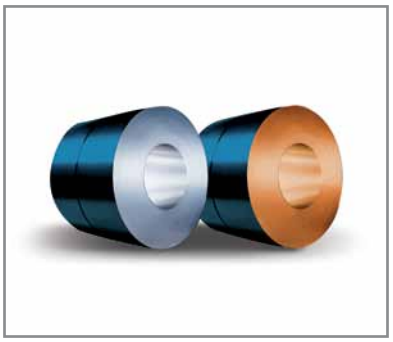
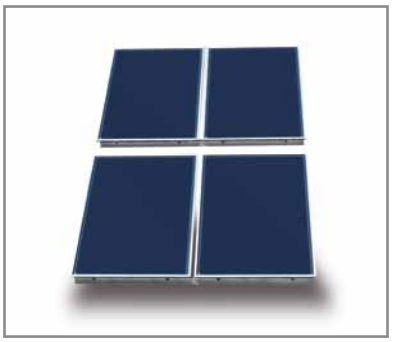
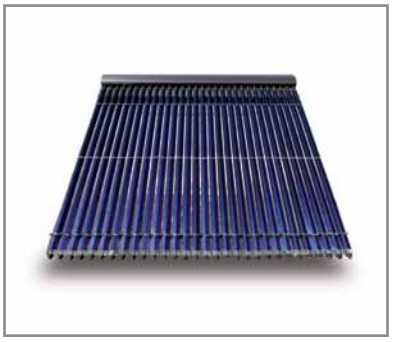
TiNOX® energy







Solar absorber coatings

ALMECO SOLAR



Maximum output

Solar thermal collectors use energy from the sun to generate heat for heating and hot water. This energy is free, environmentally friendly and reliable. The heart of flat-plate, air and evacuated-tube collectors is the absorber. It collects the energy in sunlight and converts it into heat. The more efficient the absorber, the greater the collector‘s output.

Almeco sets an industry benchmark with its TiNOX absorbers: these products absorb 95% of incident sunlight. At the same time, depending on the absorber, they only lose around 4% through heat radiation. In this way, manufacturers of collectors can ensure the highest quality and maximum yield for their customers. Almeco applies its highly selective absorber layers both to aluminium and copper substrates. Collector manufacturers are therefore able to offer a wide range of high-quality products with TiNOX absorbers.

Absorbers for every requirement

With their highly selective absorber coatings in the TiNOX product range, Almeco can provide the right absorber for every application.

TiNOX energy is characterised by outstanding absorption and emissivity rates. The highly selective blue coating guarantees the customer the best possible collector performance.

TiNOX nano has a highly selective, environmentally friendly coating, and with its reduced absorption rate is designed especially for regions with very high levels of sunlight.

TiNOX artline comes in a wide range of colours and is therefore perfect for customers who wish to match it aesthetically with their building, especially, for example, in Mediterranean countries.

All TiNOX energy products are made in Germany in modern production lines in Bernburg.

Service and consulting

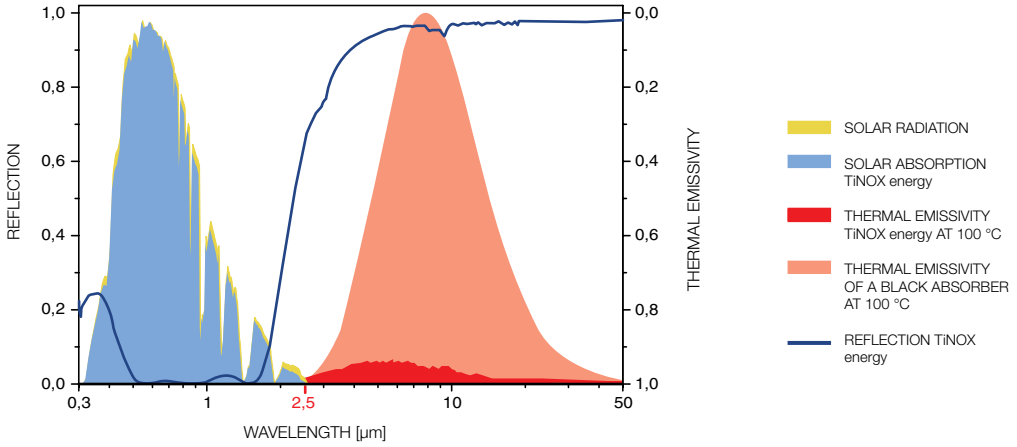
Almeco is a competent, dedicated partner for its customers with a wide international service network. Collector manufacturers can therefore rely on experienced and knowledgeable experts worldwide for all technical questions, such as product development and production-planning or training, market research and strategy development. A high-performance global distribution network also ensures that the absorbers are always delivered reliably, safely, and on time to our customers – regardless of the manufacturing location. Almeco also believes that good service includes the quick and flexible handling of individual customer requirements, such as special formats or small series production runs. To this end, Almeco has high precision cutting and prefabrication facilities in a number of service centres spread across the globe.

