question, albeit very sensibly, of possible family planning or building use so as to plan the system for extension, if necessary.

The following mean values may serve for the estimation of hot water consumption:

1 x Hand washing (40 °C)	3 l
1 x Taking a shower (40 °C)	35 l
1 x Taking a bath (40 °C)	120 l
1 x Hairwash (40 °C)	9 l
Cleaning per person and day	3 l
Cooking per person and day	2 l
Dish washing (50 °C) per person and day	10–20 l

Refer to the currently valid DIN and DIN EN standards as basis for calculation.

Standards and regulations

The following standards and regulations have to be heeded when setting up and installing the *LATENTO* XXL and the vacuum tubes IVT CPC 12/18. It might be a good idea to put "or British Standard Equivalent" here.

Standards of the series:

DIN 1988	Codes of practice for drinking water installations (TRWI))

Normen der Reihe:

DIN EN 806	Specifications for installations inside buildings conveying water for human consumption
DIN EN 1717	Protection against pollution of potable water installations and general requirements of devices to prevent pollution by backflow
DVGW W 551	Systems for heating service water and piping systems – Technical measures
DVGW W 552	Controlling legionella growth
DVGW W 553	Evaluating circulation systems in central hot water heating systems.
DIN 4753	Water heaters and water heating installation for drinking water and service water; requirements, marking, equipment and testing
DIN 4708-1	Central heat-water-installations; terms and calculation-basis
DIN 4708-2	Central heat-water-installations; rules for the determination of the water-heat-demand in dwelling-houses
DIN 8947	Heat pumps; heat pump units with electrically driven compressors for water heating; concepts, requirements, testing
DIN 18380	German construction contract procedures – Part C: General technical specifications for building works – Systems for heating and central water heating
DIN 18381	German construction contract procedures – Part C: General technical specifications for building works – Gas, water and sewage plumbing works inside of buildings
DIN 18338	German construction contract procedures – Part C: General technical specifications for building works – Roof covering and roof sealing works
DIN 18339	Contract procedures for building works – Part C: General technical specifications for building works; Sheet metal works
DIN 18421	German construction contract procedures – Part C: General technical specifications for building works – Insulation works on technical installations
DIN 18451	German construction contract procedures – Part C: General technical specifications for building works – Scaffolding works
DIN EN 12828	Heating systems in buildings – planing of warm water heating systems
DIN EN 12975-1	Thermal solar systems and components – Solar collectors – Part 1: General requirements
DIN EN 12976-1	Thermal solar systems and components – Factory made systems – Part 1: General requirements
DIN EN 12976-2	Thermal solar systems and components – Factory made systems – Part 2: Test methods
DIN ENV 12977-1	Thermal solar systems and components – Custom built systems – art 1: General requirements
DIN ENV 12977-2	Thermal solar systems and components – Custom built systems – Part 2: Test methods
DIN ENV 12977-3	Thermal solar systems and components – Custom built systems – Part 3: Performance characterization of stores for solar heating systems

VDE 0100 and VDE 0700 as well as the provisions of your energy provider have to be heeded when connecting to power.

* This list does not claim to be complete.

Datenerfassung Thermische Solaranlage

LATENTO

Gebäude

Angaben zur Solaranlage

Fa. Musterheizungsbau Bauvorhaben Fam. Mustermann:

Solaranlage mit Kombispeicher

Clima: "Nürnberg"

Breitengrad:	49,5 °
Längengrad:	-11,08 °
Jahressumme Globalstrahlung:	1050,93 kWh
Anteil Diffusstrahlung:	59,69 %
mittlere Außentemperatur:	9,29 °C

Warmwasserverbraucher

Warmwasserverbrauch:

durchschnittlicher Tagesverbrauch:	200 l
Jahresverbrauch:	73 m³
maximaler Tagesverbrauch:	236,4 l
Solltemperatur:	45 °C
Jahresenergiebedarf:	2953,59 kWh
Betriebstage:	365 Tage
nicht in Betrieb:	-keine Einschränkung-

Zirkulation:

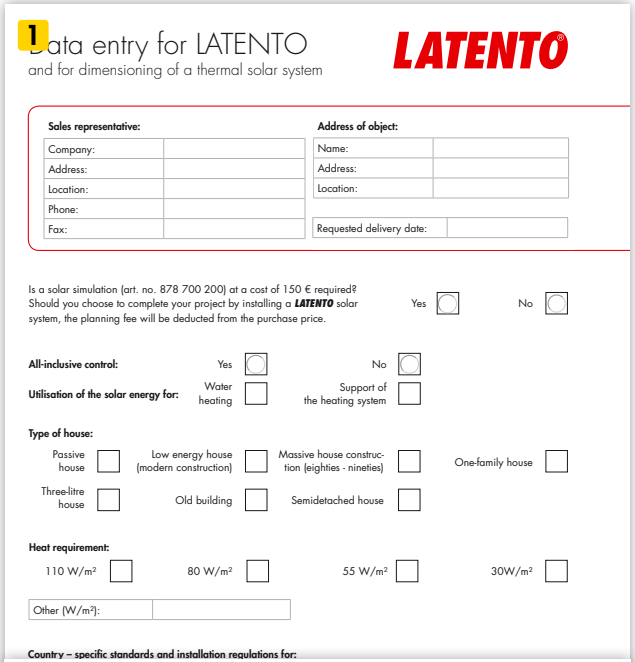
-keine Zirkulation vorhanden-

4

4. Planning Example

On the following pages, the evaluation of a customer enquiry regarding a ***LATENTO*** solar system for an individual construction project is shown as an example.

At the end of the chapter is a data entry sheet for planning a ***LATENTO*** solar system for you to photocopy and complete for your individual enquiry.



1 Data entry for LATENTO
and for dimensioning of a thermal solar system

LATENTO

Sales representative:		Address of object:	
Company:		Name:	
Address:		Address:	
Location:		Location:	
Phone:			
Fax:		Requested delivery date:	

Is a solar simulation (art. no. 878 700 200) at a cost of 150 € required? Should you choose to complete your project by installing a ***LATENTO*** solar system, the planning fee will be deducted from the purchase price. Yes ☐ No ☐

All-inclusive control: Yes ☐ No ☐

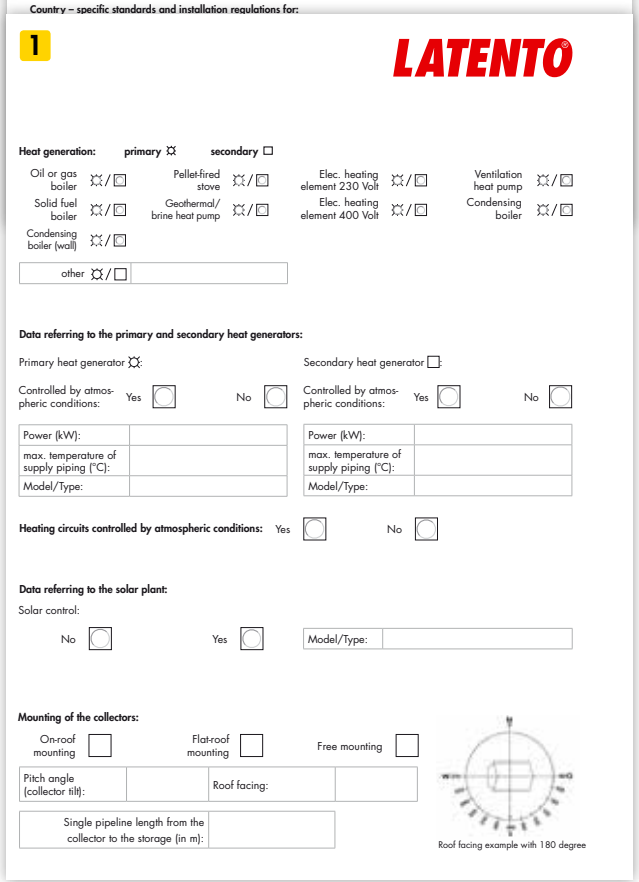
Utilisation of the solar energy for: Water heating ☐ Support of the heating system ☐

Type of house:
Passive house ☐ Low energy house (modern construction) ☐ Massive house construction (eighties - nineties) ☐ One-family house ☐
Three-litre house ☐ Old building ☐ Semidetached house ☐

Heat requirement:
110 W/m² ☐ 80 W/m² ☐ 55 W/m² ☐ 30W/m² ☐

Other (W/m²):	

Country – specific standards and installation regulations for:



1

LATENTO

Heat generation: primary ☼ secondary ☐

Oil or gas boiler ☼/☐ Pellet-fired stove ☼/☐ Elec. heating element 230 Volt ☼/☐ Ventilation heat pump ☼/☐
Solid fuel boiler ☼/☐ Geothermal/ brine heat pump ☼/☐ Elec. heating element 400 Volt ☼/☐ Condensing boiler ☼/☐
Condensing boiler (wall) ☼/☐

other ☼/☐

Data referring to the primary and secondary heat generators:

Primary heat generator ☼: Secondary heat generator ☐:

Controlled by atmospheric conditions: Yes ☐ No ☐ Controlled by atmospheric conditions: Yes ☐ No ☐

Power (kW):		Power (kW):	
max. temperature of supply piping (°C):		max. temperature of supply piping (°C):	
Model/Type:		Model/Type:	

Heating circuits controlled by atmospheric conditions: Yes ☐ No ☐

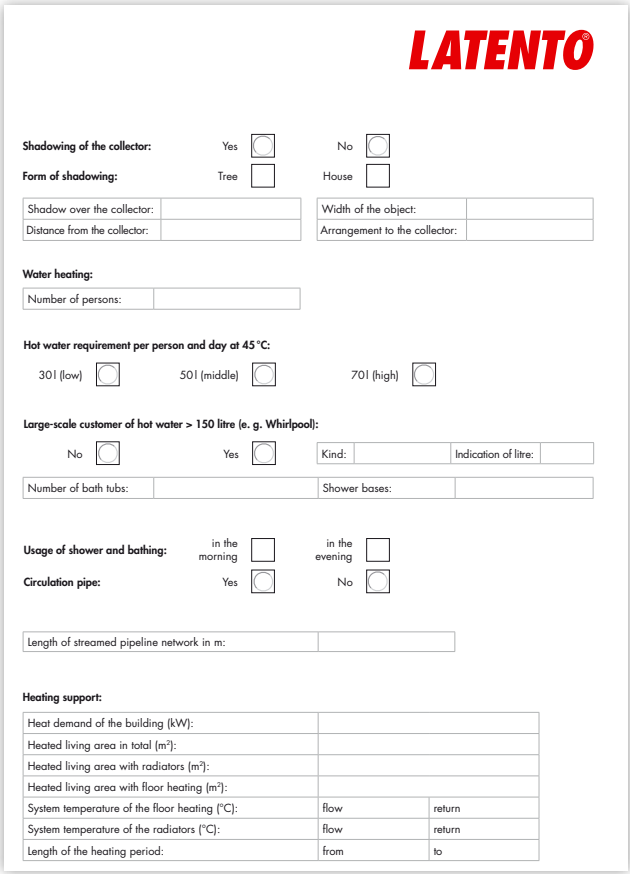
Data referring to the solar plant:
Solar control:
No ☐ Yes ☐ Model/Type:

Mounting of the collectors:
On-roof mounting ☐ Flat-roof mounting ☐ Free mounting ☐

Pitch angle (collector tilt):		Roof facing:	

Single pipeline length from the collector to the storage (in m):	

Roof facing example with 180 degree



LATENTO

Shadowing of the collector: Yes ☐ No ☐
Form of shadowing: Tree ☐ House ☐

Shadow over the collector:		Width of the object:	
Distance from the collector:		Arrangement to the collector:	

Water heating:

Number of persons:	

Hot water requirement per person and day at 45 °C:
30 l (low) ☐ 50 l (middle) ☐ 70 l (high) ☐

Large-scale customer of hot water > 150 litre (e. g. Whirlpool):
No ☐ Yes ☐ Kind: Indication of litre:

Number of bath tubs:		Shower bases:	

Usage of shower and bathing: in the morning ☐ in the evening ☐
Circulation pipe: Yes ☐ No ☐

Length of streamed pipeline network in m:	

Heating support:

Heat demand of the building (kW):		
Heated living area in total (m²):		
Heated living area with radiators (m²):		
Heated living area with floor heating (m²):		
System temperature of the floor heating (°C):	flow	return
System temperature of the radiators (°C):	flow	return
Length of the heating period:	from	to

The filled out and signed data collection sheet is required for processing. 1

The following data were stated in the example:

- Building type "Three-Liter-House"
- The heat generation should be made via condensing boiler with 8 kW power
- The collector installation site should be on the flat roof of a garage
- 4 people dwell in the house having water requirements of 50 l per day and person at 45 °C hot water temperature
- One bathtub and 2 shower trays will be installed

If solar simulation should be desired (Item. no. 878 700 200), we will calculate it for your building project using the solar simulation program T*Sol.

You will receive a detailed simulation covering one year as result. 2

2

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91189 Rohr
Model heating Ltd
Model heating Ltd Building Project Mrs.

Model heating Ltd Building Project Mrs. and Mr. A.N. Other: A5

Solar System with Combination Tank

Climate

Data Record:	"Efford"
Latitude:	50,73 °
Longitude:	1,57 °
Total Annual Global Radiation:	1101,05 kWh
Diffuse Radiation Percentage:	55,99 %
Mean Outside Temperature:	10,71 °C

Hot Water Consumption

DHW Consumption:
Average Daily Consumption: 200 l

2

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Hot Water Consumption

DHW Consumption:

Max Daily Consumption:	236,4 l
Desired Temperature:	45 °C
Annual Energy Reqirement:	2953,59 kWh
Operating Days:	365 Days
Not Operating:	-No Limitation-

Circulation:
-Circulation not available-

Load Profile

Profile:	Detached House (evening max)

Space Heating

Heat Requirement:

Standard Building Peak Heating Load:	4,5 kW
Heated Useable Area:	125 m²
Specific Standard Peak Heating Load:	36 W/m²
Room Temperature:	20 °C
Standard External Temperature:	-4,6 °C
Heating Temperature Limit:	16 °C
Design:	with Average Wall Thickness

Heat Gains:
Ratio of Windows to Gross Floor Area:

North / East / South / West:	2 % / 5 %/10 %/7 %
Total Window Area:	30 m²
Type of Window:	2 panes of insulating glass, uncoated, standard glass
Internal Heat Gains:	5 W/m²

Heating Operation:

Operating Days:	212 Days
Not Operating:	1.5 - 30.9

Room Temperature Reduction:

Drawdown of:	5 C
Night Period:	0 : 00 - 6 : 00 23 : 00 - 24 : 00

Resulting Space Heating Requirement:

Hours of Full Utilisation [h]:	1366 Hours
Annual Space Heating Requirement:	6,15 MWh
Specific Annual Space Heating Requirement:	49,19 kWh/m²

T*SOL Pro 4.5 Page 2 08.07.2010

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Collector Loop (CL 1)

Volumetric Flow Rate:	162 l/h
Specific Vol Flow Rate:	18 l/hPer m² Collector Area
Heat Transfer Medium: Water with	40 % Glycol
Heat Capacity of Mixture:	3588 Ws/kg/K

Control:
The collector loop pump control is dependent on the difference between the collector flow temperature and the tank reference temperature.

Switch on above a difference of:	15 C
Switch off below a difference of:	5 C

Collector Array

Total Gross Surface Area:	10,29 m²
Total Active Solar Surface Area	9 m²
Number of Collectors:	3

Installation (Lengthwise):

Tilt Angle:	45 °
Azimuth Angle:	0 °
Collector Surface Area Irradiation (Gross Surface):	13,04 MWh

Piping:
Single (One-Way) Length of Piping System

Inside:	8 m
Outside:	1 m
Between Collectors:	200 mm/Collector

Heat Insulation Thermal Conductivity Coefficient

Inside:	0,025 W/(m*K)
Outside:	0,045 W/(m*K)
Between Collectors:	0,045 W/(m*K)

Nominal Diameter of Piping

Inside and Outside:	15 mm
Between Collectors:	10 mm

(Corresponds to a flow velocity of approx 0,5 m/s)

Thickness of Insulation

Inside:	20 mm
Outside:	20 mm
Between Collectors:	20 mm

Evacuated Tube Collector

Manufacturer:	IVT Latento GmbH

2

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Evacuated Tube Collector

Size:

Gross Surface Area:	3,43 m²
Active Solar Surface:	3 m² (Absorber Area)

Heat Capacity:

Specific Heat Capacity:	8416 Ws/m²/K

Heat Losses:

Single Thermal Transmittance Coefficient:	0,885 W/m²K
Quadratic Thermal Transmittance Coefficient:	0,001 W/m²K²

Optical Losses:

Conversion Factor:	64,2 %
Incident Angle Modifier (IAM) for Diffuse Radiation:	92 %

Incident Angle Modifier for Direct Percentage of Radiation Depending on Entry Angle

Incident Angle Modifier (IAM) for Diffuse Radiation:	92 %
Along Pipe:	Across Pipe:
0 °: 100 %	0 °: 100 %
5 °: 99,93 %	5 °: 100,2 %
10 °: 99,72 %	10 °: 100,5 %
15 °: 99,37 %	15 °: 100,75 %
20 °: 99 %	20 °: 101 %
25 °: 98,14 %	25 °: 101,5 %
30 °: 97,22 %	30 °: 102 %
35 °: 96,03 %	35 °: 102,5 %
40 °: 94,5 %	40 °: 103 %
45 °: 92,55 %	45 °: 101 %
50 °: 89 %	50 °: 99 %
55 °: 87 %	55 °: 103 %
60 °: 80 %	60 °: 105 %
65 °: 75,42 %	65 °: 106 %
70 °: 65 %	70 °: 110 %
75 °: 48,47 %	75 °: 87 %
80 °: 20,1 %	80 °: 58 %
85 °: 14 %	85 °: 29 %
90 °: 0 %	90 °: 0 %

Combination Tank (int HE)

Manufacturer:	IVT GmbH Co KG
Type:	Latento XXL
Volume:	536 l
Specific Volume:	40 m³ Per m² Collector Area
Specific Volume:	50 % of Daily Consumption
Height/Diameter:	2,20

Insulation:

Thickness of Insulation:	80 mm
Thermal Conductivity:	0,023 W/(m*K)

T*SOL Pro 4.5 Page 4 08.07.2010

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Combination Tank (int HE)

Connections:

	Height:	Losses:
Upper Tank Outlet:	99 %	0,25 W/K
Lower Tank Inlet:	1 %	0,25 W/K
Circulation Return:	-without-	

Heat Exchanger Collector Loop Connection:

	Height:	Losses:
Return:	2 %	0,25 W/K
Flow:	40 %	0,25 W/K

Space Heating Connection:

	Height:	Losses:
Return:	45 %	0,25 W/K
Flow:	55 %	0,25 W/K

Burner Connection:

	Height:	Losses:
Return:	60 %	0,25 W/K
Flow:	90 %	0,25 W/K

Heat Exchanger:

kA Value: Collector Loop Connection:	790,59 W/K per Litre Tank Volume
Domestic Hot Water Supply:	1383,53 W/K per Litre Tank Volume
UEbergang Zone 1 - Zone 2:	30 %of Tank Height
UEbergang Zone 2 - Zone 3:	60 %of Tank Height
kA Percentage Zone 1:	40 %
kA Percentage Zone 2:	20 %
kA Percentage Zone 3:	40 %

Control:

Desired Tank Temperature:		Desired DHW Temp + 10 C
Limited Load Times:		0 : 00 - 10 : 00 12 : 00 - 16 : 00
	Height:	Switching Temp:
Switch On Auxiliary Heating:	65 %	-5 C
Switch Off Auxiliary Heating:	65 %	0 C
Collector Loop - Switch On/Off:	19 %	
Switch Off Collector Loop:	90 %	90 °C
Switch On Redirection Valve at:		5 C

Gas Condensing Boiler

Manufacturer:	T*SOL Bibliothek
Type:	Gas Condensing Boiler - 8
Nominal Output:	8 kW
Burner Type:	Modulating Boiler
Temperature Range:	5 C / 20 C / 30 C
Return Mixing Valve:	None

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Gas Condensing Boiler

Control:

Burner Connection:	
Fuel:	Natural Gas (H)
Efficiency:	91 %
with a Return Temperature of:	60 °C
Efficiency:	101 %
with a Return Temperature of:	30 °C
Domestic Hot Water Supply Efficiency:	70 %
Efficiency related to Higher Heating Value Hs (HHV):	83,03 %
with a Return Temperature of:	60 °C
Efficiency related to Higher Heating Value Hs (HHV):	92,16 %
with a Return Temperature of:	30 °C
Domestic Hot Water Supply Efficiency related to Higher Heating Value Hs (HHV):	63,87 %
Hi (LHV):	37512 kJ/m³
Not Operating:	-No Limitation-

Space Heating Loop

High Temp Heating Loop:

Flow Temperature:	60 °C
Return Temperature:	40 °C

Low Temp Heating Loop:

Flow Temperature:	35 °C
Return Temperature:	28 °C

Distribution to Heating Loops:

Percentage of HT Loop when split amongst loops:	0 %

Results of Annual Simulation

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Natural Gas (H) Savings in m³												
441	20	31	41	57	42	43	43	43	41	38	27	15
CO2 Emissions Avoided in kg												
932	43	65	87	120	90	91	91	90	87	80	58	32
Total Solar Fraction in %												
39	14	24	34	63	100	100	100	100	99	51	24	10
DHW Solar Fraction in %												
76	39	56	70	88	100	100	100	100	99	74	47	33
Heating Solar Fraction in %												
17	7	14	21	50	0,0	0,0	0,0	0,0	0,0	35	15	4

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Results of Annual Simulation

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
System Efficiency in %												
34	45	46	46	45	27	25	23	24	31	45	46	44
Solar Contribution to DHW in kWh												
2.906	127	173	223	282	362	329	315	316	319	211	144	105
Solar Contribution to Heating in kWh												
1.025	80	137	190	285	0,0	0,0	0,0	0,0	0,0	151	133	49
Boiler Energy to DHW in kWh												
921	196	134	96	40	1	0,0	0,0	0,0	3	75	161	216
Boiler Energy to Heating in MWh												
5	1	0,8	0,7	0,3	0,0	0,0	0,0	0,0	0,0	0,3	0,7	1
Energy: Aux Heating in MWh												
6	1	1,0	0,8	0,3	0,0	0,0	0,0	0,0	0,0	0,4	0,9	1
Energy Supply to Solar System in MWh												
4	0,2	0,3	0,4	0,6	0,4	0,3	0,3	0,3	0,3	0,4	0,3	0,2
Energy from Boiler to Tank in kWh												
921	196	134	96	40	1	0,0	0,0	0,0	3	75	161	216
Boiler Energy to Heating in MWh												
5	1	0,8	0,7	0,3	0,0	0,0	0,0	0,0	0,0	0,3	0,7	1
Global Radiation - Horizontal in kWh/m²												
1.101	25	46	77	127	158	159	162	140	95	59	32	20
Wind Speed in m/s												
4	5	5	5	5	4	4	4	4	4	4	4	5
DHW Heating Energy Supply in kWh												
2.963	293	268	269	255	228	216	195	216	213	247	274	291
DHW Heating Energy Requirement in kWh												
2.963	293	268	269	255	228	216	195	216	213	247	274	291
DHW Temperature in °C												
45	45	45	45	45	45	45	45	45	45	45	45	45
Preset DHW Consumption in m³												
73	7	6	6	6	6	5	5	6	5	6	7	7
DHW - Consumption in m³												
45	5	5	4	4	3	3	2	3	3	4	5	5
Heating Energy Requirement in MWh												
6	1	1,0	0,9	0,6	0,0	0,0	0,0	0,0	0,0	0,4	0,9	1

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Results of Annual Simulation

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy from Collector Loop (CL 1) in MWh												
4	0,2	0,3	0,4	0,6	0,4	0,3	0,3	0,3	0,3	0,4	0,3	0,2
Collector Loop Efficiency (CL 1) in %												
34	45	46	46	45	27	25	23	24	31	45	46	44
T Coll out (CL 1) in °C												
68	44	50	56	69	89	94	97	94	88	61	50	40
Volumetric Flow Rate (CL 1) in m³												
242	15	23	28	34	19	17	16	16	18	24	19	13
Specific Global Radiation onto Inclined Surface Area (CL 1) in kWh/m²												
1.268	51	75	100	140	152	144	151	144	114	90	67	39
Specific Global Radiation onto Inclined, Shaded Surface (CL 1) in kWh/m²												
1.268	51	75	100	140	152	144	151	144	114	90	67	39
Irradiation onto Gross Surface Area -unshaded- (CL 1) in MWh												
13	0,5	0,8	1	1	2	1	2	1	1	0,9	0,7	0,4
Irradiation onto Gross Surface Area (CL 1) in MWh												
13	0,5	0,8	1	1	2	1	2	1	1	0,9	0,7	0,4
Irradiation onto Active Solar Surface Area -unshaded- (CL 1) in MWh												
11	0,5	0,7	0,9	1	1	1	1	1	1	0,8	0,6	0,3
Irradiation onto Active Solar Surface Area (CL 1) in MWh												
11	0,5	0,7	0,9	1	1	1	1	1	1	0,8	0,6	0,3
Optical Losses (CL 1) in MWh												
4	0,2	0,3	0,3	0,5	0,5	0,5	0,5	0,5	0,4	0,3	0,2	0,1
Losses - External Piping (CL 1) in kWh												
149	4	6	8	11	22	21	23	22	15	8	5	3
Losses - Internal Piping (CL 1) in kWh												
466	7	12	19	31	73	74	85	79	52	21	10	5
Thermal Collector Losses (CL 1) in kWh												
2.537	66	97	129	182	383	366	410	390	256	122	82	55
Tank Losses in kWh												
868	31	36	49	67	110	112	120	117	104	55	36	30
Change of Energy Level in kWh												
-2,9	-1,8	3	1	-0,5	26	0,3	0,8	-16,8	6	-16,0	-4,7	0,0
Heating Return Increase Energy in kWh												
1.025	80	137	190	285	0,0	0,0	0,0	0,0	0,0	151	133	49

2

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Results of Annual Simulation

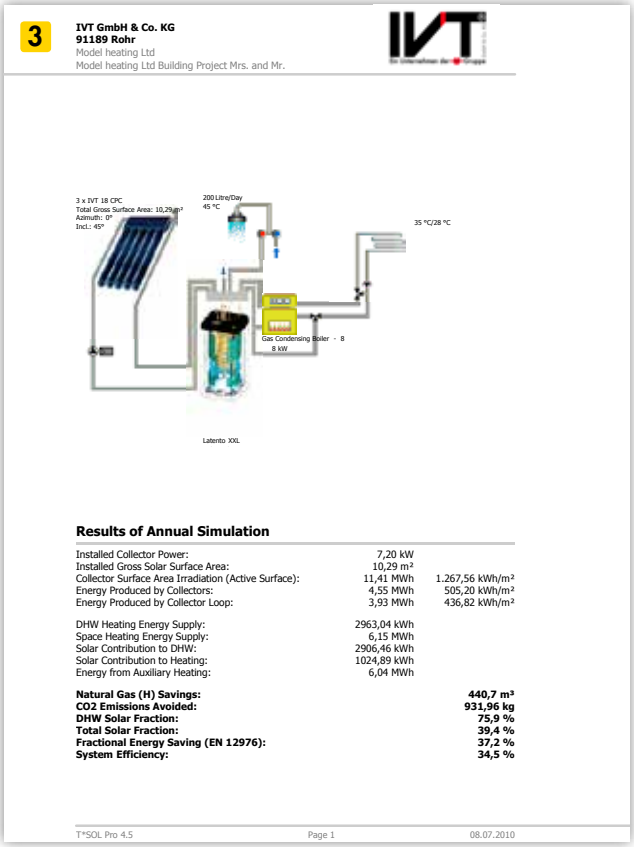
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Energy from Boiler in MWh												
6	1	1,0	0,8	0,3	0,0	0,0	0,0	0,0	0,0	0,4	0,9	1
Primary Energy Equivalent in MWh												
6	1	1,0	0,8	0,3	0,0	0,0	0,0	0,0	0,0	0,4	0,9	1
Consumption Natural Gas (H) in m³												
581	126	94	78	31	0,2	0,0	0,0	0,0	0,3	34	87	131
Low Temperature Space Heating Loop Energy in MWh												
6	1	1,0	0,9	0,6	0,0	0,0	0,0	0,0	0,0	0,4	0,9	1

T*SOL Pro 4.5 Page 9 08.07.2010

We use in our example 3 IVT CPC 18 collectors for solar hot water heating and backup heating for the solar simulation.

By this, 72 % of the hot water requirement will be covered corresponding to an energy quantity of 2976 kWh.

The covering fraction of heat requirement for the heating system is 16,9 % corresponding to an energy quantity of 1147 kWh. The total covering of the power demand for heating and hot water is 37 %. The total saving of natural gas is 438 m^3. 3



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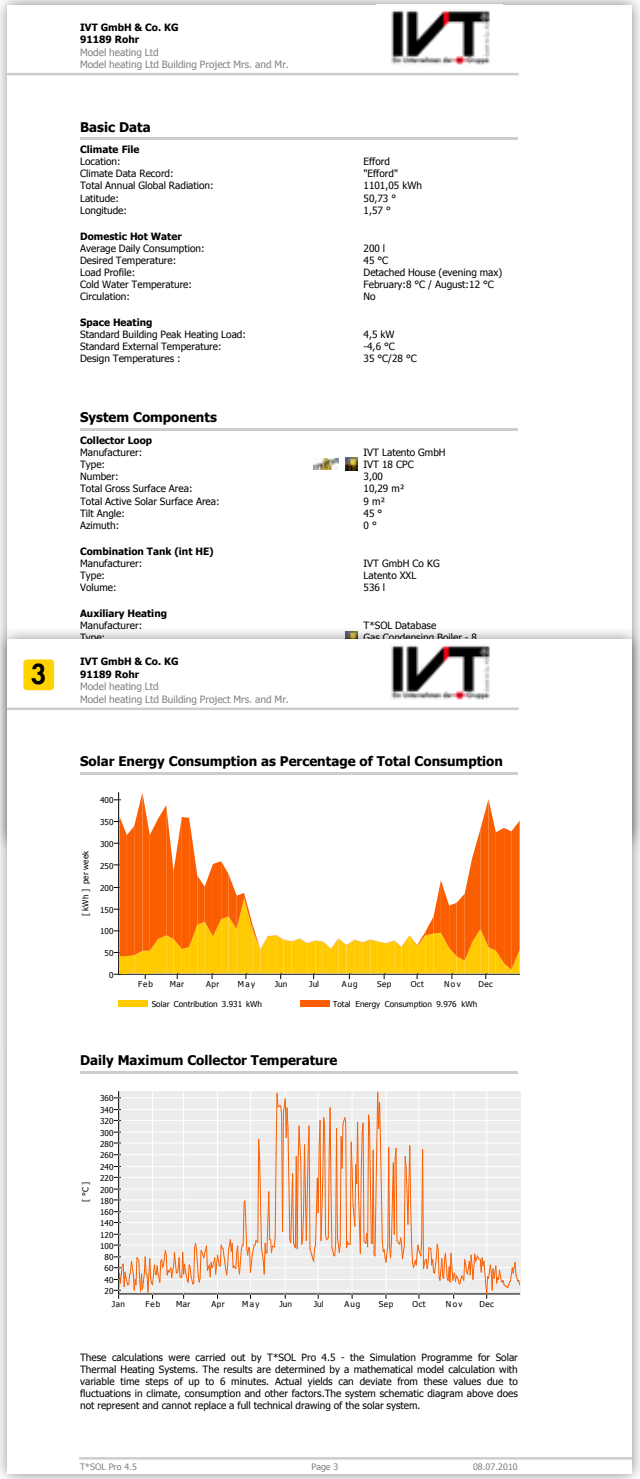
Model heating Ltd
Model heating Ltd Building Project Mrs. and Mr.

Results of Annual Simulation

Installed Collector Power:	7,20 kW	
Installed Gross Solar Surface Area:	10,29 m²	
Collector Surface Area Irradiation (Active Surface):	11,41 MWh	1.267,56 kWh/m²
Energy Produced by Collectors:	4,55 MWh	505,20 kWh/m²
Energy Produced by Collector Loop:	3,93 MWh	436,82 kWh/m²
DHW Heating Energy Supply:	2963,04 kWh	
Space Heating Energy Supply:	6,15 MWh	
Solar Contribution to DHW:	2906,46 kWh	
Solar Contribution to Heating:	1024,89 kWh	
Energy from Auxiliary Heating:	6,04 MWh	
Natural Gas (H) Savings:		**440,7 m³**
CO2 Emissions Avoided:		**931,96 kg**
DHW Solar Fraction:		**75,9 %**
Total Solar Fraction:		**39,4 %**
Fractional Energy Saving (EN 12976):		**37,2 %**
System Efficiency:		**34,5 %**

T*SOL Pro 4.5 Page 1 08.07.2010



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Model heating Ltd
Model heating Ltd Building Project Mrs. and Mr.

Basic Data

Climate File

Location:	Efford
Climate Data Record:	"Efford"
Total Annual Global Radiation:	1101,05 kWh
Latitude:	50,73 °
Longitude:	1,57 °

Domestic Hot Water

Average Daily Consumption:	200 l
Desired Temperature:	45 °C
Load Profile:	Detached House (evening max)
Cold Water Temperature:	February:8 °C / August:12 °C
Circulation:	No

Space Heating

Standard Building Peak Heating Load:	4,5 kW
Standard External Temperature:	-4,6 °C
Design Temperatures :	35 °C/28 °C

System Components

Collector Loop

Manufacturer:	IVT Latento GmbH
Type:	IVT 18 CPC
Number:	3,00
Total Gross Surface Area:	10,29 m²
Total Active Solar Surface Area:	9 m²
Tilt Angle:	45 °
Azimuth:	0 °

Combination Tank (int HE)

Manufacturer:	IVT GmbH Co KG
Type:	Latento XXL
Volume:	536 l

Auxiliary Heating

Manufacturer:	T*SOL Database

3

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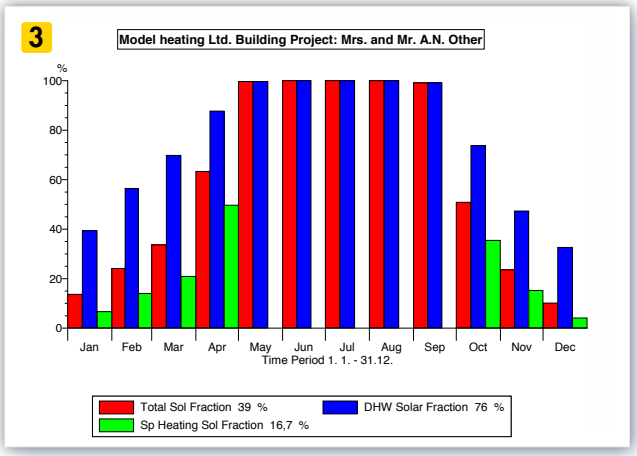
Model heating Ltd
Model heating Ltd Building Project Mrs. and Mr.

Solar Energy Consumption as Percentage of Total Consumption

Daily Maximum Collector Temperature

These calculations were carried out by T*SOL Pro 4.5 - the Simulation Programme for Solar Thermal Heating Systems. The results are determined by a mathematical model calculation with variable time steps of up to 6 minutes. Actual yields can deviate from these values due to fluctuations in climate, consumption and other factors.The system schematic diagram above does not represent and cannot replace a full technical drawing of the solar system.

