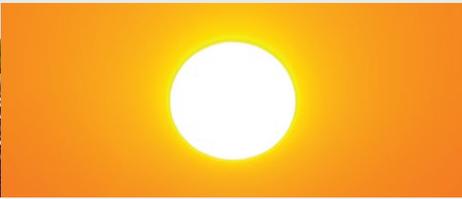


# SOLAR





## SOLAR

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# The ALMECO service

## A Partner for solar energy industries.

*From selective  
**TiNOX**<sup>energy</sup> absorber  
surfaces to specular  
**vega**<sup>energy</sup> :  
a complete range,  
unparalleled quality  
and 360° service.*

The ALMECO GROUP is ranked among the world leaders of highly specialised surface production for solar energy applications, a sector in which the required performance in terms of reflection or absorption of solar radiation is particularly high. This recognised leadership is expressed in the technologically advanced Almeco GmbH production facilities in Bernburg, Germany, where copper and aluminium coils are subjected to the process of continuous vacuum PVD (Physical Vapour Deposition) coating. Through this process, which is managed via software and moni-

tored with the most sophisticated measuring instruments, a series of thin cermet films is deposited on the substrate, giving it characteristics of selective absorption or raising its reflection performance, depending on the applicable sector to which the product is intended.

The main types of surfaces are:

- **TiNOX energy** for solar thermal applications;
- **vega energy** for concentration applications.

The use of the PVD technology ensures a fully sustainable and eco-friendly process, perfectly in





tune not just with the "green" destination of the products, but also with the philosophy of the Almecco Group which, in addition to meeting the quality standard required by the EN ISO 9001:2000 regulation, is certified with the certifications OHSAS 18001 and environmental ISO 14001, with full respect for the values of environmental protection and the well-being of the employees. The great attention to the environment and the direct contribution offered by the ALMECCO GROUP for the production of renewable energy is united with the constant pursuit

of high quality for the final product and customer service. Strict checks, carried out by qualified personnel, ensure that the product performance remains unchanged over time. Thanks to the many service and cutting centres placed in the various strategic markets worldwide, the ALMECCO GROUP is capable of guaranteeing delivery times in line with the most stringent customer requirements. Furthermore, the ALMECCO GROUP qualifies as an ideal partner to study, engineer and implement highly personalised in-

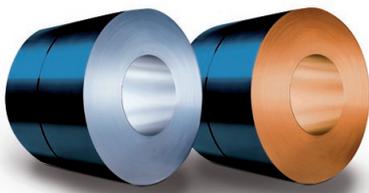
novative surfaces. This absolutely unique service is made possible by the technical personnel's specialised know-how and the technologies used. An added value for Almecco is its organisational flexibility and comprehensiveness of its machining that ranges from industrial production to the production of special sizes and small batches. The collaboration with the client goes all the way from the planning to the production of reflectors and components for concentration plants.



# TiNOX<sup>®</sup> energy

## The highest efficiency in solar absorption.

The **TiNOX<sup>®</sup> energy** surfaces guarantee an absorption of 95% of the solar radiation and an emissivity of only 4%. These values remain constant over time.



The solar thermal panels use the sun's energy to generate heat which is used for the production of hot water. What results is free energy that is environmentally friendly and reliable: energy for our future.

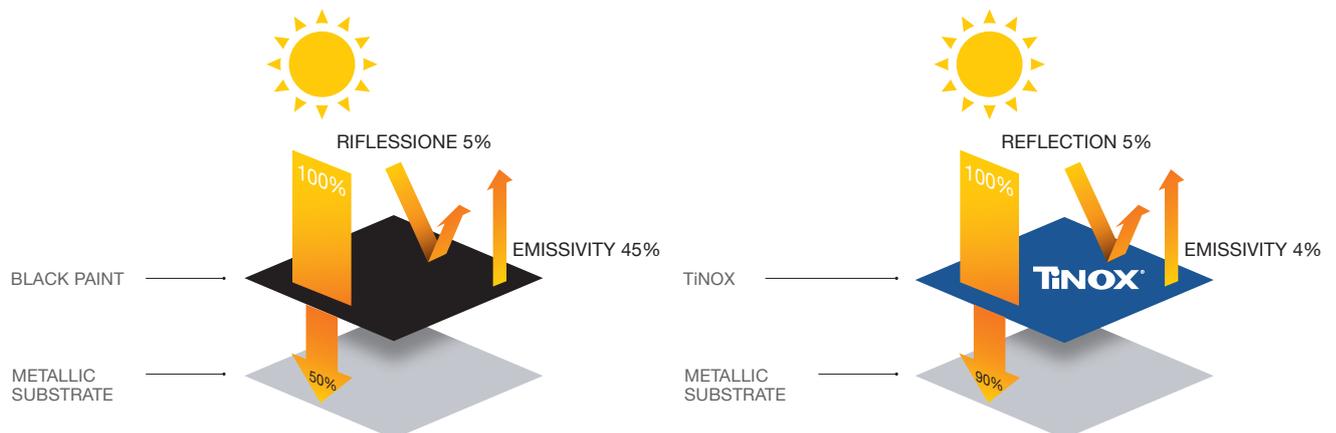
The core of the solar thermal panels is the absorber, which is given the unique task of collecting the energy in the form of solar radiation and converting it into heat.