The energy trap

The TiNOX absorbers are energy traps. They collect almost all available solar radiation and convert it into heat. Unlike black chrome or black-coated absorbers, almost none of this energy is lost again as heat radiation. The energy is directly transferred into the heating-support and water heating systems by the TiNOX absorbers.

Selective reflection

How is that possible? TiNOX absorbers make use of the fact that solar radiation energy irradiates at wavelengths below 2.5 µm, while the characteristic wavelength range for heat radiation from a 100°C surface (maximum operational temperature of a hot water collector) is above 2.5 µm. The absorbers are therefore capable of reacting differently to wavelengths above and below 2.5 µm – they are selective. This significantly reduces losses from heat radiation, as the following graph depicting the performance data of TiNOX energy shows.

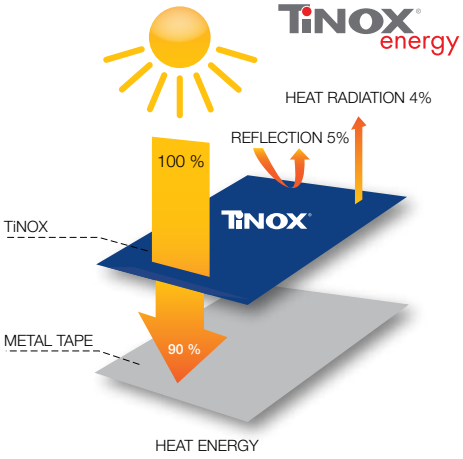


The blue area shows how well TiNOX energy absorbs solar radiation. The pale red area depicts heat radiation emissions from a black absorber with non-selective coating. The contrasting low heat radiation emissions of TiNOX energy are shown in dark red. The blue curve shows the reflective properties of TiNOX energy. In the range of solar radiation, reflection is very low because the absorber is designed to take up as much energy as possible. In comparison, the coating reflects infrared light very well, resulting in very low heat radiation emissions – the maximum amount of energy stays in the absorber.

TiNOX energy

TiNOX energy is the premium product in the TiNOX product range: with its outstanding absorption and emissivity performance, the highly selective, blue absorber is the first choice for collector manufacturers who wish to guarantee their customers the highest output even when less sunlight is available.

TiNOX energy is capable of absorbing 95% of incident solar radiation and converting it into heat. Like an "energy trap," the highly selective blue TiNOX coating only loses approx. 4% of the captured solar energy as heat radiation.

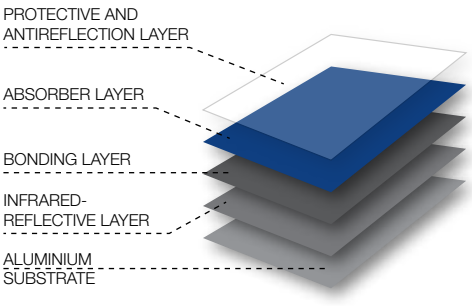


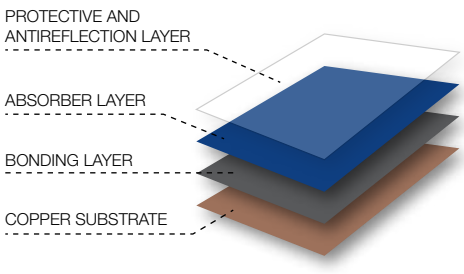
Solar absorption: α ~ 95 %	Thermal emissivity: ε ~ 4 %

All TiNOX energy absorbers are available with both copper and aluminium substrates. Both substrate materials have excellent thermal conductivity properties. On request, Almeco can also coat other materials.

