# PRISMA PVT 3.0

## Electricity and thermic energy from one hybrid collector

*The most efficient technology for reducing fossil fuels in private, commercial and public spaces.*

TWL

# PRISMA PVT 3.0

The new hybrid collector

## No energy transition without a heat transition

Create your own energy turnaround!
According to the Federal Environment Agency in Germany, electricity consumption and heating account for 22 percent of our CO2 emissions. Electricity accounts for 7 percent, heating for 15 percent! Heating thus pollutes our environment twice as much as electricity consumption.

The solar energy yield of our Prisma PVT 3.0 collector takes this into account. The thermal yield for heating support is more than twice as high as the electricity production. At the same time, the module even produces 5-10 percent more electrical energy on an annual average than standard photovoltaic collectors due to the cooling of the PV cells by means of the highly efficient copper absorber installed on the back. This maximised solar yield of the PRISMA PVT 3.0 thus sustainably reduces your energy costs. At the same time, you support the reduction of CO2 emissions by avoiding the burning of fossil fuels.


## Your roof can do more! Electricity and heat from from one source means maximum energy harvest from a limited area.

The roof area that can be used to install your domestic power plant is limited. Roof windows, shaded areas due to chimneys, surrounding buildings or trees further limit this area. The energy demand for electricity and heat of your building can only be achieved through optimal energetic utilisation of the usable roof area. The aesthetic appearance of your house is not impaired even when Prisma PVT 3.0 and pure PV modules of the same design are installed together. Everything appears to be cast from a single mould.

## Thermal and electric annual performance of PRISMA PVT 3.0 Hybridcollector (cooled) at reference location Würzburg.

| Number of collectors | Annual Thermic Yield | Annual Electric Yield |
|---|---|---|
| 1 | 766 kWh | 440 kWh |
| 6 | 4.596 kWh | 2.640 kWh |
| 8 | 6.128 kWh | 3.520 kWh |
| 10 | 7.660 kWh | 4.400 kWh |
| 14 | 10.724 kWh | 6.160 kWh |
| 16 | 12.256 kWh | 7.040 kWh |
| 20 | 15.320 kWh | 8.800 kWh |

*based on 16 modules at the Würzburg site taking into account 5 percent additional electricity yield due to rear cooling.