The more efficient the absorber is, the greater the heat produced by the panel will be.

With the **TiNOX energy** surfaces,

created indifferently on copper or aluminium, the **ALMECO GROUP** represents an important reference for the sector. These surfaces absorb 95% of incident solar energy and convert 90% into thermal energy, losing only 4% of heat in the form of radiation.

This allows solar panel manufacturers to ensure the highest quality and greatest yield to those who install them. The structure of **TiNOX energy** absorbers has been developed to optimise its function at the typical operating temperature of the solar collectors





(approx. 100°C). For this, the special PVD multilayer is able to absorb most of the incident solar energy on the panel (propagated with wavelengths less than 2.5 micron) and to minimise the heat lost from the same material under the form of radiation (wavelengths longer than 2.5 micron). The characteristic to adapt its behavior according to the different wavelengths, or rather the selectivity, allows **TiNOX energy** products to "capture" up to 50% more energy than non-selective products. This particular type of coating was

developed for the first time in the **ALMECO GROUP** laboratories. The **TiNOX energy** surfaces are suitable for the most common welding techniques. In addition, the constant focus on innovation and specialised know-how of the research and development team allows the **ALMECO GROUP** to satisfy the most demanding customer requirements. The high quality of **TiNOX energy** absorbers has been confirmed by leading certification institutes using the "Task X" test, which simulates the effect of years of temperature

changes and environmental exposure on the absorbers' behavior. The products that pass this test are guaranteed to deliver 95% of their original performance even after 25 years.

The **TiNOX** absorbers have obtained a certificate of approval from:

- Fraunhofer Institute for Solar Energy Systems, Freiburg (ISE)
- Institute of Technology Solar Rapperswill College (SPF)
- Institut für Thermodynamik und Wärmetechnik (ITW).



 **Fraunhofer**  
ISE

 **SPF** Solartechnik  
Prüfung  
Forschung

*itw*

**TiNOX energy**

# TiNOX<sup>®</sup> robust

## The perfect balance between efficiency and adaptability.



**TiNOX robust** is a highly selective absorber coating designed for harsh environmental conditions, as can be found in flat plate solar collectors installed near the sea-side or in industrial environments. Compared to other absorber coatings designed for such conditions, based on black chromium or lacquer, **TiNOX robust** features nearly the same optical properties as the well-established **TiNOX energy** coating, thanks to a complex multilayer structure applied by PVD coating process. Due to the special ceramic top layer, the material has

good corrosion resistance and fingerprints are nearly invisible. Even in humid conditions, optical performance is maintained stable.

**TiNOX robust** is deposited on aluminium substrates up to 1,250 mm width (copper or stainless steel are available on request).

**TiNOX robust** absorbers can be used equally well in various designs of flat-plate water heating and air heating collectors.