Version	TiNOX energy Al	TiNOX energy Cu
Width	Max. 1,250 mm	Max. 1,250 mm
Thickness	0.20 – 0.75 mm	0.12 – 0.50 mm

TiNOX energy absorbers consist of a number of layers, carefully designed to work together. The substrate material is a highly infrared-reflective metal sheet that conducts heat well. A diffusion barrier is applied to the adhesive layer. This prevents metal atoms from entering the absorber layer at high temperatures and changing the optical properties. This is followed by the absorber layer consisting of a multilayer cermet structure. Finally, the top layer is an anti-reflective, protective layer made of fused quartz. This material is extremely hard and also scratch-resistant. The absorber is therefore very well protected from damage during handling. By minimising surface reflection, the absorption of solar radiation is further optimised.





TiNOX nano

An optimum balance between efficiency, costs and environmentally friendly manufacture: the TiNOX nano. This absorber is suitable for regions with high levels of sunshine and provides an extremely cost-effective, environmentally friendly alternative to the black chrome or lacquer absorbers that are often used in those regions.

In contrast to black chrome or lacquer absorber layers, which have a high level of emissivity in heat radiation, TiNOX nano still delivers the best possible output even at high temperatures in the collector, thanks to a low emissivity level of only 5%. The absorption level is especially designed for high levels of solar radiation, keeping the stagnation temperature low and thus reducing the thermal stress on the collector. Thanks to a top-quality protective layer, TiNOX nano absorbers are extremely robust and resistant to environmental damage.

Almeco produces TiNOX nano – like all its other absorbers – exclusively in cutting-edge PVD coating facilities in Bernburg, Germany. Unlike in the manufacture of black chrome or varnish coatings, no toxic waste is produced in the process. The coating procedure is also completely emissions-free. With TiNOX nano, collector manufacturers are capable of providing their customers in very sunny countries in Southern Europe, Latin America, Asia or Africa with a reliable and high-performance product, which is designed especially for the unique conditions in these regions.

Solar absorption: α ~ 90 %	**Thermal emissivity:** ε ~ 5 %

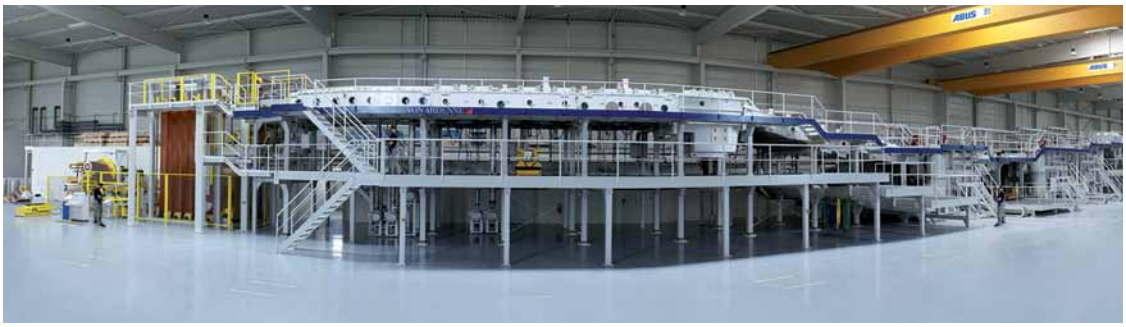
TiNOX artline

TiNOX artline combines efficiency and aesthetic appeal in a unique way because of its individual colour scheme, TiNOX artline is the ideal product for those looking for an alternative to conventional blue absorbers – but who do not want to compromise on heat output.

TiNOX artline is particularly suited for use in Mediterranean countries, as collectors with TiNOX artline inconspicuously fit in with the rooftop landscapes of this region. TiNOX artline is also the perfect choice for many facades. With TiNOX absorbers, collector manufacturers can expand their product range with a high-performance product that also meets special requirements of property owners and architects.

TiNOX artline still achieves an especially high output whatever colour is chosen. With its exceptionally low emissivity levels, the product is particularly powerful when collectors are required to deliver high-temperature results.