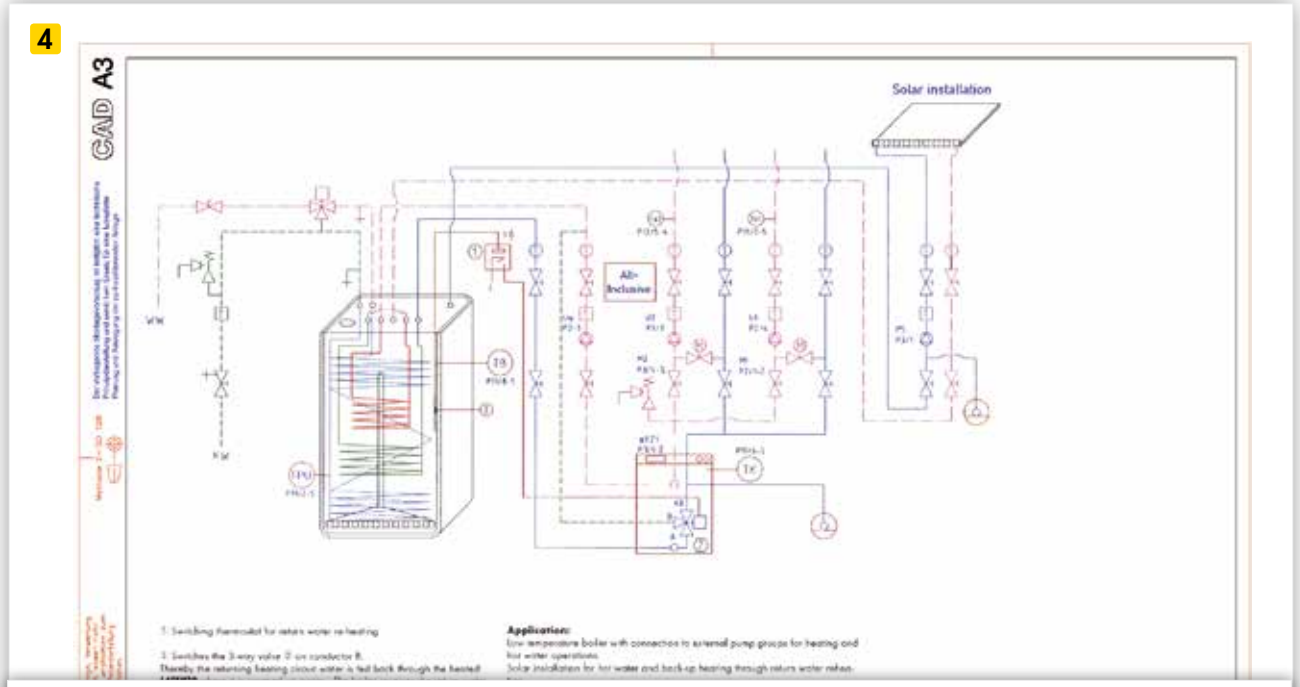
T*SOL Pro 4.5 Page 3 08.07.2010



3

An installation proposal (acc. to the data collection sheet) will be prepared for the hydraulic connection of the ***LATENTO*** XXL. **4**

4



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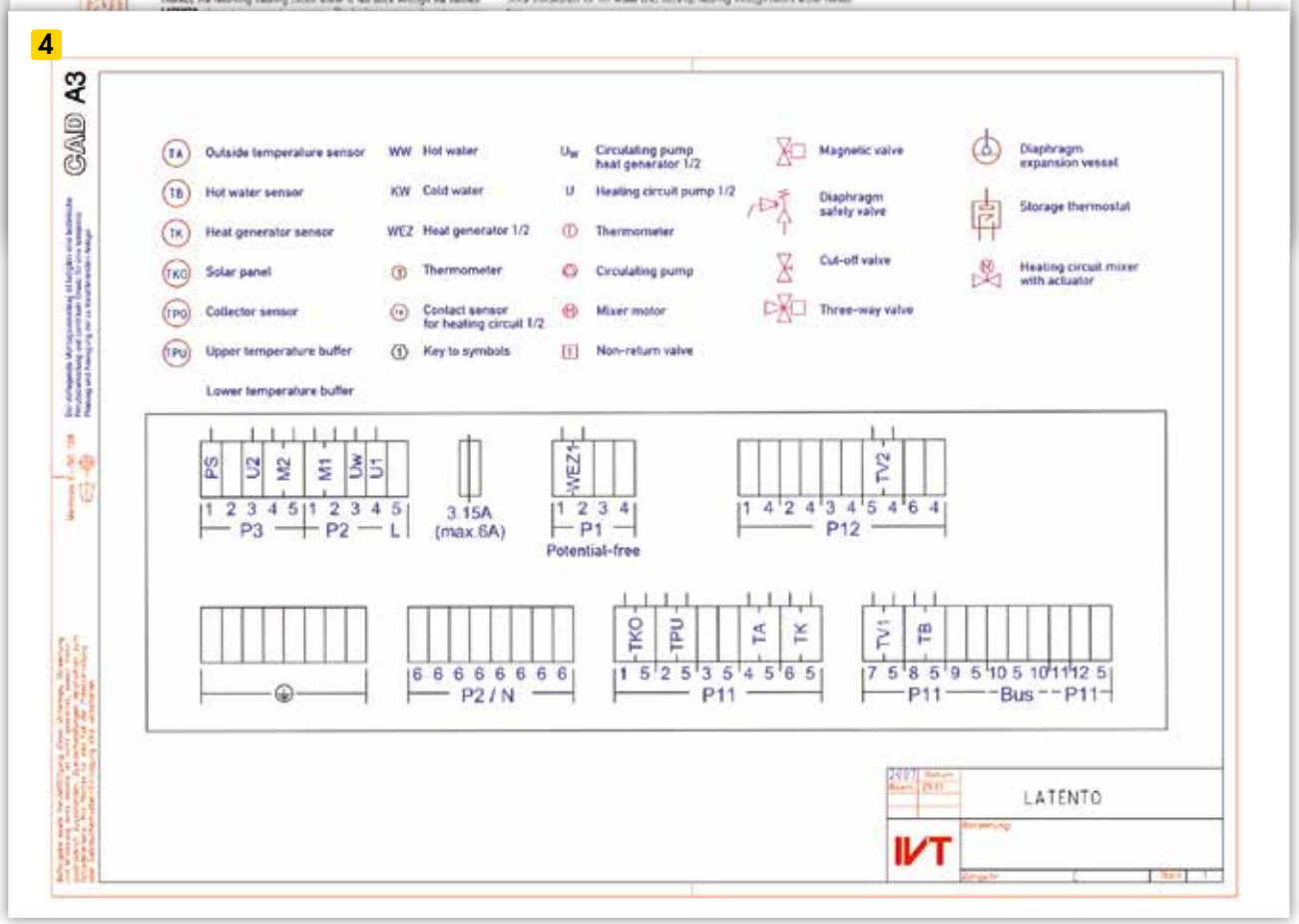
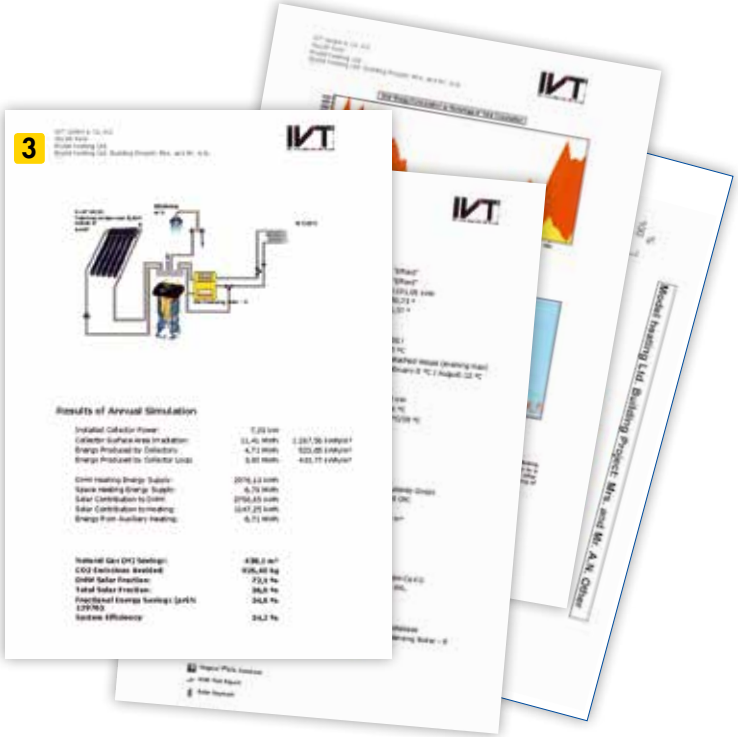


4

You will receive the project 3 documents, the order list 6 with the required components and the solar simulation along with the cover letter 5 .



Data entry thermal solar system

For preparation of a non-binding Installation suggestion

LATENTO®

Executing company:

Company:	
Customer-ID:	
Address:	
Location:	
Phone:	
Fax:	

Address of object:

Name:	
Address:	
Location:	

Sales representative:	
Requested delivery date:	

Is a solar simulation (art. no. 878 700 200) at a cost of 150 € required? Should you choose to complete your project by installing a ***LATENTO*** solar system, the planning fee will be deducted from the purchase price. Yes ☐ No ☐

System control favoured: Yes ☐ No ☐

Building

Established building ☐ New building ☐

Type of house:

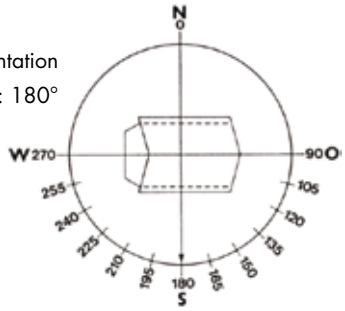
Passive house ☐ Low energy house (modern construction) ☐ Massive house construction (eighties–nineties) ☐ Old building (before 1980) Year of constr. approx. _____ ☐

Size of building:

One-family house ☐ Apartment building (Flats: _____) ☐ Industrial building / other ☐

Specifications of solar system

Roof orientation
Example: 180°



Utilisation of the solar energy for:

Water heating ☐ Support of the heating system ☐

Mounting of the collectors:

On-roof mounting ☐ Flat-roof mounting ☐ Free mounting ☐

Pitch angle (collector tilt): _____ °

Single pipeline length from the collector to the storage: _____ m

Roof facing: _____ ° (see illustration, example: 180 °)

Shadowing of the collector: Yes ☐ No ☐

Form of shadowing: House ☐ Tree ☐ Other: _____ ☐

Shadow over the collector = m **Width of the obiect** = m

Data entry thermal solar system

For preparation of a non-binding Installation suggestion

LATENTO®

Heat generation

Primary heat generator:

Oil or gas boiler ☐ Condensing boiler ☐ Natural gas ☐ Conventional ☐ Pellet-fired stove ☐

Solid fuel boiler ☐ Elec. Heating element ☐ Heat pump ☐ Other: _____ ☐

Secondary heat generator:

Oil or gas boiler ☐ Condensing boiler ☐ Natural gas ☐ Conventional ☐ Pellet-fired stove ☐

Solid fuel boiler ☐ Elec. Heating element ☐ Heat pump ☐ Other: _____ ☐

Data referring to heat generator:

Controlled by atmospheric conditions: Yes ☐ No ☐

Power (kW):	
Max. temperature of supply piping (°C):	
Model/Type:	

Data referring to heat generator:

Controlled by atmospheric conditions: Yes ☐ No ☐

Power (kW):	
Max. temperature of supply piping (°C):	
Model/Type:	

Water heating

Number of persons: _____

Hot water requirement per person and day at 45 °C:

30 l (low) ☐ 50 l (middle) ☐ 70 l (high) ☐

Number of bath tubs: _____ **Shower bases:** _____

Large-scale customer of hot water > 150 litre (e. g. Whirlpool): Yes ☐ No ☐

Kind: _____ **Indication of litre:** _____

Usage of shower and bathing: In the morning ☐ In the evening ☐ Both ☐

Circulation pipe: Yes ☐ No ☐ **(Length of streamed pipeline network:** _____ m**)**

Heating support

Heat demand of the building: _____ kW **Heated living area in total:** _____ m^2

Heated living area:

with radiators (m^2):		
System temperatures (°C):	flow	return

with floor heating (m^2):		
System temperatures (°C):	flow	return

Controlled by atmospheric conditions: Yes ☐ No ☐

Controlled by atmospheric conditions: Yes ☐ No ☐

Length of the heating period: From _____ to _____

Data entry thermal solar system

For preparation of a non-binding Installation suggestion

LATENTO®

Further information

Comments or specific characteristics (e.g. specific installation situations, slated roof etc.)

Drawing of installation layout or hydlaulic scheme

IVT GmbH & Co. KG will use the data acquired here to design the basic layout of a thermal solar system, thus creating a non-binding assembly proposal and list of materials. The underlying calculations are exclusively based on customer specifications and on generally accessible calculation methods. They are therefore only approximate and do not replace expert planning! We cannot be held liable for any inaccuracies contained in the data and calculations given here. IVT GmbH & Co. KG hereby expressly excludes any liability resulting from these non-binding calculations. By signing this declaration below, the customer acknowledges the conditions provided by IVT GmbH & Co. KG as binding.

Date | **Name executing company (block letters)** | **Signature**

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D - 91189 Rohr
Hotline +49 9876 9786 97
Fax +49 9876 9786 69
info@ivt-rohr.de • www.ivt-rohr.de

IVT
MEMBER OF THE WÜRTH GROUP

5. Stratified storage tank XXL/WP-S

Technical documentation

Technical documentation

This technical documentation comprises contents that are important for the qualified installer as well as the end user. This technical documentation must remain with the ***LATENTO*** XXL after installation or handed over to the end user for storage.

Proven according to DIN
The pressureless solar stratified storage tank ***LATENTO*** XXL was tested through the Research Association HVAC (Heating, Ventilation, & Air Conditioning) at the Stuttgart University. The tests were conducted according to DIN 4708, part 3 and DIN 4753, part 8. (Test report no. I 04 B2 050 001)

1. Safety Notes

Two different stages of safety notes are used in this documentation:

NOTE

Indicates a note that failure to comply would endanger personal safety, i.e.: there is risk of injuries.

CAUTION

Indicates a note on equipment safety. Failure to comply may cause damage to the device described.

CAUTION

The technical documentation must be exactly observed. IVT GmbH & Co. KG does not assume any liability for damages derived from non-observance of this technical documentation or the applicable standards and installation instructions.

NOTE

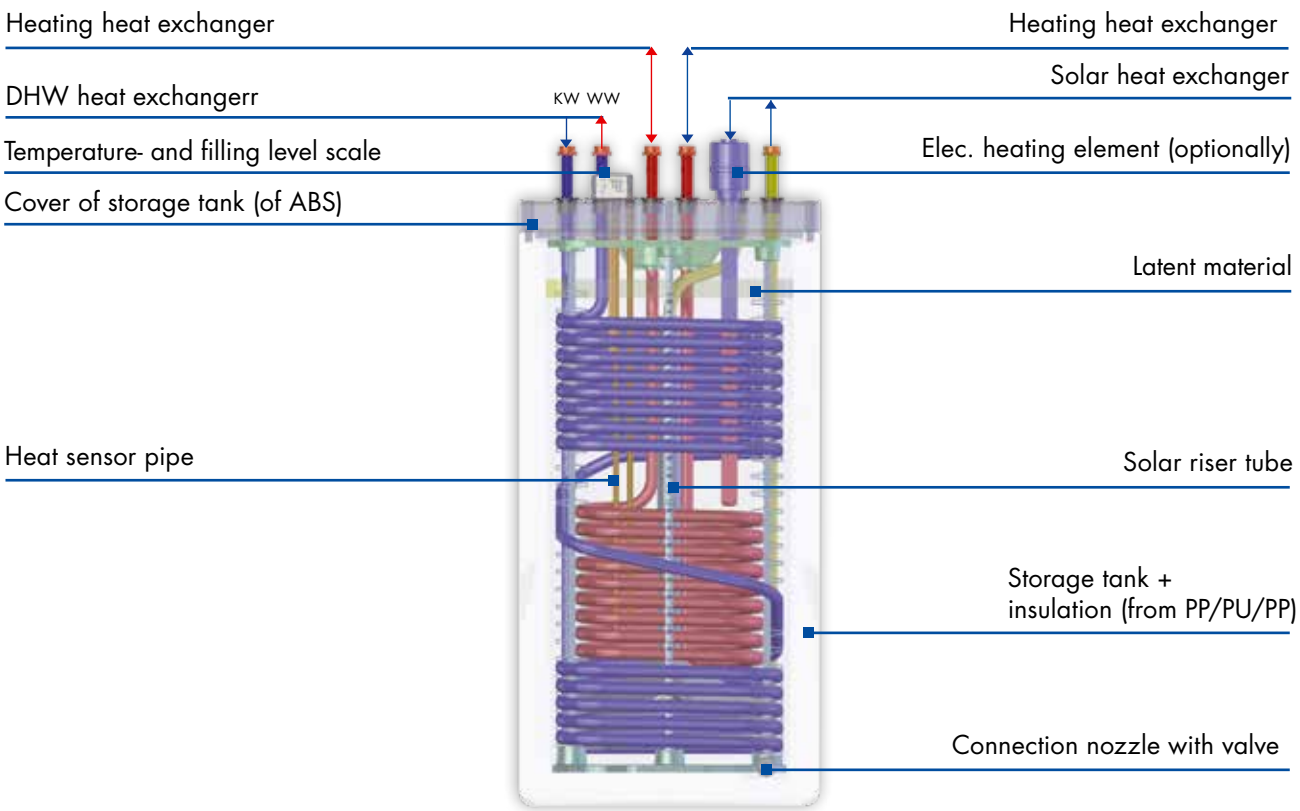
Risk of scalding when opening the storage tank cover during operation: There may be up to 85 °C in the storage tank! Since the latent material on the surface prevents the water from evaporating, the temperature of the storage water is often underestimated. Therefore, check the temperature of the storage water, before you start any work on the *LATENTO* XXL. Wait until the *LATENTO* XXL has cooled to 40 °C or less before commencing any work on the *LATENTO* XXL.

Installation and commissioning of the *LATENTO* XXL as well as all repair work must only be carried out by persons who have been accordingly qualified and authorized.

In the case of problems with the ***LATENTO*** XXL which you cannot solve using this technical documentation, the ***LATENTO*** hotline will gladly be at your service.

LATENTO Hotline: +49 (0) 9876/9786–60

2. Designation of the components



Illustrations similar

All heat exchangers of long-wave stainless steel corrugated pipes DN 25 da 32.8 mm, connections G 1¼".

3. Product Description

The ***LATENTO*** XXL is an unpressurised stratified solar storage tank that was developed for employment in a one-/two-family house. Apartment houses (multi-family houses) can be supplied via several ***LATENTO*** XXL Tichelmann-system connected units.
The ***LATENTO*** XXL has the capacity of storing approx. 20 kWh solar energy (= free energy). The insulation of the storage tank has been designed such that the accumulated energy can be stored over several days. Depending on power demand, this renders supply possible that covers a spell of bad weather too.
In the case of insufficient solar energy, the ***LATENTO*** XXL, using other heat sources, can be heated up to the temperature required to guarantee supply of sufficient hot water, and during the heating period, of sufficient heating power. The ***LATENTO*** system regulator allowing control of the entire heating system, enables adaptation to your individual requirements. Thereby the conventional energy fed into the ***LATENTO*** XXL must be subtracted from the possible charging capacity for the solar charge (cf. the Chapter Adaptation to Your Individual Requirements on page 60).

Latent material:
The ***LATENTO*** XXL can be operated with max. 20 kg of latent material. The latent material melts at a temperature of approx. 65 °C. While doing so, it absorbs approx. 1.1 kWh heat energy without the temperature changing in the storage tank at all. So energy can be stored without major heat-losses – as it is the case at temperature rise, for instance. When the storage tank cools below 65 °C, the latent material will re-solidify dissipating the stored energy to the storage water.

Moreover, the latent material prevents evaporation of the storage water. To minimise water and energy losses, each LATENTO XXL is fitted ex-works with latent material.The latent material does not pose any health hazard. Disposal via normal domestic waste possible.

5

4. Heat generators for Reheating

The ***LATENTO*** XXL is primarily charged with free solar heat. However, if there is not enough solar energy, other heat generators can be utilized for reheating. To guarantee sufficient hot water supply, the supply of the heat generator must have at least a 15 °C higher temperature than the desired hot water temperature (e.g. 60 °C hot water temperature, min. 75 °C flow temperature of the heat generator).

- Elec. heating element: Installation proposal A, Chapter 11 in the ***LATENTO*** catalogue
- Boiler unit with high flow temperature (min. 60 °C): Installation proposal B, Chapter 11 in the ***LATENTO*** catalogue
- Low-temperature boiler: Installation proposal C, Chapter 11 in the ***LATENTO*** catalogue
- Boiler unit with high flow temperature with additional solid material boiler: Installation proposal D, Chapter 11 in the ***LATENTO*** catalogue
- Low-temperature boiler with additional solid material boiler: Installation proposal E, Chapter 11 in the ***LATENTO*** catalogue
- Pellets boiler: Installation proposal F, Chapter 11 in the ***LATENTO*** catalogue
- Heat pump with additional electrical heating element: Installation proposal G, Chapter 11
- District heating

5. Function

Unpressurised solar stratified storage tank:
The storage water in the ***LATENTO*** XXL is only used for heat absorption. The heat is fed in and taken via heat exchangers. Hence the storage water does not have any contact to the heating or DHW system. Thereby problems such as furring up and sludge accumulation in the storage tank and legionella growth in the DHW heat exchanger is prevented.

Solar yield:
Primarily, free solar energy which is utilized for DHW heating and (optionally) to backup heating is stored in the ***LATENTO*** XXL. The solar heat is fed in the ***LATENTO*** XXL via the solar heat exchanger. This happens as soon as the temperature in the collector is higher than the temperature in the lower storage tank region and as long as the ***LATENTO*** XXL is fully heated to maximum temperature. The maximum temperature is stored in the control system on the TPU sensor which is normally preset to 80 °C. By this, a temperature of approx. 85 °C is reached in the upper region (cf. picture of upper storage tank region for hot water supply).

DHW + solar yield:
First of all, the cold water in the DHW heat exchanger will flow through the lower storage tank region. Thereby the region of solar feed-in is cooled and the DHW preheated at the same time. By this, relatively low temperature levels can be utilized too. At the same time, the extraction volume for the hot water is increased.

The solar yield increases through cooling of the lower storage tank region because a larger temperature spreading between feed and return increases the performance of the solar heat exchanger. So the ***LATENTO*** XXL can be charged faster and use solar heat already at low temperatures.

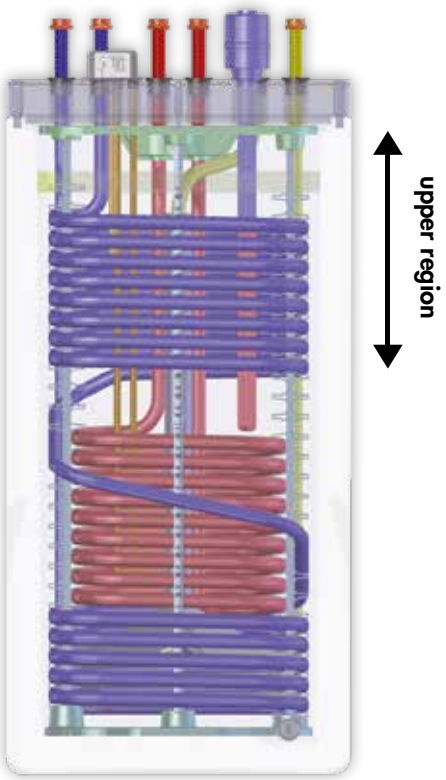
Hot water:
The hot water is heated following the continuous flow heater principle. Thereby the hot water is always generated whenever required. The advantage: The water is fresh at all times and legionella have no chance of growing. What's more, the stainless steel heat exchanger guarantees perfect drinking-water quality and corrosion resistance.

Reheating:
If there is not enough solar energy, the ***LATENTO*** XXL can be heated up to the required temperature via the reheating heat exchanger.
A high flow temperature would be favorable to reheat the ***LATENTO*** XXL. The higher the reheating temperature the faster the ***LATENTO*** XXL can be heated. See Chapter Performance Data on page 64 for data on the heating behavior of the ***LATENTO*** XXL.

Electrical heating element:
Serving as stand-alone solution (power supply only via solar collectors and electrical heating element) or when heat pumps are employed for peak demand, an electrical heating element with 9 kW or 3 kW is optionally offered.

CAUTION

The electrical heating element must only be operated when the *LATENTO* XXL is sufficiently filled with water. Fire hazard! The electrical heating element must only be connected through an authorized professional electrician.



6. Connection notes

Warranty
IVT GmbH & Co. KG will exclusively assume warranty for the functionability of the ***LATENTO*** XXL only then if all notes described in this chapter are observed.
In particular heed the correct hydraulic integration of the ***LATENTO*** XXL: The warranty applies exclusively for that ***LATENTO*** XXL that has been connected following an installation proposal from Chapter "Part 10 Installation Proposals". The responsibility will be with the planning or executing company in case of a hydraulic connection of the ***LATENTO*** XXL deviating from this.

Heating connection
It is essential to take care of professional bleeding (e.g. automatic bleeder) when connecting the ***LATENTO*** XXL to the heat generator/s.

5

CAUTION

If there are steel pipes used in the cold water supply or in the heating grid, beware of the danger of getting steel blades in the drinking water heat exchanger. This has to be prevented by using a filter, otherwise there may be a contact corrosion, causing a permeable drinking water heat exchanger.

6.1 Transportation
The ***LATENTO*** XXL may be tilted max. horizontally for a short time, e.g. when carrying it to the place of installation. Great care must be taken that the cover was closed with all four clamps.
The tilt height of the ***LATENTO*** XXL is approx. 190 cm.

NOTE

The *LATENTO* XXL must always be delivered in a standing position so as to avoid any damage.

6.2 Mounting
Heed the following points when selecting the installation site for the ***LATENTO*** XXL:
- Frost-protected room
- Level, clean swept floor
- Do not subject the ***LATENTO*** XXL to direct solar radiation (the UV can destroy the plastic)
- Heed the load capacity of the foundation, the filled ***LATENTO*** XXL weighs approx. 660 kg (XXL 500).
- Keeping heat-losses as little as can be, place the ***LATENTO*** XXL in the vicinity of the reheating heat generator
- If possible, mount system in a heated room to minimize heat-losses (EnEV – Energy Saving Decree)

NOTE

For operation with electrical heating element (878 700 039): The screwing of the electrical heating element into the *LATENTO* storage tank should take place before its filling and piping.
In areas with low room height (<2,70 m) it can be necessary to tilt the *LATENTO* storage tank in order to insert the electrical heating element.

6.3 Pipework
A thermal mixing valve (Item no. 878 700 021) must be installed to the hot water outlet of the domestic water heat exchanger so as to prevent scalds. The hot water heat exchanger should be 60 °C according to DIN EN 806-2 (June 2005).

Keeping heat-losses of the hot water tube as low as can be, we recommend you to limit the thermal mixing valve to 45 °C–50 °C hot water temperature. Should thermal disinfection become necessary, you may set the mixing valve to 70 °C.

Pressurised flushing connections must be installed in front of the thermal mixer for the flushing and for any descaling of the drinking water heat exchanger that may be necessary. If water hardness exceeds 20° dH (3,57 mmol), we recommend to install a water softening device to avoid an efficiency loss due to limescale in the heat exchangers.

Temperature Sensors
Position the temperature sensors into the sensors glands at the level so indicated in the installation proposal and connect the sensors to the regulation unit. The sensor glands have been dimensioned such that several sensors can be inserted into one sensor gland.

6.4 Temperature- and filling level scale

Is the button shortly pushed, the temperature- and filling level scale will be on for circ. 5 seconds. Is the button pushed until there is "Lon" shown in the scale, the filling level scale will be on for circ. 15 minutes.

Switching temperature unit

To switch the temperature scale from °C to °F and back, push the button during operation (measurement of filling level is shown) as long as temperature is shown with the new unit.

Battery replacement

If battery replacement should become necessary, the housing must be opened and the board loosened. The battery (AA lithium 3.6 V) is on the rear of the PCB. Ensure correct polarity when inserting the battery, + is on the side where the cable is connected to the PCB.

After battery replacement, all the segments of the filling level indicator are shown. The filling level sensor only requires a slight increase in filling level for reinitialisation. This can be achieved through thermal expansion of the water during operation. In individual cases it can be necessary to top up the water level in the ***LATENTO*** slightly. Following this reinitialisation, the correct filling level is displayed again.

Calibration

During calibration, keep the button pressed with the system switched off until "RESET" appears in the display. Then press the button briefly again so that an "X" appears under the "J". After the display has gone out again, calibration is automatically completed. After calibration, the display initially indicates an empty tank even when it is full. As after battery replacement, a slight increase in filling level will lead to the correct filling level being indicated again.

6.5 Filling

After installation the filling level & temperature display must be calibrated (see chapter 6.4)!
Fill the ***LATENTO*** XXL with drinking water via the filling and draining valve. Open the cover for the optional E-heating rod to allow the air displaced by the filling process to escape.

When using the E-heating rod:

Screw the heating rod as far out of the thread as necessary to allow displaced air to escape.

Fill the system with water until the segment display of the filling level indicator is at "OPT". Since the filling level sensor is only located in the topmost 40 cm of the ***LATENTO***, it takes some time for the filling level to be indicated on the display. Put the display into filling mode during filling! With the system switched off, keep the button pressed until the word "LONG" appears in the display. The display then remains switched on for about 15 minutes.

CAUTION

Heed the regulations of the local water distribution company and relevant DIN standards when connecting. The connections must be made pressure-tight. The componenttested safety installations have to be installed according to DIN 4753, Part 1, para. 6.3-7 (safety valve, reflux valve, pressure reducing valve, drainage, control and safety device)

The heating installation must be pressure-checked and flushed due to DIN EN 14336.

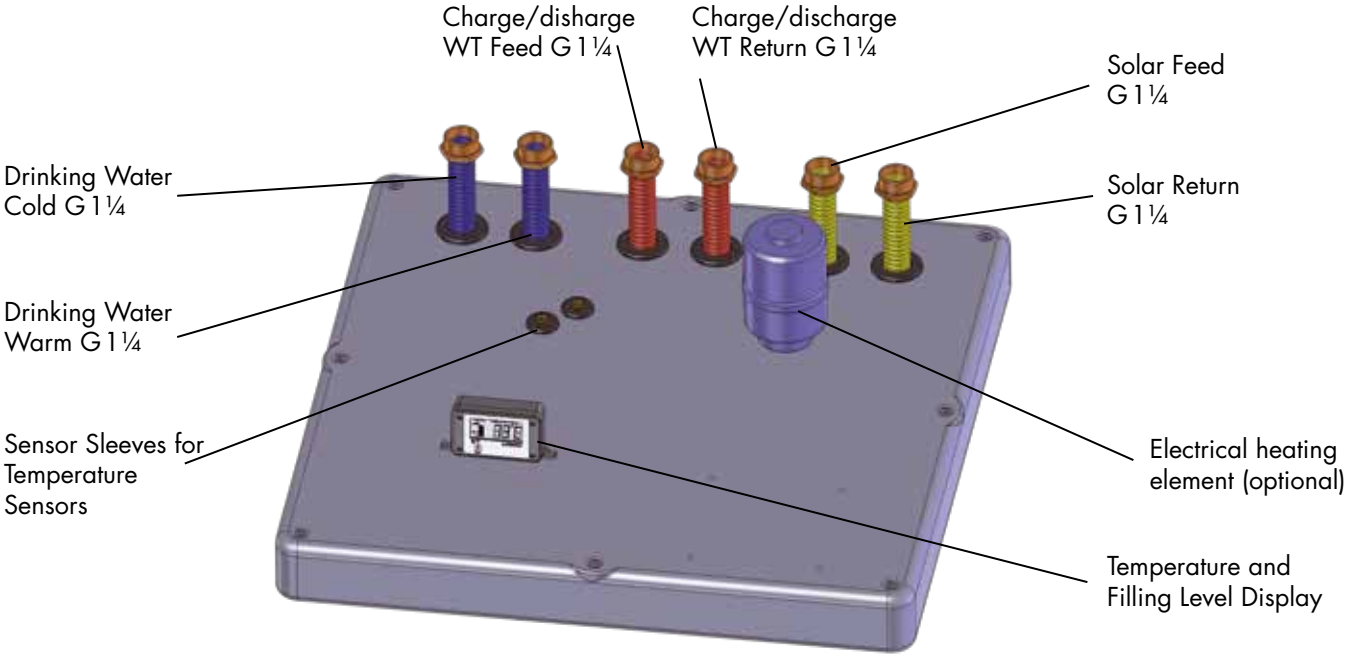
NOTE

The DHW heat exchanger must only be charged with a pressure of max. 15 bar. The heat exchanger would expand if the water pressure exceeded 15 bar. The LATENTO XXL might get damaged because of this.

Due to DIN EN 12502, there is a max. chloride concentration of water of 53 mg/l (warm water) respectively, to be kept. Otherwise there may be hole-/grid-corrosion in the heat exchanger.

6.6 Emptying

If the ***LATENTO*** needs to be emptied, this can also be done via the fill/drain cock on the storage tank cover.
The fill/drain cock is provided on the inside of the storage tank with an immersion tube that reaches up to the tank bottom. This allows the ***LATENTO*** to be emptied using a hose or via gravity (siphon principle) or via a pump.
To do so, as during filling, the cover for the optional electric heating rod must be opened or the electric heating rod must be unscrewed from the thread, to avoid the formation of a vacuum inside the storage tank.



5

7. Adapting to the individual requirements

The ***LATENTO*** XXL has primarily been designed to store free solar heat. The conventional reheating should be limited to a minimum in order to store as much solar heat as can be. There are some tips in the following on how you can achieve this goal:

- Select the storage tank temperature low enough so that it can just cover your hot water requirements. The lower this temperature the more can be stored through the solar yield
- If you leave the house during the morning hours regularly, you may set the hot water heating schedule such that there will not be an conventional reheating after the the tapping of hot water in the morning hence leaving more "space" for the solar yield. It will be in the evening only, when conventional reheating takes place if the required temperature through solar charging should not have been reached
- The less the flow through the DHW heat exchanger, the lower the temperature in the ***LATENTO*** XXL can be to get the same extraction volume of hot water. A flow reduction from 20 l/min to 13 l/min will increase the extraction volume by approx. 25 %

8. Avoiding heat losses

You can operate the system as economic as possible also by avoiding heat-losses. Aside from insulating all hot-water carrying pipes and fittings, there are further measures possible to avoid heat-losses:

You can operate the system as economic as possible also by avoiding heat-losses. Aside from insulating all hot-water carrying pipes and fittings, there are further measures possible to avoid heat-losses:

Circulation pipes will always cause heat-losses!

- Planning the tap connections favorably, a one-family house can do without a circulation pipes
- In case circulation pipes should really be necessary, a circulation pump and a circulation control unit should be installed. Using the circulation control, the circulation pump will only be switched on if required (e.g. a switch in the bathroom, short opening of the hot water, etc.) and only when the temperature in the pipelines has dropped below a defined value. In addition, the running time of the circulating pump should be set to a very short time
- The pump operating as circulation pump should be as small as possible
- Heat-losses are caused through micro circulations too. By installing heat siphons into all hot water carrying pipes (DHW heating and solar), the micro circulation can be reduced

9. Commissioning

Verify the following check list before commissioning the ***LATENTO*** XXL.
Start running the ***LATENTO*** XXL only then when you can answer all questions with "yes".

- Has the container been sufficiently filled with water? ☐ Yes ☐ No
- Has the solar heat exchanger been correctly connected? ☐ Yes ☐ No
- Has the re-/heating heat exchanger (heating circuit, boiler circuit) been correctly connected? ☐ Yes ☐ No
- Has the DHW heat exchanger been correctly connected – including shut-off valves and pressure-rinsing connections? ☐ Yes ☐ No
- Is the pipework complete and correct acc. to the installation proposal? ☐ Yes ☐ No
- Are the heating circuits filled and bled? ☐ Yes ☐ No
- Is the solar circuit filled and bled? ☐ Yes ☐ No
- Are all temperature sensors installed at the right position and connected to the regulation unit? ☐ Yes ☐ No
- Is the storage tank cover attached with clamps and closed tight? ☐ Yes ☐ No
- When using the electrical heating element: Is this element screwed tight in the cover and has been connected by an expert? ☐ Yes ☐ No
- Have all connection pipes and fittings been insulated conforming to standards? ☐ Yes ☐ No
- Are pumps and heat generator connected to the regulation unit correctly? ☐ Yes ☐ No

10. Periodic maintenance work

The ***LATENTO*** XXL is very easy to maintain. The only periodic work would be checking the water level and the system pressures.

Half-yearly

- Check the water level in the ***LATENTO*** XXL: The float must be at the level of the mean temperature in the storage tank (mean temperature = (temperature in the upper region of the storage tank (TPO or TP) + temperature in the lower region of the storage tank (TPU))/2). Refill the storage tank if necessary as described on page 58

5

CAUTION

Risk of scalding!
Before dismantling see that the *LATENTO* XXL is not working and the storage water has cooled.

- Check the system pressure of the solar/boiler/heating system – correct pressure appropriately, whenever required

Whenever required

- Should the performance of the DHW heat exchanger fade, you will need to rinse or descale it. The intervals for this work depend on the hardness of the drinking water and the temperatures in the storage tank
- The solar liquid must be checked in case the power of the solar yield should fade (at existing solar radiation!). Exchange possibly flocculated or brown discolored solar liquid
- Exchange the solar liquid depending on manufacturer information
- The temperature and filling level indicator is battery operated. The battery must be replaced as necessary. For more detailed information, see Chapter 6.4 on the temperature and filling level indicator.

11. Drainage and dismantling

- Drain all pipelines
- Loosen all pipework
- Open the cover of the ***LATENTO*** XXL and remove the solid latent material. (Disposal of the latent material: The latent material can be disposed via normal domestic waste.)
- Drain the ***LATENTO*** XXL via the lower connection nozzle

12. Take back or disposal

In case you stratified solar storage tank ***LATENTO*** XXL should be disposed of, we kindly ask you to give the solar stratified storage tank ***LATENTO*** XXL to a suitable recycling facility. In addition, we offer you to take back the ***LATENTO*** XXL for recycling if it is delivered free of charge to our address.

13. Troubleshooting and remedy

Storage water not heated

- In case of solar power in the collector:
  - Check the solar circuit for disturbances
  - Check the solar pump for function
  - Are flow and return pipes of the solar heat exchanger connected correctly?
  - Any air in the solar circuit? Bleed via air vent plug
  - Check pressure
  - Collector sensor placed correctly?
- In case of conventional reheating:
  - Has the reheating heat exchanger been correctly connected?
  - Check the boiler circuit for disturbances
  - Check pressure
  - Check charging pump for function – trapped air
  - Check of regulation. Are heat generators, pumps and temperature sensors connected correctly?
  - Are the temperature sensors positioned at the right height and functional?

Hot water not heating

- Filling level of the storage water sufficient? Possibly top up?
- Are flow and return pipes of the domestic water heat exchanger connected correctly?
- Is the storage water warm? (vd. storage water not heating)
- Is the thermal mixing valve properly set?

Loss of storage water

- Is the storage tank cover closed with the clamps?
- Check the storage tank cover – tight?
- Is the drain valve on the lower front screw down mounting tight?

The storage tank has identical temperatures on top and bottom

- Are the submersible sensors fitted at the right height?
- Has a too strong circulating pump been installed?
- Is the running time of the circulating pump too long?
- Does hot water enter the cold water supply?

Pressure drop in the system

- Pressure drop in the first weeks through escaping dissolved air is normal!
- Pressure fluctuations of up to 0.3 bar are normal during operation!
- Check system for leak tightness
- Check safety valve for correct installation, leak tightness and function
- Was the bleeding valve shut again after filling?
- Has the expansion vessel been regulated correctly or is it broken?

Storage tank cools over night without hot water consumption

- Does the solar circuit pump run at night? – Check the controller settings!
- Is the collector temperature higher than the outdoor temperature at night? Check the gravity brakes in the flow and return tube of the solar pump group!
- Are all connections insulated?
- Has the hot water outlet been directly laid upwards? (Micro circulation!) Make the connection to the side or use siphon design!
- Does the solar circuit pump run at night? Change timer setting!
- Are the gravity brakes functional? Possibly clean them?
- Is the gravity circulation in the circulation line too strong? Employ a stronger reflux valve or integrate an electric 2-way valve after the circulating pump!

14. Performance data

Performance data when using the electrical heating element

Hot water extraction volume
When heating up using the elec. heating element, a different quantity of hot water depending on the temperature of the upper region of the ***LATENTO*** XXL may be tapped (45 °C, ΔT = 35 K, flow 20 l/min): This temperature is set in the ***LATENTO*** XXL system regulation via the hot water temperature.

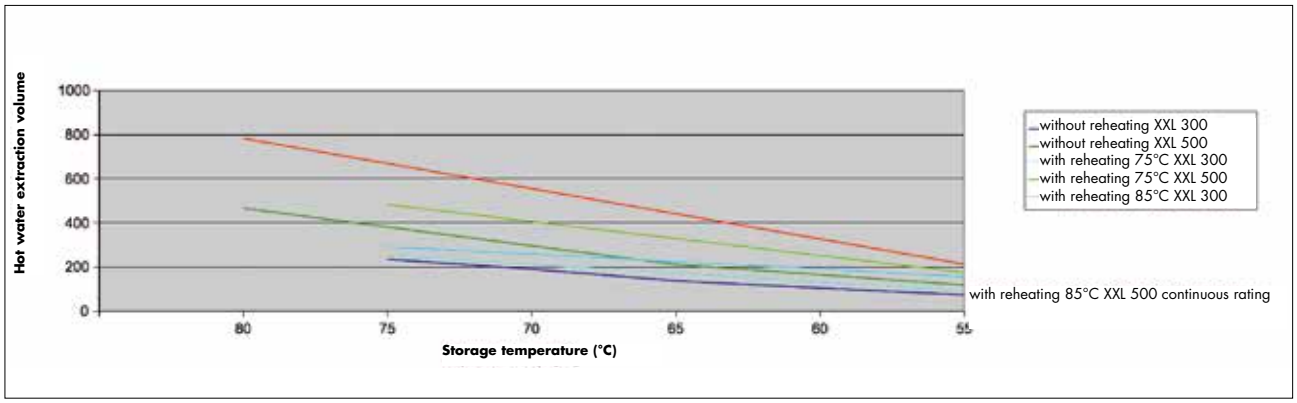
Lower *LATENTO* XXL range cold:
At this measurement, the lower region of the ***LATENTO*** XXL is at the temperature of the cold water (approx. 16 °C). There will be no reheating during hot water tapping. This is e.g. the case when the hot water temperature is set to a lower value than at the time of heating. So solar yield can be waited for over the day before conventional reheating takes place. (Point 7)

Reheating with 75 °C:
Reheating at 75 °C flow temperature is done during hot water tapping. The maximum power consumption is 43 kW.