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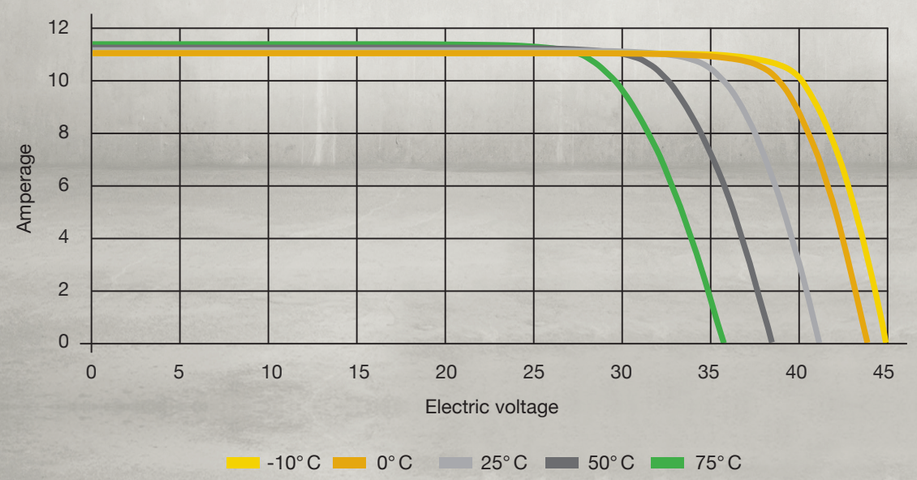
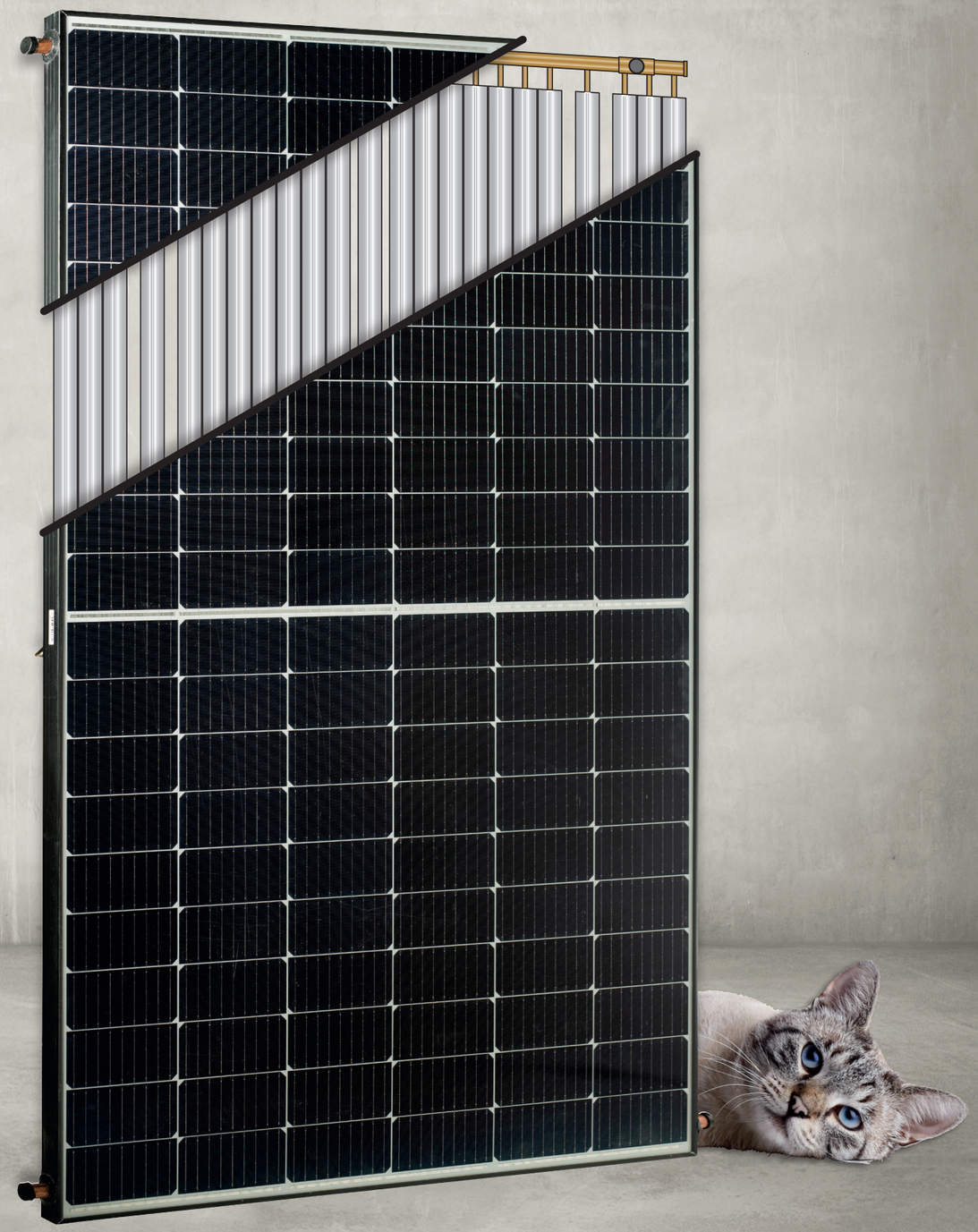
## The system PRISMA PVT 3.0

The Prisma PVT collectors combine a monocrystalline PV high-performance module with a highly efficient copper absorber installed on the back. The dimensions and the external appearance from the visible side are identical to the pure PV module.

A water-glycol solution flows through the absorber. The individual modules are hydraulically connected to form a system and the waste heat from the PV cells and the ambient heat is stored in the TWL buffer tank via a circulation pump and a heat exchanger. The heating water preheated in this way can then be further processed by various conventional burner types or a heat pump.

At the same time, the monocrystalline photovoltaic module produces electrical energy, which is fed into the house grid by means of an inverter. The electricity production is significantly increased by the cooling of the PV cells. The performance data of the PV cells are usually specified at 25° C. In summer, however, surface temperatures of up to 80° C are reached. The performance of the PV cells decreases by approx. 0.4 percent per degree of temperature increase. At a cell temperature of 75° C, that is a 20 percent reduction in performance! The focus with regard to the generated electrical energy should be on the highest possible self-consumption, since the feed-in tariffs are far below the purchase costs of the electricity from the energy supplier. In addition to the use of solar batteries, this can also be supported by the „Power to Heat“ system concept. In this case, surplus solar power is converted into thermal energy by means of a heating rod and stored in the buffer tank. If your heat pump is „Smart Grid Ready“, it can be switched on as an alternative to the heating rod. This energy is then available to generate hot water and to support the heating circuit.