# TiNOX<sup>®</sup> artline

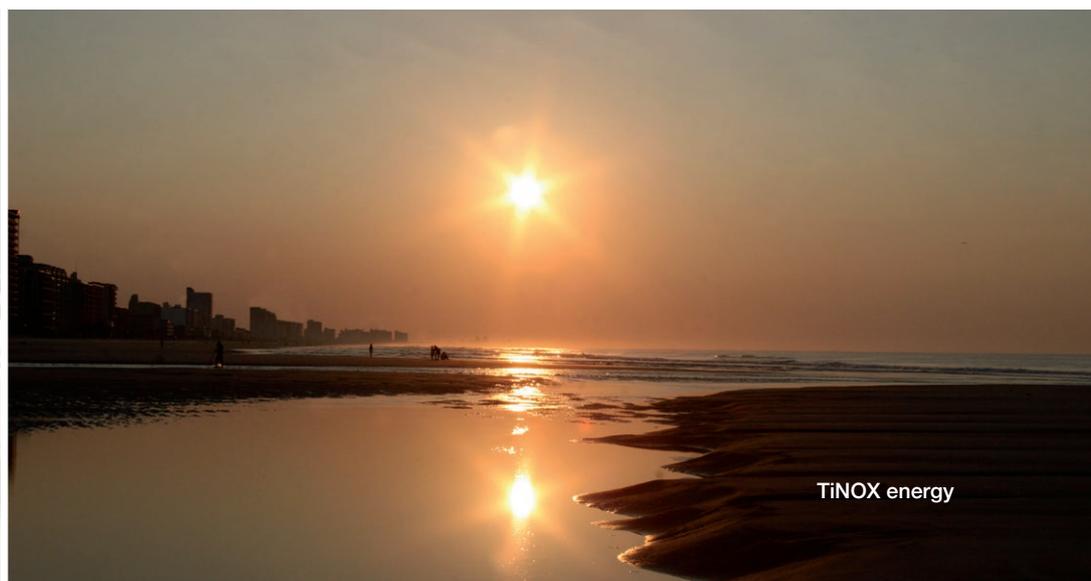
## The absorber that combines aesthetics with efficiency.

**TiNOX artline** is the ideal product for those looking for an alternative to traditional blue absorbers without sacrificing the advantages in terms of absorption that **TiNOX energy** can offer.

This material, in fact, combines aesthetics and efficiency in a unique way and, thanks to its color, it stands out as an excellent choice for those solar panels placed on the

roof or facade seeking a smooth integration into the landscape.

With **TiNOX artline** absorbers, the manufacturers of solar thermal panels can expand their range of proposals by offering a product that guarantees high performance and exceptionally low emission levels, capable of catering even the special aesthetic needs of clients and designers.



# vega energy®

## A complete range with high reflective properties.

*Surfaces with very high reflection (over 98%) for all applications that require high concentration.*



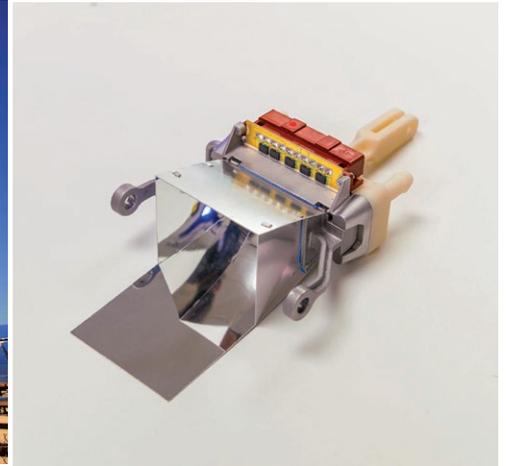
Reflective surfaces are a key element in solar concentrating systems: indeed, these should reflect the solar radiation as effectively and accurately as possible.

Valuing the know-how acquired with the PVD process in the lighting industry, the ALMECO GROUP has developed a range of **vega energy** specular surfaces, even with reflectance higher than 98%.

Thanks to their exceptional reflective properties, the **vega energy** surfaces can find successful application in various types of systems, such as:

- Concentrated Solar Power (CSP) plants, for example parabolic through collectors and linear Fresnel collectors, that convert sunlight into thermal energy to be used in various industrial processes or in the production of electric power
- Secondary concentrators for linear Fresnel plants, where the material is exposed to high temperature
- Concentration Photovoltaic (CPV) systems for the production of electric energy
- Compound Parabolic Concentrator (CPC) panels for the production of sanitary hot water
- micro CSP concentrators for the production of process heat in the industrial sector.





To guarantee the highest efficiency in each specific application, the ALMECO GROUP has developed a series of surfaces with different characteristics within the vega energy range:

- **vega energy SP** surfaces are made of pre-anodized aluminum with a multilayer coating, obtained by PVD process, which uses a thin film of 99.99% pure aluminium or silver
- specular SWR surfaces are made of pre-anodized, bright-

ened aluminum, protected by a special weather-resistant coating

- **vega energy TS** use a modified anodizing and PVD process, to achieve surfaces that can withstand higher working temperatures

Almeco ensures that the reflectance value of the **vega energy** surfaces will be maintained within 3% of its original value for a period of 10 years.