Reheating with 85 °C:
Reheating at 85 °C flow temperature is done during hot water tapping. The maximum power consumption is 43 kW.

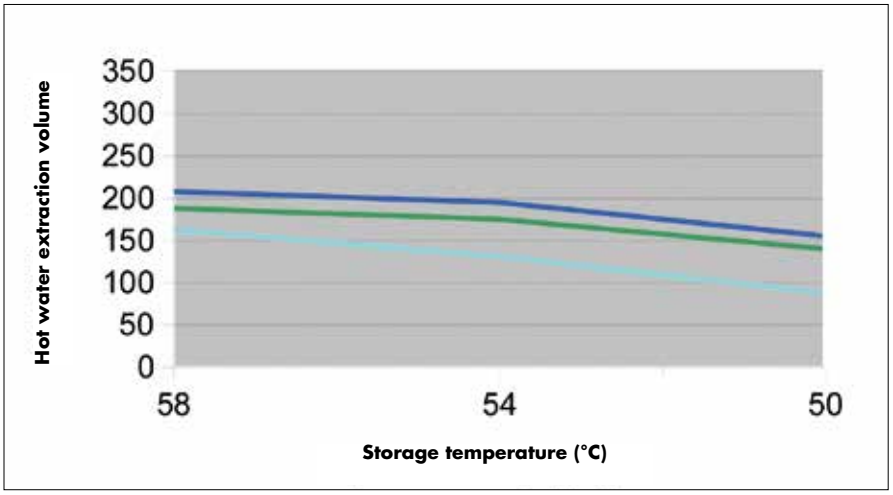
5

Continuous flow *LATENTO* XXL[1]



[1] DHW 45 °C, ΔT = 35 K, 20 l/min flow
At reheating 85 °C (1800 l/h) a continuous flow water temperature of 45 °C (ΔT = 35 °C) is guaranteed.

Hot water extraction volume *LATENTO* WP-S with use of reheating heat-exchanger[1]



[1] DHW 45 °C, ΔT = 35 K, 20 l/min flow

WP-S 500			
Storage temperature in °C	58	54	50
10l/min, 10/45	208	195	155
15l/min, 10/45	188	175	140
20l/min, 10/45	163	131	88

Heating power

The heating power alone is limited via the ***LATENTO*** XXL heating heat exchanger and depends on:

- The flow temperature of the heat generator for reheating
- The temperature to be maintained in the ***LATENTO*** XXL to get the required hot water power
- The maximum required flow temperature of the heating system

15. Technical data ***LATENTO*** XXL

Storage	**XXL 500**
CONTAINER	
Material of internal container	Polypropylene
Material of external container	Polypropylene
Material of insulation	Polyurethane
Material class to DIN 4102-1	B2 - normal flammability
Length l [cm]	78
Width b [cm]	78
Height h [cm]	158
Tilt height [cm]	176
Empty weight [kg]	98
With latent material [kg]	118
Nominal capacity, storage water [l]	536
Mean temperature decrease per hour [K/h]	0,1
Max. storage tank temperature [°C]	85
Tapping rating (65 °C storage temperature) without re-heating [l]	247
Continuous rating (85 °C re-heating) [l/h]	1220
Performance characteristics N_L*	7,3
Continuous output of hot water Q_D [kW]	(bei 85/10/45) 50

Solar heat exchanger	
Length [m]	14
Surface [m²]	2,2
Water content [l]	9,8
Connection	G 1 ¼

Drinking water heat exchanger	
Length [m]	29,1
Surface [m²]	4,2
Water content [l]	20,5
Connection	G 1¼

Heating heat exchanger	
Length [m]	15,8
Surface [m²]	2,3
Water content [l]	11
Connection	G 1¼

* DIN 4708-3 (re-heating 60 kW)

Technical data ***LATENTO*** WP-S

Storage	**WP-S 500**
CONTAINER	
Material of internal container	Polypropylene
Material of external container	Polypropylene
Material of insulation	Polyurethane
Material class to DIN 4102-1	B2 - normal flammability
Length l [cm]	78
Width b [cm]	78
Height h [cm]	158
Tilt height [cm]	176
Empty weight [kg]	105
With latent material [kg]	125
Nominal capacity, storage water [l]	536
Mean temperature decrease per hour [K/h]	0,1
Max. storage tank temperature [°C]	85
Tapping rating (65 °C storage temperature) without re-heating [l]	330
Continuous rating (85 °C re-heating) [l/h]	1700
Performance characteristics N_L*	10*
Continuous output of hot water Q_D [kW]	(bei 85/10/45) 69

Solar heat exchanger	Long-wave stainless steel corrugated pipe DN 25 (ø 32.8 x 0.3 mm)
Length [m]	14
Surface [m²]	2,2
Water content [l]	9,8
Connection	G 1¼

Drinking water heat exchanger	Long-wave stainless steel corrugated pipe DN 25 (ø 32.8 x 0.3 mm)
Length [m]	39,3
Surface [m²]	5,7
Water content [l]	27,5
Connection	G 1¼

Heating heat exchanger	Long-wave stainless steel corrugated pipe DN 25 (ø 32.8 x 0.3 mm)
Length [m]	27,3
Surface [m²]	4
Water content [l]	19
Connection	G 1¼

* DIN 4708-3 (re-heating 60 kW)

6

6. Unpressurized hot water storage tank XW

Technical documentation

LATENTO®

Technical documentation

This technical documentation comprises contents that are important for the qualified installer as well as the end user.
This technical documentation must remain with the ***LATENTO*** XW or handed over to the end customer for storage.

1. Safety Notes

Two different stages of safety notes are used in this documentation:

NOTE

Indicates a note that failure to comply would endanger personal safety, i.e.: there is risk of injuries.

CAUTION

Indicates a note on equipment safety. Failure to comply may cause damage to the device described.

NOTE

The technical documentation must be exactly observed. IVT GmbH & Co. KG does not assume any liability for damages derived from nonobservance of this technical documentation or the applicable standards and installation instructions.

CAUTION

Installation and commissioning of the *LATENTO* XW as well as all repair work must only be carried out by persons who have been accordingly qualified and authorized.

Risk of scalding when opening the storage tank cover during operation: there may be up to 85 °C in the store tank! Since the latent material on the surface prevents the water from evaporating, the temperature of the storage water is often underestimated. Therefore, check the temperature of the store water before you start any work on the *LATENTO* XW. Wait until the *LATENTO* XW has cooled to 40 °C or less before commencing any work on the *LATENTO* XW.

In the event of problems with the ***LATENTO*** XW that you cannot solve with the help of these Fitting and Operating Instructions, help is available to you on the ***LATENTO*** Hotline.

LATENTO Hotline: +49 (0) 9876/9786–60

2. Designation of the components

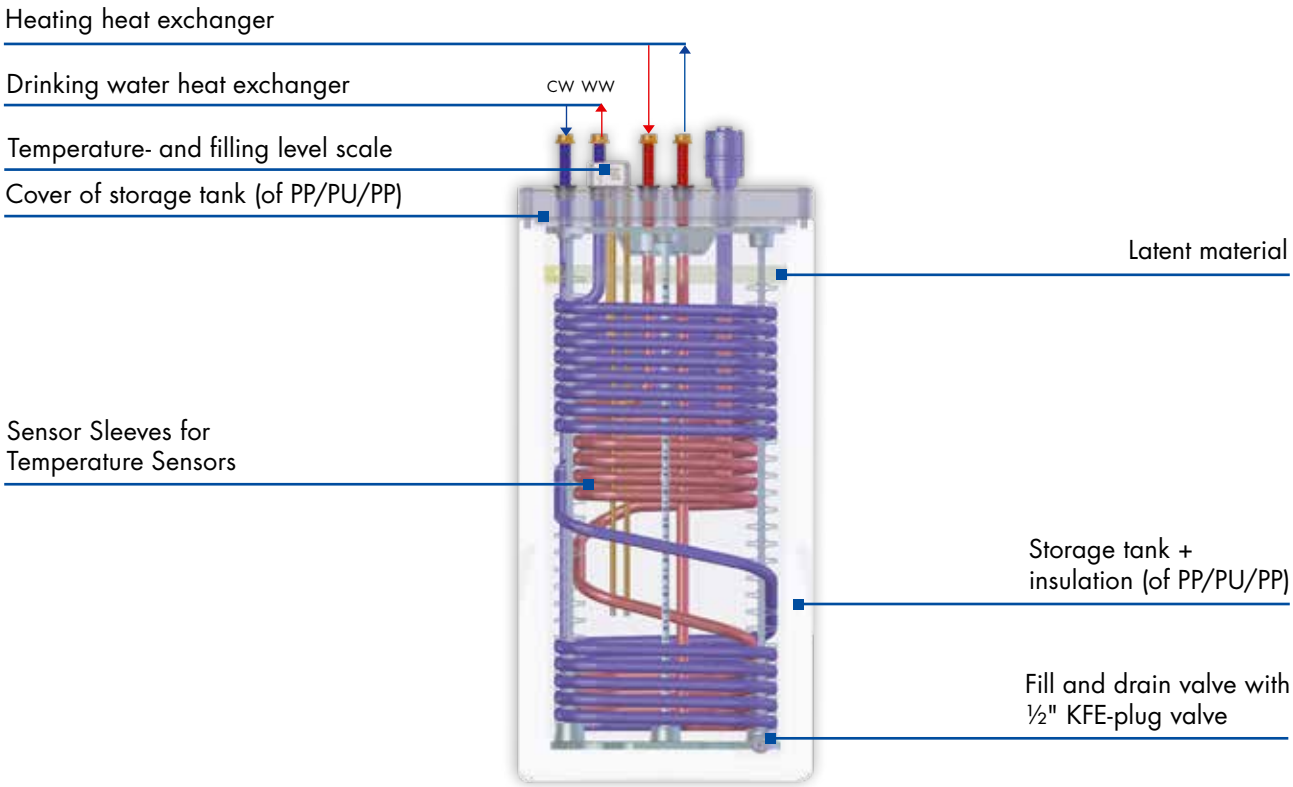


Illustration similar

All heat exchangers of long-wave stainless steel corrugated pipes DN 25 da 32.8 mm, connections G 1¼".

3. Product Description

The ***LATENTO*** XW is an unpressurised hot water storage tank that was developed for employment in a one-/two-family house. Apartment houses (multi-family houses) can be supplied via several ***LATENTO*** XW Tichelmann-system connected units. The ***LATENTO*** XW has been designed for saving energy for the domestic hot water generation. The insulation of the storage tank has been designed such that the accumulated energy can be stored over several days.

The ***LATENTO*** XW may be operated with different heat sources to be heated up to the temperature required to guarantee supply of sufficient hot water. The ***LATENTO*** system regulator allowing control of the entire heating system, enables adaptation to your individual requirements.

Latent Material
The ***LATENTO*** XW is operated with 20 kg of latent material. The latent material melts at a temperature of approx. 65 °C. While doing so, it absorbs heat energy without the temperature changing in the storage tank at all. So energy can be stored without major heat-losses – as it is the case at temperature rise, for instance. When the storage tank cools below 65 °C, the latent material will resolidify dissipating the stored energy to the storage water.
Moreover, the latent material prevents evaporation of the storage water. This will minimize losses of water and energy.

For that reason the ***LATENTO*** XW has been factory filled with a small quantity of latent material. The latent material does not pose any health hazard. Disposal via normal domestic waste possible.

4. Heat generators for Reheating

To guarantee sufficient hot water supply, the supply of the heat generator must have at least a 15 °C higher temperature than the desired hot water temperature, i.e. temperature of DAW 60 °C, supply of heat generator with 75 °C.

5. Function

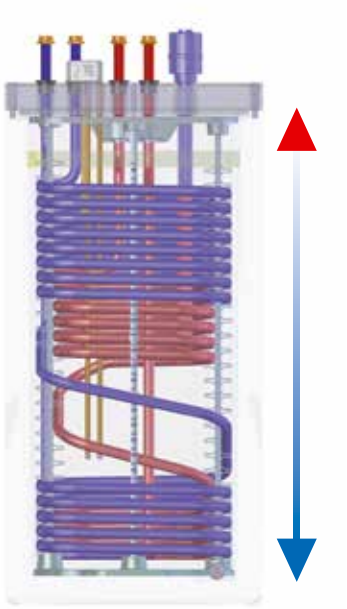
Unpressurised hot water storage tank:
The storage water in the ***LATENTO*** XW is only used for heat absorption. The heat is fed in and taken via heat exchangers. Hence the storage water does not have any contact to the heating or DHW system. Thereby problems such as furing up and sludge accumulation in the storage tank and legionella growth in the DHW heat exchanger is prevented.

Hot water:
The hot water is heated following the continous flow heater principle. Thereby the hot water is always generated whenever required. The advantage: The water is fresh at all times, and legionellae have no chance of growing. What`s more, the stainless steel heat exchanger guarantees perfect drinking water quality and corrosion resistance.

Electrical heating element::
Serving as stand-alone solution (power supply only via solar collectors and electrical heating element) or when heat pumps are employed for peak demand, an electrical heating element with an output of max. 9 kW is optionally offered.

CAUTION

The electrical heating element must only be operated when the *LATENTO* XW is sufficiently filled with water. Fire hazard! The electrical heating element must only be connected through an authorized professional electrician.



6. Connection notes

Warranty
IVT GmbH & Co. KG will exclusively assume warranty for the functionability of the ***LATENTO*** XW only then if all notes described in this chapter are observed.

Heating connection
It is essential to take care of professional bleeding (e.g. automatic bleeder) when connecting the ***LATENTO*** XW to the heat generator/s.

CAUTION

If there are steel pipes used in the cold water supply or in the heating grid, beware of the danger of getting steel blades in the drinking water heat exchanger. This has to be prevented by using a filter, otherwise there may be a contact corrosion, causing a permeable drinking water heat exchanger.

6.1 Transportation
The ***LATENTO*** XW must always be delivered in a standing position so as to avoid any damage! The ***LATENTO*** XW may be tilted max. horizontally for a short time, e.g. when carrying it to the place of installation. Great care must be taken that the cover was closed with all screws.

NOTE

For operation with electrical heating element (878 700 039): The screwing of the electrical heating element into the *LATENTO* storage tank should take place before its filling and piping.
In areas with low room height it can be necessary to tilt the *LATENTO* storage tank in order to insert the electrical heating element.

6.2 Mounting
Heed the following points when selecting the installation site for the ***LATENTO*** XW:
- Frost-protected room
- Level, clean swept floor
- Do not subject the ***LATENTO*** XW to direct solar radiation (the UV can destroy the plastic)
- Heed the load-bearing capacity of the foundation, the filled ***LATENTO*** weighs approx. 650 kg (XW 500)
- Keeping heat-losses as little as can be, place the ***LATENTO*** XW in the vicinity of the reheating heat generator
- If possible, mount system in a heated room to minimize heat-losses (ENEV – Energy Saving Decree)

6.6 Pipework
A thermal mixing valve (Item no. 878 700 021) must be installed to the hot water outlet of the domestic water heat exchanger so as to prevent scalds. The hot water heat exchanger should be 60 °C according to DIN EN 806-2 (June 2005).
Keeping heat-losses of the hot water tube as low as can be, we recommend you to limit the thermal mixing valve to 45 °C – 50 °C hot water temperature.

Pressurised flushing connections must be installed in front of the thermal mixer for the flushing and for any descaling of the drinking water heat exchanger that may be necessary. If water hardness exceeds 20° dH (3,57 mmol), we recommend to install a water softening device to avoid an efficiency loss due to limescale in the heat exchangers.

Temperature Sensors
Position the temperature sensors into the sensors glands at the level so indicated in the installation proposal and connect the sensors to the regulation unit. The sensor glands have been dimensioned such that several sensors can be inserted into one sensor gland.

6.4 Temperature- and filling level scale
When the button is pressed briefly until the display lights up, the temperature and filling level indicator is switched on for approx. 5 seconds. If the button is pressed longer until "LONG" appears in the display, the filling level indicator is switched on for approx. 15 minutes.

Switching temperature unit
To switch the temperature display between °C and °F and back, press the button during operation (the maximum filling level measured so far will appear during this process) until the temperature is displayed with the new unit.

Battery replacement
If battery replacement should become necessary, the housing must be opened and the board loosened. The battery (AA lithium 3.6 V) is on the rear of the PCB. Ensure correct polarity when inserting the battery, + is on the side where the cable is connected to the PCB.

After battery replacement, all the segments of the filling level indicator are shown. The filling level sensor only requires a slight increase in filling level for re-initialisation. This can be achieved through thermal expansion of the water during operation. In individual cases it can be necessary to top up the water level in the ***LATENTO*** slightly. Following this re-initialisation, the correct filling level is displayed again.

Calibraation
During calibration, keep the button pressed with the system switched off until "RESET" appears in the display. Then press the button briefly again so that an "X" appears under the "J". After the display has gone out again, calibration is automatically completed. After calibration, the display initially indicates an empty tank even when it is full. As after battery replacement, a slight increase in filling level will lead to the correct filling level being indicated again.

6

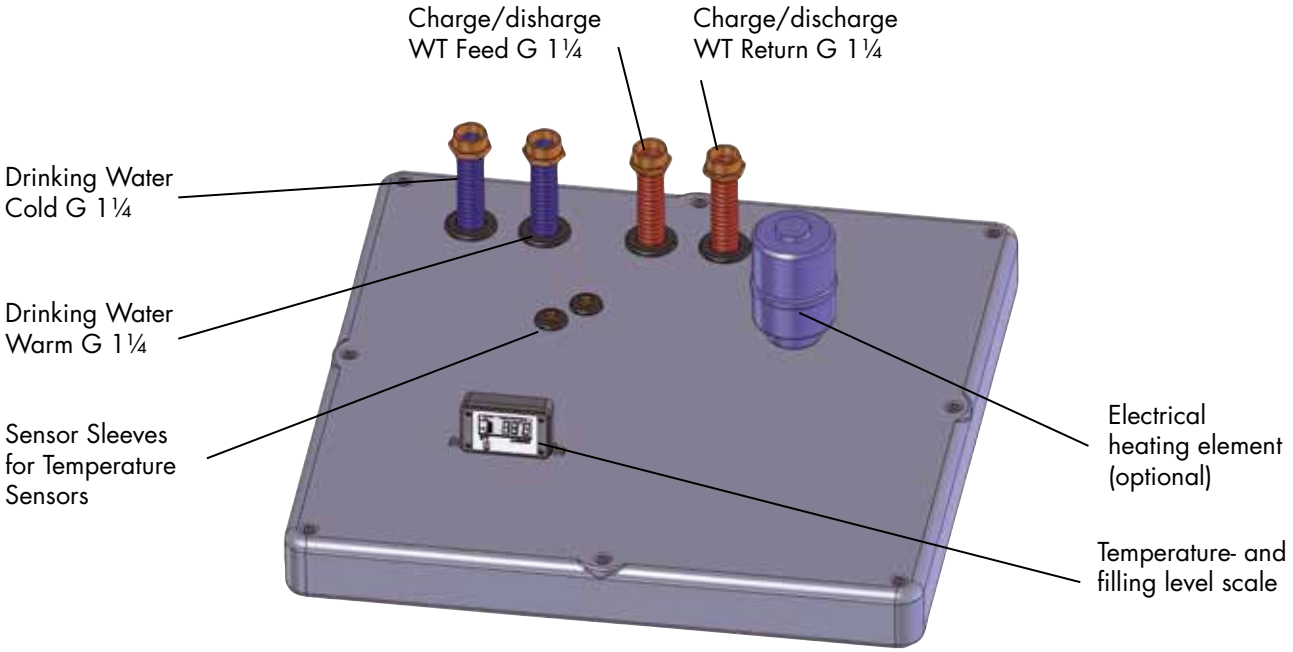
6.5 Filling
After installation the filling level & temperature display must be calibrated (see chapter 6.4)! Fill the ***LATENTO*** XW with drinking water via the filling and draining valve. Open the cover for the optional E-heating rod to allow the air displaced by the filling process to escape.

When using the E-heating rod:
Screw the heating rod as far out of the thread as necessary to allow displaced air to escape.
Fill the system with water until the segment display of the filling level indicator is at "OPT". Since the filling level sensor is only located in the topmost 40 cm of the ***LATENTO***, it takes some time for the filling level to be indicated on the display. Put the display into filling mode during filling! With the system switched off, keep the button pressed until the word "LONG" appears in the display. The display then remains switched on for about 15 minutes. After filling, close the KFE valve and the cover for the E-heating rod again.

NOTE

The DHW heat exchanger must only be charged with a pressure of max. 15 bar. The heat exchanger would expand if the water pressure exceeded 15 bar. The *LATENTO* XW might get damaged because of this.

Due to DIN EN 12502, there is a max. chloride concentration of water of 53 mg/l (warm water) respectively, to be kept. Otherwise there may be hole-/grid-corrosion in the heat exchanger.



7. Avoiding heat losses

You can operate the system as economic as possible also by avoiding heat-losses. Aside from insulating all hot-water carrying pipes and fittings, there are further measures possible to avoid heat-losses:

Circulation pipes will always cause heat-losses!

- Planning the tap connections favourably, a one-family house can do without circulation pipes
- In case circulation pipes should really be necessary, a circulation pump and a circulation control unit should be installed. Using the circulation control, the circulation pump will only be switched on if required (e.g. switch in the bathroom, short opening of the hot water, etc.) and only when the temperature in the pipelines has dropped below a defined value. In addition, the running time of the circulation pump should be set to a very short time
- The pump operating as circulation pump should be as small as possible
- Heat-losses are caused through circulations too. By installing heat siphons into all hot water pipes (DHW, heating and solar), the micro circulation can be reduced

CAUTION

Heed the regulations of the local water distribution company and relevant DIN standards when connecting. The connections must be made pressure-tight. The component-tested safety installations have to be installed according to DIN 4753, Part 1, para. 6.3-7 (safety valve, reflux valve, pressure reducing valve, drainage, control and safety device).

Pressurised flushing connections must be installed in front of the thermal mixer for the flushing and for any descaling of the drinking water heat exchanger that may be necessary. If water hardness exceeds 20° dH (3,57 mmol), we recommend to install a water softening device to avoid an efficiency loss due to limescale in the heat exchangers.

8. Commissioning

Verify the following check list before commissioning the ***LATENTO*** XW. Start running the ***LATENTO*** XW only when you can answer all questions with "yes".

- Has the container been sufficiently filled with water? ☐ Yes ☐ No
- as the reheating heat exchanger (heating circuit) been correctly connected? ☐ Yes ☐ No
- Has the DHW heat exchanger been correctly connected including shut-off valves and pressure-rinsing connections? ☐ Yes ☐ No
- Are the heating circuits filled and bled? ☐ Yes ☐ No
- Are all temperature sensors installed at the right position and connected to the regulation unit? ☐ Yes ☐ No
- Is the storage tank cover attached and closed tight? ☐ Yes ☐ No
- When using the electrical heating element: Is this element screwed tight in the cover and has been connected by an expert? ☐ Yes ☐ No
- Have all connection pipes and fittings been insulated conforming to standards? ☐ Yes ☐ No
- Are pumps and heat generator connected to the regulation unit correctly? ☐ Yes ☐ No

9. Periodic maintenance work

The ***LATENTO*** XW is very easy to maintain. The only periodic work would be checking the water level and the system pressures.

half-yearly
Check the water level in the ***LATENTO*** XW: The float must be between "Min" and "Max". Ideal is the middle between "Min" and "Max". When required, refill the storage tank, as on page 26 described.

Check the system pressure of the solar, boiler and heating system – correct pressure appropriately, whenever required.

whenever required
Should the performance of the DHW heat exchanger fade, you will need to rinse or descale it. The intervals for this work depend on the hardness of the drinking water and the temperatures in the storage tank.
The temperature and filling level indicator is battery operated. The battery must be replaced as necessary. For more detailed information, see Chapter 6.4 on the temperature and filling level indicator.

CAUTION

Risk of scalding.
Before dismantling, please see that the *LATENTO* XW is off power and the storage water is cold.

6

10. Drainage and dismantling

- Drain all pipelines
- Loosen all pipework
- Open the cover of the ***LATENTO*** XW and remove the solid latent material. (Disposing of the latent material: the latent material can be disposed via normal domestic waste.)
- Drain the ***LATENTO*** XW via the lower connection nozzle

11. Take back or disposal

In case you stratified solar storage tank ***LATENTO*** XW should be disposed of, we kindly ask you to give the solar stratified storage tank ***LATENTO*** XW to a suitable recycling facility. In addition, we offer you to take back the ***LATENTO*** XW for recycling if it is delivered free of charge to our address.

12. Troubleshooting and remedy

Storage water not heating
- Has the reheating heat exchanger been correctly connected?
- Check the boiler circuit for disturbances.
- Check pressure.
- Check charging pump for function – trapped air.
- Check of regulation. Are heat generators, pumps and temperature sensors connected correctly?
- Are the temperature sensors positioned at the right height and functional?

Hot water not heating
- Filling level of the storage water sufficient? Possibly top up?
- Are flow and return pipes of the domestic water heat exchanger connected correctly?
- Is the storage water warm? (see storage water not heating)
- Is the thermal mixing valve properly set?

Loss of storage water
- Is the storage tank cover closed with the clamps?
- Check the seat of the store cover – tight?
- Is the drain valve on the lower front screw down mounting tight?

The storage tank has identical temperatures on top and bottom
- Are the submersible sensors fitted at the right height?
- Has a too strong circulating pump been installed?
- Is the running time of the circulating pump too long?
- Does hot water enter the cold water supply?

Pressure drop in the system
- Pressure drop in the first weeks through escaping dissolved air is normal!
- Pressure fluctuations of up to 0.3 bar are normal during operation!
- Check system for leak tightness.
- Check safety valve for correct installation, leak tightness and function.
- Was the bleeding valve shut again after filling?
- Has the expansion vessel been regulated correctly or is it broken?

Storage tank cools down over night without hot water consumption
- Does the hot water loading pump run at night? Check the controller settings!
- Are all connections insulated?
- Has the hot water outlet been directly laid upwards? (Micro circulation!) Make the connection to the side or use siphon design!
- Does the solar circuit pump run at night? Change timer setting!
- Are the gravity brakes functional? Possibly clean them?
- Is the gravity circulation in the circulation line too strong? Employ a stronger reflux valve or integrate an electric 2-way valve after the circulating pump!

13. Performace Data

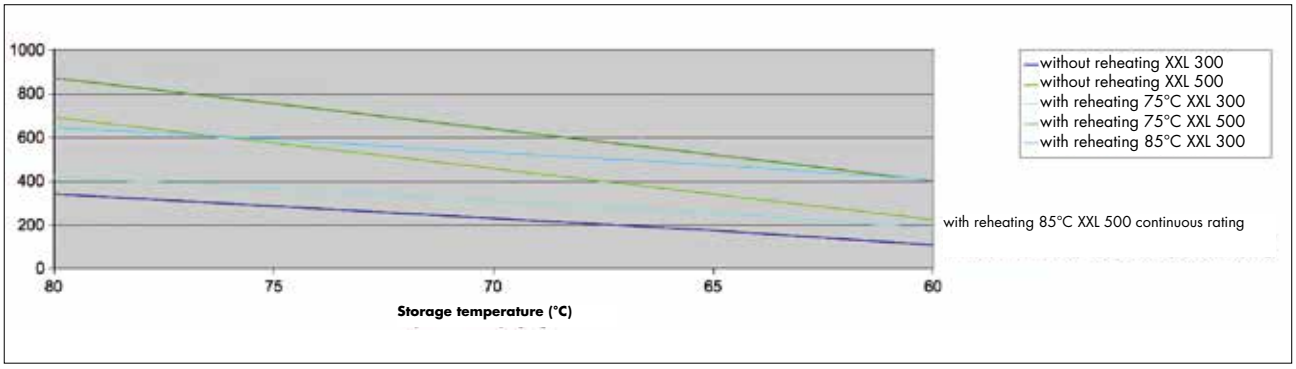
Performance Data *LATENO* XW 500 when using the reheating heat exchanger

Hot water extraction volume:
When heating up using the reheating heat exchanger, a different quantity of hot water, depending on the temperature of the upper region of the ***LATENTO*** XW, may be tapped (45 °C, ΔT = 35 K, flow 20 l/min): The hot water extraction volume is also influenced by the flow temperature of the heat generator if reheating takes place during hot water tapping.
In the ***LATENTO*** system regulator, the temperature in the upper region of the ***LATENTO*** XW is set via the hot water temperature.

Reheating at 75 °C:
Reheating at 75 °C flow temperature is done during hot water tapping. The maximum power consumption is 60 kW.

Reheating at 85 °C:
Reheating at 85 °C flow temperature is done during hot water tapping. The maximum power consumption is 60 kW.

Hot water extraction volume *LATENTO* XW[1]



[1]DHW 45 °C, ΔT = 35 K, 20 l/min flow
At reheating with 85 °C (1800 l/h) a continuous hot water flow-temperature of 45 °C (ΔT = 35 °C) is guaranteed.

14. Technical data

Storage	XW 500
Container	
Material of container	Polypropylene
Material of top cover	Polypropylene
Material of insulation	Polyurethane
Material class to DIN 4102-1	B2 - normal flammability
Length l [cm]	78
Width b [cm]	78
Height h [cm]	158
Tilted size [cm]	176
Empty weight [kg]	92
Weight with latent material [kg]	112
Nominal capacity, storage water [l]	536
Mean temperature decrease per hour [K/h]	0,1
Max. storage tank temperature [°C]	85
Performance characteristics N_L*	11,5
Tapping rating (65°C storage temperature) without re-heating [l]	277
Continuous rating (85°C re-heating) [l/h]	1350
Continuous output of hot water Q_D [kW]	(at 85/10/45) 55
Drinking water heat exchanger	
Length [m]	31,2
Surface [m²]	4,5
Water content [l]	21,7
Connection	G 1 ¼
Heating heat exchanger	
Length [m]	19,5
Surface [m²]	2,8
Water content [l]	13,6
Connection	G 1 ¼

* DIN 4708-3 (heating output 60 kW)

* DIN 4708-3 (re-heating 60 kW)

7

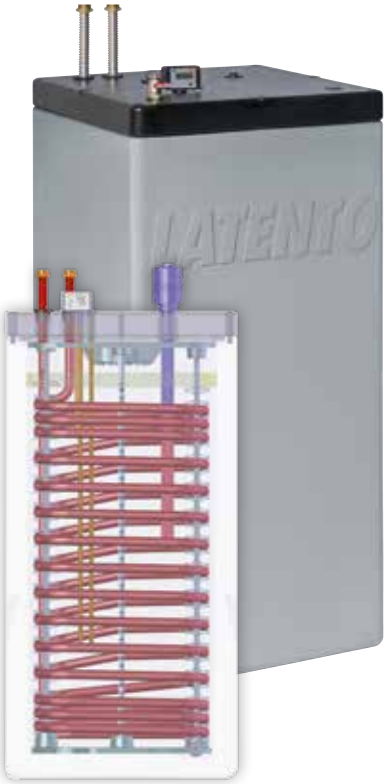
7. Unpressurized buffer storage tank XP

Technical documentation

LATENTO®

Technische Dokumentation

This technical documentation comprises contents that are important for the qualified installer as well as the end user.
This technical documentation must remain with the ***LATENTO*** XP or handed over to the end customer for storage.



1. Safety Notes

Two different stages of safety notes are used in this documentation:

NOTE

Indicates a note that failure to comply would endanger personal safety, i.e.: there is risk of injuries.

CAUTION

Indicates a note on equipment safety. Failure to comply may cause damage to the device described.

NOTE

The technical documentation must be exactly observed. IVT GmbH & Co. KG does not assume any liability for damages derived from nonobservance of this technical documentation or the applicable standards and installation instructions.

CAUTION

Installation and commissioning of the *LATENTO* XP as well as all repair work must only be carried out by persons who have been accordingly qualified and authorized.

Risk of scalding when opening the storage tank cover during operation:
there may be up to 85 °C in the store tank! Since the latent material on the surface prevents the water from evaporating, the temperature of the storage water is often underestimated. Therefore, check the temperature of the store water before you start any work on the *LATENTO* XP. Wait until the *LATENTO* XP has cooled to 40 °C or less before commencing any work on the *LATENTO* XP.

In the case of problems with the ***LATENTO*** XP which you cannot solve using this technical documentation, the ***LATENTO*** hotline will gladly be at your service.

LATENTO Hotline: +49 (0) 9876/9786–60

2. Designation of the components

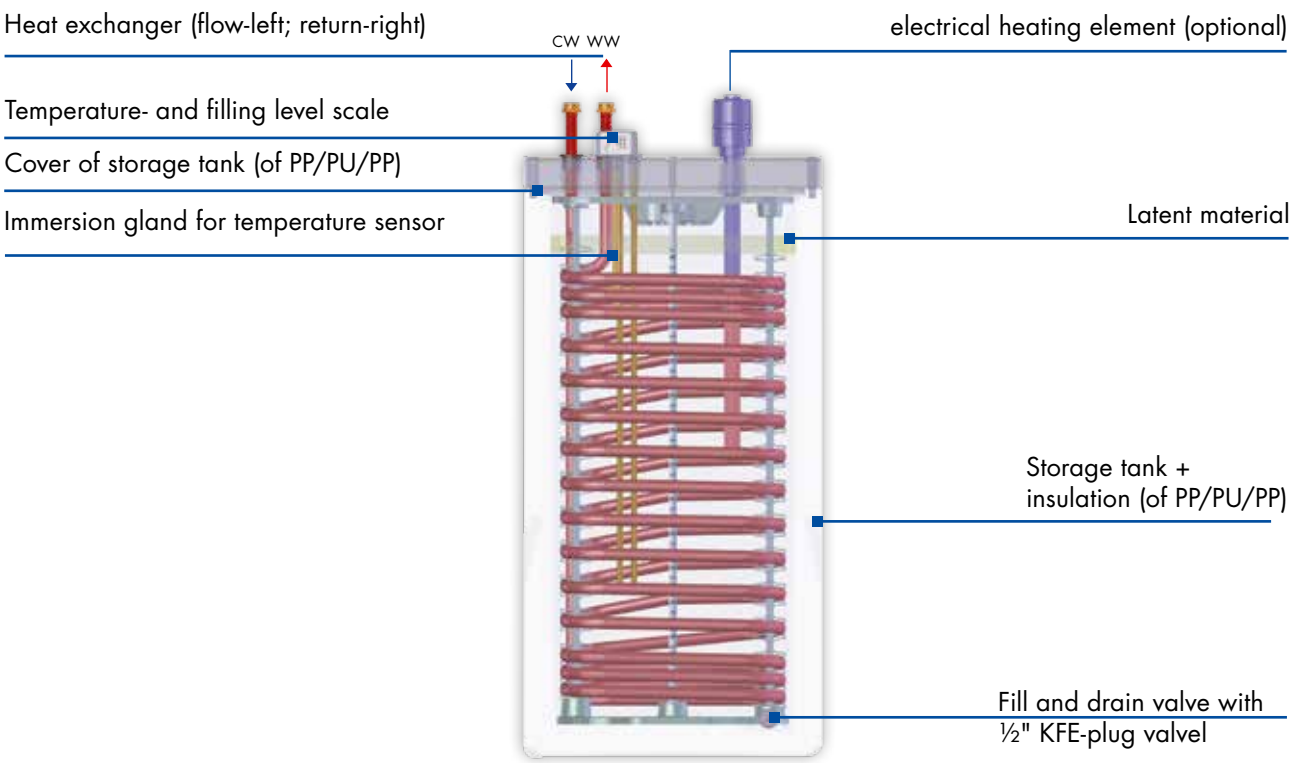


Illustration similar

Stainless steel: DN 25, da 32.5 mm with G 1¼" connection

3. Product Description

The ***LATENTO*** XP is an unpressurised buffer storage tank that was developed for employment in a one-/two-family house. Apartment houses (multi-family houses) can be supplied via several ***LATENTO*** XP Tichelmann-system connected units.
The ***LATENTO*** XP has the capacity of buffering approx. 30 kWh useful energy. The insulation of the storage tank has been designed such that the accumulated energy can be stored over several days. Depending on power demand, this also allows supply over night without auxiliary heating requirement through the central-heating boiler.

Latent material:
The ***LATENTO*** XP will be operated with 20 kg of latent material. The latent material melts at a temperature of approx. 65 °C. While doing so, it absorbs heat energy without the temperature changing in the storage tank at all. So energy can be stored without major heat-losses – as it is the case at a temperature rise, for instance. When the storage tank cools below 65 °C, the latent material will re-solidify dissipating the stored energy to the storage water using the heat conducting plate.
Moreover, the latent material prevents evaporation of the storage water. This will minimize losses of water and energy. The latent material does not pose any health hazard. Disposal via normal domestic waste possible.

4. Function

The ***LATENTO*** XP was developed due to the growing regenerative energy generation, e.g. solid material boilers.

Non-utilized power of the heat generator which is not needed for heat flow of the building is buffered in the ***LATENTO*** XP and transmitted to the system if required.

Re-charging is possible from an existing ***LATENTO*** XXL into the ***LATENTO*** XP in case of higher solar yield.

5. Connection notes

Warranty
IVT GmbH & Co. KG will exclusively assume warranty for the functionability of the ***LATENTO*** XP only then if all notes described in this chapter are observed. In particular heed the correct hydraulic integration of the ***LATENTO*** XP: The warranty applies exclusively for that ***LATENTO*** XP that has been connected following an installation proposal. The responsibility will be with the planning or executing company in case of a hydraulic connection of the ***LATENTO*** XP deviating from this.

5.1 Heating connection

It is essential to take care of professional bleeding (e.g. automatic bleeder) when connecting the ***LATENTO*** XP to the heat generator/s.

5.2 Transportation

The ***LATENTO*** XP may be tilted max. horizontally for a short time, e.g. when carrying it to the place of installation. Great care must be taken that the cover was closed with all four clamps.

NOTE

The *LATENTO* XP must always be delivered in a standing position so as to avoid any damage.