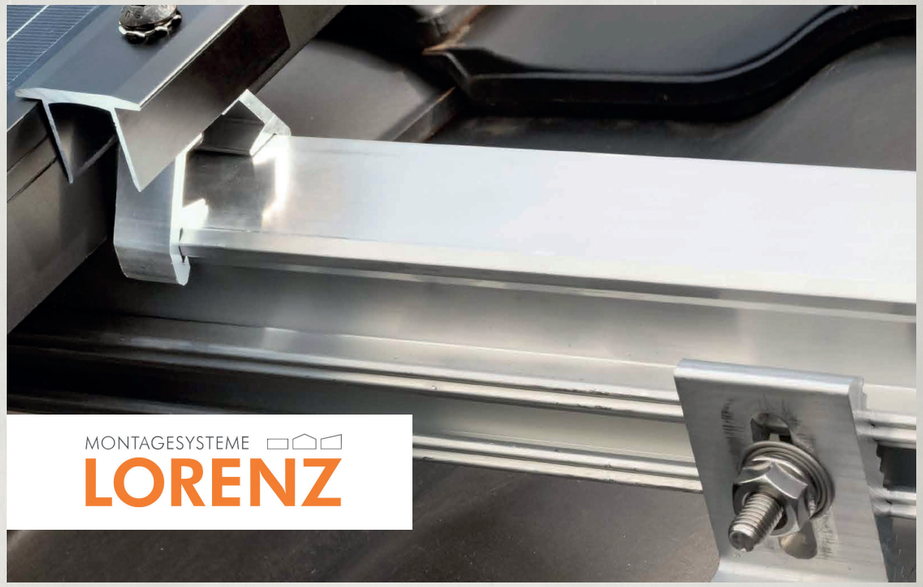
# TWL PRISMA PVT 3.0 Collector Technical Data

| Module | | Prisma PVT 3.0 |
|---|---|---|
| Dimensions | (mm) | 1755 x 1037 x 35 |
| Aperture area | ($m^2$) | 1,89 |
| Empty weight | (kg) | 30 |

| Module PV-Specs | | Prisma PVT 3.0 |
|---|---|---|
| Test conditions | | STC |
| Tolerance | (%) | 0~+3 |
| Degree of Efficiency | (%) | 20,08 |
| Maximum Performance Pmax | (W) | 380 |
| Open circuit voltage | Voc (V) | 41,56 |
| Short circuit current | Isc (A) | 11,46 |
| Voltage at maximum power | Vm (V) | 34,29 |
| Current at maximum power | Im (A) | 10,94 |
| Cell type | | Monocrystalline silicon cell |
| Number of cells | (Stk.) | 120 (6x20) |
| Connection cable | | 4 $mm^2$ MC4-plug |
| Snow load | (Pa) | 5400 |
| Wind load | (Pa) | 2400 |
| 25 years performance guarantee | | 10 years 91 %, 25 years 80,7 % |

| Module Thermic-Absorber | | Prisma PVT 3.0 |
|---|---|---|
| Max. thermal output | (Wp) | 989 |
| Average thermal output (Würzburg) | (kWh/$m^2$/Jahr) | 409,5 |
| Average thermal output (Würzburg) | (kWh/Jahr) | 766 |
| Input and output connection of thermal absorber | (mm) | copper pipe 22 mm |
| Type of medium | | Propylene glycol + water |
| Volume of medium | (liter) | 2,04 |
| Absorber sheets | | Aluminium |
| Register | (mm) | copper pipe 8 |
| Insulation | (mm) | Rockwool 20 |
| Warranty on workmanship and thermal part | | 10 years |

# LORENZ cost efficient roof maounting system for eternity




LORENZ solo-basic is the mounting system for eternity: Because the durability of the material used is not only important when building a house, but also when mounting a PVT system. The particularly costefficient LORENZ solo-basic strong mounting system uses corrosion-resistant aluminium and is predestined for higher loads. The aluminium spar chamber profile can be connected directly to the ultra strong aluminium roof hooks. This mounting system easily compensates for roof unevenness and thus ensures a uniform surface for the entire PVT system. The LORENZ Delta system is available for flat roof installations.