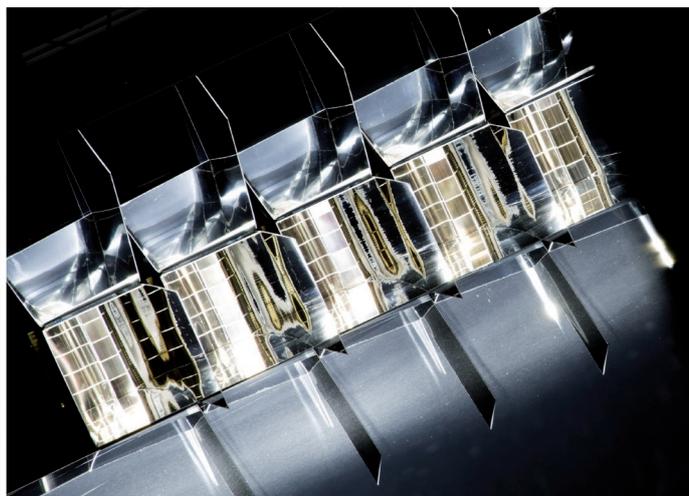
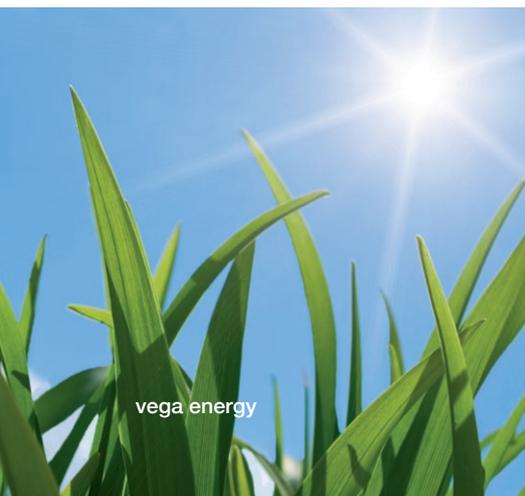
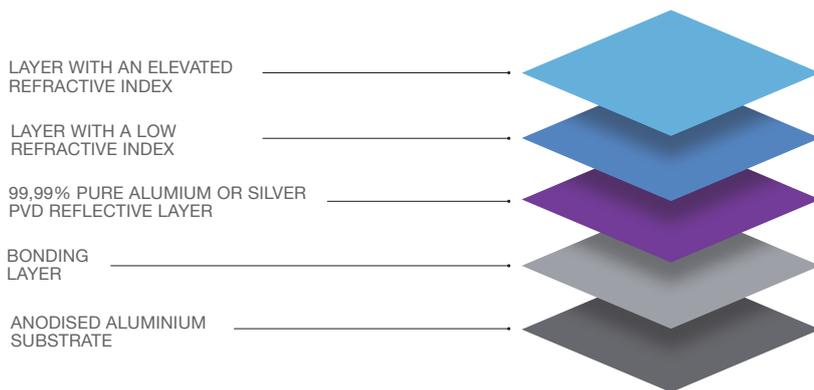


# vega energy SP

## The highest solar reflection.

The surfaces of the **vega energy SP** range offer the highest levels of total and specular reflectance and are used for solar concentrators placed in protected environments. Their behavior is optimized for solar radiation, resulting in a higher concentration and a lower diffusion of light.

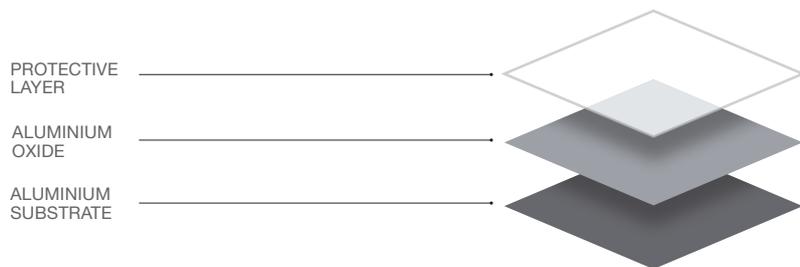
**vega energy SP** surfaces are made of pre-anodized aluminum with a multilayer coating obtained by PVD process, which is designed around a thin reflective film of 99.99% pure aluminum or silver.



## The guarantee of long durability over time.

The **robust SWR686** surface is mainly used for the creation of CPC (Compound Parabolic Concentrators) for vacuum tube collectors and micro-CSP systems, where the optimization of the investment is as essential as the reflectance.