5.3 Mounting

Heed the following points when selecting the installation site for the ***LATENTO*** XP:

- Frost-protected room
- Level, clean swept floo.
- Do not subject the ***LATENTO*** XP to direct solar radiation (the UV can destroy the plastic)
- Heed the load capacity of the foundation, the filled ***LATENTO*** XP weighs approx. 580 kg (XP 500)
- Keeping heat-losses as little as can be, place the ***LATENTO*** XP in the vicinity of the reheating heat generator
- If possible, mount system in a heated room to minimize heat-losses (EnEV – Energy Saving Decree)

NOTE

For operation with electrical heating element (878 700 039): The screwing of the electrical heating element into the *LATENTO* storage tank should take place before its filling and piping.
In areas with low room height it can be necessary to tilt the *LATENTO* storage tank in order to insert the electrical heating element.

5.4 Pipework

NOTE

The heat exchanger must only be charged with a pressure of max. 15 bar. The heat exchanger would expand if the water pressure exceeded 15 bar. The *LATENTO* XP might get damaged because of this. Due to DIN EN 12502, there is a max. chloride concentration of water of 213 mg/l (cold water) or 53 mg/l (warm water) respectively, to be kept. Otherwise there may be hole-/grid-corrosion in the heat exchanger.

CAUTION

Heed the relevant DIN standards when connecting. The connections must be made pressure-tight. The heating installation must be pressure-checked and flushed due to DIN EN 14336. The component-tested safety installations have to be in stalled according to DIN 4753, Part 1, para. 6.3-7 (safety valve, reflux valve, pressure reducing valve, drainage, control and safety device).

5.5 Temperature Sensors

Position the temperature sensors into the sensors glands at the level so indicated in the installation proposal and connect the sensors to the regulation unit. The sensor glands have been dimensioned such that several sensors can be inserted into one sensor gland.

5.6 Temperature- and filling level scale

When the button is pressed briefly until the display lights up, the temperature and filling level indicator is switched on for approx. 5 seconds. If the button is pressed longer until "LONG" appears in the display, the filling level indicator is switched on for approx. 15 minutes.

Changing the temperature unit

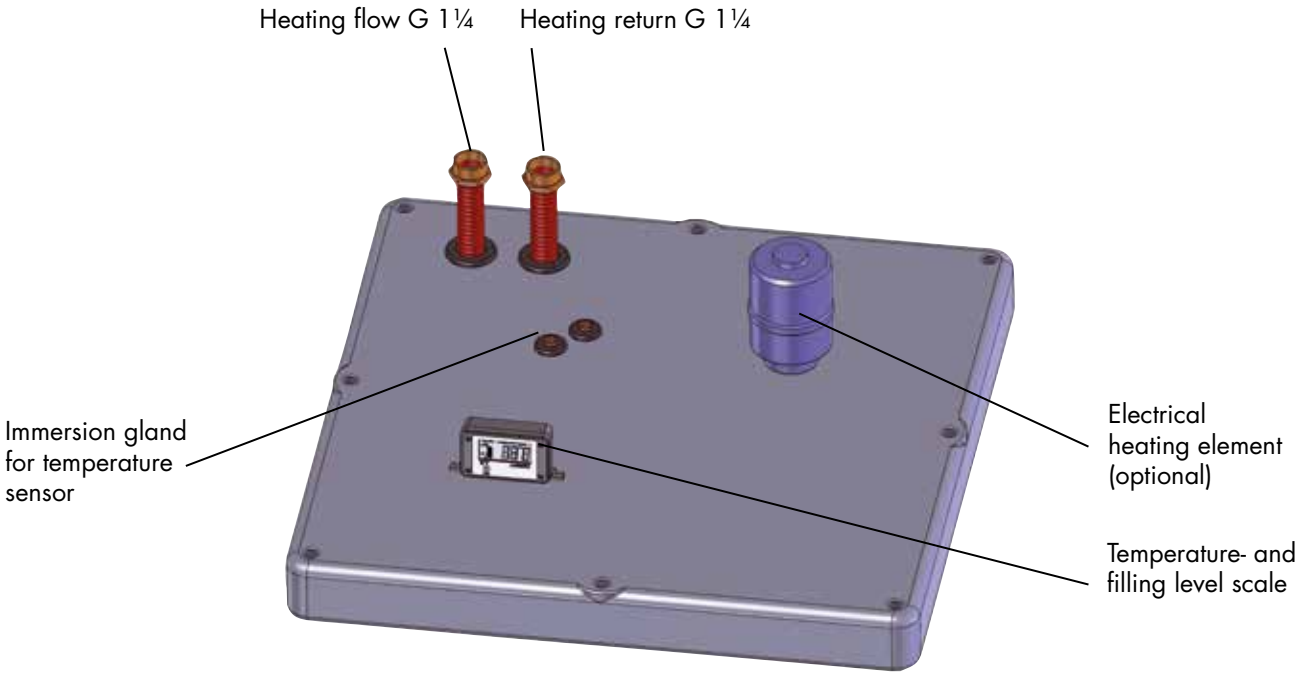
To switch the temperature display between °C and °F and back, press the button during operation (the maximum filling level measured so far will appear during this process) until the temperature is displayed with the new unit.

Battery replacement

If battery replacement should become necessary, the housing must be opened and the board loosened. The battery (AA lithium 3.6 V) is on the rear of the PCB.
Ensure correct polarity when inserting the battery, + is on the side where the cable is connected to the PCB.
After battery replacement, all the segments of the filling level indicator are shown. The filling level sensor only requires a slight increase in filling level for re-initialisation. This can be achieved through thermal expansion of the water during operation. In individual cases it can be necessary to top up the water level in the ***LATENTO*** slightly. Following this re-initialisation, the correct filling level is displayed again.

Calibration

During calibration, keep the button pressed with the system switched off until "RESET" appears in the display. Then press the button briefly again so that an "X" appears under the "J". After the display has gone out again, calibration is automatically completed. After calibration, the display initially indicates an empty tank even when it is full. As after battery replacement, a slight increase in filling level will lead to the correct filling level being indicated again.



5.7 Filling

After installation the filling level & temperature display must be calibrated (see chapter 5.6)!

Fill the ***LATENTO*** XP with drinking water via the filling and draining valve. Open the cover for the optional E-heating rod to allow the air displaced by the filling process to escape.

When using the E-heating rod:
Screw the heating rod as far out of the thread as necessary to allow displaced air to escape. Fill the system with water until the segment display of the filling level indicator is at "OPT". Since the filling level sensor is only located in the topmost 40 cm of the ***LATENTO***, it takes some time for the filling level to be indicated on the display. Put the display into filling mode during filling! With the system switched off, keep the button pressed until the word "LONG" appears in the display. The display then remains switched on for about 15 minutes.

After filling, close the KFE valve and the cover for the E-heating rod again.

6. Avoiding heat losses

You can operate the system as economic as can be also by avoiding heat-losses.
Aside from insulating all heating pipes and fittings, there are further measures possible to avoid heat-losses:
The installation of a thermal siphon prevents circulation in the piping system.
Set the timer programs for heating and hot water to the usage times.

7. Commissioning

Verify the following check list before commissioning the ***LATENTO*** XP.
Start running the ***LATENTO*** XP only then when you can answer all questions with "yes".

- Has the container been sufficiently filled with water? ☐ Yes ☐ No
- Has the stainless steel heat exchanger (boiler circuit) been correctly connected? ☐ Yes ☐ No
- Is the pipework complete and correct acc. to the installation proposal? ☐ Yes ☐ No
- Are the heating circuits filled and bled? ☐ Yes ☐ No
- Is the storage tank cover attached and closed tight? ☐ Yes ☐ No
- Are all temperature sensors installed at the right position and connected to the regulation unit? ☐ Yes ☐ No
- When using the electrical heating element:
  Is this element screwed tight in the cover and has been connected by an expert? ☐ Yes ☐ No
- Have all connection pipes and fittings been insulated conforming to standards? ☐ Yes ☐ No
- Are pumps and heat generators connected to the regulation unit correctly? ☐ Yes ☐ No

8. Periodic maintenance work

The ***LATENTO*** XP is very easy to maintain. The only periodic work would be checking the water level and the system pressures.

Half-yearly

- Check the water level in the ***LATENTO*** XP. The float must be between "Min" and "Max". Ideal ist the middle position between "Min" and "Max".
  When required, refill the storage tank, as in point 5 described
- Before dismantling, make sure that the ***LATENTO*** XP is off power and the storage water is cold.
- Check the system pressure of the solar, boiler and heating system – correct pressure appropriately, whenever required
- The temperature and filling level indicator is battery operated. The battery must be replaced as necessary. For more detailed information, see Chapter 6.4 on the temperature and filling level indicator..

CAUTION

Risk of scalding.
Before dismantling, please see that the *LATENTO* XP is off power and the storage water is cold.

7

9. Drainage and dismantling

- Drain all pipelines
- Loosen all pipework
- Open the cover of the ***LATENTO*** XP and remove the solid latent material. (Disposing of the latent material: the latent material can be disposed via normal domestic waste.)
- Drain the ***LATENTO*** XP via the lower connection nozzle

10. Take back or disposal

In case your buffer storage tank ***LATENTO*** XP should be disposed of, we kindly ask you to give the solar stratified storage tank ***LATENTO*** XP to a suitable recycling facility. In addition, we offer you to take back the ***LATENTO*** XP for recycling if it is delivered free of charge to our address.

11. Troubleshooting and remedy

- Storage water not heating
  - In case of conventional and regenerative reheating:
    - Has the stainless steel heat exchanger been correctly connected?
    - Check the boiler circuit for disturbances.
    - Check pressure.
    - Check circulating pump for function – trapped air.
    - Check of regulation. Are heat generators, pumps and temperature sensors connected correctly?
    - Are the temperature sensors positioned at the right height and functional?
  - Loss of storage water
    - Is the storage tank cover closed with the clamps?
    - Check the storage tank cover – tight?
    - Is the drain valve on the lower front screw down mounting tight?
  - Pressure drop in the system
    - Pressure drop in the first weeks through escaping dissolved air is normal!
    - Pressure fluctuations of up to 0.3 bar are normal during operation!
    - Check system for leak tightness.
    - Check safety valve for correct installation, leak tightness and function.
    - Was the bleeding valve shut again after filling?

12. Technical data

Container	XP 500
Container	
Material of container	Polypropylene
Material of top cover	Polypropylene
Material of insulation	Polyurethane
Material class to DIN 4102-1	B2 - normal flammablity
Length l [cm]	78
Width w [cm]	78
Height h [cm]	158
Tilt height [cm]	176
Empty weight [kg]	88
Weight with latent material [kg]	108
Nominal capacity, storage water [l]	536
Mean temperature decrease per hour [K/h]	0,1
Max. storage tank water temperature [°C]	85
Max. storage capacity [kWh]	47

Heat exchanger	
Length [m]	33,5
Surface [m²]	4,8
Water capacity [l]	23,5
Connection	G 1¼

8

8. Solar collectors

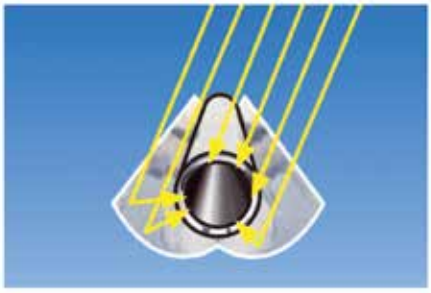
System planning and fitting instructions

1. General

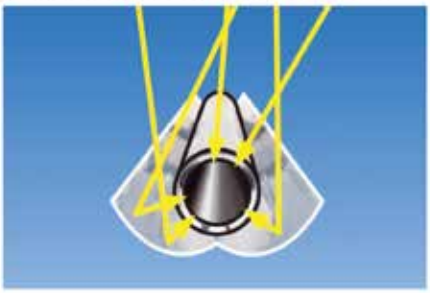
IVT CPC system set-up
12 or 18 vacuum tubes are merged to-gether in a collector module. At their top ends, V-shaped copper tubes with direct medium passage are connected to the collector distributor tube through which the solar liquid flows. The vacuum tubes can be exchanged without opening this connection. This means that a very effective thermal connection is made without further assembly effort. This connection version avoids all sealing problems. Individual glass tubes can be exchanged at any time without the system having to be stopped or emptied. The distributor and collector tube are mounted in a plastic-sheathed insulation that minimizes heat losses with high-quality CFC-free insulation. The vacuum tubular collector is mounted complete, meaning that installation can be problem-free and time-saving.

e.g. direct sunshine

e.g. oblique, direct sunshine



e.g. diffuse sunshine



How the IVT vacuum collector with CPC mirror works
The absorber surface that converts the incoming sunlight into heat and transmits it to a heat circuit is the core of the solar collector. The absorber is selectively coated with a permanently stable layer of aluminum nitride. This means that it almost completely absorbs the incoming radiation (>92 %), but radiates less energy in the spectral range of heat radiation (<6 %).

The vacuum tubes are made of two glass cylinders that are fused together at the top end. There is a vacuum in the annular gap between the two glass cylinders. The inside of the two glass tubes is formed as an absorber and selectively coated. The aluminum nitrite coating is thus in the vacuum and cannot be damaged.

A weather-resistant, highly reflective CPC mirror was located behind the tubes to increase the performance of the IVT CPC tube. The radiation is guided through the mirror onto the tube from all directions. Due to the mirror geometry, direct and diffuse sunlight is guided onto the absorber. Even with unfavorable radiation angles, the sunlight is optimally guided through the mirror onto the absorber.

Distributor and collector tubes are to be found in the tube collector boxes. U-shaped bent copper pipes are connected to these collector and distributor pipes. The copper tubes are surrounded by heat conducting elements and the heat is transmitted almost without resistance from the inner glass tube to the U tube and thus to the solar liquid. This enables very simple installation and guarantees operation that is particularly insensitive to disruption. If a collector tube is damaged, the operation of the system is not interrupted. The tubes can be exchanged individually.

To prevent heat losses from heat conduction, the absorber layer is applied to the inside in an evacuated glass tube. This means that high efficiency is achieved, even at low outdoor temperatures. The stable vacuum of 10–5 mbar also protects the absorber against any degradation and thus ensures the long useful life of the collector.

Technical data

CPC collectors type: IVT CPC	12	18	
No. of vacuum tubes:	12	18	pcs
Outer dimensions (l x 1.64 x 0.12)	1.39	2.08	m
Gross surface area:	2.28	3.41	m^2
Aperture surface area	2.00	3.00	m^2
Collector content:	1.5	2.4	l
Weight approx.:	37	54	kg
Max. working pressure.:	10	10	bar
Color:	gray RAL 7015		
Glass material:	Borosilicat 3.3		
Glass tube diameter:	47 mm		
Wall thickness:	1.6 mm		
Vacuum:	Long-time stability 10^{-6} mbar		
Absorber material:	Aluminium		
Coating:	Aluminum nitrite		
Optical coefficient:	C_0: 0.642		
Loss factor:	C_1: 0.885 W/m^2K		
Loss factor:	C_2: 0.001 W/m^2K^2		
Mounting angle:	15–90°		
Max. working pressure:	10 bar		
Connection:	Clamping ring screw connection 15 mm		

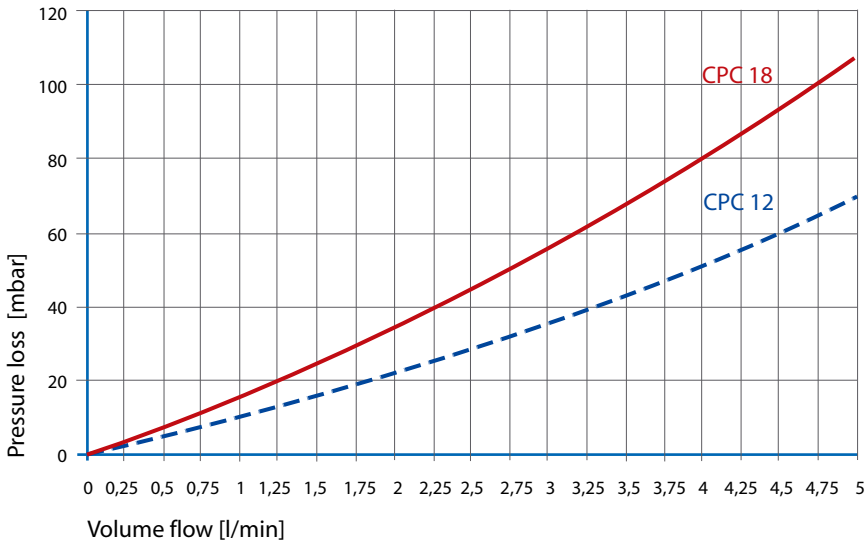
Fig. ***LATENTO*** vacuum tube collector CPC 12

Certification
The collector has been tested according to DIN 4757 Part 4. The collector has been tested by the technical inspection authorities and qualification approved.

8

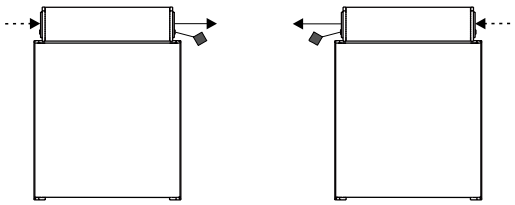
Pressure loss curve

Pressure loss of the vacuum tube collectors CPC 12 and CPC 18, calculated with heat carrier liquid SOLAR 20

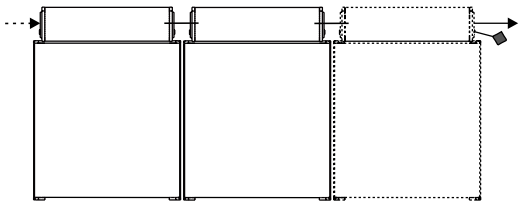


2. Connection options

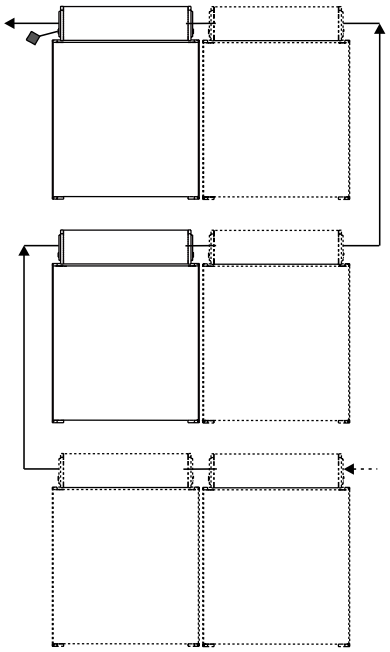
Connection option for 1 collector



Connection options for 2 or several collectors parallel



Connection options for 2 or several collectors on top of each other



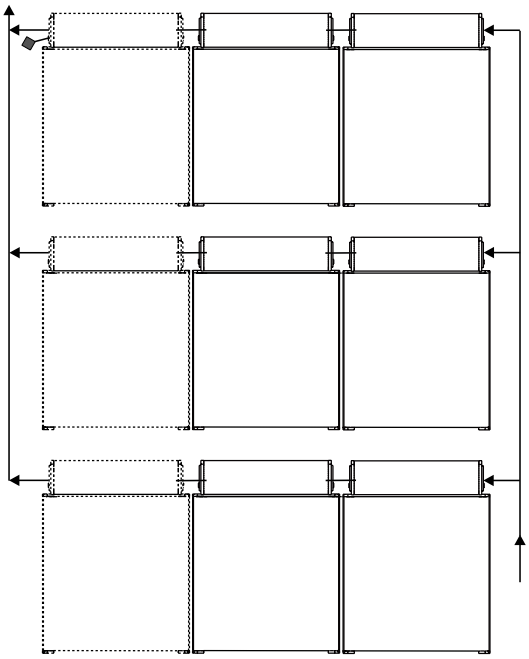
NOTE

Position of sensor on the flow side (hot)

NOTE

Watch out for pressure loss if connected in series! Max. 4 CPC 18 or 6 CPC 12 – depending on the solar line and pump capacity

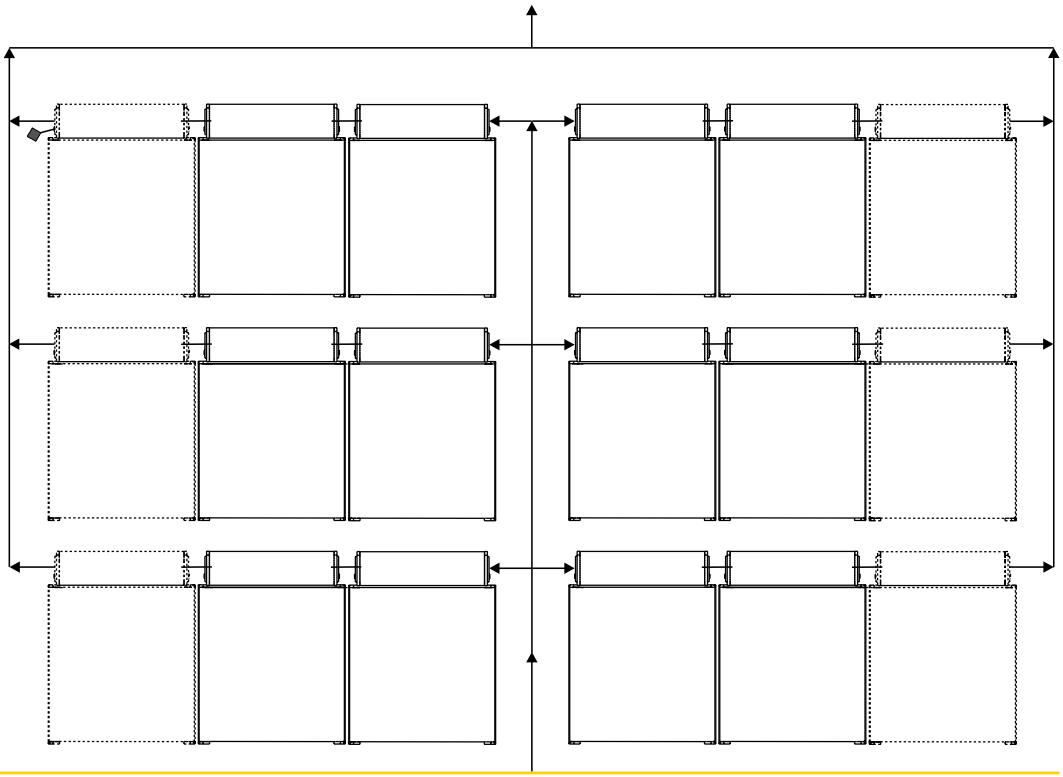
Connection options for 1 or 2 collectors parallel and 2 or 3 collectors on top of each other



Connection options for 1 or 2 series connections in parallel and several series connections on top of each other

NOTE

Position of sensor on the flow side (hot)



3. Fitting instructions

Fitting company
Fitting and commissioning must only be carried out by an authorized specialist The latter takes the responsibility for the correct installation and initial commissioning. Check the system periodically.

NOTE

With solar radiation and diffuse global radiation, the collector tubes at the top end of the U tube reach temperatures of over 200 °C. Therefore, cover the collector during fitting.
The collector tubes must be protected from impacts.
Permissible max. positive operating pressure of the system: 10 bar.
During fitting, the DIN, VDE and DVGW safety regulations must be observed.

General notes on fitting
Wall-mounting is simple with fixing materials to be provided at the premises.

- Roof fitting is only possible on-roof
- In principle, the collector should be mounted at the top
- Additional cleaning of the collector is not necessary
- When fitting the collectors, leave the gray covering film on the vacuum tubes so that they cannot overheat
- In the solar circuit, only work with hard-soldered connections or clamping ring screw connections
- The heat insulation of the solar flow tube and return tube must be resistant up to 150 °C and also be UV-resistant in the outdoor area

NOTE

The vacuum tubes in the vacuum tubular collector are covered with gray protective film. This film may not be removed until the collector has been rinsed and filled. Furthermore, the pressure test must have been carried out. The film must never be exposed to weathering for longer than 4 weeks. The film must cover the whole black surface of the vacuum tubes.

Lightning protection
If a lightening protection system is already installed on the house, the collector system must be included in the lightening protection system. Lightening protection equipotential bonding must be carried out in accordance with VDE 0185 in each case.

Maintenance
We recommend an annual service by an expert!
The anti-freeze should be checked in the process. The anti-freeze safety can be determined by a density pipette or a measuring spindle.
The pH value is a meaningful criterion for corrosion protection. This can be determined with pH measuring sticks. If the value is below pH = 7, the corrosion protection can no longer be guaranteed. In this case, the Solar 20 must be replaced immediately.
In addition to a function check-up and visual inspection of the system, the system pressure must also be checked. If the system pressure falls below the required operating pressure, the solar carrier liquid must be topped up.

Steam formation in the collector

CAUTION

There is the possibility already at normal daylight that the liquid in the collector may vaporize. This steam escapes from the collector connections. There is a risk of scalding!

Caution glass

CAUTION

Do not exert any mechanical pressure on the glass vessels. There is risk of cutting yourself on the glass splinters!

NOTE

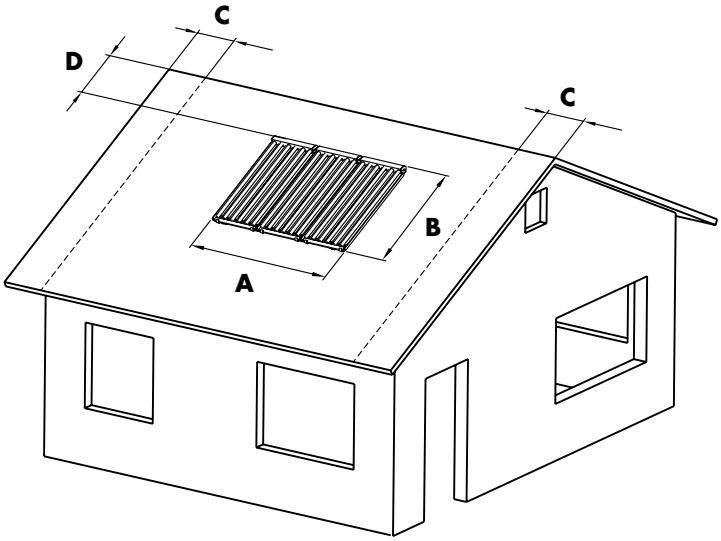
Wear gloves and protective goggles when installing the vacuum tubular collector in order to prevent any injuries in the event of damage!

CAUTION

Important:
guarantee will expire when using soft solders!

Fitting instructions

Space requirements for pitched roofs



Space requirements for a single-row collector field:

	CPC 12		CPC 18	
Number of the collectors	Measure A (m)	Measure B (m)	Measure A (m)	Measure B (m)
1	1.40	1.64	2.10	1.64
2	2.80	1.64	4.20	1.64
3	4.20	1.64	6.30	1.64
4	5.60	1.64	8.35	1.64
5	7.00	1.64	10.45	1.64
6	8.40	1.64	12.55	1.64

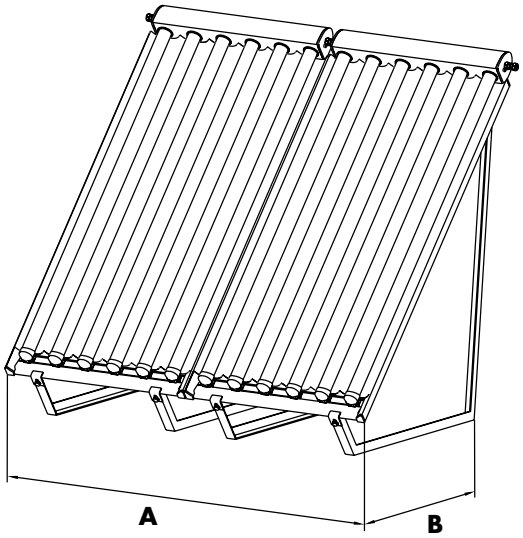
Space requirements for a dual-row collector field:

	CPC 12		CPC 18	
Number of the collectors	Measure A (m)	Measure B (m)	Measure A (m)	Measure B (m)
2	1.40	3.35	2.10	3.35
4	2.80	3.35	4.20	3.35
6	4.20	3.35	6.30	3.35
8	5.60	3.35	8.35	3.35
10	7.00	3.35	10.45	3.35
12	8.40	3.35	12.55	3.35

Measure C
Corresponds to the roof overhang including gable wall thickness. The adjacent 0.30 m distance to the collector are required for the hydraulic connection under the roof.

Measure D
Stands for min. 3 pantile rows up to the ridge. Else there is the risk, particularly in case of pantiles laid wet on wet, to damage the roofing at the ridge.

Space requirements for flat roofs

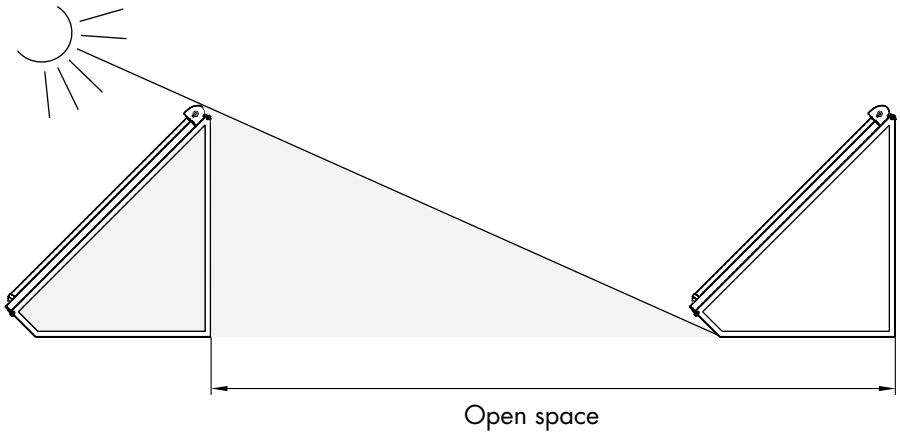


Space requirements for a single-row collector field:

	CPC 12				CPC 18		
Number of collectors	Measure	Measure	Measure		Measure	Measure	Measure
	A	B	B		A	B	B
		30°	45°			30°	45°
	(m)	(m)	(m)		(m)	(m)	(m)
1	1.40	1.47	1.23		2.10	1.47	1.23
2	2.80	1.47	1.23		4.20	1.47	1.23
3	4.20	1.47	1.23		6.30	1.47	1.23
4	5.60	1.47	1.23		8.35	1.47	1.23
5	7.00	1.47	1.23		10.45	1.47	1.23
6	8.40	1.47	1.23		12.55	1.47	1.23

Open space between the collectors,
for dual-row or multiple-row collector fields.

Open space:	
30°:	4.10 m
45°:	5.00 m
60°:	5.45 m



Weight and placement of the concrete slabs on flat roofs

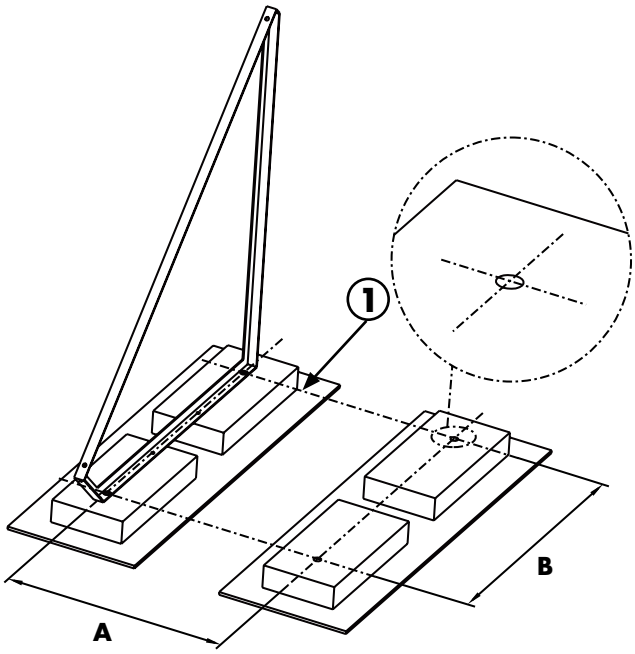
(1) Align concrete slabs acc. to opposite illustration.

NOTE

With 60° support, it is necessary to ensure that the distance from the floor is at least 80 mm.

TIP

Flat roofs with gravel riprap: Free footprint for concrete slabs from gravel. Flat roofs with plastic roofing membranes: Place concrete slabs onto protective supports (building protection mats, item 1).



Measures for fixing points

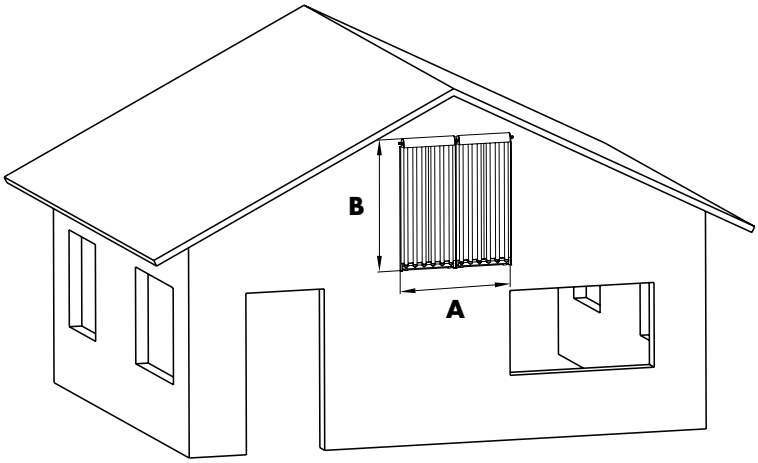
CPC 12			CPC 18		
Measure A	Measure B	Measure B	Measure A	Measure B	Measure B
	30°	45°		30°	45°
(mm)	(mm)	(mm)	(mm)	(mm)	(mm)
1100	1225	915	1400	1225	915

Number and weight of required concrete slabs

Building height up to 8 m				
Collector type	**Number of angular frames**	**Angle of frame**	**Required weight of the front concrete slab**	**Required weight of the rear concrete slab**
CPC 12	2	30°	75 kg	75 kg
CPC 18	2	30°	75 kg	75 kg
CPC 12	2	45°	75 kg	75 kg
CPC 18	2	45°	75 kg	75 kg

Building height up to 20 m				
Collector type	**Number of angular frames**	**Angle of frame**	**Required weight of the front concrete slab**	**Required weight of the rear concrete slab**
CPC 12	2	30°	120 kg	120 kg
CPC 18	2	30°	120 kg	120 kg
CPC 12	2	45°	120 kg	120 kg
CPC 18	2	45°	120 kg	120 kg

Space requirements for vertical facade fitting



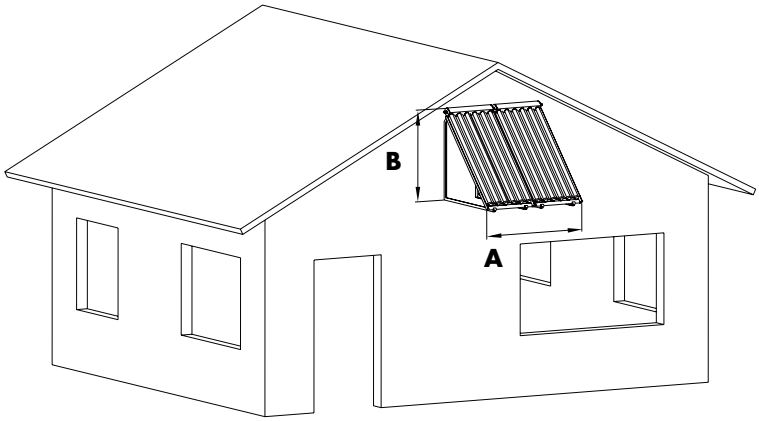
Space requirements for a single-row collector field:

	CPC 12		CPC 18	
Number of the collectors	Measure A (m)	Measure B (m)	Measure A (m)	Measure B (m)
1	1.40	1.64	2.10	1.64
2	2.80	1.64	4.20	1.64
3	4.20	1.64	6.30	1.64
4	5.60	1.64	8.35	1.64
5	7.00	1.64	10.45	1.64
6	8.40	1.64	12.55	1.64

Space requirements for a dual-row collector field

	CPC 12		CPC 18	
Number of the collectors	Measure A (m)	Measure B (m)	Measure A (m)	Measure B (m)
1	1.40	3.35	2.10	3.35
2	2.80	3.35	4.20	3.35
3	4.20	3.35	6.30	3.35
4	5.60	3.35	8.35	3.35
5	7.00	3.35	10.45	3.35
6	8.40	3.35	12.55	3.35

Space requirements for facade fitting with angular frame 30° or 45° or 60°



Space requirements for a single-row collector field

	CPC 12				CPC 18			
Number of the collectors	Measure	Measure	Measure	Measure	Measure	Measure	Measure	Measure
	A	B	B	B	A	B	B	B
		30°	45°	60°		30°	45°	60°
	(m)	(m)	(m)	(m)	(m)	(m)	(m)	(m)
1	1.40	1.06	1.23	1.47	2.10	1.06	1.23	1.47
2	2.80	1.06	1.23	1.47	4.20	1.06	1.23	1.47
3	4.20	1.06	1.23	1.47	6.30	1.06	1.23	1.47
4	5.60	1.06	1.23	1.47	8.35	1.06	1.23	1.47
5	7.00	1.06	1.23	1.47	10.45	1.06	1.23	1.47
6	8.40	1.06	1.23	1.47	12.55	1.06	1.23	1.47

4. Collector installation

Sequence of stage for fitting

- Finding space for the components of the solar system
- Connect ***LATENTO*** to the collector heating ready to function
- Mount the solar station
- Lay the complete solar pipework from the ***LATENTO*** to the collector field
- Mount fitting set for collector(s)
- Suspend and fix collector(s) in prepared fixing
- Connect collector(s) to solar pipework
- Connect collector sensor
- Rinse with anti-freeze
- Pressure test with frost protection
- Draw up test protocols according to DIN 18380
- Remove the gray solar protection film
- Commission the solar system
- Instruct the operator

NOTE

Make sure that the vacuum tubular collectors and the fitting set are attached carefully so the fixings can safely withstand high wind and snow loads.

Instruct the operator collector

A completely pre-mounted unit comprises:

- 12 or 18 tubes according to the thermos flask principle
- Collector box with direct heat transmission units and dry connection of the vacuum tubes
- CPC mirror

How does the collector get on the Roof?

Important:

In principle, wind strengths should be considered when transporting the collector on the roof. Take the collector onto the roof with the packaging. This can prevent damage to the back of the collector because damage can have a direct impact on the collector performance

5. Roof-fitting on a tiled roof

When fitting the vacuum tubular collector on a roof, the collector is fitted over the roof membrane. Only retaining brackets penetrate the roof membrane.

