

# Drain Back for export

**Drain-back systems are almost unknown in Germany – by far Europe's biggest solar market. Only a few German suppliers include them in their range, mostly for the export business. Suppliers in Switzerland and the Benelux states, by contrast, are now trying to convince German consumers of the advantages of their drain-back systems.**

**E**arly August. Holiday time. The Gruber family from Germany is sunbathing on the beach of Cesenatico. And at home in the Munich suburb of Gauting, the sun is also shining strongly on their house – and on the recently installed solar collectors. As long as the Grubers remain on holiday in Italy, no one is using warm water at home. But the solar collectors are constantly supplying heat to the solar storage tank. Soon it has reached its maximum temperature, at which point the thermostat switches off the pump. In the solar collectors the heat transfer fluid starts to heat up more and more – until it reaches its boiling point. Then within minutes it evaporates.

On the Italian coast, Mr Gruber is rubbing suntan lotion on his wife's back. And at the same moment the fluid vapour is flowing out of the solar collectors into the expansion vessel. This takes up the extra volume of the vapour and thus, as planned, protects the solar heating system from damage. Nevertheless, if collectors, pumps or piping are overheated too often their life expectancy decreases.

The Kerkhoven family from Holland have now also arrived at their holiday home in South Tyrol. They recently bought a solar heating system – a drain-back system, of the sort usual in the Netherlands. In August the sun burns down on Rotterdam as well. But the Kerkhoven family don't need to worry about evaporating solar fluid. If their unit is inactive the heat transfer fluid flows out of the solar collectors and piping into a special drain-back reservoir. This provides sure protection at higher temperatures, should the system for whatever reason not be working despite sunny conditions.

**The cover picture shows a solar thermal installation of Buderus Heiztechnik, but no drain-back system. Buderus is one of the nine suppliers of drain-back systems which are introduced in the following article.**

*Photo: Buderus*





Drain-back systems are gaining ground, in the view of the Swiss company Muntwyler Energietechnik AG. The picture shows a detached house with a drain-back combination system (11 m<sup>2</sup>).

*Photo: Muntwyler*



Drain-back in detail: the connecting piping for the collector must be installed at a gradient so that the collector can drain fully empty.



Rotex is following its own route with its open system in which the tank water flows directly through the collectors.

*Photos (2): Rotex*



Technical overview of the drain-back systems (apart from Rotex, all manufacturers supply closed systems)

<sup>a</sup> With a third pump as additional component, 16 m can be achieved.

<sup>b</sup> A booster pump can increase the maximum collector circuit length to 40 m.

<sup>c</sup> Use of a booster pump raises the maximum unit height to 12 m (Powerpak 5 kW) or to 16 m (Powerpak 10 kW).

<sup>d</sup> With extra drain-back reservoir.

Company	Product	Max. collector circuit length [m]	Max. unit height [m]	Tank volume [litres]
Buderus Heiztechnik GmbH	Solarpaket Diamant for hot water / for hot water and heating	24 / 12	20	300, 400 and 500 / up to 1,500
European Solar Engineering SA	Dynasol	30	20	300 and 500
Muntwyler Energietechnik AG	Energypak 150/2 (hot water pre-heat system) / Energypak 365/3 (hot water system)	n/a	n/a	150 / 325
Rotex Heating Systems GmbH	Rotex Solaris (2 to 5 collectors)	15 to 45	12 <sup>a</sup>	500
Solahart Industries Pty Ltd	Powerpak 5 kW / 10 kW	20 <sup>b</sup>	6 / 8 <sup>c</sup>	up to 600 / up to 1,200
Vaillant GmbH & Co. KG	AuroSTEP	20 and 40	8.5	150 and 250
Vögelin Solar-technik GmbH	Sunrise 2000 (2 and 3 collectors)	30	13	400 and 600
Wagner & Co Solar-technik GmbH	Secusol 150-1 / 250-1 / 250-2	25 / 30 / 40	8.5	150 / 250 / 250
ZEN international group of Solar companies bv	Solar XS drain-back systems	25 or 50 <sup>d</sup>	8 or 20 <sup>d</sup>	100, 150, 200 and 300



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Collector surface area [m <sup>2</sup> ]	Absorber	Drain-back volumes	Special properties	Heat transfer fluid	Pump
7.2 / 12	full-surface, pipe-type absorber and internal Tichelmann piping system	stainless-steel drain-back reservoir	all-in-one system with control and pump unit	pure water or solar fluid	cogwheel pump
4.8 and 7.2	full-surface absorber with serpentine pipe	extra-large heat exchanger	polyamide piping	solar fluid	volumetric pump
Max. 5.6	full-surface absorber	drain-back tank		special solar fluid	additional booster pump
5.2 to 13	harp-type absorber	unpressurised plastic tank	tank is simultaneously drain-back reservoir	water	circulating pump plus pressure-increase pump
up to 7.4 / up to 14.9	full-surface absorber	25-litre drain-back tank	powerpak is combinable	special solar fluid	additional booster pump
4.4	full-surface absorber with serpentine pipe	extra-large heat exchanger	anti-freeze medium factory-filled	anti-freeze medium	solar pump
Up to 8	full-surface, pipe-type absorber	backBox, factory-filled with solar fluid, as drain-back reservoir	solar storage unit with integrated drain-back reservoir (BackBox)	solar fluid	peripheral-wheel pump
2.6 / 5.2 / 5.2	full-surface absorber with serpentine pipe	heat exchanger volumes in tank	storage unit with solar control, pump, safety system	water-glycol mixture (30 %)	rotary pump
2.75 - 4.12	absorber with serpentine pipe	stainless-steel drain-back reservoir in tank	special drain-back control (high/low speed)	water	special centrifugal pump