The specular aluminum surface, electro brightened and anodized, is protected with an additional coating that is highly resistant to most environmental conditions. With 87% of total reflectance, **SWR686** is the ideal solution to ensure a long life for outdoor environments



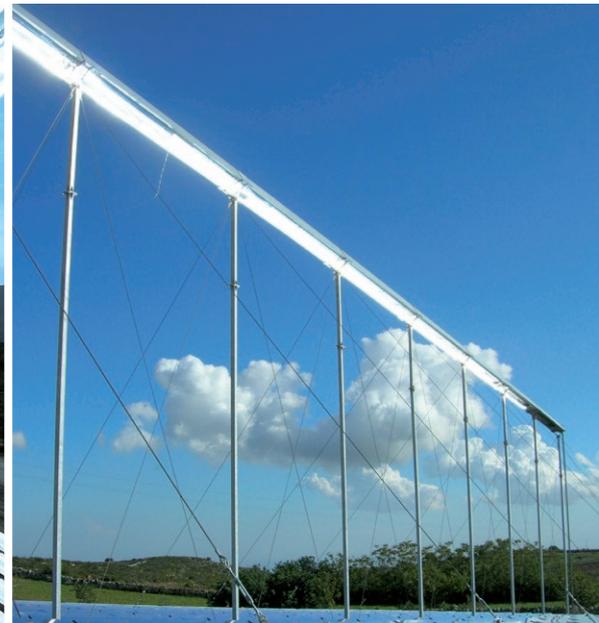
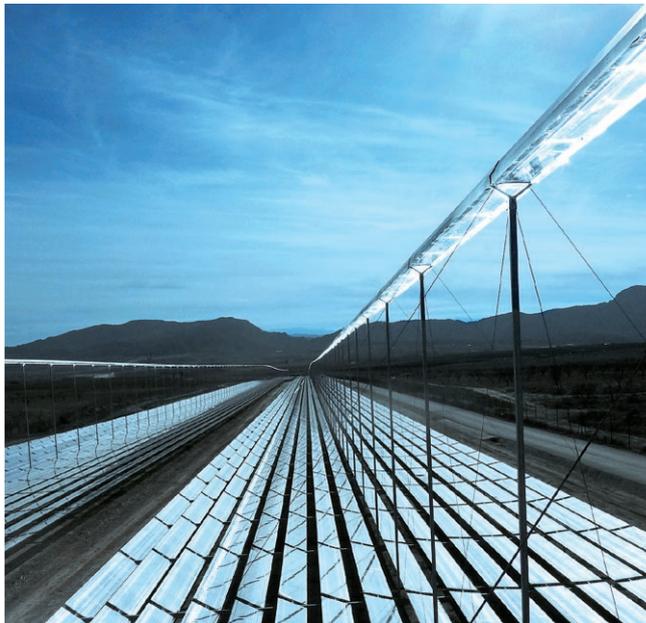
# vega energy TS

## Long system life at maximum temperatures.

Almeco is one of the few companies in the world able to combine the development of highly specialized optical surfaces with the engineering of solar reflectors, resulting in the production of components with unique characteristics.

**vega TS** is one such example. Its special, robust structure allows it to keep its reflectance performances stable even at operating temperatures above 300° C. Not surprisingly, the acronym TS stands for its exceptional thermal stability.

PRODUCT	TOTAL VISIBLE REFLECTANCE [%]	TOTAL SOLAR REFLECTANCE [%]	MAX OPERATING TEMPERATURE [°C]
VSP 295	> 95	> 93	not developed for this application
VTS 290	> 91	> 90	300





[Almeco S.p.A.](#)

*Via della Liberazione, 15  
20098 San Giuliano Milanese (Mi) - Italy*  
Tel: +39 02 9889631  
Fax: +39 02 98896399  
E-mail: [info.it@almecogroup.com](mailto:info.it@almecogroup.com)

[Almeco GmbH](#)

*Claude Breda Strasse, 3  
D-06406 Bernburg - Germany*  
Tel: +49 3471 3465500  
Fax: +49 3471 3465509  
E-mail: [info.de@almecogroup.com](mailto:info.de@almecogroup.com)

[Almeco USA, Inc.](#)

*1610 Spectrum Drive  
Lawrenceville, GA 30043 - USA*  
Tel: +1 770 449 3454  
Fax: +1 770 449 3677  
Email: [info@almecousa.com](mailto:info@almecousa.com)

[Almeco International Trading \(Shanghai\) Co.,Ltd](#)

*Sales and Marketing: Room 2011 G, 7315 Originality Carrier, 2577 Longhua Rd,  
Xu Hui District,  
Shanghai, 200030 China*  
Tel: +86 21 64755012  
Fax: +86 21 64755012  
E-mail: [info.cn@almecogroup.com](mailto:info.cn@almecogroup.com)