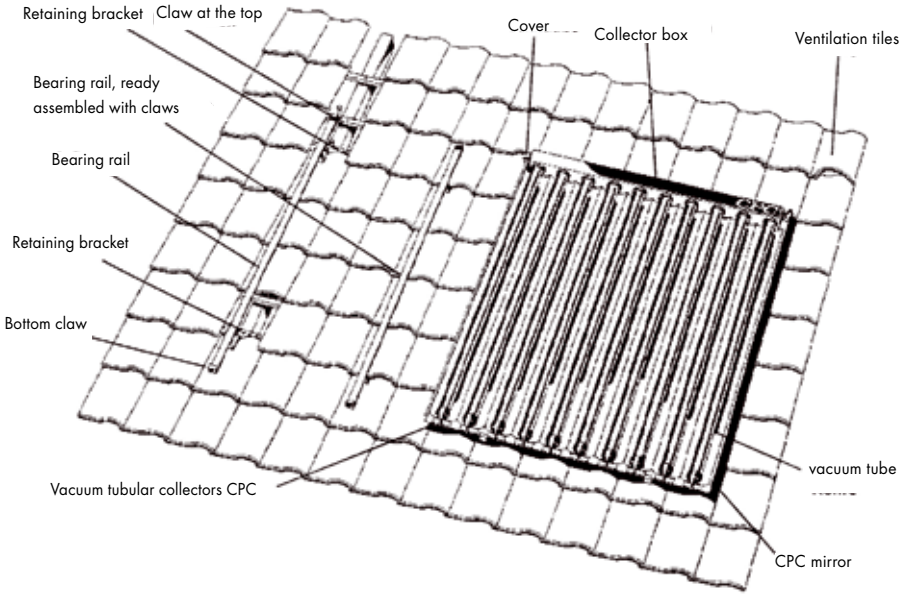
On-roof holders	Number of rails
CPC 12	2
CPC 18	3

Accessories required:
2 Ventilation tiles (quantity depending on number of roof penetrations).

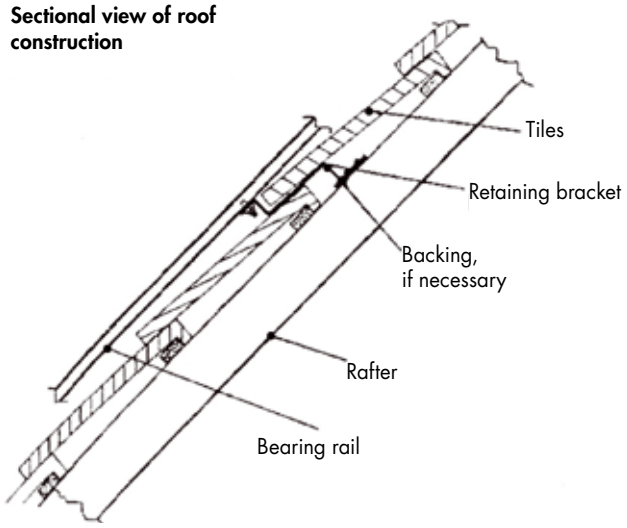
CAUTION

For fastening vacuum tube collectors CPC 12 and CPC 18 on roof.
This setup is designed for common tiles. It's applicable for superposition of max. 110mm and a total hight of max. 90mm.
(tiled roofs only - others on request)

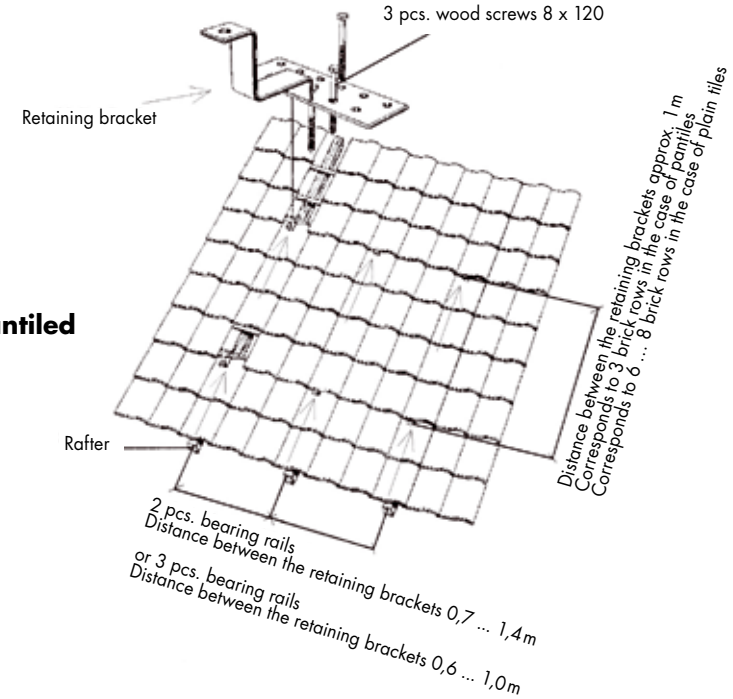
Overview picture



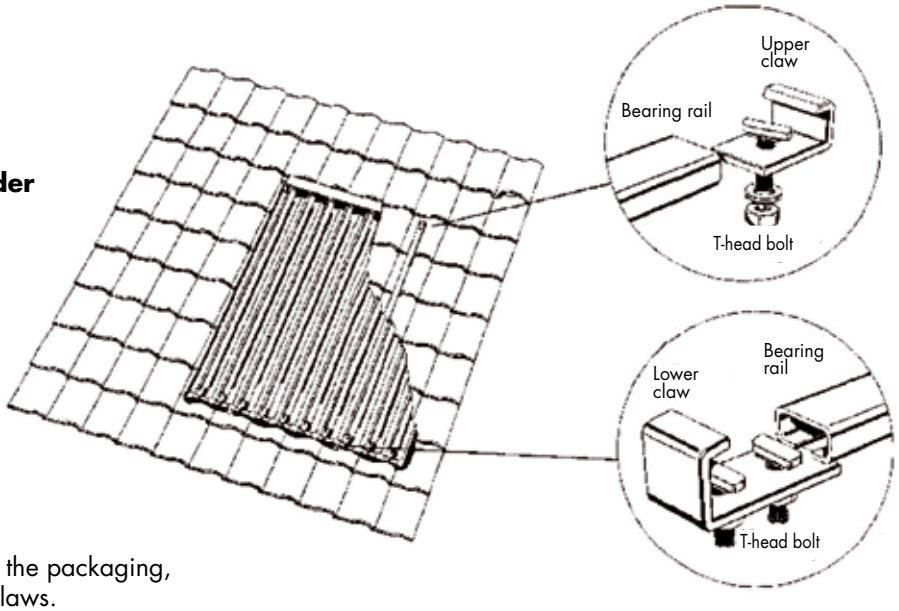
Sectional view of roof construction



Fitting the retaining brackets on a pantiled roof or plain tile



Montage der Auflagschiene, der Krallen und des Kollektors



8

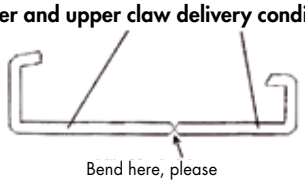
Fitting the collector

Take the collector onto the roof with the packaging, carefully lift it over the fitted lower claws.

Open the packaging and slide the col-lector into the lower claws from above, to do this it may be necessary to lift the collector a little at the top so that the claws grip the lower profile.

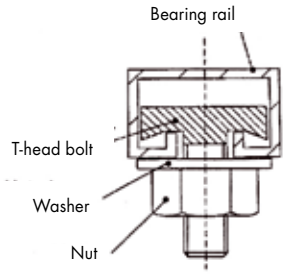
Push the top claw into the groove on the collector box and screw it firmly using the T-head bolt

Lower and upper claw delivery condition



Final position of the lower claw

Sectional view of the bearing rail/T-head bolt connection

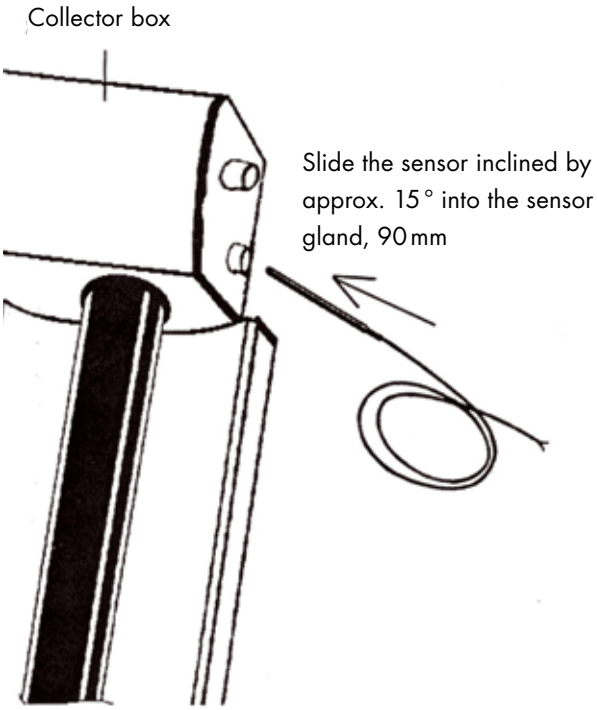


Mounting principle

6. Fitting the sensor

In principle, the sensor must be fitted on the side of the collector where the feed tube (hot) is located.

There is an integrated sensor gland on both the left and right side of the collector box. When fitting the senor, place the sensor in the gland, penetrate the rubber membrane with the sensor and insert the sensor in the sensor immersion gland as far as it will go.



NOTE

Do not attach the sensor cable directly to the blank flow tube so as to avoid fusing through very high operating temperatures.

TIP

At first, perforate the membrane using a thin rod (min. 15 cm long, max. 6 mm diameter) and insert the rod into the sensor gland as far as it will go. Then the exact position and depth of the gland is known.

7. Exchanging individual tubes

CAUTION

When replacing faulty or damaged tubes, always wear gloves and protective goggles – risk of injuries!

Vacuum tubes are permanently vacuum sealed. If a tube is damaged by external impact or if it leaks it must be replaced. A damaged tube cannot always be recognized by broken glass. But a faulty tube can always be recognized by the fact that the silver-colored mirror (barium gatter) in the foot area of the tube changes to a whitish tinge caused by incoming air.

Dismantling the tube
In the case of mechanically damaged tubes:
Carefully remove the cullet without destroying the CPC mirror surface. Remove glass waste from the collector box. Then remove the tube holder as shown in Fig. 1 and 2.

In the case of non-mechanically damaged tubes:
Firstly, remove the tube holder at the bottom end. To do this, slide the tube approx. 5 mm up in the collector box to relieve the holder. Take the tube holder in your hands, pressing the two unlocking levers down with your thumb and index finger and disengage the tube holder by lifting towards the collector box (cf. Fig. 1 and 2).

Lift the tube slightly and, turning it slightly around the longitudinal axis, pull it out downwards in a straight line (cf. Fig. 3).
If there is not enough space to pull the tube out completely downwards, e.g. if fitted on a flat roof, proceed as follows:

NOTE

Protect the end of the tube by holding it with a glove and pull it down to the ground, then pull the tube end in a straight line along the ground. Make sure that the U-shaped copper tube is not pulled out of the collector level by more than 20° because of a risk of bending.

Fig. 1

Fig. 2

Fig. 3

Fitting an individual tube
Make sure that the silicone ring in the collector box is sitting cleanly. If the silicone ring was damaged when the old tube was being removed, it should be replaced by a new silicone ring. The silicone ring is available as a spare part.

Coat the upper tube end with soapsuds so the tube can be simply pushed through the silicone ring on the collector box. Now, steadily slide the new tube over the heat conducting area in the same way as the tube was removed, making sure that the 8 mm copper tube and the heat-conducting plates cannot be lifted from the collector level by more than 20°. Protect the tube end by holding it with a glove (Caution: very hot – do not touch!). Slide the tube into the collector box by turning it slightly through the silicone ring (cf. Fig. 4 and 5).

Place the tube holder on the tube end. Grasp the mirror contour from above at the end with the tube holder, insert the tube holder between the two notches on the aluminium profile, press down and engage in the profile groove. Press the tube down into the tube holder as far as it will go and engage it (cf. Fig. 6 and 7).


Fig. 4


Fig. 5


Fig. 7


Fig. 6

8. Commissioning

The initial start up of the system may only be carried out by a specialist. A start up protocol is to be maintained.

Anti-freeze
In order to avoid damages in the solar circuit, the freezing of the heat transfer medium must be prevented. The anti-freeze to be used, Solar 20, is mixed and ready for use for -28 °C. Solar 20 may not be mixed with water or thinned.

NOTE

If another anti-freeze is used, the guarantee claims for the vacuum pipe collectors IVT CPC are invalid.

Checking the sealing
The pressure check and rinsing of the system may not be carried out using water since it is not possible to drain the collectors.
To test the sealing of the solar system, proceed as follows:

1. Carry out a pressure test on the system in accordance with the valid norms and guidelines
2. Test the sealing of the pipes and connections, including the hydraulic components, solar station, collectors and rinse and filling taps
3. Eliminate any leaks and check again

Setting the pressure
The initial pressure of the expansion tank (diaphragm type) must be coordinated to match the local situation prior to filling the system. In order to calculate the intended value for the initial pressure, first determine the static height. The static height is the difference in height between the expansion tank and the highest point of the solar system.

The operating pressure of the system must be 0.5 bar above the initial pressure in the expansion tank when in an idle state (solar system inactive, collectors cooled down).
Example: With an initial pressure of 2.5 bar, the idle pressure of the system must be 3.0 bar.

In order to ensure the correct functionality of the solar system, the expansion tank must be sufficiently dimensioned and the pressures set correctly.

Static height	Initial fluid volume in diaphragm type expansion tank in relation to the nominal size	Initial pressure	Operating pressure
0–10 m	12,5 %	2,5 bar	3,0 bar
10–15 m	11,0 %	3,0 bar	3,5 bar
15–20 m	10,0 %	3,5 bar	4,0 bar

Rinse solar circuit, vent and fill
The sun protection foil on the collector enables the solar system to be filled even if the sun is shining or if there is strong diffused radiation.

NOTE

The sun protection foil protects the collector from sunlight. It may only be removed after the successful completion of the start up.

The solar system may not be filled if the collectors are or have been previously exposed to direct sunlight. Only Solar 20 may be used to rinse and fill. The solar fluid tends to form a light, milky foam when rinsing.
The rinsing process is to be continued until such time as the Solar 20 flowing out of the system is clear.

The filling of the solar system may be carried out with a motorised filling pump or a simple hand operated pump. A motorised filling pump with a minimum performance of 5 l/min with 6 bar is recommended.

NOTE

If parts of the solar system are hard-soldered, approximately the first 2 litres of the anti-freeze must be re-routed to a separate collection container and then disposed of.

In order to rinse, vent and fill the solar system, proceed as follows:

1. Open the shut-off slide gates, flow rate regulation valves, non-return valves and gravity brakes fully
2. Fill the solar system with Solar 20 via the filling tap
3. Rinse the solar system until no more air exits at the draining tap
4. D Ensure that the Solar 20 exiting the system is clear
5. Carry out the sealing test
6. Observe the permitted operating pressure. The pressure may not drop for half an hour.
7. Rinse the solar system again to completely remove residual air

There may be air in the pipe to the expansion tank.

To ensure that the expansion tank is air-free, proceed as follows:

1. Allow the operating pressure to rise to the maximum permitted value
2. Open the drainage tap quickly. The air is rinsed out of the expansion tank.
3. Repeat the procedure until such time as no more air escapes from the expansion tank
4. Rinse the solar circuit both in the conveyance direction as well as against the conveyance direction
5. Set the solar system to the appropriate operating pressure, see section of "Setting pressure"
6. Close the filling tap
7. Bring the shut-off slide gates, flow rate regulation valves, non-return valves and gravity brakes back to operating position

NOTE

If automatic vents are used, the upstream shut-off valves are to be closed. The shut-off valves prevent the venting components from thermal destruction in the event of vapour formation.

When collectors are switched in parallel it may be necessary to rinse all collector strings separately.
Proceed as follows.

Set the flow rate

For the greatest possible efficiency of the solar system, we recommend the so-called Low-Flow principle. For this, the volume flow should be set to around 0.3 l/min and m² aperture area. The recommended set values for the relevant collector size can be taken from the table below.

The flow rate can be roughly set using the selection of the pump level and finely set at the flow meter.

Flow rate	Aperture area	Number of collectors	
		CPC 12	CPC 18
1,8 l/min	6 m²	-	2
1,8 l/min	6 m²	3	-
2,1 l/min	7 m²	2	3
2,4 l/min	8 m²	3	2
2,7 l/min	9 m²	-	3

Completing the start up
The following points are to be checked in order to ensure a fault-free start up:
- Check the anti-freeze of the heat transfer medium with a suitable anti-freeze tester
- Check the electrical connections – Check the plugged connections and the cable ducting for firm seating – Check pipes for damages
- Put the regulator into operation and check the swit ching functions
- Check the circulation pumps and flow meter
- Check the safety features for functionality
- Remove the sun protection foil on the collector

Instruction of the system operator
The vacuum pipes of the collector are also designed for adverse weather conditions. There is a 5 year guarantee on production faults. The manufacturer does not accept the guarantee if any damages are caused as a result of:
- Improper or unsuitable use
- Faulty assembly or start up
- Natural wear
- Faulty or negligent handling, unsuitable operating media
- Chemical, electro-chemical or electrical influences that cannot be traced back to us
- Non-observation of the assembly instructions
- Improper changes or repair work
- Effects of components from third-party sources
- Aggressive vapours, oxygen corrosion
- Further use of the system despite the occurrence of a fault
- Storm, hail or other weather related damages

Taking out of commission
Proceed as follows:
- Disconnect the regulator from the power source
- Drain the heat transfer medium via the filling tap
- Dispose of the heat transfer medium under the observation of local regulations and ensure proper disposal

LATENTO®

System Operator:

Prename:	
Last name:	
Street:	
Location:	
Phone:	

Installing company:

Prename:	
Last name:	
Street:	
Location:	
Phone:	

Initial operation date: _____ **Time:** _____

Solar System

Collector: **Product:** _____ **Type:** _____ **Number:** _____

Total collector surface			
Circuitry	Chain ☐	Parallel ☐	Tichelmann ☐
Year of manufacture			
Value Collector temperature sensor (C°)			

Controller: **Product:** _____ **Type:** _____ **Number:** _____

Solarstation:

Nominal Size expansion vessel (MAG) (l):	
System pressure expansion vessel (bar):	
Site pressure (Sys. pressure + 0,5 bar) (bar):	
Volume flow rate (l/min):	

Solar liquid: **Solar 20:** Yes ☐ No ☐ **Antifreeze: up to** _____ °C

Solar storage: **Product:** _____ **Type:** _____

Additional information

Kind of thermal solar system: Hot water supply (HWS) ☐ HWS + Support of heating system ☐

Special characteristics:

The solar system was set up and taken into operation regarding all relevant standards and rules.

Date, Location **Signature Installer** **Signature Operator**

9. Maintenance

We recommend an annual check of the system by a specialist!

CAUTION

Risk of burning due to hot components!
Hot vapours may occur in the solar system and these may enter into the storage facility. As a result, components may heat up considerably.

– Avoid contact with hot components
– When working on hot components, use suitable gloves

Check the operating pressure
The operating pressure of the system may drop as a result of a pressure drop.
The causes of a drop in pressure may be:
- Leaks
- The safety valve letting off pressure
- Insufficient initial pressure in the expansion tank

In order to check the operating pressure, proceed as follows:
1. Compare the operating pressure with the intended values or the original setting values from the start up protocol
2. If necessary, set the operating pressure back to the intended value by refilling the heat transfer media

NOTE

In the event of a longer standstill or a failure of the solar system, the collector area should be covered over in order to prevent the "thermal destruction" of the solar fluid.

Check the pumps, valves and gravity brakes
- Check the pumps, valves and gravity brakes for full functionality.
- Check all safety mechanisms for full functionality.

Check the anti-freeze of solar fluid
Check the anti-freeze of the solar fluid in the following way:
1. Prior to the start of each winter, check the anti-freeze with an anti-freeze tester
2. Restore the anti-freeze properties if need ben
3. Only refill Solar 20 neat

Check the corrosion protection
Check the corrosion protection of the solar fluid in the following way:
1. Check the corrosion protection using a pH measuring stick
2. Replace the solar fluid fully if the pH value is < 7

Visual check of collectors and connections
When carrying out the visual check of the collectors and connections, pay attention to the following:
1. Check the collectors for damages. Defective pipes can be recognised by the silver-coloured vaporisation in the foot region of the pipes changes to a white deposit caused by ingress of air.
2. If necessary, replace damaged pipes
3. Check the connections for leaks

EC - Safety Data Sheet according to 91/155/EEC

1. Substance/Preparation and Company Name

Trade name:	SOLAR 20 heat carrier liquid (LS ready mixed, cold protection -28°C)
Company:	IVT GmbH & Co KG
Emergency information:	Fon: 0049 (0) 9876-9786-0

2. Possible risks

Additional hazard information for people and the environment:	No specific hazards known

3. Composition/Information on ingredients

Chemical Characterization:	Aqueous solution of 1,2 polypropylene glycol with corrosion inhibitors. CAS no.: 57-55-6
Acute Toxicity:	LD50/oral/Rat:>2000 mg/kg Primer Skin irritation/rabbit: not irritating (OECD-Richtlinie 404). Primer Mucosa irritation/rabbit: nicht reizend (OECD-Richtlinie 405).
Additional advice:	The product was not tested. The statement is derived from the single components.

4. First aid measures

General notes:	Remove contaminated clothing
After inhalation:	In the case of having troubles after inhaling steam/aerosol: Fresh air, call for medical assistance
After contact with the eyes:	Rinse thoroughly under running water for 15 minutes with the eyes wide open
After contact with the skin:	Wash off with soap and water
If swallowed:	Rinse out mouth and drink plenty of water
Information for the doctor:	Symptomatic treatment (decontamination, vital functions), no specific antidote known
Marking as of EG-rules:	No duty to mark
Other rules:	Water endangering class: WGK 1: weakly water endangering (Germany, VwVwS vom 17.05.1999)

5. Measures of fire suppression

Suitable extinguishing agents:	SOLAR 20 is not combustible. Spray water, dry extinguishing agents, alcohol-resistant foam as well as carbon dioxide (CO2) are appropriate for extinguishing near-by fires.
Specific hazards:	Fumes harmful to health. Development of smoke/mist. The substances/substance groups may be released in the event of a fire.
Special protective equipment:	Im Brandfall umluftunabhängiges Atemschutzgerät tragen.
Further information:	In the event of a fire, wear breathing equipment not depending on the ambient air.
Other indications:	All information that has been changed in comparison to the previous issue are marked by a vertical line at the left margin of the relevant passage. Older issues will thereby become invalid. The Safety Data Sheet is designed to convey the key physical safety-technical, toxicological and ecological data when handling chemical substances and to give recommendations for safe dealings or storage, handling and transport.

dealings or storage, handling and transport. Liability for damage asso- ciated with the use of this information or the use, application, adaptation or processing of the products described therein is ruled out. This does not apply if we, our legal representatives or vicarious agents are liable in the case of intent or gross negligence. Liability for indirect damage is ruled out.

This information has been prepared to the best of our knowledge and belief and in accordance with our current level of knowledge. The information does not contain any assurance of product properties.

Department issuing data sheet: Dept. AWT, phone: 0049 (0)9876/9786-0

6. Measures if released accidentally

Personal measures:	No special measures necessary.
Environmental protection measures:	Retain contaminated water/fire water. The product must not reach water bodies without pre-treatment (biological treatment plant).
Procedures for cleaning/absorption:	Dam in the leaked material and cover with large quantities of sand, soil or other material, then brush up vigorously to encourage absorption. Fill the mixture in containers or plastic sacks and remove for disposal. Rinse away small quantities (splashes) with lots of water, in the case of large quantities that could escape into drainage or water bodies, inform competent water authorities.

8

7. Handling and storage

Handling:	Good ventilation at the workplace, otherwise no special measures necessa- ry.
Fire and explosion protection:	No special measures necessary. Use water to cool containers at risk from heat.
Storage:	Store container in a dry place sealed tightly. Galvanized containers are not suitable for storage.

8. Exposure restriction and personal protection equipmentg

Respiratory protection:	Atemschutz bei Freisetzung von Dämpfen/Aerololen.
Eye protection:	Schutzbrille mit Seitenschutz (Gestellbrille) (EN 166).
Hand protection:	Chemicals resistant safety gloves (DIN EN 374-1). Recommended: Nitrile rubber (NBR), protection index 6. Heed the manu- facturers' instructions for use due to the large number of different types.
General protection and hygienic measures:	The usual precautions for handling chemicals must be observed.

9. Physical and chemical properties

State:	liquid
Color:	red fluorescent

Odor:	product-specific
Freezing point:	approx. -25°C (ASTM D 1177)
Solidification temperature :	approx. -31°C (DIN 51583)
Boiling temperature:	> 100 °C (ASTMD D 1120)
Flash point:	N/A
Explosive limits	– lower (LEL): 2,6 vol.-% (propylene glycol) – upper (UEL): 12,6 vol.-% (propylene glycol)
Ignition temperature:	N/A
Vapor pressure at 20°C:	20 mbar
Density at 20°C:	approx. 1,030 g/cm^3 (DIN 51757)
Solubility in water:	completely soluble
Solubility in other solvents:	soluble in polar solvents
pH value at 20°C:	9,0–10,5 (ASTM D 1287)
Viscosity (kinematic, 20°C):	approx. 5.0mm2/s (DIN 51562)

10. Stability and reactivity

Substances to be avoided:	Strong oxidizing media
Dangerous reactions:	No dangerous reactions, if the regulations/notes on storage and handling are observed.
Dangerous decomposition products:	No dangerous decomposition products, if the regulations/notes on storage and handling are observed.

11. Information on ecology

Assessment of aquatic toxicity:	The product was not tested. The statement is derived from the properties of the individual components.
Persistence and decomposability:	AInformation on elimination: Test method: OECD 301A (new version) Analysis method: DOC-reduction Elimination degree: >70% Evaluation: Easily biodegradable
Ecological toxicity:Fish toxicity:	Leuciscus idus/LC50 (96 h): >100mg/l Aquatic invertebrates: EC 50 (48 h): >100mg/l Aquatic plants: EC 50 (72 h): >100mg/l Microorganisms/action on activated sludge DEV-L2 >1000 mg/l. With correct discharge of low concentrations in adapted biological treat ment plants no disruption to the degradation activity of activated sludge is to be expected.

12. Notes on disposal

SOLAR 20 heat carrier liquid must be taken to a suitable landfill or incineration facility, taking account of the local regulations. In the case of quantities below 100l , contact the local municipal cleansing or the special environmental vehicle of that department.

Uncleaned packaging: Non-contaminated packagings can be reused. Packagings not capable of being cleaned should be disposed of like the substance.

13. Information on transportation

No hazardous freight in the sense of the transport regulations.
(ADR RID ADNR IMDG/GGVSee ICAO/IATA)

9

9. Regulation

1. ***LATENTO*** system regulator

The LATENTO system regulator is a universal use heating regulator for the efficient regulation of weather-led heating systems with differing heat sources and solar systems.
Up to two heat generators and one solar system can be regulated.
With 11 preprogrammed hydraulic variations in accordance with the IVT assembly suggestions, as well as 13 further basic systems for heating circuit, solar and heating generation functions, there is a wide variety of system variations available. In addition, unused relays may be freely occupied with additional functions (e.g. reloading, temperature difference etc.).
Alongside the self-explanatory operator guidance in the full text menu with help texts and graphical animations, a start up wizard ensures quick start up and simple operation.

System regulator

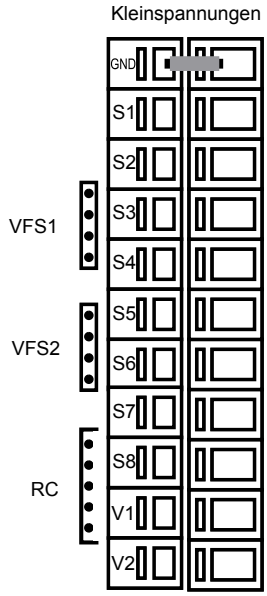
Functions
11 preprogrammed systems in accordance with the IVT assembly suggestions
13 basic systems with heating circuit, solar and heat generation functions as well as switchable functions for unused relays

- Self-explanatory operator guidance using 4 input keys
- Full text menu with help texts and graphic mode with animations
- Function control with graphic evaluation with long-term data storage for statistics for heat quantity and operating hours.
- RTC Real Time Clock with >24h power reserve
- Menu in 4 languages: DE, EN, ES, IT
- LEDS in red/green to display the operating modes
- Simple heat quantity measurement
- Heat counter via Grundfos direct sensor VFS
- Time and temperature controlled thermostat function
- Legionaries switch via solar
- Legionaries switch by means of additional heating
- Cooling function
- Start up wizard
- System protection
- Collector protection
- Storage protection
- Anti-freeze programme
- Return cooling
- Start logic for vacuum pipe collectors
- Control programme for self-draining systems (Drain Back)
- Fault memory and evaluation with date and time
- Menu blocker
- Data logging to SD card
- Ethernet connection with PC control software, optional
- Digital interface/bus system, optional

Equipment

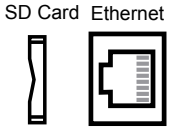
- 8 sensor inputs for Pt 1000 temperature sensor
- 2 connectors for VFS or RPS sensors
- 2 connectors for CAN in/out for data logger and network connection
- 1 connectors for RC21 room controller
- 1 slot for Micro SD including 2GB card
- 2 electronic relays ELR 230VAC for revolution regulation of standard pumps
- 4 relay outputs 230VAC mechanical in for pumps/valves
- 1 relay outputs for potential-free changer
- 2 outputs can be switched 0…10V or PWM for revolution regulation of high efficiency pumps

Plan of connector block for connection

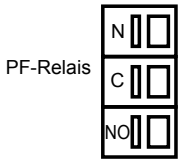


max. 12 V
Low voltage max. 12VAC/DC

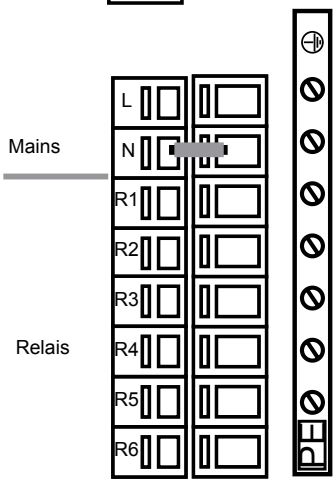
Clamp:	Connection for:
S1	Sensor 1
S2	Sensor 2
S3	Sensor 3
S4	Sensor 4
S5	Sensor 5
S6	Sensor 6
S7	Sensor 7
S8	Sensor 8
V1	0–10V / PWM
V2	0–10V / PWM
VFS1	Grundfos Direct Sensor
VFS2	Grundfos Direct Sensor
RC	Room Controller



SD Card Slot for Data saving and Updates. Mind correct orientation of card! Card must clinch without resistance; do not press exessively! Ethernet for connection in a LAN CAN device.



Potential free Relais R7 NO Normally open C Common NC Normally closed



Electricity network side 230 VAC
Electricity power supply 230 VAC 50–60 Hz

Clamp:	Connection for:
R1	Switching output 1 (drehz.)
R2	Switching output 2 (drehz.)
R3	Switching output 3
R4	Switching output 4
R5	Switching output 5
R6	Switching output 6
N	Network neutral wire N
L	Nezwork outer wire L

The connection of the protective conductor PE takes place at the PE metal fixing block!

What you as user can set by yourself

You may carry out the following setting on the heating controller:

- Select heating operation
- Select operating mode
- Adapt room temperature heating operation
- Lock
- Party function
- Set time
- Set room temperature heating operation
- Set room temperature lowering operation
- Adapt heating curve
- Set maximum flow temperature
- Set heating operation heating limit
- Query target/actual values
- Set timer program heating/hot water

CAUTION

All other settings must only be carried out by qualified personnel.
Incorrect changes may cause erratic behaviour of the heating facility or exercise adverse effects on the life of the installation.

Technical data

Power supply:	100 – 240 VAC
Network frequency:	50 – 60 Hz
Power consumption:	0.5 – 3 W
Switching performance:	
Total switching performance of electronic relays:	460 VA for AC1 / 460 W for AC3
Electronic relay R1:	min. 5 W …max. 120 W for AC3
Electronic relay R2:	min. 5 W …max. 120 W for AC3
Total switching performance of mechanic relays:	460 VA for AC1 / 460 W for AC3
Mechanical relay R3:	460 VA for AC1 / 460 W for AC3
Mechanical relay R4:	460 VA for AC1 / 460 W for AC3
Mechanical relay R5:	460 VA for AC1 / 460 W for AC3
Mechanical relay R6:	460 VA for AC1 / 460 W for AC3
Potential free relay R7:	460 VA for AC1 / 460 W for AC3
0…10 V output:	Designed for 10 kΩ
PWM output:	Freq. 1 kHz, level 10 V
Internal fuse:	2 A slow blowing 250 V (3x)
Protection type:	IP 40
Protection class:	II
Over voltage protection category:	II
Level of contamination:	II
Ambient temperature:	
In regulator operation:	0°C – 40°C
During transportation:	0°C – 60°C
Dimensions:	H= 228mm, W= 180mm, D= 53mm
Display:	Fully graphical display 128x128 dots
Housing:	3 piece, plastic ABS

Checking temperature sensors
All temperature sensors for the all-inclusive regulation have the same characteristics (PT, 1000 Ohm at 0°C).
The resistance values are to be obtained from the operating instructions, page 5.

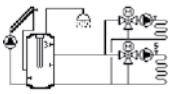
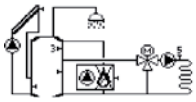
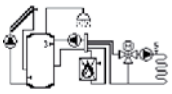
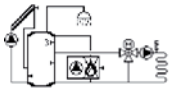
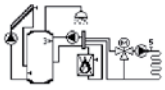
NOTE

Notes on installation
The electrical installation and fuse rating have to comply with the local regulations. The heating controllers need to stay always energized so as to safeguard their operational availability at any time. Hence upstream power switches have to be confined to emergency stop switches or master switches which would normally be left in connected position.

DANGER

The device is operated with electric current. Incorrect installation or incorrect attempted repairs may cause danger of life through electric shock. Installation and commissioning must only be carried out by adequately qualified staff. Generally refrain from opening the device and the accessory parts. Only the manufacturer may carry out repairs.

Preprogrammed installation suggestions

	Connection	Scheme 1	Scheme 2	Scheme 3	Scheme 4	Scheme 5	Schema 6
							
		IVT MV A 1 HK	IVT MV A 2 HK	IVT MV B 1 HK	IVT MV C 1 HK	IVT MV D 1 HK	IVT MV E 1 HK
Temperature sensors – only low voltage	**S1**	Storage Solar (bottom)	Storage Solar (bottom)	Storage Solar (bottom)	Storage Solar (bottom)	Storage Solar (bottom)	Storage Solar (bottom)
	S2	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Return sensor
	S3	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)
	S4		HC 2 Flow		Return sensor	Solids-boiler sensor	Solids-boiler sensor
	S5	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow
	S6			Blower sensor	Blower sensor	Blower sensor	Blower sensor
	S7	Outside	Outside	Outside	Outside	Outside	Outside
	S8	Collector	Collector	Collector	Collector	Collector	Collector
	VFS1						
	VFS2						
	V1		Signal Solar pump				Signal Solar pump
	V2						
Relais connections – 230 VA	**R1 (ELR)**	Solar pump	Heating pump 1	Solar pump	Solar pump	Solar pump	
	R2 (ELR)		Heating pump 2	Boiler pump	return valve	Solids-boiler pump	return valve
	R3		Mixer 1 open		Tapwater pump	Boiler pump	Tapwater pump
	R4	Mixer open	Mixer 1 close	Mixer open	Mixer open	Mixer open	Mixer open
	R5	Mixer close	Mixer 2 open	Mixer close	Mixer close	Mixer close	Mixer close
	R6	Heating pump	Mixer 2 close	Heating pump	Heating pump	Heating pump	Heating pump
	R7 (Pot. frei)	Heating element	Heating element	Blower	Blower	Blower	Blower

Scheme 7	Scheme 8	Scheme 9	Scheme 10	Scheme 11	Scheme 12	Anschluss
IVT MV F 1 HK	IVT MV F 2 HK	IVT MV G 1 HK	IVT 2HK + 1WEZ + Solar	IVT 2HK + 1WEZ	Kombispeicher + Heizkreis	
Storage Solar (bottom)	Storage Solar (bottom)	Storage Solar (bottom)	Storage Solar (bottom)			**S1**
Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	**S2**
Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	**S3**
Solids-boiler sensor	HC 2 Flow		HC 2 Flow	HC 2 Flow		**S4**
HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	**S5**
	Solids-boiler sensor		Blower sensor	Blower sensor		**S6**
Outside	Outside	Outside	Outside	Outside	Outside	**S7**
Collector	Collector	Collector	Collector			**S8**
						VFS1
						VFS2
	Signal Solar pump		Signal Solar pump			**V1**
						V2
Solar pump	Heating pump 1	Solar pump	Heating pump 1	Heating pump 1		**R1 (ELR)**
Solids-boiler pump	Heating pump 2		Heating pump 2	Heating pump 2		**R2 (ELR)**
	Mixer 1 open		Mixer 1 open	Mixer 1 open		**R3**
Mixer open	Mixer 1 close	Mixer open	Mixer 1 close	Mixer 1 close	Mixer open	**R4**
Mixer close	Mixer 2 open	Mixer close	Mixer 2 open	Mixer 2 open	Mixer close	**R5**
Heating pump	Mixer 2 close	Heating pump	Mixer 2 close	Mixer 2 close	Heating pump	**R6**
	Solids-boiler pump	Compressor	Blower	Blower		**R7 (Pot. frei)**

	Connection	Scheme 13	Scheme 14	Scheme 15	Scheme 16	Scheme 17	Scheme 18
		Storage tank + Compressor + Loading pump	Storage tank + Solar + Blower	Storage tank + Heating circuit 2	Boiler + Heating circuit	Boiler + Compressor + Loading pump	Boiler + Blower
Temperature sensors – only low voltage	**S1**		Storage Solar (bottom)	Storage Solar (bottom)			Speicher Solar (unten)
	S2	Storage HC (middle)	Storage HC (middle)				
	S3	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)
	S4			HC 2 Flow			
	S5	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow
	S6		Blower				Blower
	S7	Outside	Outside	Outside	Outside	Outside	Outside
	S8		Collector	Collector			Collector
	VFS1						
	VFS2						
	V1						
	V2						
Relais connections – 230 VA	**R1 (ELR)**		Solar pump	Solar pump			Solar pump
	R2 (ELR)	Loading pump	Boiler pump			Loading pump	Boiler pump
	R3			Heating pump 2	Tapwater pump	Tapwater pump	Tapwater pump
	R4	Mixer open	Mixer open	Mixer open	Mixer open	Mixer open	Mixer open
	R5	Mixer close	Mixer close	Mixer close	Mixer close	Mixer close	Mixer close
	R6	Heating pump	Heating pump	Heating pump	Heating pump	Heating pump	Heating pump
	R7 (Pot. frei)	Compressor	Blower demand			Compressor	Blower demand

Schema 19	Scheme 20	Scheme 21	Scheme 22	Scheme 23	Scheme 24	Anschluss
Puffer + Boiler + Heizkreis	Puffer + Boiler + Verdichter	Puffer + Boiler + Solar + Brenner	2 gemischte Heizkreise	2 gemischte Heiz-kreise + Verdichter	2 gemischte Heizkreise + Solar + Verdichter	
		Storage Solar (bottom)			Storage Solar (bottom)	**S1**
Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	Storage HC (middle)	**S2**
Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	Storage DHW (top)	**S3**
			HC 2 Flow	HC 2 Flow	HC 2 Flow	**S4**
HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	HC1 Flow	**S5**
		Blower				**S6**
Outside	Outside	Outside	Outside	Outside	Outside	**S7**
		Collector			Collector	**S8**
						VFS1
						VFS2
					Signal Solar pump	**V1**
						V2
		Solar pump	Heating pump 1	Heating pump 1	Heating pump 1	**R1 (ELR)**
	Loading pump	boiler pump	Heating pump 2	Heating pump 2	Heating pump 2	**R2 (ELR)**
Tapwater pump	Tapwater pump	Tapwater pump	Mixer 1 open	Mixer 1 open	Mixer 1 open	**R3**
Mixer open	Mixer open	Mixer open	Mixer 1 close	Mixer 1 close	Mixer 1 close	**R4**
Mixer close	Mixer close	Mixer close	Mixer 2 open	Mixer 2 open	Mixer 2 open	**R5**
Heating pump	Heating pump	Heating pump	Mixer 2 close	Mixer 2 close	Mixer 2 close	**R6**
	Compressor	Blower demand		Compressor	Blower	**R7 (Pot. frei)**

2. ***LATENTO*** L solar regulator

The LATENTO L solar regulator is a temperature-difference regulator for the regulation of complex solar, storage and solid fuel boiler systems. Preprogrammed hydraulic variations as well as a start up wizard help to ensure quick and simple operation. The self-explanatory menu guidance is also easy for a layperson to understand.
An optional flow rate sensor may be connected which ensures precise recording of the solar yield.