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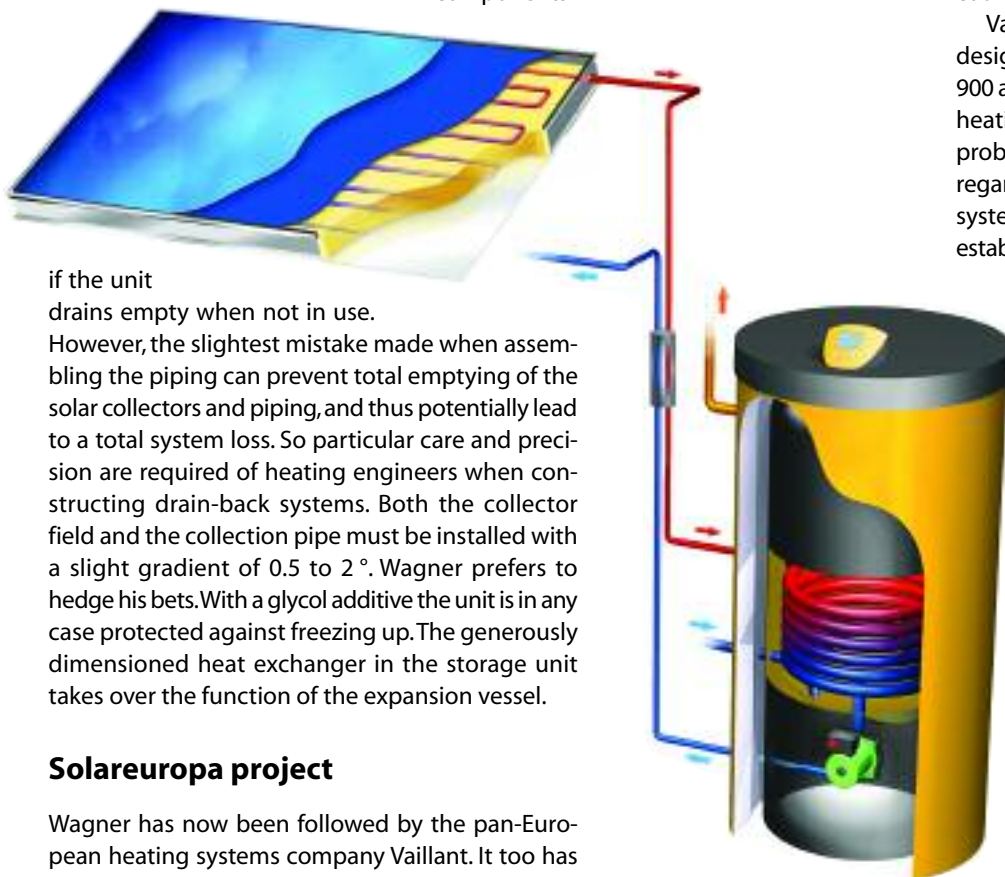
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## When the solar power unit drains empty

In Germany only a few manufacturers have so far shown interest in this simple method of overheating protection. Those who are interested don't really have Northern Europeans like the Grubers or the Kerkhovens in mind. Instead, they are aiming at the Rodriguez family in Valencia or the Fabio family in Milan. One of the oldest German manufactures of collectors, Wagner & Co., presented its version of a drain-back system last year. Wagner states that this robust system, comparatively cheap at a net price of 1,800 €, is intended chiefly for the markets in southern Europe. The three available Secusol variants are dimensioned with collector surfaces of 2.6 or 5.2 m<sup>2</sup> and storage tank volumes of 150 or 250 litres. With this capacity, solar power can meet more than two-thirds of the warm water requirements of a four to six-member family in Italy or Spain. »Actually it's only half a drain-back system,« admits Andreas Wagner, the long-serving company founder. This is because the collector manufacturer doesn't want to dispense completely with anti-freeze. On the one hand drain-back systems can work with pure water as heat transfer fluid, because neither overheating nor frost can damage the system components



if the unit drains empty when not in use. However, the slightest mistake made when assembling the piping can prevent total emptying of the solar collectors and piping, and thus potentially lead to a total system loss. So particular care and precision are required of heating engineers when constructing drain-back systems. Both the collector field and the collection pipe must be installed with a slight gradient of 0.5 to 2°. Wagner prefers to hedge his bets. With a glycol additive the unit is in any case protected against freezing up. The generously dimensioned heat exchanger in the storage unit takes over the function of the expansion vessel.