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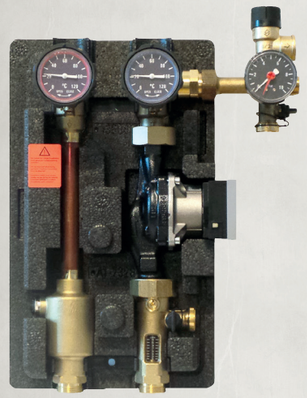
### Oventrop Solarstation Regusol LH 15 with Deltasol MX



The Regusol LH15 is responsible for the circulation of the solar fluid in the PVT collector array. The flow rate can be precisely adjusted to the system hydraulics and the weather conditions. The permanent venting keeps the system free of air and thus ensures trouble-free operation of the circulation pump. The DeltaSol MX temperature difference controller regulates the circulation pump with regard to the optimum speed and balances the temperatures in the collector field with the storage tank temperature. This ensures the maximum solar yield of your PVT collector array.

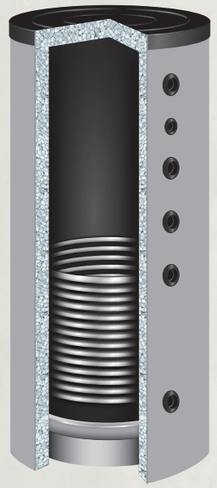
## 4

### Oventrop Service water station Regumaq X 45 WP / X80

The Regumaq fresh water stations are optimised for heat pumps or solar thermal energy sources. A highly efficient stainless steel heat exchanger extracts the heat extremely effectively from the upper area of the buffer tank and transfers it to your hot water supply. Due to the small volume of the heat exchanger, there is no risk of legionella formation. Optionally, the Regumaq fresh water stations can be equipped with a drinking water circulation set.

## 5

### TWL Buffertank PR 300-500



If the heat pump is supplied monovalently or bivalently with ground baskets via your PVT system, this buffer storage tank with a heat exchanger serves as the primary energy source. The heat pump pumps the heat energy supplied by the PVT system in the low temperature range and stored in this primary storage tank to a higher temperature level and then stores it in the secondary storage tank.

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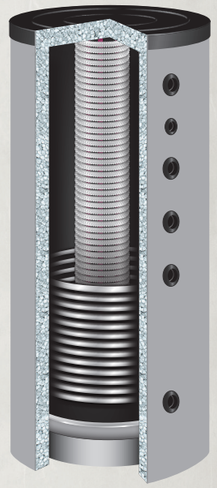
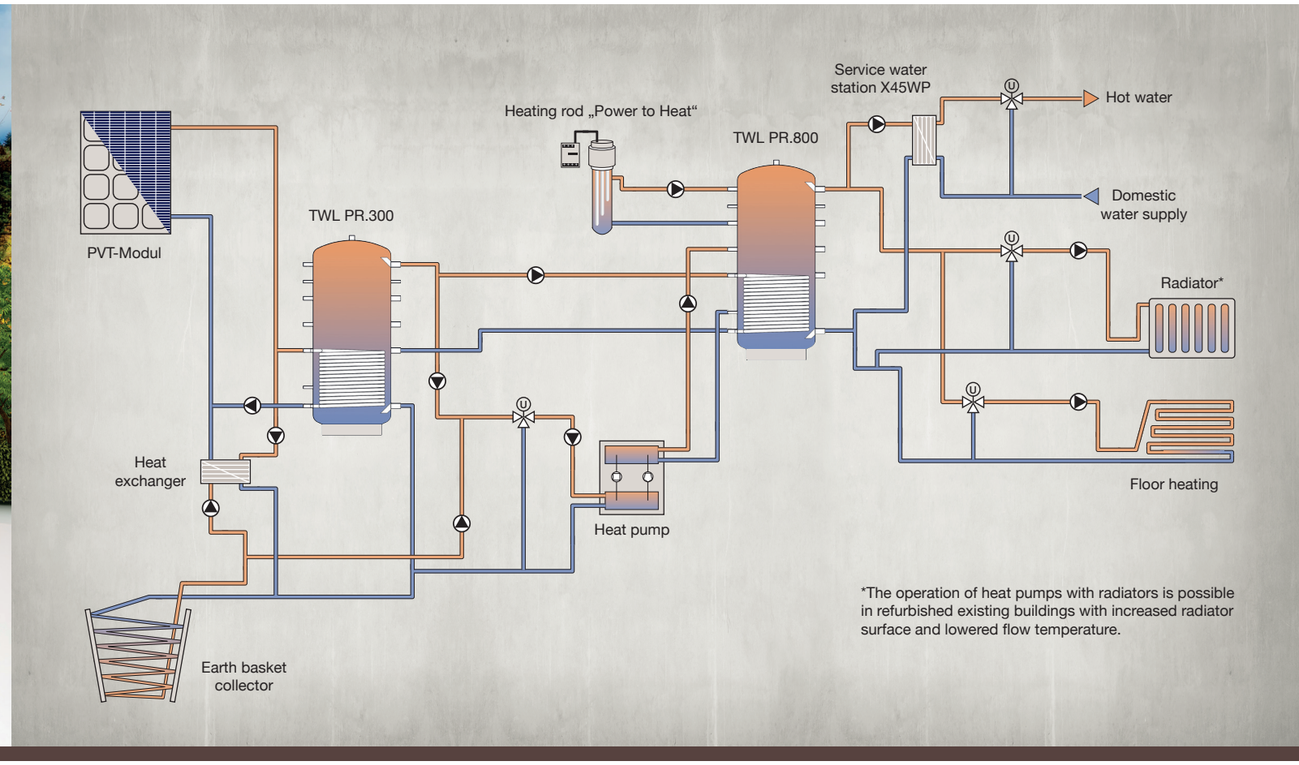
### TWL Hygiene combination tank KER 500-X