Functions:
- 36 basic systems with solar or solid fuel boiler as well as switchable functions for unused relays
- Self-explanatory operator guidance using 4 input keys
- Full text menu with help texts and graphic mode with animations
- Function control with graphic evaluation with long-term data storage for statistics for heat quantity and operating hours
- RTC Real Time Clock with >24h power reserve
- Menu in various languages: DE, EN, FR, ES, IT, RUS, ...
- LEDS in red/green to display the operating modes
- Simple heat quantity measurement
- Heat counter via Grundfos direct sensor VFS
- Time and temperature controlled thermostat function
- Legionaries switch via solar
- Legionaries switch by means of additional heating
- Cooling function
- Start up wizard
- System protection
- Collector protection
- Storage protection
- Anti-freeze programme
- Return cooling
- Start logic for vacuum pipe collectors
- Control programme for self-draining systems (Drain Back)
- Fault memory and evaluation with date and time
- Menu blocker

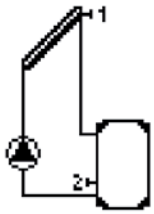
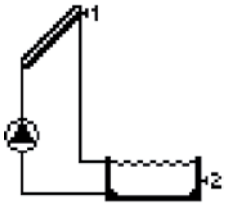
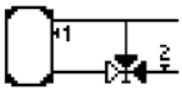
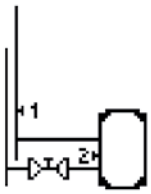
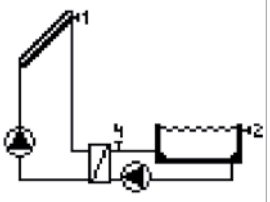
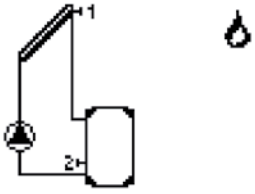
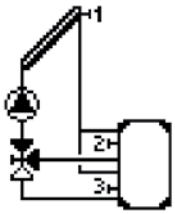
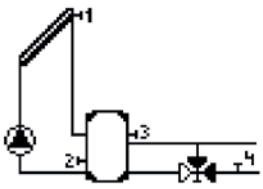
Equipment
- 6 sensor inputs for Pt 1000 temperature sensor
- 2 connectors for VFS or RPS sensors
- 2 connectors for CAN in/out for data logger and network connection
- 2 electronic relays ELR 230VAC for revolution regulation of standard pumps
- 1 relay output 230 VAC mechanical changer for pumps/valves
- 2 outputs can be switched 0…10V or PWM for revolution regulation of high efficiency pumps

Technical data:

Power supply:	100–240 VAC
Network frequency:	50–60 Hz
Power consumption:	0,5–2,5 W
Electronic relay R1:	min. 5 W …max. 120 W for AC3
Electronic relay R1:	min. 5 W …max. 120 W for AC3
Mechanical relay R3:	460 VA für AC1 / 460 W for AC3

0…10 V output:	Designed for 10 kΩ
PWM output:	Freq. 1 kHz, level 10 V, 1 kΩ resistance
Protection type:	IP 40
Protection class:	II
Over voltage protection category:	II
Level of contamination:	II
Ambient temperature:	
In regulator operation:	0 °C–40 °C
During transportation:	0 °C–60 °C
Dimensions:	H = 163mm, W = 110mm, D = 51mm
Display:	Fully graphical display 128x64 dots
Housing:	3 piece, plastic ABS

Vorprogrammierte Hydraulikschemen

 Scheme 1: Solar	 Scheme 2: Solar with Pool	 Scheme 3: Solids boiler	 Scheme 4: Reloading
 Scheme 5: Return uprating	 Scheme 6: Thermostat	 Scheme 7: Universal DeltaT	 Scheme 8: Block valve
 Scheme 9: Solar with Pool + HESensor	 Scheme 10: Solar + Thermostat	 Scheme 11: Solar + 2-Zone storage + Ventil	 Scheme 12: Solar with Return uprating

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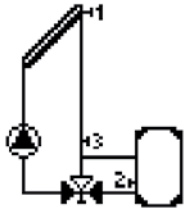
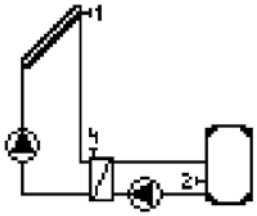
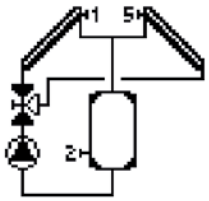
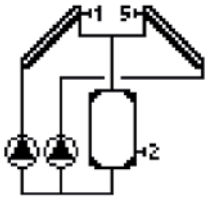
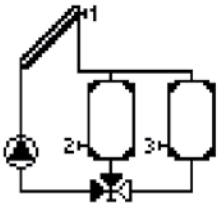
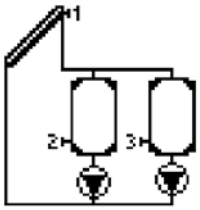

Scheme 13: Solar + Bypass

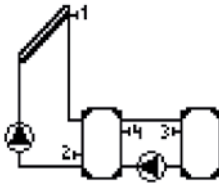

Scheme 14: Solar + HE

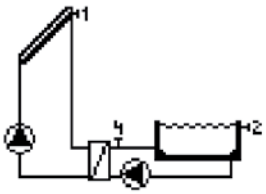

Scheme 15: Solar + 2. Collector + Valve

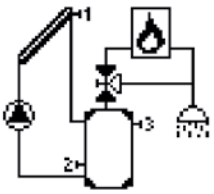

Scheme 16: Solar + 2. Collector + Pump

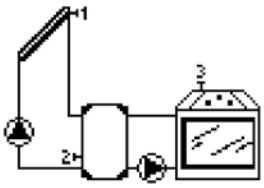

Scheme 17: Solar + 2. Storage with Valve

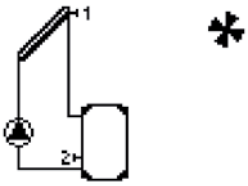

Scheme 18: Solar + 2. Storage + Pump

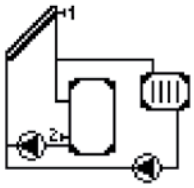

Scheme 19: Solar + Storage reloading

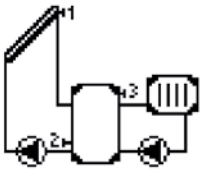

Scheme 20: Solar with Pool + HE

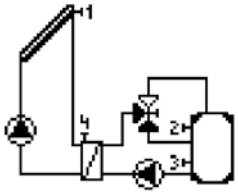

Scheme 21: Solar + Thermostat as Valve

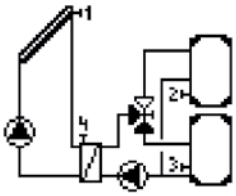

Scheme 22: Solar + solids boiler

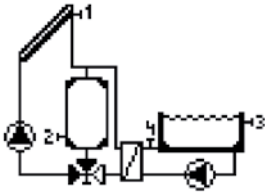

Scheme 23: Solar + Cooling 1

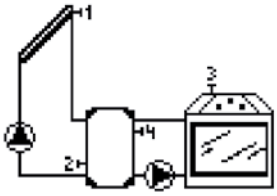

Scheme 24: Solar + Cooling 2

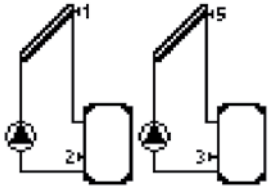

Scheme 25: Solar + Cooling 3

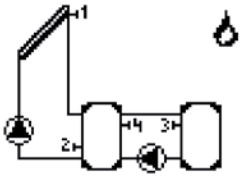

Schema 26: Solar + HE + 2 Zone Storage + Valve

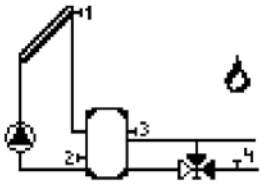

Scheme 27: Solar + HE + 2 Storages with Valve

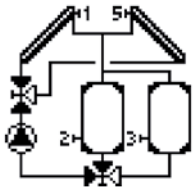

Scheme 28: Solar + Valve for Pool+HE

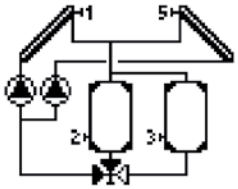

Scheme 29: Solar + Solids-Boiler + S4

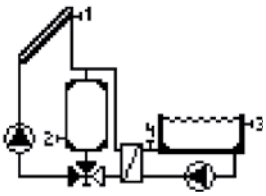

Scheme 30: 2x Solar

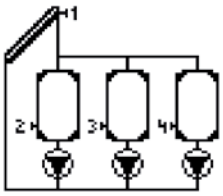

Scheme 31: Solar + Reloading + Thermostat

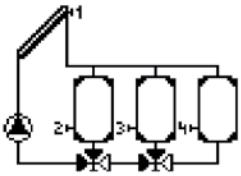

Scheme 32: Solar + Returnuprating + Thermostat


Scheme 33: Solar + 2. Collector + Valve + 2. Storage with Valve

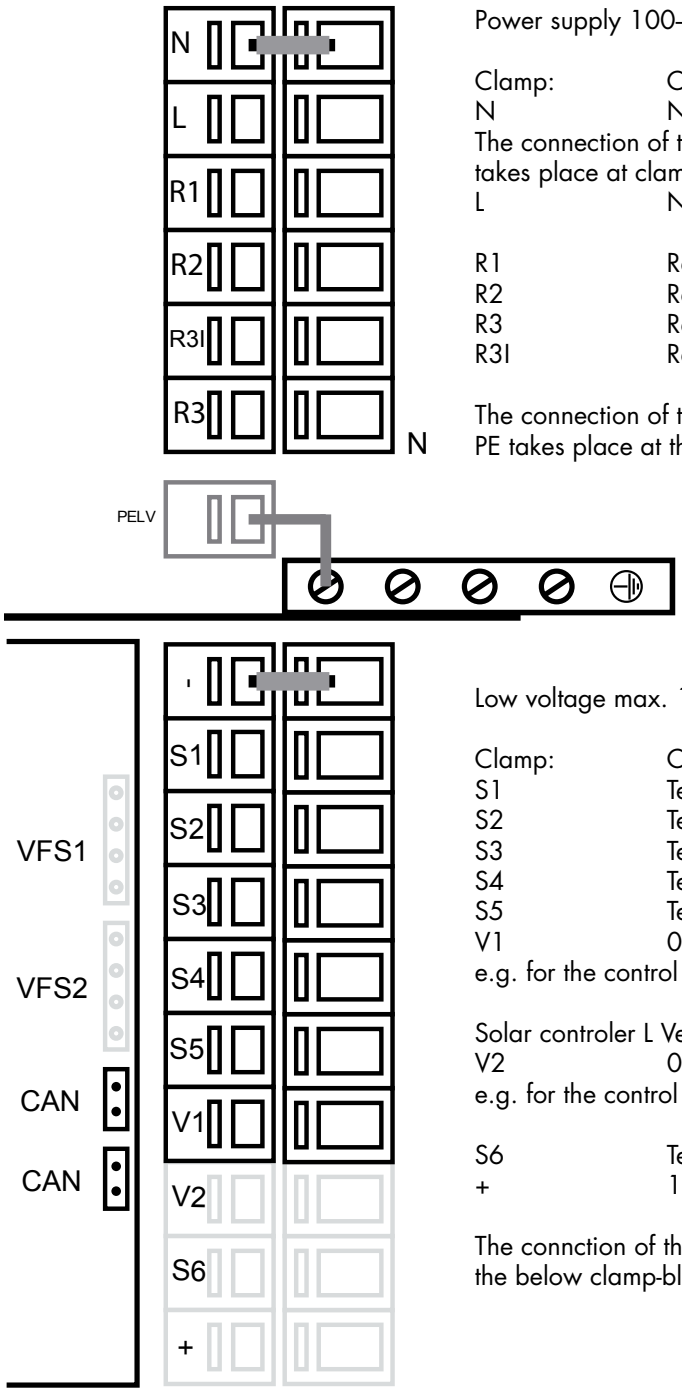

Scheme 34: Solar + 2. Collector with Pump + 2. Storage with Valve


Scheme 35: Solar + Valve for Pool + HE


Scheme 36: Solar + 3 Storages with Pumps


Scheme 37: Solar + 3 Storages with Valves

Plan of connector block for connection



Power supply 100–240 VAC 50–60 Hz

Clamp:	Connection for:
N	Net neutral conductor N

The connection of the neutral conductor N takes place at clamp-block N.

L	Net outer conductor L
R1	Relais 1
R2	Relais 2
R3	Relais 3 (closer)
R3I	Relais 3 (opener)

The connection of the protective conductors PE takes place at the PE metal clamp-block!

On the regulation board:
Solar control L
Version V3 + V4:

VFS1 Grundfos
Direct sensor

VFS2 Grundfos
Direct sensor

CAN1 CAN
Bus connection

CAN2 CAN
Bus connection

Low voltage max. 12 VAC/DC

Clamp:	Connection for:
S1	Temperature sensor 1
S2	Temperature sensor 2
S3	Temperature sensor 3
S4	Temperature sensor 4
S5	Temperature sensor 5
V1	0-10 V / PWM Signal output

e.g. for the control of energy saving pumps

Solar controler L Version V3 + V4:

V2	0–10 V / PWM Signal output

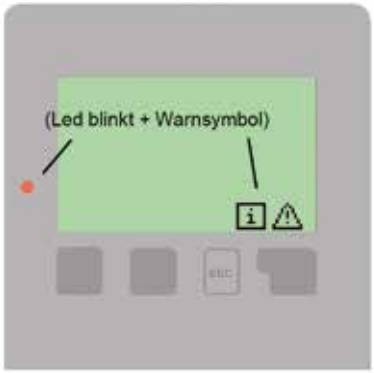
e.g. for the control of energy saving pumps

S6	Temperature sensor 6
+	12 V voltage supply

The connction of the ground wire takes place at the below clamp-block (grey).

Faults with error messages

If the regulator recognises a faulty function, the warning symbol appears on the display. If the fault is no longer present, the warning symbol changes to an information symbol. Further information about the fault can be found by pressing the button under the warning or information symbol.



CAUTION

Do not act on your own.
In the event of a fault, consult a specialist!

Possible error messages:	Notes for the specialist:
Sensor x defective	Means that either the sensor, sensor input on the regulator or the connection cable is/was defective.
Collector alarm	Means that the set alarm temperature at the collector has been exceeded.
Restart	Means that the regulator must be restarted, for example, as a result of a power failure. Check the date and time!
Time and date	This is displayed automatically after a longer network interruption because the time and date need to be checked and corrected.
No flow	If Δ T between the storage and collector for is not 50 °C or more for 5 minutes, this error message is output.
Heavy cycling	Means that within 5 minutes the relay has switched on and off more than 5 times.
AL failed	AL failed appears when at least AL-T intended-5 °C for the set time exposed cannot be maintained at the AL sensor.

3. ***LATENTO*** S solar regulator

The LATENTO S solar regulator is a temperature-difference regulator for the regulation of simple solar systems. In addition, this regulator can be used as a universal temperature-difference regulator or thermostat function for various systems. Preprogrammed hydraulic variations as well as a start up wizard help to ensure quick and simple operation.

Funktion

- 9 basic systems with solar or solid fuel boiler
- Self-explanatory operator guidance using 4 input keys
- Full text menu with help texts and graphic mode with animations
- Function control with graphic evaluation with long-term data storage for statistics for heat quantity and operating hours
- RTC Real Time Clock with >24h power reserve
- Menu in 18 languages: DE, EN, FR, ES, IT, PT, PL, CZ, DK, GR, HR, HU, NL, RU, SE, FI, TR, BG
- Simple heat quantity measurement
- Time and temperature controlled thermostat function
- Legionaries switch via solar
- Start up wizard
- System protection
- Collector protection
- Storage protection
- Anti-freeze programme
- Return cooling
- Start logic for vacuum pipe collectors
- Control programme for self-draining systems (Drain Back)
- Fault memory and evaluation with date and time
- Menu blocker

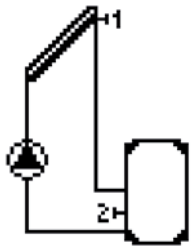
Technical Data

Power supply	100–240 VAC
Network frequency:	50–60 Hz
Power consumption	0,5–2,0 W
Switching performance:	
Electronic relay R1	min. 5 W …max. 120 W for AC3
0…10 V output	Designed for 10 kΩ
PWM output	Freq. 1 kHz, level 10 V, 1 kΩ resistance
Apparent power of the voltage transformer	250 VAC, 6 (2)A, 50 Hz
Internal fuse	2 A träge 250 V
Protection type	IP 40
Protection class	II
Over voltage protection category	II
Level of contamination	II
Ambient temperature:	
In regulator operation	0 °C–40 °C

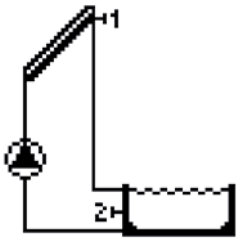
During transportation:	0 °C–60 °C
Humidity:	
In regulator operation:	max. 85 % relative humidity at 25 °C
During transportation:	no condensation permitted
Dimensions:	H = 115mm, W = 86mm, D = 45mm
Display:	Fully graphical display 128 x 64 dots
Housing:	2 piece, plastic ABS

Equipment:
- 3 sensor inputs for Pt 1000 temperature sensor
- 1 electronic output ELR 230VAC for revolution regulation of standard pumps
- 1 output can be switched 0…10V or PWM for revolution regulation of high efficiency pumps

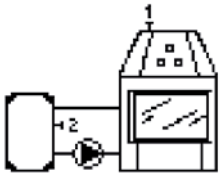
Hydraulikschemen



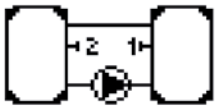
Scheme 1: Solar with Storage



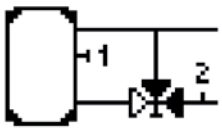
Scheme 2: Solar with pool



Scheme 3: Solids-boiler with Storage



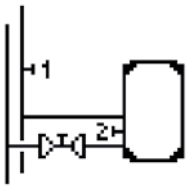
Scheme 4: Storage reloading



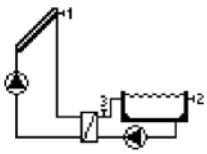
Scheme 5: HC return uploading

Scheme 6: Thermostat

Scheme 7: Delta T Universal



Scheme 8: Lock valve



Scheme 9: Solar with heat exchanger and pool

Faults with error messages meldungen

If the regulator recognises a faulty function, the warning symbol appears on the display. If the fault is no longer present, the warning symbol changes to an information symbol. Further information about the fault can be found by pressing the button under the warning or information symbol.

CAUTION

Do not act on your own.
In the event of a fault, consult a specialist!

Possible error messages:	Notes for the specialist:
Sensor x defective	Means that either the sensor, sensor input on the regulator or the connection cable is/was defective.
Collector alarm	Means that the set alarm temperature at the collector has been exceeded.
Heavy cycling	Means that the solar pump has been switched more than 6 times in 5 minutes.
Restart	Means that the regulator must be restarted, for example, as a result of a power failure. Check the date and time!

10

10. Accessories

1. Pump group solar

Brief description
Pump group solar, completely insulated, to be installed in solar circuit, with WILO Star 25/6 pump and with integrated permanent breather valve.

NOTE

The fitting group must be fitted at a sufficient distance to the collectors (because of the possible high temperatures immediately after the collectors)! When fitting in the roof space, ensure that the expansion tank does not overheat (e.g. using an intermediate tank)!
Fitting and installation of solar systems are subject to DIN EN 12976-1.
Electric connections must only be carried out by adequately qualified staff. The pertinent regulations (VDE 0100, VDE 0185, VDE 0190, etc.) have also to be heeded and special local (building) regulations too.
Solar systems have to be grounded for lightning protection. The expansion tank has to be periodically checked acc. to DIN 4807.

Pump group solar
(Item. no. 878 700 085)
Technical data

Dimensions:

Height (with insulation):	500 mm
Width (with insulation, w/out ADG set):	315 mm
Center distance supply return:	125 mm
Connections:	Solar circuit Rp ¾" Expansion vessel G ¾"

Operating data:

Max. admissible pressure:	10 bar
Max. admissible temperature (at standstill):	110 °C, temporarily 130 °C

Equipment:

Safety valve:	6 bar
Pressure gage:	0–10 bar
Thermometer:	20–150 °C
Gravity brakes:	in supply/ return ball valve
Flowmeter:	Glykol: 0,8–10,3 l/min, water: 1–13 l/in

Material:

Components:	brass
Gasket:	PTFE, asbestos-free fiber gasket
Gravity brakes:	brass
Insulation:	EPP, λ = 0.04 W/(m*K)

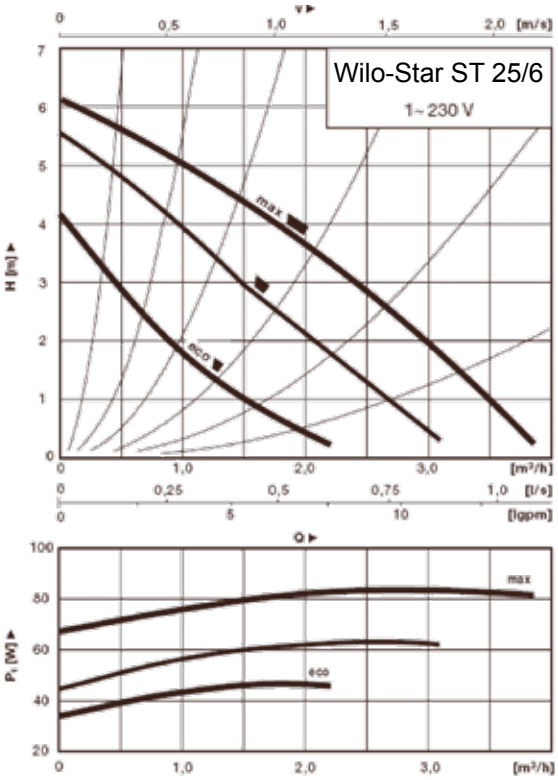
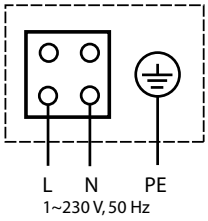


Diagram of solar pump Wilo Star ST25/6-3



Terminal connections

2. Pump group, solar high efficiency pump

Brief description
Solar pump group, fully insulated, for installation in the solar circuit, with high efficiency pump Grundfos Solar PM 2 25-85 180, PWM signal and permanent vent.

NOTE

The fitting group must be fitted at a sufficient distance to the collectors (because of the possible high temperatures immediately after the collectors)! When fitting in the roof space, ensure that the expansion tank does not overheat (e.g. using an intermediate tank)!
Fitting and installation of solar systems are subject to DIN EN 12976-1.
Electric connections must only be carried out by adequately qualified staff. The pertinent regulations (VDE 0100, VDE 0185, VDE 0190, etc.) have also to be heeded and special local (building) regulations too.
Solar systems have to be grounded for lightning protection. The expansion tank has to be periodically checked acc. to DIN 4807.

Solar pump group with high efficiency pump (Art.-Nr. 878 700 078)
Technical Data

Dimensions:

Height (with insulation):	500 mm
Width (with insulation, w/out ADG set):	315 mm
Center distance supply return:	125 mm
Connections:	Solar circuit Rp ¾" Expansion vessel G ¾"

Operating data:

Max. admissible pressure:	10 bar
Max. admissible temperature (at standstill):	110 °C, temporarily 130 °C

Equipment:

Safety valve:	6 bar
Pressure gage:	0–10 bar
Thermometer:	20–150 °C
Gravity brakes:	in supply/ return ball valve
Flowmeter:	Glykol: 0,8–10,3 l/min, water: 1–13 l/in

Material:

Components:	brass
Gasket:	PTFE, asbestos-free fiber
Gravity brakes:	brass
Insulation:	EPP, λ = 0,04 W/(m*K)

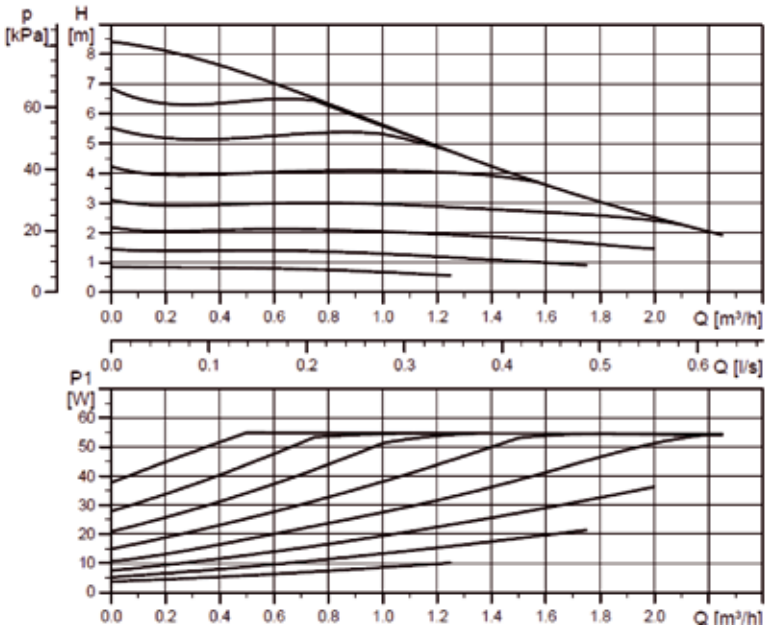


Diagram Grundfos Solar PM 2 25-85

3. High efficiency pump group solar with regulation

Brief description
Solar pump group, completely insulated, for installation in the solar circuit, with Wilo Yonos Para ST 25/7 PWM pump. The controller enables a continuous electronic speed control over the pump's whole output range.

NOTE

The fitting group must be fitted at a sufficient distance to the collectors (because of the possible high temperatures immediately after the collectors)! When fitting in the roof space, ensure that the expansion tank does not overheat (e.g. using an intermediate tank)! Fitting and installation of solar systems are subject to DIN EN 12976-1. Electric connections must only be carried out by adequately qualified staff. The pertinent regulations (VDE 0100, VDE 0185, VDE 0190, etc.) have also to be heeded and special local (building) regulations too. Solar systems have to be grounded for lightning protection. The expansion tank has to be periodically checked acc. to DIN 4807.

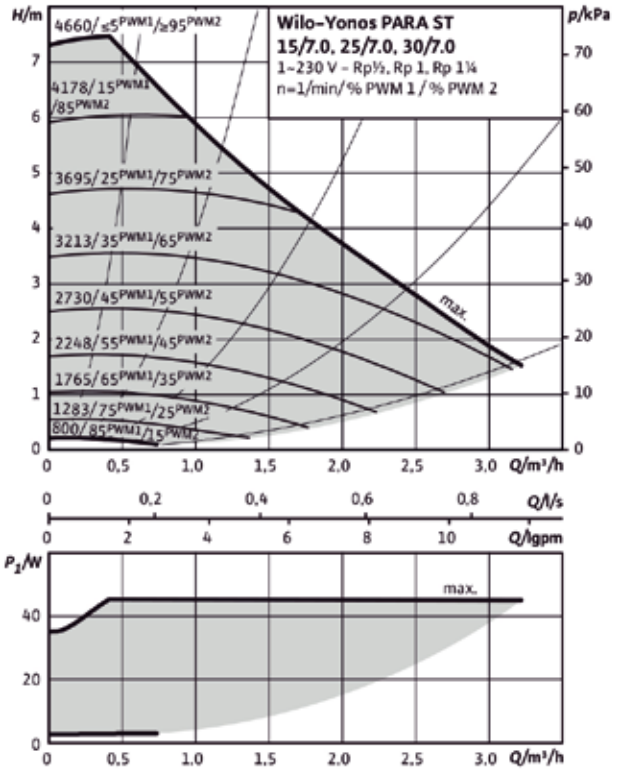


Diagram pump group solar Wilo Yonos Para ST 25/7 PWM

High efficiency pump group solar with regulation (Item. no. 878 700 026)
Technical data

Dimensions:

Height (with insulation):	440 mm
Width (with insulation, w/out ADG set):	320 mm
Center distance supply – return:	125 mm
Connections:	3/4" AG (male)

Operating data:

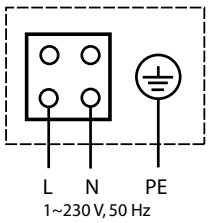
Max. admissible pressure:	6 bar
Max. admissible temperature (at standstill):	120 °C, temporarily 160 °C

Equipment:

Safety valve:	6 bar
Pressure gage:	0–10 bar
Thermometer:	0–120 °C
Gravity brakes:	in supply/return ball valve
Flowmeter:	2–12 l/min

Material:

Flat gaskets:	Klingerit – max. 200 °C
O-ring gaskets:	VITON/EPDM – max. 180 °C
Gravity brakes:	PPS
Insulation:	EPP, λ = 0.041 W/(m*K)



Terminal connections

4. Heating circuit pump group with high efficiency

Brief description
Heating circuit pump group, completely insulated, for installation for a mixed heating circuit with 3-way mixer with Grundfos Alpha 2 25-60. Gravity brake in the return and 2 stopcocks with thermometers. Wet rotor circulating pump with integrated electronic power control.
Optimum heat comfort with maximum energy saving.
Avoids annoying flow noises in the heating system.

Automatic night-time reduction integrated.

Energy label A.

NOTE

It should be installed by trained skilled personnel. Accepted good engineering practice and the legal regulations must be noted and followed when installing. Electrical connections may only be made by trained electricians. The relevant regulations (VDE 0100, VDE 0185, VDE 0190, etc.) and the local (building) regulations must be complied with.

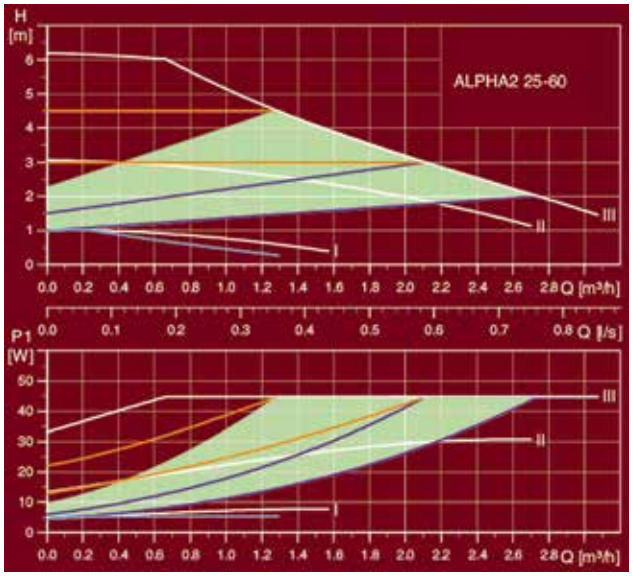


Diagram of Grundfos Alpha 2 25-60 solar pump

Due to its energy saving potential, the "Alpha2" pump has been given the Energy+ Award. In an ideal case, its power consumption is reduced to five watt and the energy consumption is reduced to approx. 60 kilowatt hours per year.
This is a saving of up to 80 percent compared to conventional models.

Heating circuit pump group with energy saving pump group (Item. no. 878 700 079)
Technical data

Dimensions:

Height (with insulation):	420 mm
Width (with insulation):	250 mm
Center distance supply return:	125 mm
Connection, bottom:	G 1½ AG
Connection, top:	IG 1"

Operating data:

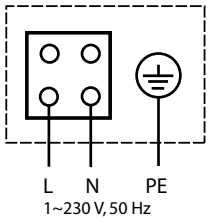
Max. allowable pressure:	10 bar
Max. allowable temperature:	2 °C–110 °C,
Kvs value:	6.2
Power consumption:	5... 45 W

Equipment:

Thermometer:	0 °C–120 °C
Gravity brake:	in the return

Material:

Components:	steel, brass
Gasket:	PTFE, asbestos-free fiber gasket
Insulation:	EPP, λ = 0.04 W/(m*K)



Terminal connections

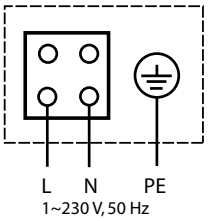
5. Circulation pump group with high efficiency pump

Brief description
Circulating pump group, completely insulated, for an unmixed heating circuit or for storage tank charge. With Grundfos Alpha 2L 25-60.

NOTE

Fitting to be carried out by trained specialists. When fitting, the rules acc. to the latest technology and the statutory regulations must be observed. Electric connections must only be carried out by adequately qualified staff. The pertinent regulations (VDE 0100, VDE 0185, VDE 0190, etc.) have also to be heeded and special local (building) regulations too.

Terminal connections



Circulating pump group (Item. no. 878 700 080) Technical data

Dimensions:

Height (with insulation):	420 mm
Width (with insulation):	250 mm
Center distance supply return:	125 mm
Connection, top:	Rp 1"
Connection, top:	G 1½" in. male thread, flat-sealing

Operating data:

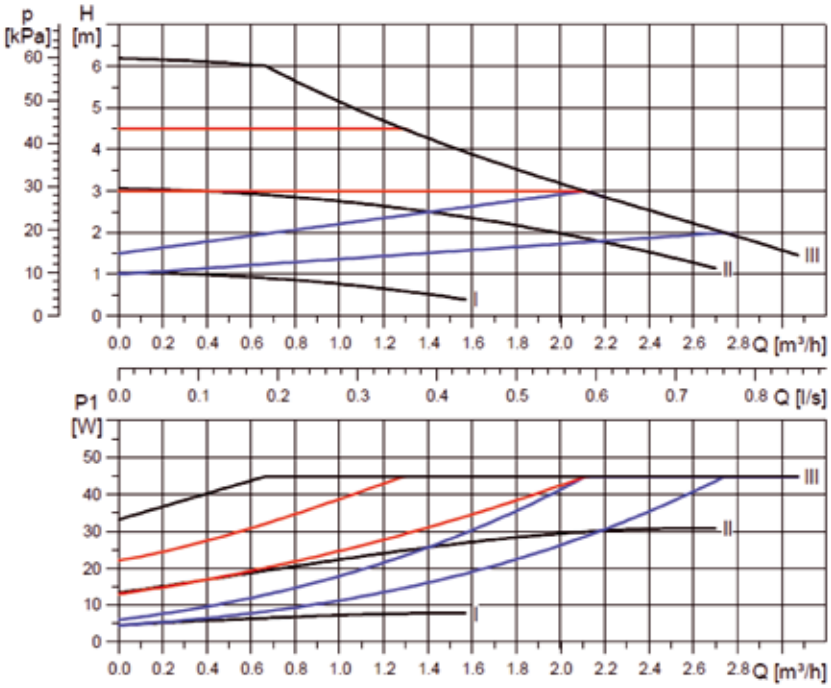
Max. admissible pressure:	8 bar
Max. admissible temperature:	–15 °C to 110 °C, temporarily 130 °C
Kvs-Wert:	9.7

Equipment:

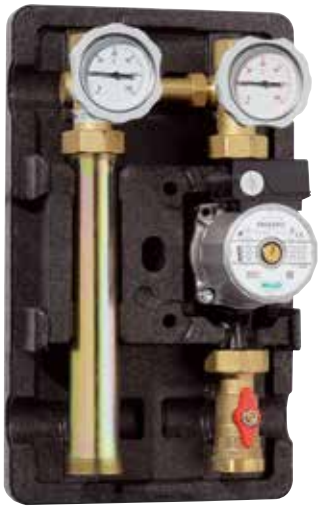
Thermometer:	0–120 °C
Gravity brake:	in return flow

Material:

Components:	steel, brass
Gasket:	PTFE, brass
Insulation:	EPP, λ = 0.04 W/(m*K)



Grundfos Alpha 2L 25-60



6. Boiler pump group with high efficiency pump

Brief description
Boiler-charging set for installation between solid-fuel boiler and heating circuits and/or storage tanks with self-regulating bypass valve for return control (opening temperature selectable between 40 °C – 70 °C). Transgression below the dew point in the boiler is safely avoided with the aid of the boiler-charging set, hence safely counteracting possible boiler sooting. Pump group is completely insulated, with Grundfos Alpha 2L 25-60. pump.

NOTE

Fitting to be carried out by trained specialists. When fitting, the rules acc. to the latest technology and the statutory regulations must be observed. Electric connections must only be carried out by adequately qualified staff. The pertinent regulations (VDE 0100, VDE 0185, VDE 0190, etc.) have also to be heeded and special local (building) regulations too.