### Solareuropa project

Wagner has now been followed by the pan-European heating systems company Vaillant. It too has designed its drain-back system with the southern European neighbours in mind, and has correspondingly named the project »Solareuropa«. During the development phase, project manager Sven Schicke organised workshops with heating engineers from all over Europe in order to hear their opinions and wishes. This resulted in a complete system with a 150



**Final installation of the Australian Powerpaks: with these compact units the sun can be connected to existing tanks.**

*Photo: Muntwyler*

or 250 litre storage unit and two flat collectors with a total area of 4.4 m<sup>2</sup>.

The solar pump and the integrated thermostat are pre-installed in the storage unit delivered by Vaillant. Moreover, the company employs flexible piping as standard installation accessory and pinch-screw connections to save its fitters difficult soldering work on the building site. Schicke has no worries about them forgetting to install piping at a gradient. »We give our heating engineers extensive training. And heating engineers with trainer status from neighbouring countries have taken part in our courses in the Vaillant headquarters.«

Vaillant has revamped its previous flat collector design for this system. In the new auroTherm VFK 900 a serpentine-type absorber ensures the required heating performance. »Harp-type absorbers have problems with emptying,« explains Schicke. He too regards drain-back units as »simple and economical systems.« He can therefore imagine that they can establish themselves in Germany as well, as a cheaper alternative to the established system types.

### Difficult learning process

One company that already has experiences with drain-back systems for the German market is Buderus Heiztechnik GmbH. »Problematic experiences,« as marketing manager Tobias Geibel admits. To begin with they had difficulties with the all-in-one unit. He doesn't wish to elaborate – but what he will say is that it was about managing water in all its states. The hydraulic requirements for the fitters also led to extra effort. But above all the noise created by the cogwheel pump had been underestimated.

For Buderus the drain-back units form just a small part of the solar-generated turnover. Nonetheless the company plans to keep the systems in its product range. Geibel sees them as an interesting exclusivity factor with regard to other German solar suppliers. But he doesn't expect major turnover. »Due to the German customs and building types I don't expect this technology to gain as much ground as in the Netherlands. Otherwise this would already have happened.«

**Drain-back system from Wagner: the generously proportioned heat exchanger in the tank also functions as expansion vessel.**

*Figure: Wagner*

## Enthusiastic neighbours

His colleagues in Switzerland see things very differently. Urs Muntwyler of Muntwyler Energietechnik AG is convinced: »Drain-back systems are gaining ground«. Daniel Vögelin, managing director of Vögelin Solartechnik GmbH, also believes that the low level of interest shown in Germany up to now will quickly change. »We have acquired the technology, now we have to reduce the price.« On this basis he is sure that most manufacturers will be supplying the system in five years' time. Vögelin is now selling over 70 percent of his solar heating units in the form of drain-back systems.

Another factor fuelling Urs Muntwyler's enthusiasm for drain-back units is their ease of expansion. He has been working with the technology since 1999, and has found the right system for his needs in the form of the Powerpaks of the Australian manufacturer Solahart. The compact units combine hot water pump and collector pump, heat exchanger, control and display elements and a drain-back tank in one unit. »With the Powerpak the sun can be connected up to existing storage units,« says Muntwyler.

## Sceptical neighbours

While the Swiss are going for additional compact stations with drain-back reservoirs, the Belgian OEM European Solar Engineering SA (ESE) is supplying the required flow-back volume with a heat exchanger 30% larger than normal. Instead of working with copper pipes, ESE applies piping made of polyamide. The company says these are cheaper and can be installed from the drum without any welding.

Despite the drain-back principle, the ESE systems also use a glycol mixture as heat transfer medium.



Photo: Vaillant



**The heart of the Buderus drain-back system: the Logasol DBS complete unit with drain-back reservoir (right).**

Photo: Buderus

»For additional safety,« explains the ESE director Jean Paul Vantomme. He is well aware that he faces an uphill struggle on the German market with drain-back systems. »I have the impression that in Germany all the suppliers are standardised on one system. At trade fairs I see only the usual unit type.« The one belonging to the Gruber family...

John van Dam has been selling drain-back systems to the »Kerkhovens« and their Dutch compatriots since 1977. The biggest to date was in 1997, with a collector surface of 2,400 m<sup>2</sup> and a storage volume of 125 m<sup>3</sup>. Van Dam describes his experiences with Germany: »We have tried to enter the market several times,« recounts the technical director of ZEN International. »But it's very difficult to sell the Germans complete systems.« He has a simple explanation for the success of drain-back technology in his own country: »In the early years of solar heating technology the Dutch drinking water regulations forbade the use of anti-freeze in solar units.«

Joachim Berner

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