Solar absorption: α ~ 90 %	**Thermal emissivity:** ε ~ 5 %



When it comes to high-quality coatings for solar applications, Almeco is a renowned partner thanks to its cutting-edge production facilities, meticulous quality processes, many years of experience and comprehensive expertise.

Pre-handling of metal

High-performance absorber layers require very pure, highly reflective metal surfaces. After all, there must be as much infrared reflection as possible to achieve the characteristic extremely low emissions of these highly selective absorbers. The laws of physics also stipulate that the mirror used should be completely flawless.

For TiNOX energy absorber strip, Almeco uses only the purest copper with a special pre-cleaned surface and works with reliable, premium suppliers for this product. The aluminium used for TiNOX absorber strip is electrochemically treated in Almeco's strip processing plants to provide the optimum finish before being vacuum coated.

Multilayer PVD coating

The coating is applied in high-tech plants in Munich and Bernburg. In this process, multiple thin layers of metal and ceramics are applied to the metal substrates in a vacuum. Environmentally friendly PVD (physical vapour deposition) technology is used, in which both electron beam vapour deposition and sputtering are applied.

The whole process is controlled by computer and monitored throughout with optical sensors. In addition, experienced quality engineers carefully visually inspect all absorbers.

Cutting and packaging

Almeco-TiNOX runs a number of service centres with cutting facilities so that absorbers can be tailored exactly to customer needs. To protect the coating, the substrates are supplied with an intermediate foil or paper layer. Almeco-TiNOX uses protective foils from the market leader, which are especially developed for our high-quality absorber surfaces.

Environmental impact

TiNOX energy absorbers are green products. Very few resources are consumed during the production process at Bernburg and Almeco GmbH only needs about one kilowatt-hour of energy to vacuum coat and manufacture a square meter of absorber substrate. Some sunny days are enough to get back the energy invested.

The coating procedure is completely emissions-free and, unlike conventional black chrome coating, produces no toxic waste. Furthermore, there is no adverse "end of life" environmental impact as the copper and aluminium substrate materials are very easily and efficiently recycled.



The company

For more than fifty years the Almeco Group has devoted itself to making aluminium products with reflective and decorative surface finishes. This specialization has led to the Group becoming one of the world's largest producers of components for the lighting and solar energy industries.
All Tinox energy products are manufactured in Germany at Almeco GmbH, which incorporates the Solar Business Division of Almeco Group. With modern, high technology vacuum coating and manufacturing lines, Almeco GmbH specializes in high-tech reflector and absorber coatings that convert sunlight into heat energy in an efficient, reliable and environmentally friendly manner.

Service and consulting

Almeco has close, long-term partnerships with its customers. But for Almeco, collaboration is not limited to the supply of high-quality, high-yield products. As a competent service partner, the company looks after all of its customers with a wide range of services, including individual consulting, training sessions and other special services.

Research and development

Almeco works continuously to further improve the efficiency of high-tech solar coatings. To this end, the company has its own research and development department in Bernburg, and collaborates with prestigious research institutes all over the world.

Guarantees and certificates

Almeco offers a 10-year guarantee on the performance of its TiNOX absorber products. The high quality of TiNOX energy absorbers has been confirmed by a number of renowned testing institutes. A key element in the product approval is the "Task X" test, which simulates the effect of years of temperature fluctuations and exposure to the environment on the absorber's selective layers. Absorbers that pass this test are guaranteed to provide 95% of their original output even after 25 years.

TiNOX absorbers have certificates of approval from the following institutes:
- Fraunhofer Institute for Solar Energy Systems, Freiburg (ISE)
- Institute of Solar Technology, Rapperswill College (SPF).

Almeco GmbH fulfills the quality standards required for compliance with DIN EN ISO 9001:2000; Environmental Management Standard ISO 14001 and Occupational Health and Safety management standard OHSAS 18001.

Fraunhofer ISE

SPF Solartechnik Prüfung Forschung

ISO 9001:2008
ISO 14001:2004
BS OHSAS 18001:2007
DEKRA Certification
DEKRA
zertifiziert

Bernburg – Germany
Munich – Germany
Milan – Italy

ALMECO SOLAR

Almeco GmbH
Triebstrasse 3 – 80993 Munich – Germany
Ph.: +49 89 147296-0 – Fax: +49 89 147296-72
info@almecosolar.com – www.almecosolar.com

EN - 06/2012