EFFICIENCY. SOLAR. SURFACES.

alanod

SOLAR

Alanod-Solar

EFFICIENCY. SOLAR. SURFACES.

Surface treatment par excellence

As a subsidiary of ALANOD GmbH & Co KG, Alanod-Solar benefits from more than 30 years of experience in the production of surface finished aluminium and copper strips. This expertise enables Alanod-Solar to focus with its products on the environmentally friendly generation of solar energy.

On four vacuum coating lines (PVD), and a lacquering line, specially developed for Sol-Gel processes, selective absorbing or highly reflective coating systems are produced in a coil-to-coil process. An existing global sales network ensures tailor-made, on-site advice and support.
Whichever world wide market you are in, we have on hand the resources and logistics to look after your specific needs.


Vacuum coating line

Solar reflection

With our reflecting surfaces, we offer various materials with a total solar reflectance ranging between 85% and 95%. Thanks to a weather-resistant nano-composite layer, MIRO-SUN® is an ideal material for outdoor applications. This is used as CPC reflectors (CPC= Compound Parabolic Concentrator) in evacuated tube collectors and parabolic trough concentrators (CSP = Concentrated Solar Power). In addition, MIRO-SUN® can also be used as a concentrating reflector material for photovoltaic applications (CPV = Concentrated Photovoltaics). The different products in the portfolio enables Alanod-Solar to offer an ideal component for every possible application.

Solar absorption

eta plus®, mirotherm® and mirosol® TS are the three selective absorber coating systems for solar collectors. eta plus® and mirotherm® coatings are continuously produced in a PVD-process. This achieves 95% absorption and at the same time, a low emission of not more than 5%. For the first time we offer, with mirosol® TS, a coil coated selective absorptive lacquer.

All the absorbing products are used in a diverse range of solar-thermal collectors. Mostly copper or aluminium tubes are welded to the rear side of the absorbers to conduct heat, whereby laser welding has become established as the optimum technology for joining together both identical and dissimilar metals. This method ensures that the joints achieve not only long-term mechanical stability but also excellent thermal conductivity.

Global player

Our top quality products are sold, processed and installed by our partner companies on all five continents. We are the world's first company to have reached the milestone of having sold more than 21 million square metres of absorber surface area.

Furthermore, we have an integrated and certified quality and environmental management system according to EN ISO 9001/14001 and also an energy management system certified to ISO 50001.

Product advantages

EFFICIENCY. SOLAR. SURFACES.

Applications:

- flat plate collectors
- air collectors
- vacuum tube collectors

Absorption:

- 10 - year material warranty
- selective coatings system ensures maximum absorption and lowest emission
- all standard joining technologies can be used
- protective film or paper interleaving available upon request
- CO_2 savings per sqm:
  100 kg/year compared to natural gas
  130 kg/year compared to heating oil
- > 21 Mio sqm supplied and installed worldwide
- more than 2.1 Mio tons CO_2 savings annually
- state-of-the-art continuous in-line measurement processes guarantee maximum quality standards
- environmentally friendly/emission-free manufacturing process
- low energy balance

Applications:

- evacuated tube collectors
  (CPC Compound Parabolic Concentrator)
- parabolic trough power plants
  (CSP Concentrated Solar Power)
- micro parabolic trough
  (CST Concentrated Solar Thermal)
- photovoltaics
  (CPV Concentrated Photovoltaics)
- solar cookers
- heliostats

Reflection:

- 10 - year material warranty
- weather resistant thanks to nano-composite layer
- optimized for highest solar reflection
- UV - resistant
- heat resistant
- easy to clean
- formable
- flexible
- scratchproof
- no delamination
- environmentally friendly/emission - free manufacturing process
- low energy balance