Pump group boiler
(Item. no. 878 700 083)
Technical data

Dimensions:

Height (with insulation):	420 mm
Width (with insulation):	250 mm
Center distance supply – return:	125 mm
Connection, top:	G 1½" in. incl. union nuts
Connection, bottom:	G 1" in., female thread

Operating data:

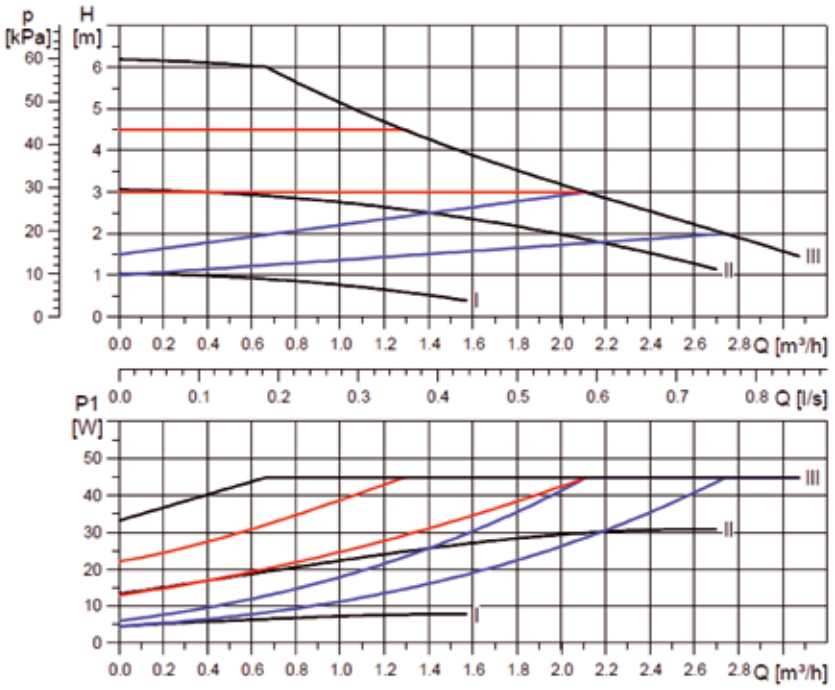
Max. admissible pressure:	8 bar
Max. admissible temperature (at standstill):	110 °C, temporarily 130 °C
Kvs-value:	9.7

Equipment:

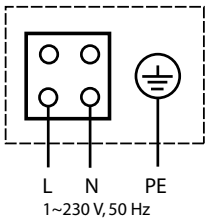
Thermometer:	0 °C–120 °C
Gravity brake:	in flow

Material:

Components	steel, brass
Gasket:	PTFE, asbestos-free fiber gasket
Insulation:	EPP, λ = 0.04 W/(m*K)



Grundfos Alpha 2L 25-60 diagram

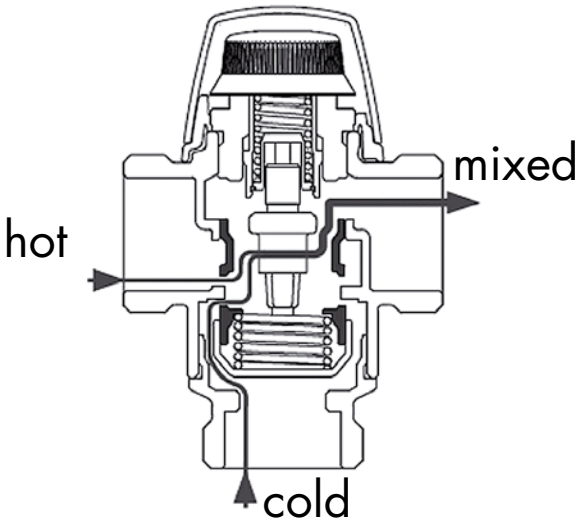


Terminal connections

7. Thermostatic mixing valve

Application
The thermostatic mixing valve is used in the hot water preparation systems at a central position after the hot water generator. This achieves a constant mixed water temperature regulation as well as scalding protection for the downstream pipe system. In particular when a solar system is able to achieve high temperatures in the storage.
The valve ensures scalding protected functionality, thus, when the cold water feed is interrupted the hot water feed is closed automatically.

Functional representation



Thermostatic mixing valve
(Art.-Nr. 878 700 021)
Technical Data

Pressure level:	PN 10
Operating pressure:	10 bar (1,0 MPa)
Difference pressure:	mixing, max. 3 bar (0,3 MPa)
Maximum temperature:	95 °C (briefly 100 °C)
Setting range, temp.:	50 °C–75 °C
Kvs value (in m^3/h):	3,0
Weight:	1.3 kg
Accessoiries:	including two non-return valves for hot- and cold twater and gasket
Areas of use:	– process water / drinking water – Water in closed systems – Water with antifreeze (Glykol ≤ 50 %-mixture)
Material / substance:	dezincing resistance brass (valve housing as well as all metal components with fluid contact)

8. Electric heating element

Brief description
For electric reheating of the solar stratified storage tank ***LATENTO*** XXL.

Mechanical fitting
Fitting is carried out into the thread G 1½" on the storage tank cover of the ***LATENTO*** XXL provided for this purpose. We recommend using Teflon tape for sealing.

NOTE

In rooms less than 2.7 m high, the tank must be tilted to screw the electric heating element into the *LATENTO*. In these cases the element must be installed before the piping and before filling the *LATENTO*.

Electrical connection
Heed VDE 0100 and the regulations of your power supply company.
Designated connecting leads: flexible leads of 1.5 to 4 mm² depending on electric loading. Protective conductor: keep at least 50 mm longer than the phase conductor and lay it such that it will be tightened last in case the lead is pulled.

NOTE

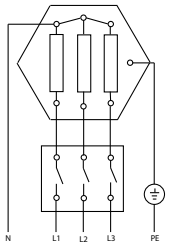
Apart from the relevant standards and regulations, the connection conditions of the local electricity and waterworks must also be complied with. The electrical connection may only be made by an approved, qualified electrician. Important: Do not forget to connect the protective conductor!

Commissioning
Check the following before commissioning:
- Professional fitting, connection and leak tightness of the ***LATENTO*** XXL
- ***LATENTO*** XXL has been sufficiently filled with water (check level mark on the float)
- Function or activation of the necessary safety installations
- Professional assignment of the heating power to the medium

Water connection
Always comply with the installation, connection and use instructions for the LATENTO stratified storage tank. It is imperative to prevent the possibility of dry heating.

Startup
The tank must be filled with water before switching on the electrical power supply. The water used to fill the tank must comply with the drinking water regulations. Please also note our specifications regarding this in the LATENTO installation/operating instructions. Otherwise pitting/crevice corrosion can occur in the heating elements. The first time the unit is heated up it must be monitored. Check automatic switching off of the temperature controller. Use original spare parts only for repairs!

Circuitry of 3-pole temperature controller/ limiter



User instructions
Please do not attempt to correct faults yourself. Trained specialists often require a single action only and your screw-in radiator is ok again.

Maintenance
Keep the electric heating cartridge free from deposits, settling material and others. Lime deposits will shorten the life of the cartridge when operated in water.
We recommend periodic descaling. Completely isolate the systems prior to starting maintenance!

TIP

The STB (safety temperature limiter) may have tripped, if the electrical heating element does not heat in spite of voltage applied. Put the heating element back into operation following the description above.

Technical data

	Electrical heating element 3/6/9 kW
Thread:	G 1½
Material of union fitting:	brass
Immersion depth:	1120 mm
Regulation:	Controller 0–85 °C/Limiter STB 100 °C
Voltage:	3-phase alternating current 230/400 V
Power:	9000 W
Material of tube heater (RHK):	Stainless steel 1.4571

9. Servo motor

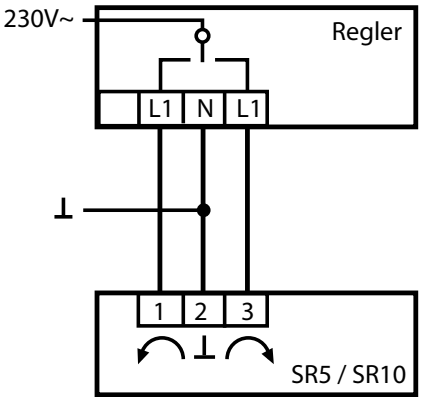
Brief description
For fitting on the 3-way mixing valve of the ***LATENTO*** pump group heating circuit. Servo motor for weather-controlled regulations, e.g. the system regulator.

Use
The servo motor for the mixing valve is used as electromotive drive for the pump group heating circuit. The servo motor is intended to be driven through a commercially available control system with 3-point output, e.g. the system regulator.

Principle of action
Thanks to a smart clicking system, the mixing valve servo motor is inserted directly to the mixing valve. The servo motor is fastened using a setscrew and locking pin which are included in delivery. These additionally serve as a thread locking device. Thanks to its compact form and small size, the servo motor fits perfectly under the insulations of the ***LATENTO*** pump group heating circuit. The angle of rotation (control range) is limited to 90°. When the servo motor reaches either of the limit switches, the voltage supply to the drive is interrupted. The servo motor can be put into manual mode by turning the adjusting knob (actuation using a slot-head screwdriver) to manual operation. Thereby the gear is disengaged and the mixing valve may be set to any position using the rotary handle (position indicator). The actuator is supplied in the left end position. The scale is pre-positioned for "right supply" (blue part of scale in the viewing window of the rotary handle). For the operation "left supply", the scale can be turned so that the red part of the scale will be visible in the viewing window of the rotary handle.

NOTE

The electric connection must be made acc. to the statutory regulations.



3-point servo motor connection diagram

Servo motor
(Item. no. 878 700 087)
Technical data of valve actuator

Operating voltage	230 V 50 Hz
Power consumption	2.5 W
Connection	cable 2 m; 3x0.75 mm²
Angle of rotation	electrically limited to 90°
Torque	6 Nm
Running time	140 s
Direction of rotation	selectable on terminals
Manual adjustment	mechanical disengagement of gear
Position indication	scale from 1 to 10
Ambient temperature	0 °C … + 50 °C
Maintenance	maintenance-free

10. 3-way valve

Application
Compact zone valve made from brass for use in heat pumps, underfloor heating or heating, ventilation and air conditioning systems.
The most important property is the ability to quickly change the flow direction between two circuits, thus efficient operation.

Function
The change from A circuit to B circuit is carried out via a signal to a control unit (e.g. LATENTO system regulator or LATENTO L solar regulator). The position indicator shows the flow rate direction.
With the adjustment motor removed, the valve takes a central position which enables flow rate in both circuits.

NOTE

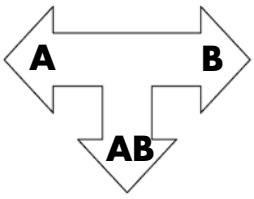
The servo motor must be protected from drip water, therefore the valve should be mounted with the drive on top.

3 way valve
(Item. no. 878 700 220)
Technical data

Pressure level:	PN 6
Maximum temperature:	95°C (briefly 110°C) / min. 5°C
Ambient temperature:	max. 60°C / min. 0°C
Power consumption:	230 +/- 10% VAC, 50 Hz
Own consumption:	15 VA
Control signal:	2-point SPDT (single-pin with 2 directions)
Protection class housing:	IP 20
Operating time:	3 s
Kvs value (in m^3/h):	6,5
Weight:	0,5 kg
Accessories:	including cable (length 1.6 m / loose, included)
Areas of use:	– Heating/underfloor heating – Comfort cooling/aeration and ventilation – Zones
Material / substance:	Dezincing resistance brass (valve housing) PPS (connector and cover plate) Stainless steel (spindle) EPDM (O rings)

Installation
It is essential to heed the direction of flow when fitting the 3-way valve!

A (de-energized closed)
B (de-energized opened)
AB (continuously open)

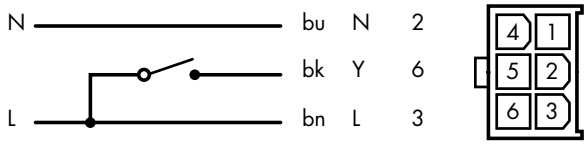


The marks **A, B** and **AB** are located on the valve body.

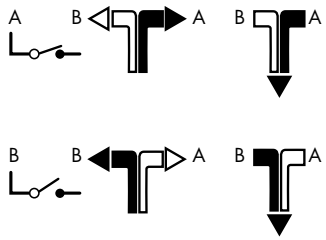
The driving head can be separated from the hydraulic part after depressing the latch button using a ¼ counter-clockwise revolution (45°).

Commissioning
The electric connection consists of 3 cables. The brown one is for continuous phase (power supply). The black one is the switching phase and the blue one the neutral conductor. The plastic slide on the driving head optically indicates the switching state of the valve.

Voltage supply and signal



Flow rate connection



11. Solenoid valve (closed when de-energized) Solenoid valve, open when de-energized

Brief description
For automatic switching off individual system circuits (prevents e.g. circulation via the heater at backup heating). The solenoid valve is closed in rest position (Item. no. 878 700 221) or open (Item. no. 878 700 222). The valve operates from 0 bar up, a minimum differential pressure is not required. Positively controlled.

Features
- High rate of flow
- For robust applications
- Close muting
- Suitable for vacuum
- For systems with low or fluctuating pressure conditions
- Valve operates without minimum pressure difference (Δ p)

Solenoid valve, Closed when de-energized (Item. no. 878 700 221)
Solenoid valve, Open when de-energized (Item. no. 878 700 222)

Description
Solenoid valve for e.g. air, water, oil

switching function:	Locked when in rest position
Direction of flow:	given
Fluid temperature:	–10 °C up to max. + 90 °C
Ambient temperature:	–10 °C up to max. + 50 °C
Fitting position:	any, preferably magnet vertical up

Materials

Housing:	brass
Seat gasket:	NBR
Internals:	stainless steels, PVDF, brass

Upstream installation of a dirt trap is recommended in case of contaminated fluids.

Characteristics

Nominal width [mm]	25
Port size	1 inch
Operating pressure min.	0
Operating pressure max.	10
Kv value (basis m^3/h)	8.0
Mass, total [kg]	1.30

standard voltages
AC: ~ (40 – 60 Hz) 24 V, 42 V, 110 V, 230 V

in accordance with VDE 0580

Voltage tolerance	± 10 %
Duty cycle	100 %

Degree of protection acc. to EN 60529 IP65
Panel connector acc. to DIN EN 175301-803A

Power consumption
Acc. to VDE 0580 at coil temperature +20 °C.
At alternating current (AC): 20 VA/18 W

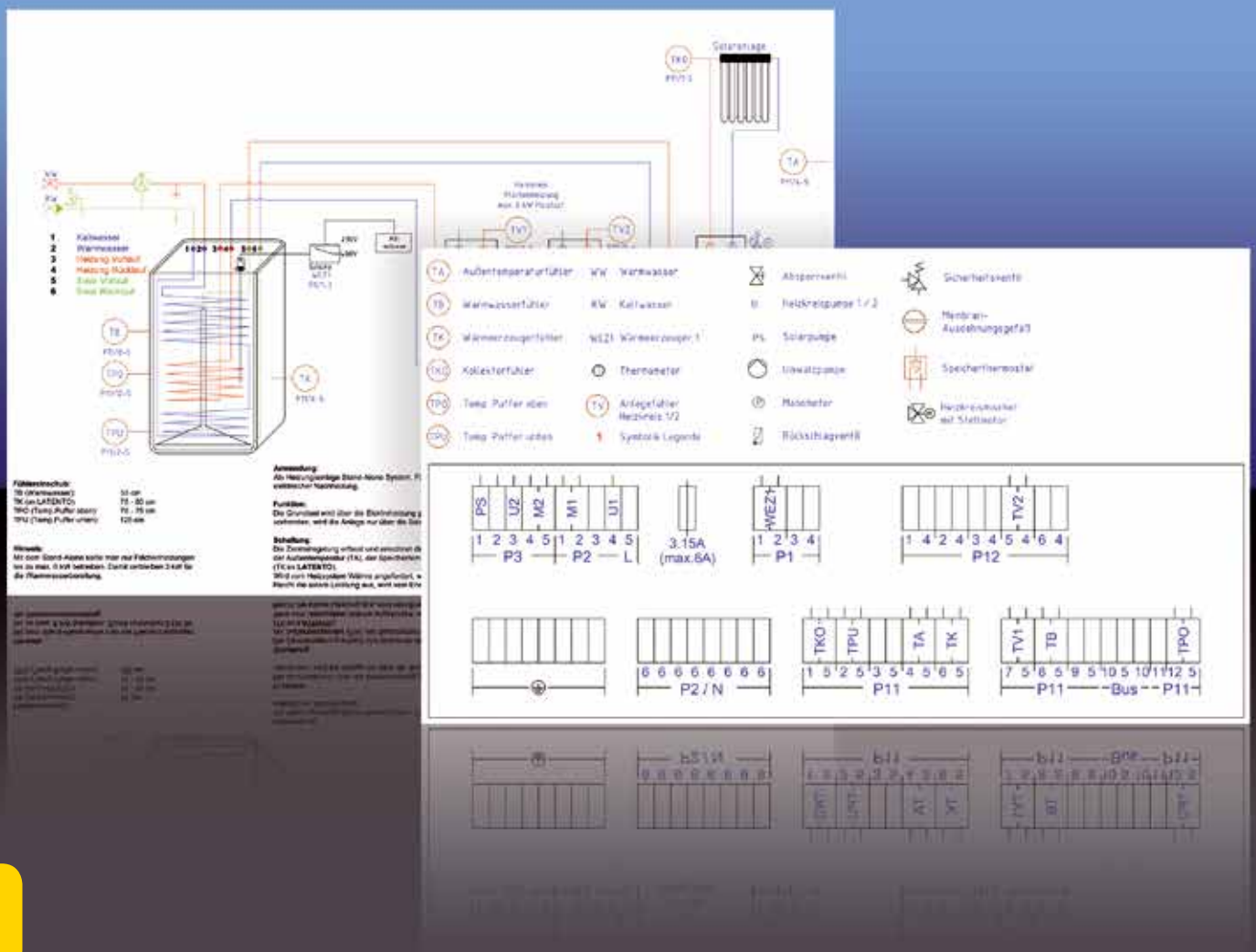
NOTE

Note on EMC Guideline:
See that appropriate electric wiring of the valves ensures that the limit values of the harmonized standards EN 50081-1 and EN 50082-1 are complied with so that Guideline 89/336/EEC (Electromagnetic Compatibility) is met.

NOTE

Fitting position of the magnet is vertical up.

Note on Pressure Equipment Directive (PED):
The valves of this model series including size DN 25 (G 1") comply with Article 3, Para. (3) of the Pressure Equipment Directive (PED) 97/23/EC. This means dimensioning and manufacture following the Good Engineering Practices prevailing in the member state. The CE marking on the valve does not refer to the PED. Hence the Declaration of Conformity is not applicable acc. to this Directive.



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11. Installation Suggestions

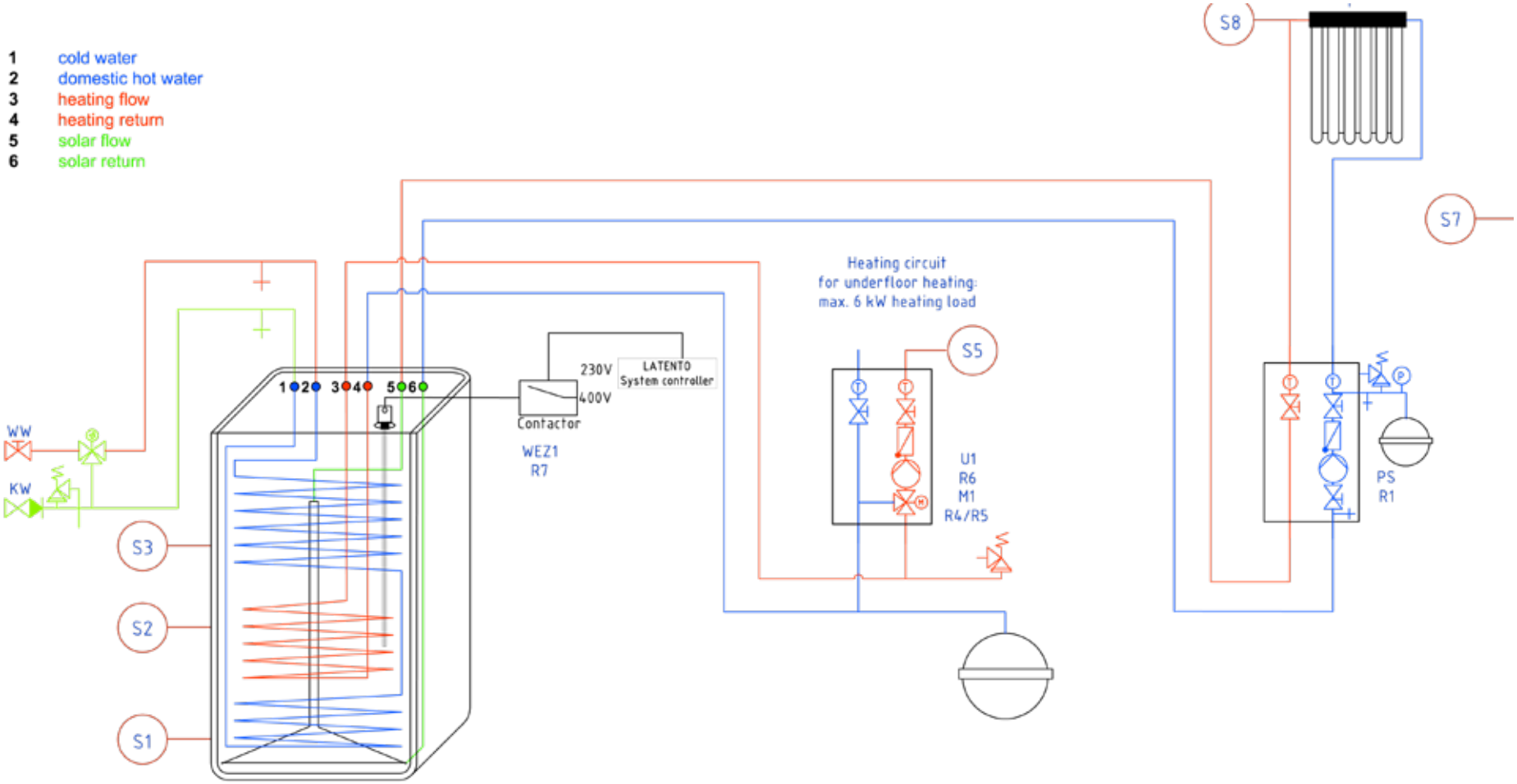
For every hydraulic combination of the ***LATENTO*** XXL the terminal connections of all the heat sensors and all the equipment are described in the ***LATENTO*** All-Inclusive-Regulations. In addition the positions of all the temperature sensors are shown.

ADVICE

The installation recommendations do not constitute plans or technical drafts. These are merely to be seen as general functioning principles, which must not be considered either as performance data for the installed equipment, nor as material facts. Also safety precaution necessary for this kind of installation has not been taken into account in these suggestions. This must be planned and installed for each individual case by the responsible engineer/installer himself.

Stand-Alone
Installation suggestion A

1 cold water
2 domestic hot water
3 heating flow
4 heating return
5 solar flow
6 solar return



Application:
Stand-Alone system. Solar plant is used as primary heater and electric heating as back-up.

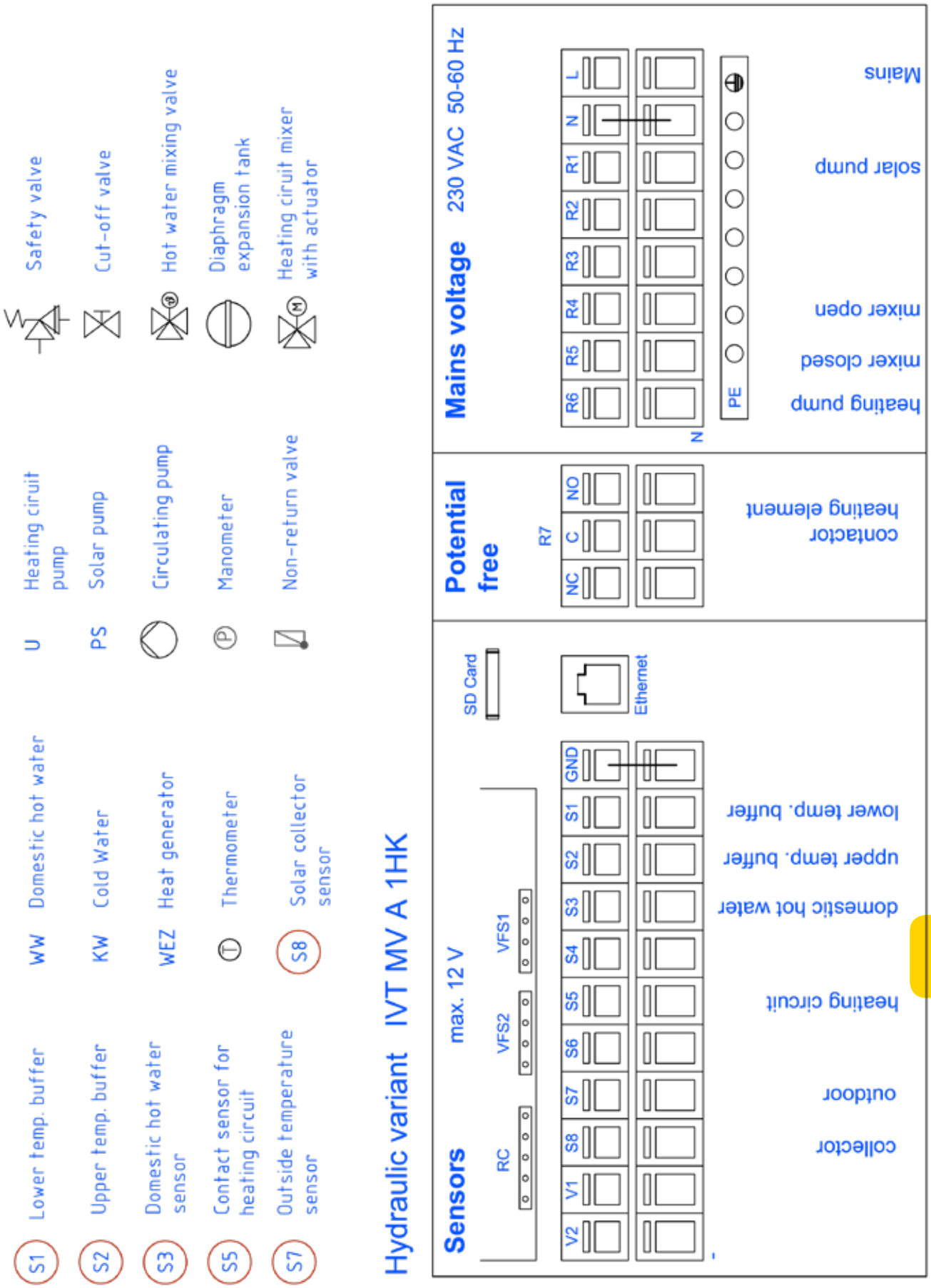
Function:
The basic output is provided by the electric heating. If there is sufficient solar energy, the system will only be supplied by solar plant.

Switching:
The central controller records and calculates the required operation temperatures,which are based on the outdoor temperature (S7) , upper buffer temperature (S3) and the boiler temperature (S5).
If heat demand in heating circuit can not be covered by solar plant , the electric heating element in the **LATENTO** tank will be activated .

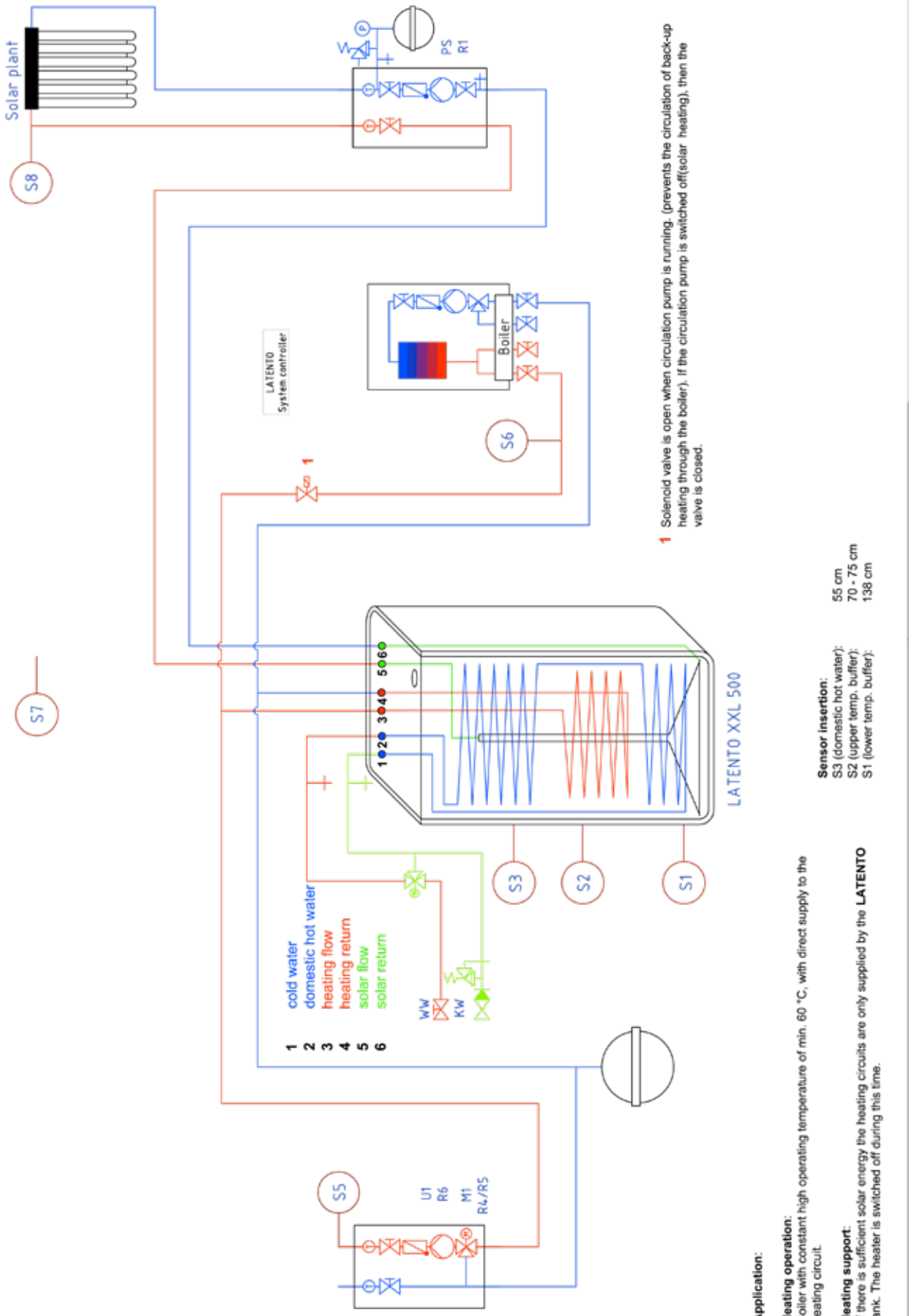
Sensor insertion:

S3 (domestic hot water):	55 cm
S2 (upper temp. buffer):	70 - 75 cm
S1 (lower temp. buffer):	138 cm

Advice:
With the electric heating (total 9kW capacity) the max surface heating load should be set 6 kW. The rest of 3 kW is reserved for domestic hot water heating .



Stand-Alone
Installation suggestion A



Boiler with high operating temperature (min. 60 °C)
Installation suggestion B

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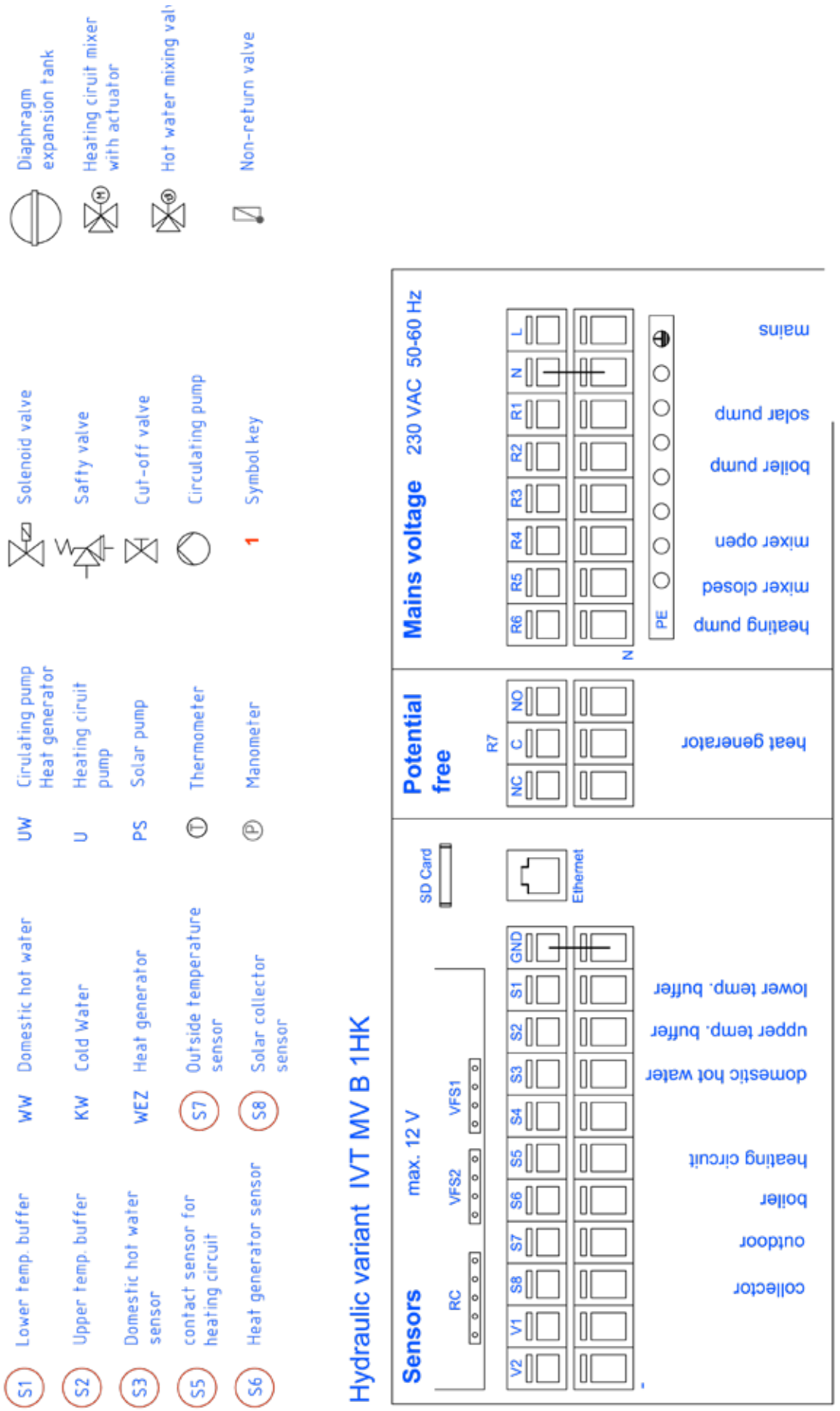
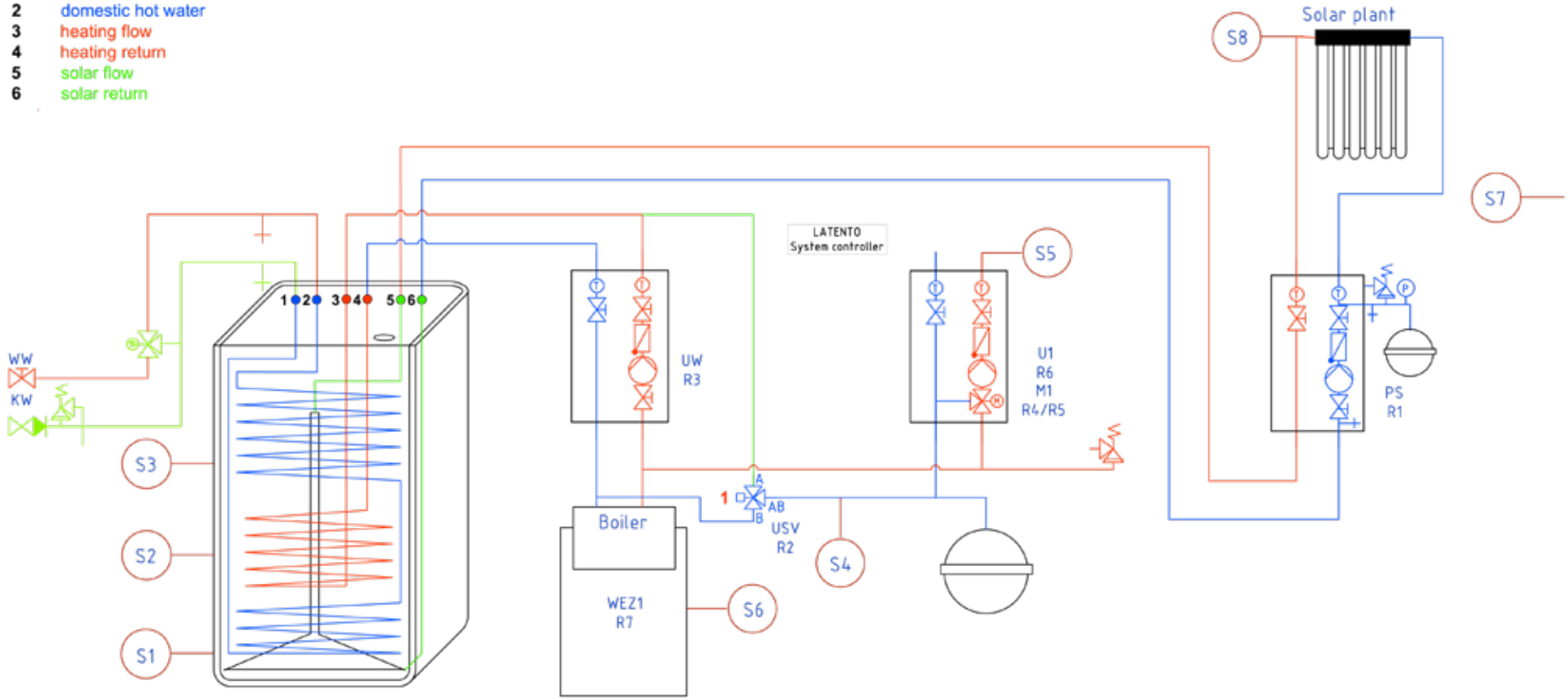


Boiler with high operating temperature (min. 60 °C)
Installation suggestion B

Low temperature boiler
Installation suggestion C

1 cold water
2 domestic hot water
3 heating flow
4 heating return
5 solar flow
6 solar return