The TWL KER hygiene combi tanks are used if your heating system works together with conventional burner technology. The lower heat exchanger then extracts the absorbed heat from the solar thermal system of the PVT system and releases it into the storage tank. Your boiler then raises the temperature to the desired level. There it is available for the heating circuit or for domestic hot water heating. The stainless steel corrugated pipe heat exchanger installed at the top is supplied by the domestic water connection and heats your hot water. Due to the small volume of 29 litres in the stainless steel corrugated pipe, perfectly hygienic hot water is always available.

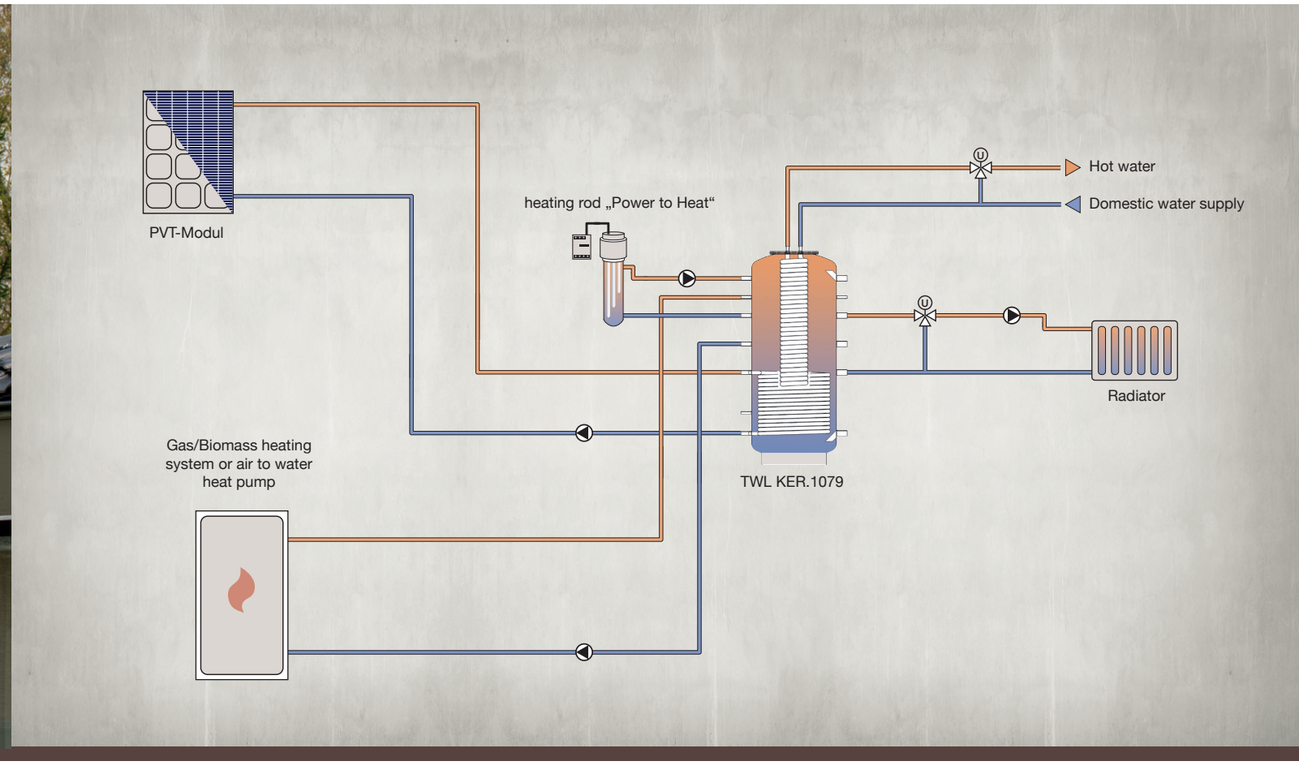



## Bivalent operation of a brine heat pump with PRISMA PVT 3.0 and geothermal baskets as primary energy source.

Geothermal probe boreholes are not possible at every location due to water law or geological constraints. Air-source heat pumps are often problematic in densely built-up areas due to noise emissions. The large area required for geothermal surface collectors is not available for every plot of land.

Geothermal baskets can be used as an alternative, at lower cost and with high efficiency, and with the smallest area requirement. These are installed below the frost line with a cover layer of 1.30-1.50 metres. This can also be done under a driveway with grass stones. In addition, the brine media heated by the PVT modules is used as source energy for the heat pump all year round. This is stored in the small primary energy storage tank via a heat exchanger. As long as the PVT system supplies thermal energy above 0° C, the primary energy circuit of the heat pump runs via this storage tank. If the temperature drops below 0° C, the system switches to the geothermal baskets. The heat pump then raises the temperature level to the desired flow temperature and loads the larger secondary boiler. The X45/90 WP fresh water station heats the domestic water if required. In summer, excess energy from the solar thermal system is dissipated via the geothermal baskets into the surrounding soil, which leads to a significant increase in the source temperature of the geothermal baskets in autumn and early winter. The electrical power of the photovoltaics supports the operation of the heat pump, if necessary using a solar battery.

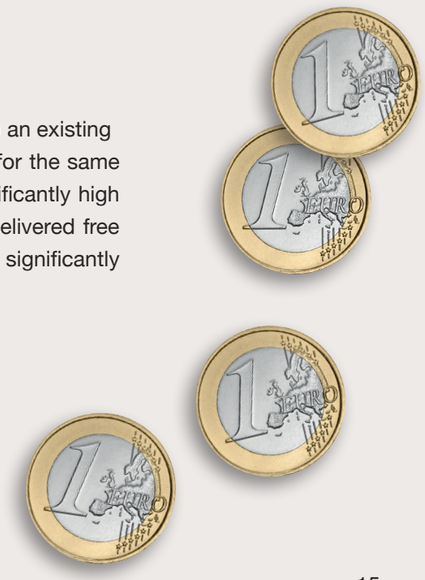
With this special system configuration, the heat pumps usually achieves higher annual coefficients of performance than when using geothermal probe boreholes of usual borehole depths as the sole primary energy source, provided the components are correctly designed.




## Solar domestic hot water heating and heating support in existing buildings using gas heating, biomass heating systems or heat pumps.

PRISMA PVT 3.0 supports the production of your hot water requirements. From March to October, your burner is considerably relieved by the solar thermal energy of the Prisma PVT 3.0. The switch-on time of your burner is significantly reduced and the switch-on intervals are extended. The less efficient operation during the heating-up phases of the burners is thus reduced proportionally to the total burning time of the boiler. As a result, fuel consumption is significantly reduced. You save money.

Alternatively, if you are thinking about installing a PV system in an existing building, you can score twice with a Prisma PVT 3.0 system for the same amount of space on the roof. In addition to electricity, a significantly high proportion of your demand for heat energy from the sun is delivered free to your home. The installation costs of the PVT system are not significantly higher than for a pure PV system.



## Prisma PVT 3.0 – The ecological solution for numerous areas of application

The combination of heat and power generation with just one collector makes the PRISMA PVT 3.0 hybrid module an absolute multi-talent. You reap maximum energy yields on limited roof surfaces. This results in numerous application possibilities; starting with detached houses and apartment buildings, to schools, university buildings, hospitals and retirement homes, to swimming pools, hotels, campsites and sports facilities. PVT modules can also be used very well as a regenerative energy source in horticultural businesses or agriculture.

## PRISMA for single-family homes

Prisma PVT 3.0 makes sense both with conventional heating systems and in combination with heat pumps to significantly reduce your consumption of fossil fuels, biomass and grid electricity. If necessary, the solar power can supply the heat pump with electricity; in combination with a solar battery, a high level of own power consumption can be realised. The noise level of air-source heat pumps, which is also annoying for neighbours, is eliminated. The rooftop power plant at the house also ensures a low-cost supply of regeneratively generated energy for your electric car. In the long term, this investment makes sense in view of the foreseeable rise in the price of fossil fuels and the high electricity costs charged by utilities. A sustainable supply of your house with a high proportion of renewable energy is guaranteed for decades. A permanent CO2 reduction through this innovative energy supply concept contributes to the preservation of our living space for you and your children.

## PRISMA as swimming pool heating

The thermal output of a sufficiently dimensioned PVT system can be used to heat the swimming pool. This is also possible outdoors, which means that the swimming season can be extended with pleasant temperatures both in spring and late summer. A suitable plate heat exchanger is used to transfer the heat energy to the pool. As a rule of thumb, 70-80 per cent of the surface area of the swimming pool should be calculated as the PVT area to be installed.

## PRISMA for hotels and restaurants

The demand for heat and electricity in hotels and restaurants is enormous. Guests want to shower or bathe every day, swimming pools and wellness oases require large amounts of hot water or have to be tempered. Kitchens also have a large demand for hot water for washing dishes and for general hygiene precautions. Here, TWL's PVT rooftop power plant can supply a considerable boost of renewable energy.

## PRISMA for residential quarters

The building services equipment planning of residential quarters, taking environmental aspects into account, is a complex task for every planner. Increasingly, cold local heating networks are being implemented or borehole heat exchangers are being installed to meet the heating requirements of large areas. Here, PVT modules can be ideally used to regenerate the probe fields or to increase the temperature of the heating networks. In this way, the roof areas can be optimally used for solar energy generation right from the start. The heat pumps used can also be supplied with electricity, especially if battery storage is used.

## PRISMA for public buildings

Ecological aspects are playing an increasingly important role in municipal planning. Political decision-makers are increasingly obliged to present citizens with forwardlooking, sustainable concepts in public spaces. Schools and university buildings, kindergartens and sports facilities offer a wide range of opportunities to replace the high electricity and heating requirements in a climate-neutral way, partly using PVT collectors.

## PRISMA for campsites

Campsites are in high season from spring to late summer. This means extremely high costs for the operators for the provision of hot water for shower facilities, washing machines or dishwashing. In addition, there is a high demand for electricity. Here, PVT hybrid modules from TWL are the ideal solution for longterm cost reduction. With a low area requirement, they deliver maximum energy yields - year after year.

## PRISMA for sports and wellness centres

After sports, it‘s time to take a shower. The hot water consumption of sports centres is high all year round. Here, PVT modules from TWL can make a good contribution to the annual base load. In addition, photovoltaics provide electricity for lighting or for operating hair dryers.

## PRISMA for greenhouses

Commercial greenhouses in horticultural businesses have a high demand for electrical and thermal energy. The early cultivation of agricultural and ornamental plants and the desire for the earliest possible harvest dates make it essential to install powerful heating systems.

The greatest demand for heat is in the colder seasons, when the solar energy source is naturally less productive. In summer, the high solar yield of the PVT system is of little use. If one wants to use PVT collectors sensibly and thus increase the renewable energy share of the total energy demand, there is no way around seasonal heat storage. Large geothermal heat reservoirs, ice stores or concrete cisterns can be charged with PVT collectors in summer. These heat quantities are then available in the cold season and can then be raised to the required temperature level via large heat pumps.