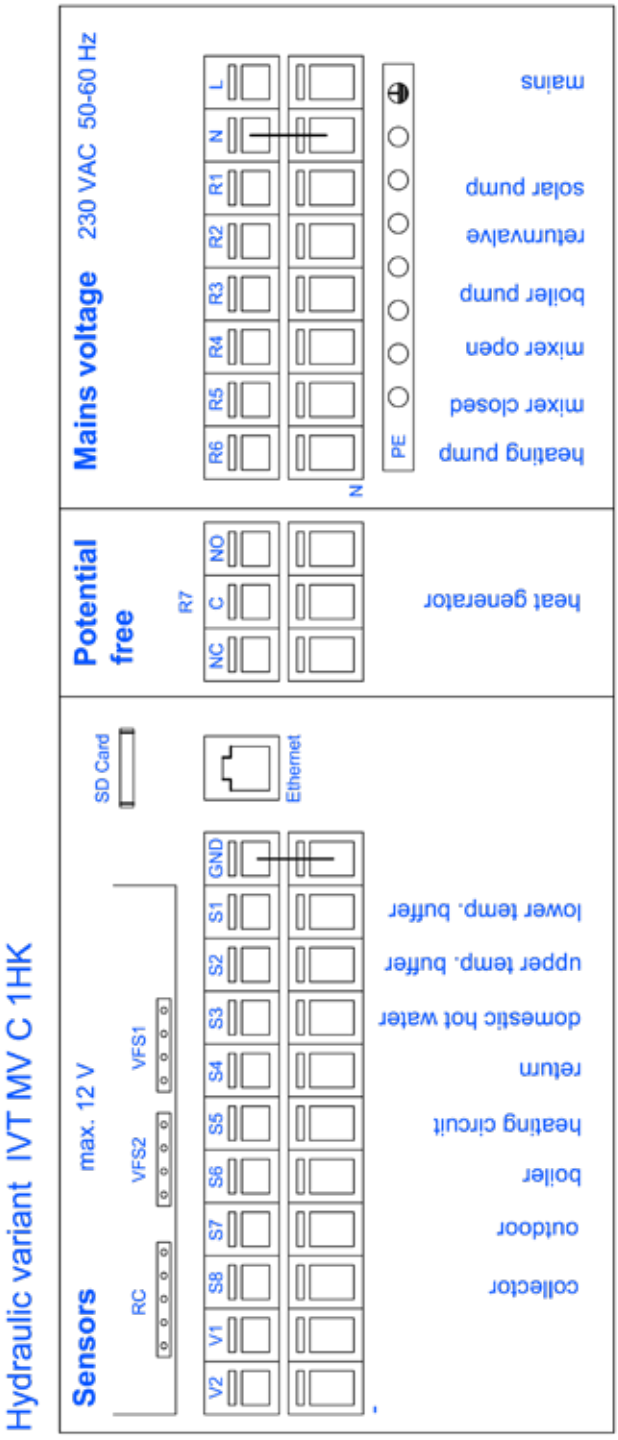
Sensor insertion:

S3 (domestic hot water):	55 cm
S2 (upper temp. buffer):	70 - 75 cm
S1 (lower temp. buffer):	138 cm

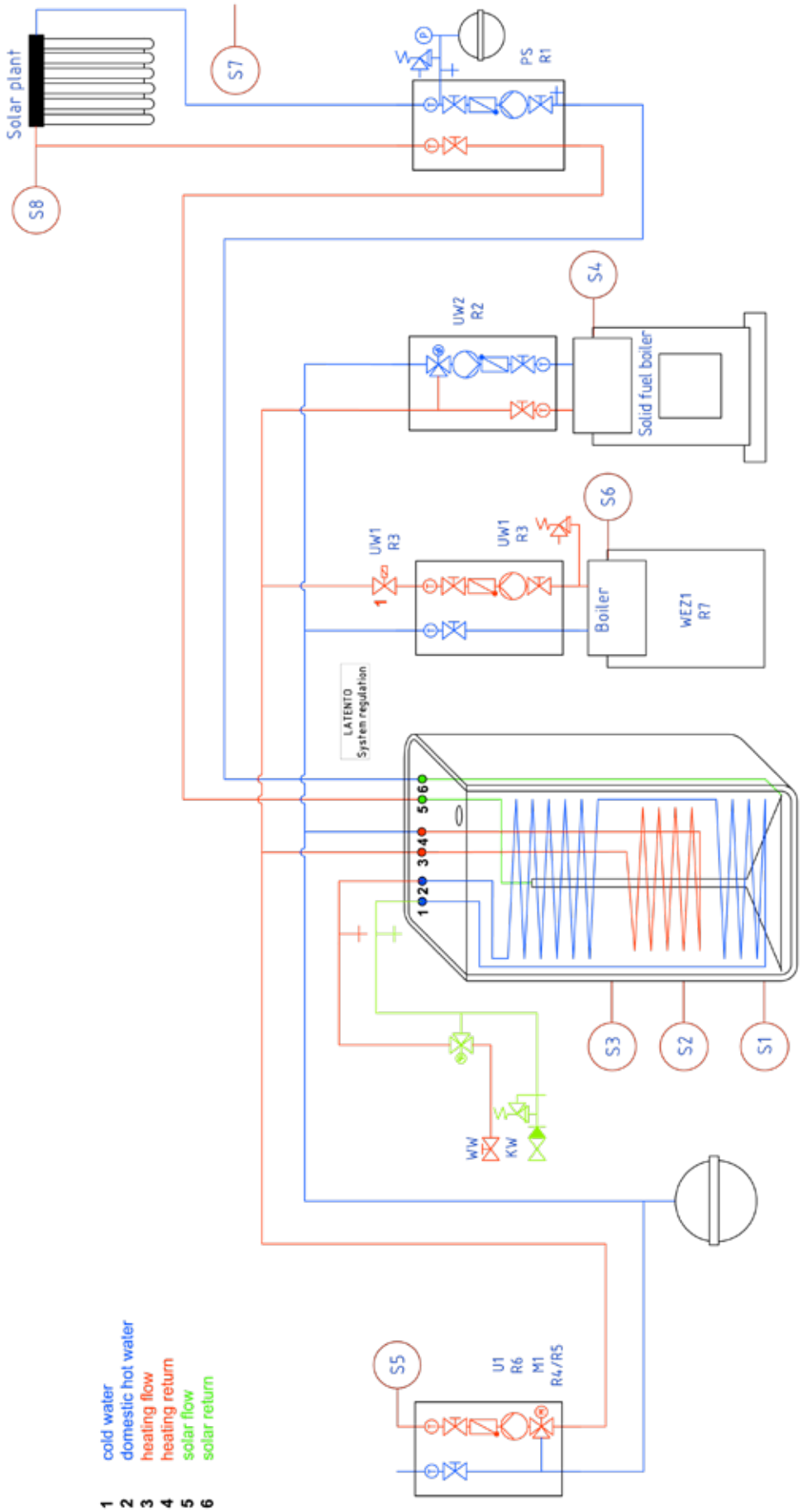
1 If the three-way valve is switched from AB to A, the return loop of heating circuit water will be led back to **LATENTO** tank and pre-heated up.

Application:
Low temperature boiler is collected with external pump groups for heating and domestic hot water operations.
Solar heating system for DHW and back-up heating is through return flow boost.

Function:
During normal operation the heating boiler runs as a low temperature heat system (heating circuit / domestic hot water heating). With sufficient solar energy output the storage temperature exceed the hot water demand valve.
In this case, system controller switches the three-way valve **1** from AB to A . The heating circuit return flows directly through the heat exchanger in the **LATENTO** and will be pre-heated . The boiler then receives pre-heated return water though the bypass pipe from the tank loading , which is needed to be heated by boiler again to reach the settting temperature. (or even no further heating by boiler is required).



Low temperature boiler
Installation suggestion C



Application:
Combination of high temperature boiler with solid fuel boiler.

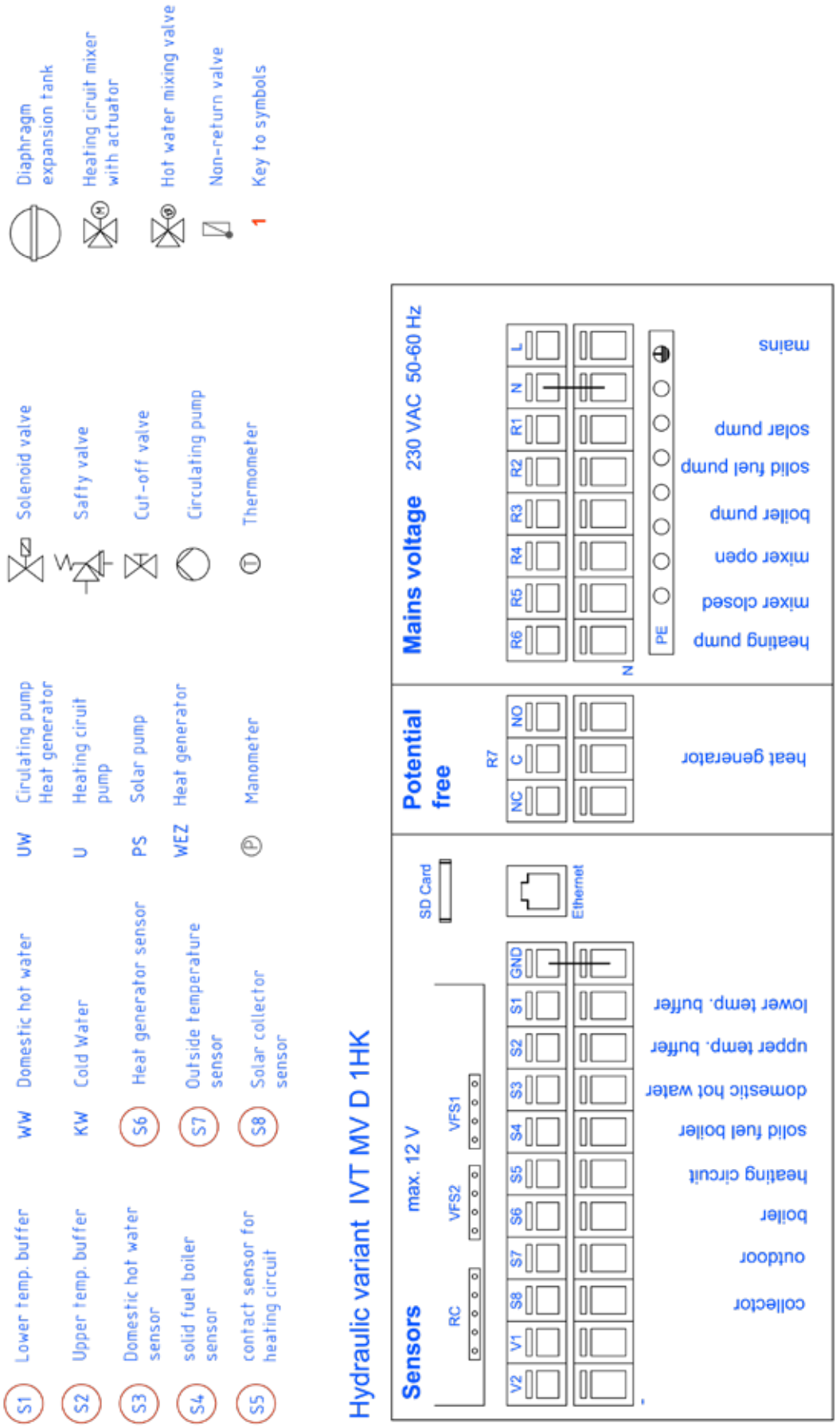
Function:
Boiler and solid fuel boiler are regulated to supply the heating circuits directly. There is no buffer loading time by the solid fuel boiler. The excess energy capacity from the solid fuel is stored in **LATENTO** tank. When the tank water temperature reaches the setting value (by solar energy or solid fuel boiler) ,the boiler is switched off and the water will be heated by the **LATENTO** tank (back-up heating).

1 Solenoid valve is open when the boiler is activated(WEZ 1)

Sensor insertion:

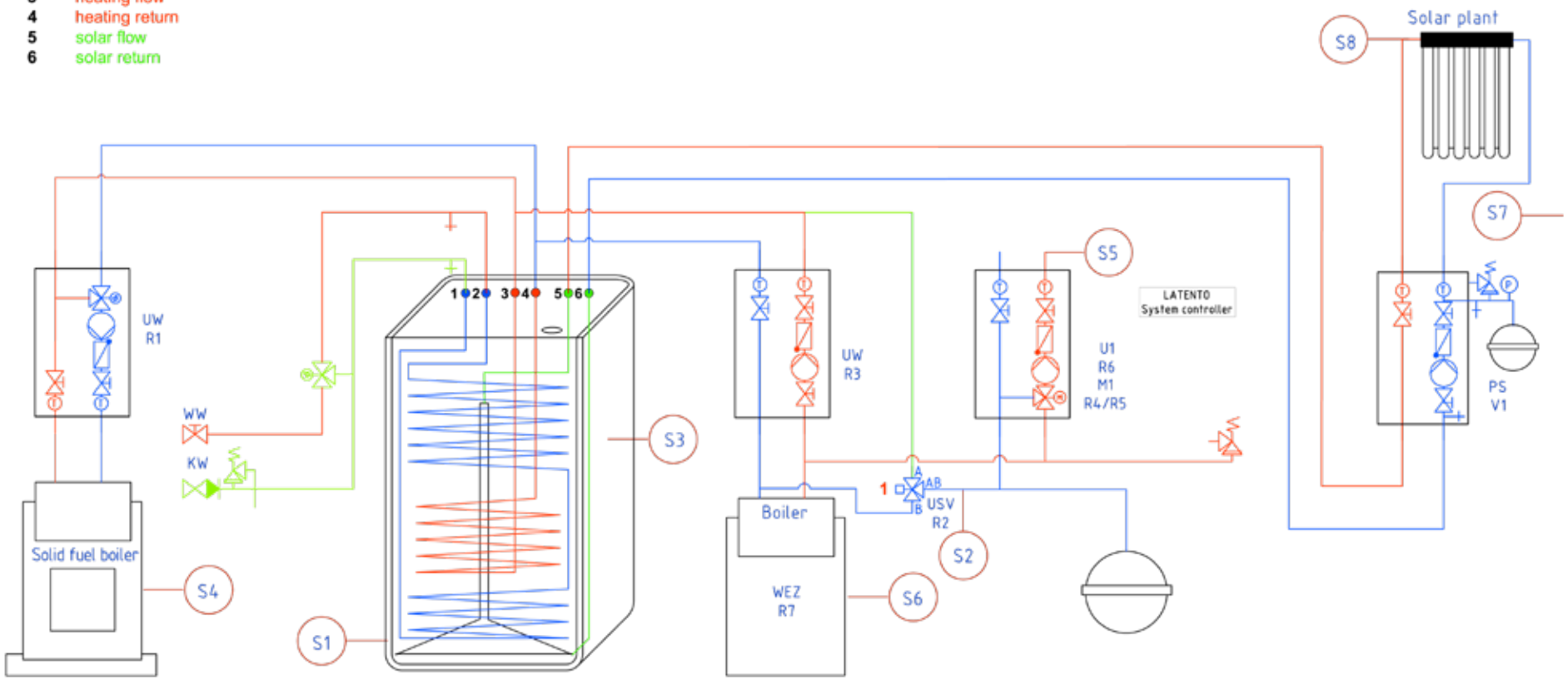
S3 (domestic hot water):	55 cm
S2 (upper temp. buffer):	70 - 75 cm
S1 (lower temp. buffer):	138 cm

Boiler with high operating temperature, with supplementary solid fuel burner
Installation suggestion D



Boiler with high operating temperature, with supplementary solid fuel burner
Installation suggestion D

Low temperature boiler, with supplementary solid fuel burner
Installation suggestion E



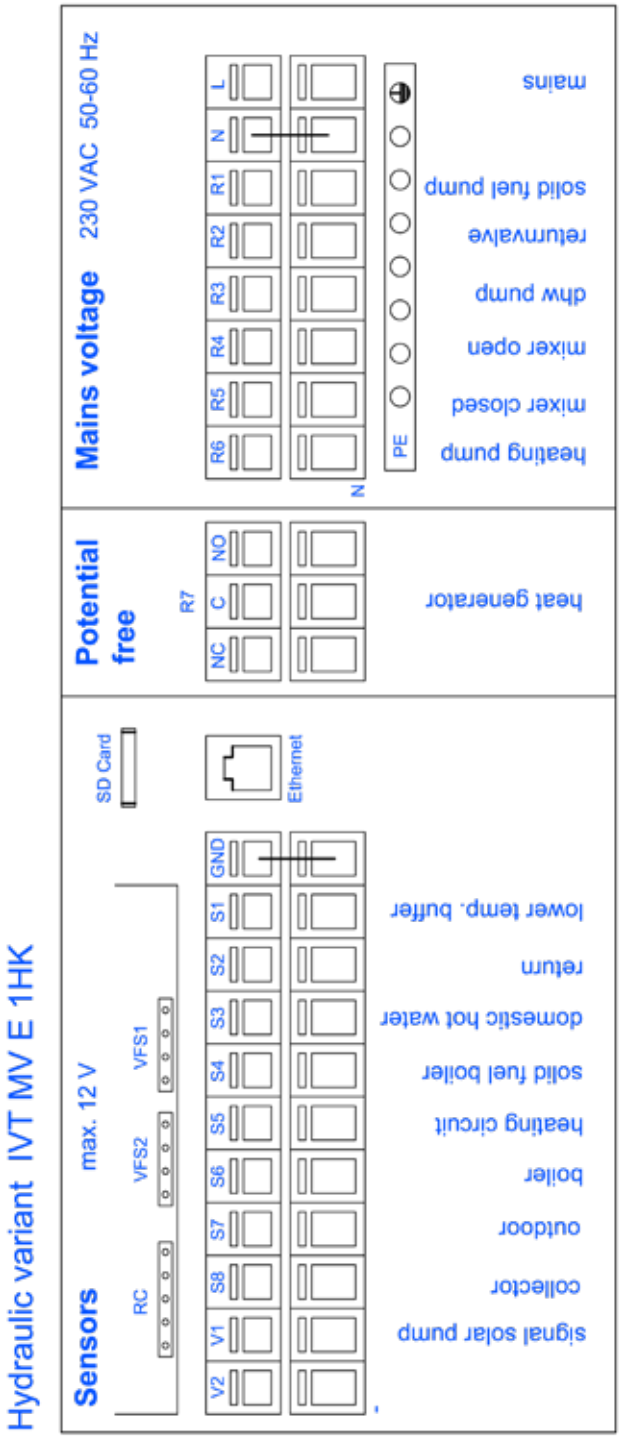
Sensor insertion:
S3 (domestic hot water): 65 cm
S1 (lower temp. buffer): 138 cm

Heating circuits:
The heating circuits and domestic water heating are supplied directly from the low temperature boiler.
If the tank has excess energy (stored from a solar energy system and / or solid fuel boiler) , the emergy will be led through the three-way valve **1** from AB to A into the heating system.

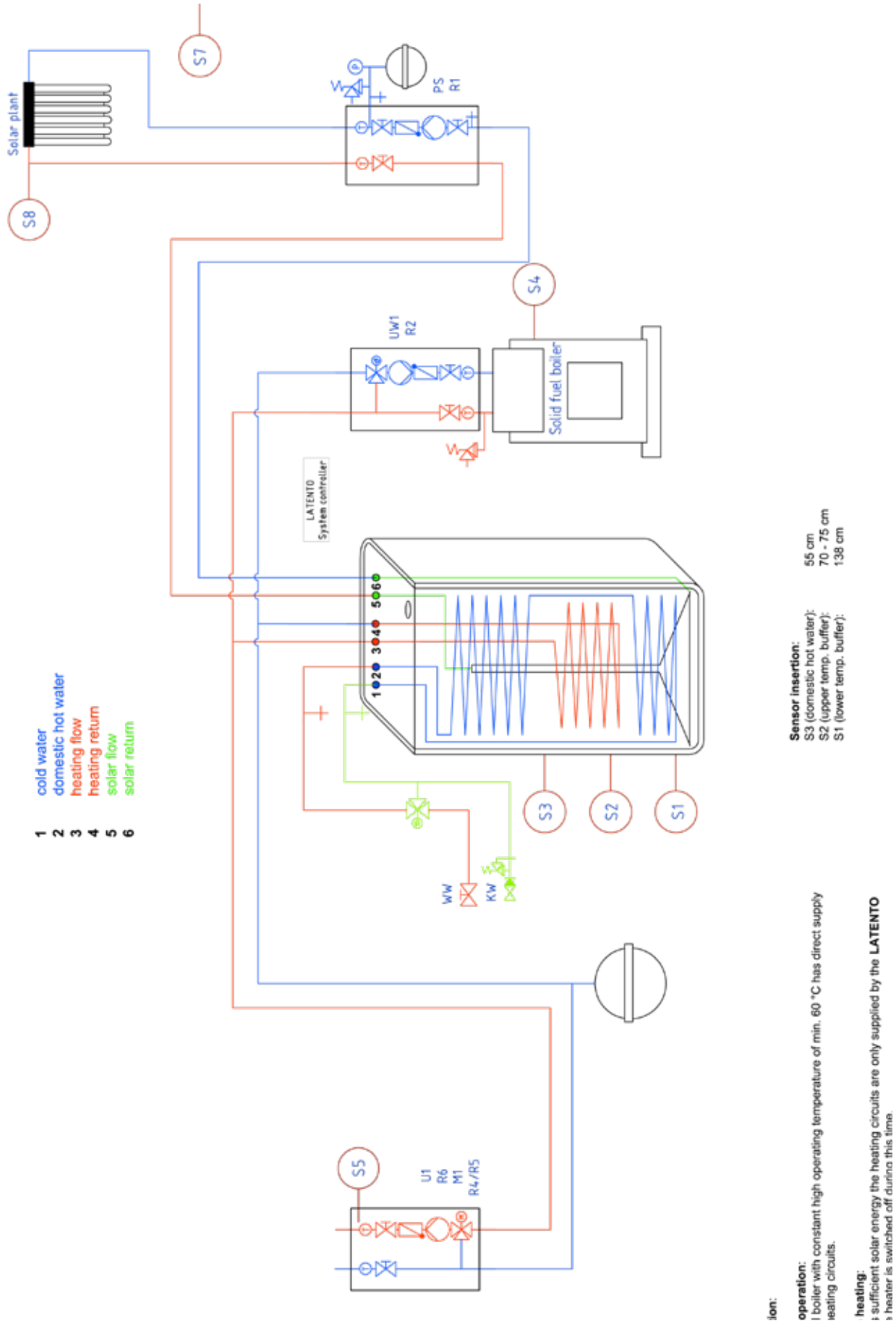
Application:
Low temperature boiler with solid fuel boiler.

Function:

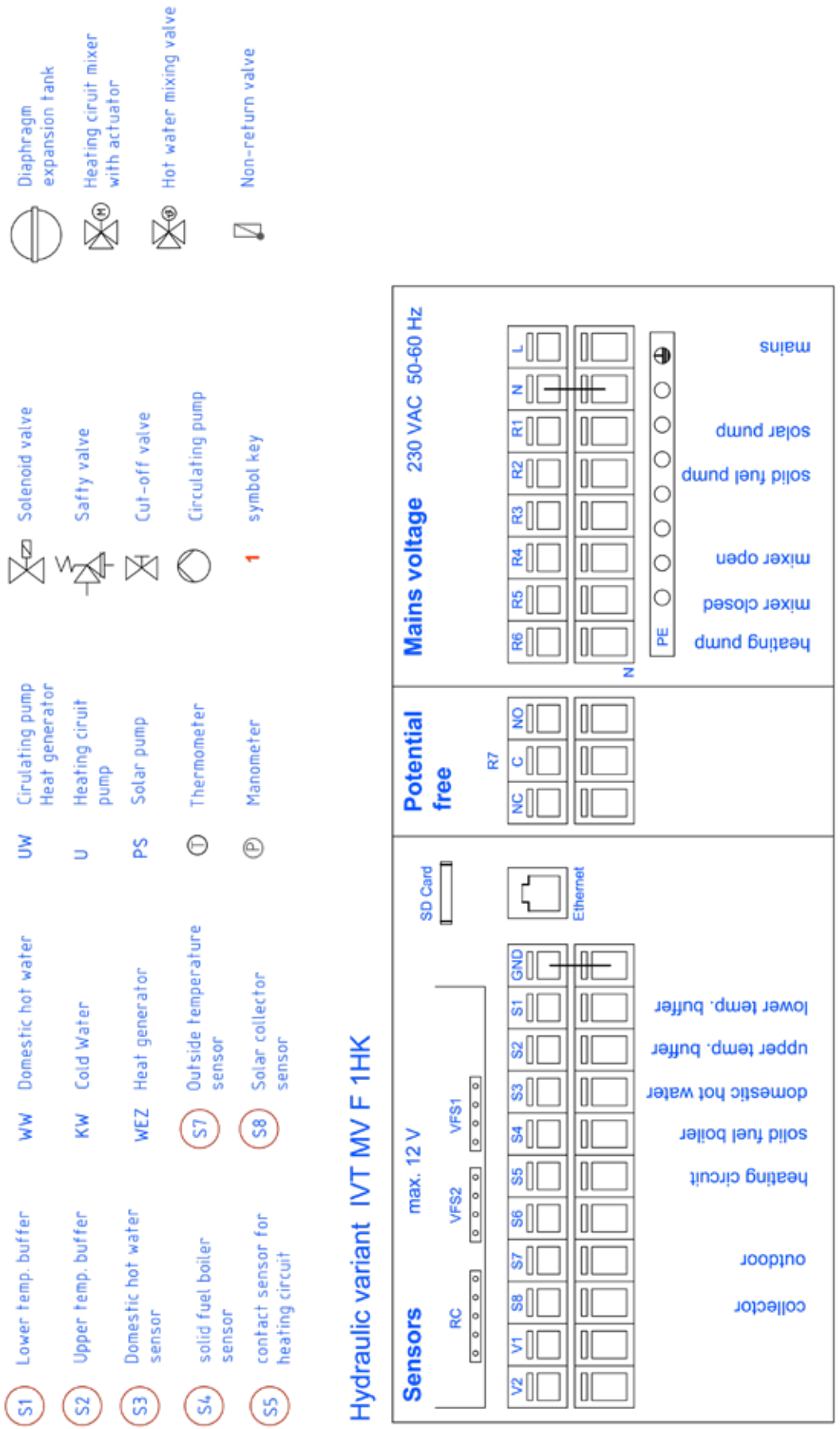
The **LATENTO** is heated up with stove or solid the fuel boiler. If the tank temperature exceeds the setting value, the system controller will switch the three-way vavle **1** to from AB to A.The heating circuit return is led through the **LATENTO** tank and as a result the water is pre-heated. Then the pre-heated return water flows back into the boiler and heated by the boiler again to reach the setting temperature (or even not heated any more). When the solid fuel boiler is not in operation, the closed mixer in the boiler pump group will prevent the unnecessary circulation of the heating circuits through the solid fuel boiler.



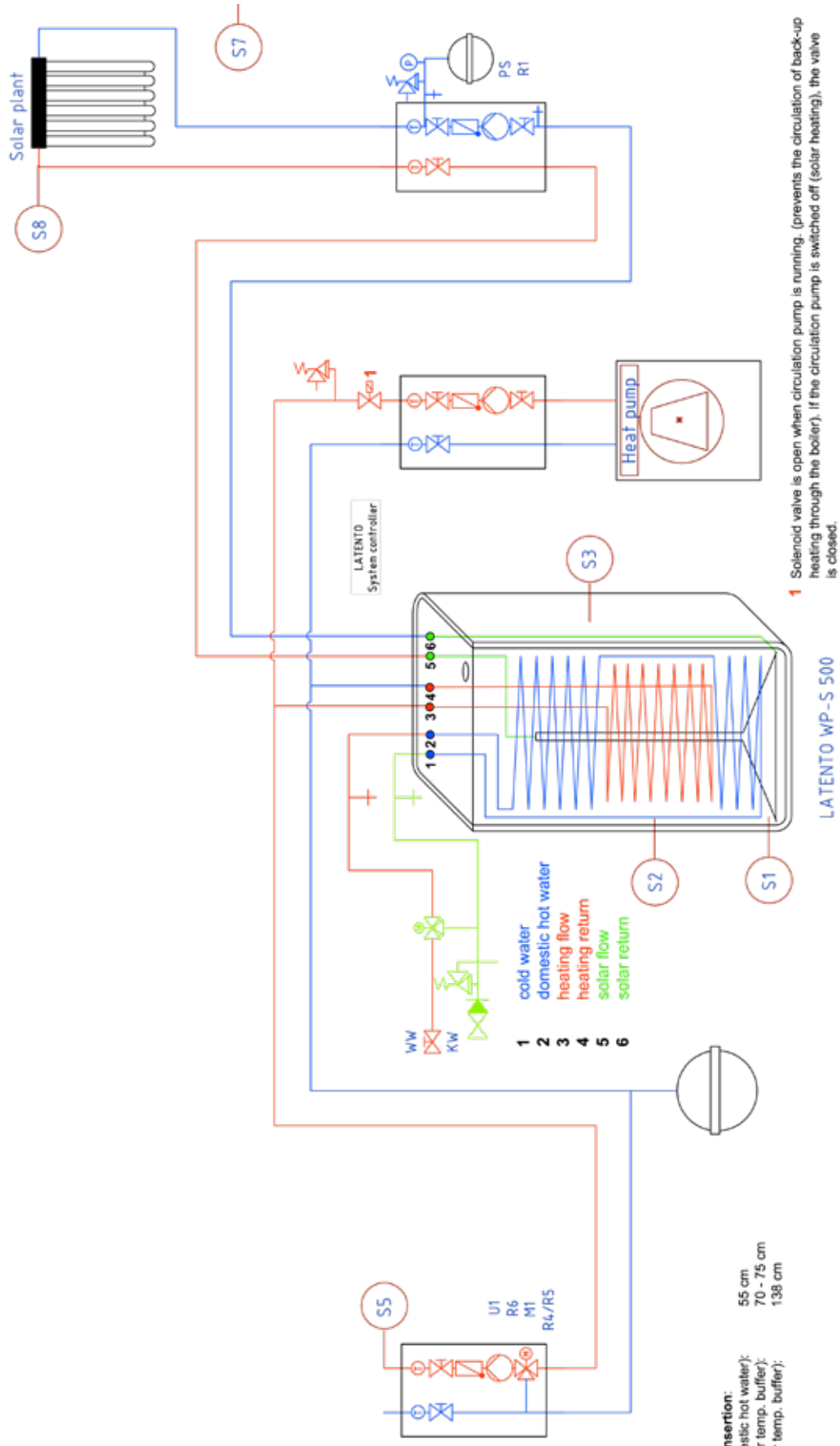
Low temperature boiler, with supplementary solid fuel burner
Installation suggestion E



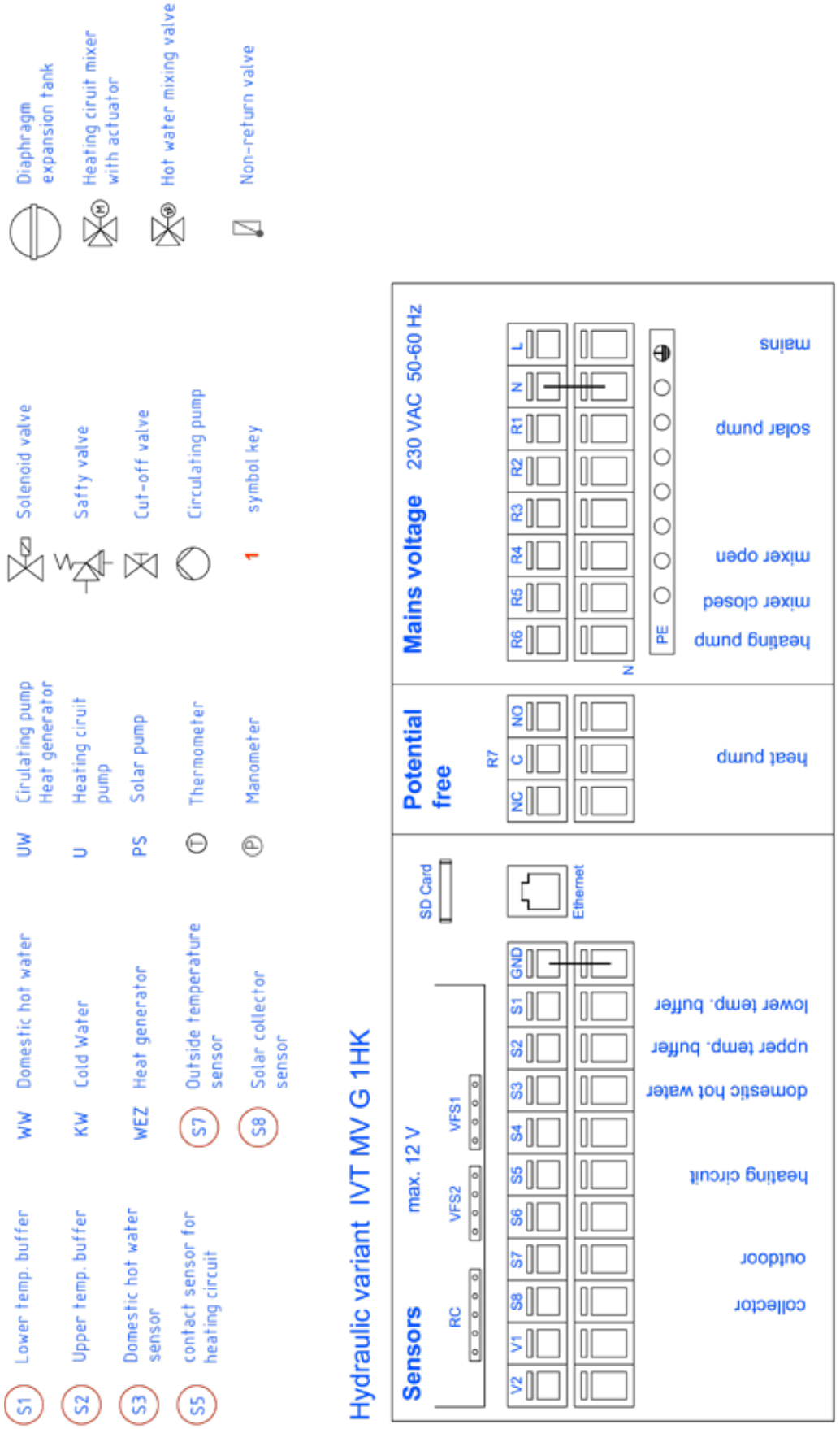
Pellet Burner
Installation suggestion F



Pellet Burner
Installation suggestion F



Heat pump with supplementary electric heating element
Installation suggestion G



Heat pump with supplementary electric heating element
Installation suggestion G

12

12. Certificates

Certificate of Warranty

LATENTO the solar heating system

The IVT solar heating system ***LATENTO*** for domestic water heating and heating support is produced from high-grade qualitiy-controlled materials. Quality assurance is effected by means of in-house and external monitoring.

The ***LATENTO*** solar heating system consists of the storage tank with top, vacuum tube collectors, pump groups and accessories as well as controllers and electrical components.

For any damage to our products which is due to processing defects or defective material we will supply replacement free of charge, if the fault lies with us.
Terms of this warranty from delivery date:

Solar layer storage with top: 5 years
Vacuum tube collectors: 5 years
Pump groups and accessories: 2 years
Controllers and electrical components: 2 years

Our third part liability insurance covers the compensation up to
EUR 5,000,000.00 for personal injury, property damage and pecuniary detriment.

No liability is accepted for faulty installation, assembly or operation. Our technical documentation and the information contained are the integral parts of this warranty.

IVT GmbH & Co. KG
Gewerbering Nord 5
D-91189 Rohr
Germany

Ralf Stottok
Managing Director IVT GmbH & Co. KG

12

DIN CERTCO
Gesellschaft für Konformitätsbewertung mbH

ZERTIFIKAT

Der Firma

IVT GmbH & Co. KG
Gewerbering Nord 5
91189 Rohr

wird für das im Herstellwerk

Dettenhausen

hergestellte Produkt

Sonnenkollektoren

vom Typ

LATENTO CPC 12, LATENTO CPC 18

die Konformität mit

DIN EN 12975-1:2006-06
DIN EN 12975-2:2006-06
CEN-KEYMARK-Programmregeln Solarthermische Produkte

bestätigt und das Nutzungsrecht für die Zeichen

in Verbindung mit der unten genannten Registernummer erteilt.

Registernummer: 011-7S206 R

Dieses Zertifikat ist unbefristet gültig, solange die erforderlichen Überwachungen mit positivem Ergebnis durchgeführt werden.

Deutscher Akkreditierungs Rat
DAP-ZE-2460.00

Weitere Angaben siehe Anhang

DIN CERTCO Gesellschaft für Konformitätsbewertung mbH
Alboinstraße 56, 12103 Berlin

GESELLSCHAFT FÜR KONFORMITÄTSBEWERTUNG MBH DIN CERTCO

2007-07-23
Dr.-Ing. Michael Garmer
- Geschäftsführer, Leiter der Zertifizierungsstelle -

FORSCHUNGS- UND TESTZENTRUM FÜR SOLARANLAGEN

Institut für Thermodynamik und Wärmetechnik
Universität Stuttgart
Professor Dr. Dr.-Ing. habil. H. Müller-Steinhagen

in Kooperation mit SWT TECHNOLOGIE

Nachweis des jährlichen Kollektorertrags

für die Vergabe des Umweltzeichens nach RAL-UZ 73

entsprechend den Richtlinien des Bundesministeriums für Wirtschaft zur Förderung von Maßnahmen zur Nutzung erneuerbarer Energien vom 1. August 1995

Für Sonnenkollektoren mit der Vertriebsbezeichnung:	**LATENTO CPC 12**
und die baugleiche Typen:	**LATENTO CPC 18**
der Vertreiberfirma:	**IVT GmbH & Co. KG Gewerbering Nord 5 91189 Rohr**

wurde eine Nachweisrechnung entsprechend der beim Deutschen Fachverband Solarenergie hinterlegten "Empfehlung zum Nachweis eines Kollektormindestertrages" durchgeführt bzw. eine entsprechende Nachweisrechnung anerkannt, die für einen baugleichen Kollektor durchgeführt wurde.

Der Nachweis basiert auf der Auswertung des Prüfberichts: 06COL513/2OEM04 vom 4.7.2007 nach EN 12975-2: 2006 des Forschungs- und Testzentrums für Solaranlagen Stuttgart.

Der erforderliche Kollektorertrag* von 525 kWh/m²a wird erreicht.

*am Standort Würzburg bei einem solaren Deckungsanteil von 40%

Zusätzliche Feststellungen:

keine

Dieser Nachweis ist registriert unter der Nummer: 06COL513

Stuttgart, den 04.07.2007

i V

Prof. Dr. Dr.-Ing. habil H. Müller-Steinhagen

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LATENTO®

E&OE; subject also to technical modifications!

02/2019

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WÜRTH GROUP