## PRISMA for hospitals and retirement homes

The energy demand for electricity and heat in hospitals is at a high level all year round. Nursing and hygiene have a consistently high demand for hot water. Integrated laundries also consume large amounts of hot water. The electricity demand of a hospital is immense. The roof surfaces of a hospital allow for large-scale PVT systems. This means that significant amounts of the total energy demand can be generated from renewable sources.

## PRISMA for the regeneration of geothermal probes

Geothermal probes draw their heat from the surrounding soil. The heat input from above or from groundwater layers is often too low. As a result, the surrounding soil cools down increasingly. The source temperature of the heat pump thus decreases and its annual coefficient of performance deteriorates. The increasing density of boreholes in residential areas further worsens the yield situation. In order to ensure long-term profitable operation of 50 years and more, Geothermal probes can be regenerated in summer by feeding them with heated water from the PVT system. The surrounding soil is heated and this thermal energy is then available in winter. The efficiency of the primary energy source is thus permanently maintained.

## PRISMA for paint shops

Spray booths and paint drying areas are subject to high temperatures all year round. Covering a significant proportion of this high energy demand from renewable sources should be the goal of every system planner in this segment. TWL PRISMA PVT 3.0 collectors can make a significant contribution here.

## PRISMA for car and truck wash facilities

Car wash facilities have an enormous, year-round demand for hot water and electrical energy. Rising energy prices and increasing environmental awareness among customers have been forcing operators to install regenerative energy sources for years. Up to now, PV systems or solar thermal systems have mostly been installed. With PRISMA PVT 3.0, a collector is now available for the car wash service sector that both makes a significant contribution to the solar pre-heating of the wash water and takes into account the high power requirements of the systems. Compared to a pure PV system, the energy yield of a Prisma PVT 3.0 system is more than three times higher, and that on an identical roof area!

## Ground-mounted systems for energy grids

Anergy networks or cold local heating networks are increasingly being designed and implemented for the supply of municipalities or settlements. In the warmer seasons, the surplus thermal energy of the PVT collectors can be used to regenerate the nearsurface geothermal systems. Another storage option is large underground heat storage tanks. In the cold seasons, the energy is extracted from these sources to supply heat pumps and thus made usable. Due to the relatively low temperature level of the stored energy, up to a maximum of 25° C, the supply lines and, if necessary, the underground heat storage tanks need to be insulated only slightly or not at all, which has a positive effect on the construction costs for these energy networks. Due to the additional electrical energy available, in contrast to purely solar thermal energy networks, the electricity generated is available for operating the heat pumps or other electrical consumers.



## The company TWL

Founded in 2002 in Weiden, the company‘s strong growth made it necessary to build a new facility in Freihung in 2007. In addition to the office and exhibition building, a total of 8,500 m² of production and storage space is currently available in four factory halls on 36,000 m² of company grounds. Already during the planning of the building complex, care was taken to ensure that the orientation and shape of the building would guarantee the prerequisites for high solar yields through direct solar radiation on the glass south façade. As an active component, a 150 m² EtaSunPro vacuum tube solar system was installed on the roof, which, together with the 24,000 litre seasonal storage tank, ensures that 80 percent of the annual heating energy required is provided. This system is supplemented with a 45 kW pellet boiler as additional heating for two winter months. All roof surfaces of the four factory buildings are covered with PV systems and generate 350 MWh of electricity annually.

Energy efficiency and CO2 reduction in the global topic of heating and hot water generation have thus been the company‘s DNA from the very beginning. In 2016, TWL was the first company in the industry to launch the efficiency combination tank which has now become the market standard. The strict structural separation of domestic hot water and heating water created an energy-efficient storage solution for heat pumps and condensing boilers. The heat pump stratified storage tank developed in 2020 continues this guiding principle of „optimised storage tanks for energy-efficient systems“. A previously unattained clean stratification in the two separate storage areas enables highly efficient production of domestic hot water and heating water. This design, for which a patent application has been filed, leads to an increase in the annual performance factor of the heat pump.

With the latest new development, the PRISMA PVT 3.0 hybrid collector, TWL is consistently continuing this success story. The combination of solar thermal energy with photovoltaics achieves a previously unattained solar efficiency and thus makes a significant contribution to decarbonisation in the building sector.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