Absorption

Technical information

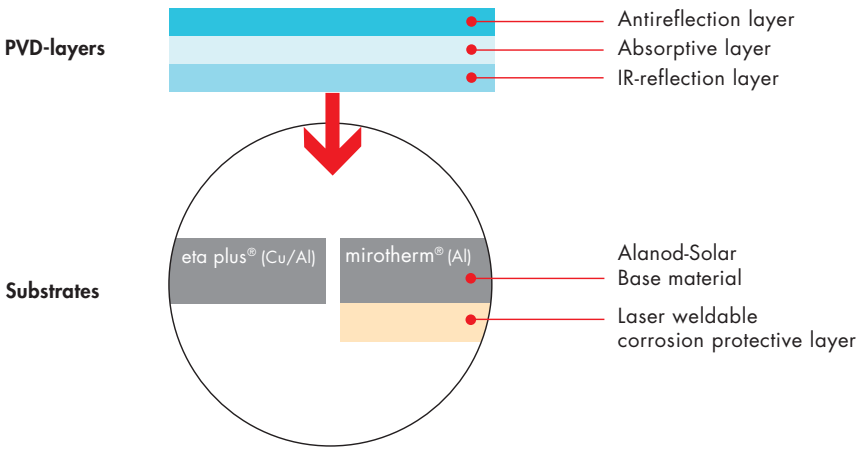
eta plus® and mirotherm®

Consists of an aluminium or copper strip which has been anodised on both sides; then in a world-wide unique air-to-air process, a system of three layers is applied using the physical vapour deposition technique (PVD). While an infrared reflecting layer ensures low thermal emission (ε), the metal oxide absorption and antireflection layers ensure highest solar absorption (α) while offering resistance against outside agents.

mirosol® TS

For the first time, besides PVD coatings, selective lacquer is available for solar thermal applications. mirosol TS is a selective lacquer applied in a specially developed process on aluminium. The selective lacquer is hydrophob and resistant to fingerprints.

Layer-System

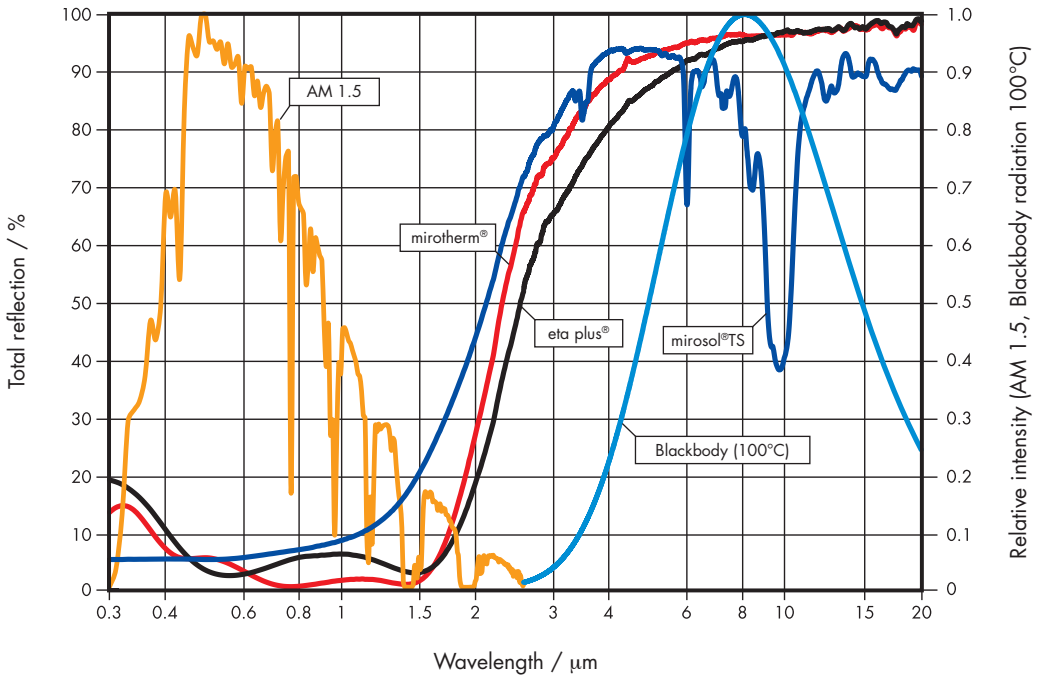


Properties	Parameter	mirotherm®	mirosol® TS	Prüfnorm
Mechanical	Alloy: Hardness:	Al 1.050• or purer Hard•	Al 1.050• or purer Half hard•	•DIN EN 573-3 •DIN EN 485-2
Optical	Solar absorption, α_{sol}: Thermal emission, $\varepsilon_{100\,°C}$: Colour coordinate a* (D 65): Colour coordinate b* (D 65):	0.95 ± 0.01 0.05 ± 0.02 -12 to 0 -25 to 0	0.90 ± 0.02 0.20 ± 0.03 -1 to +2 -1 to +2	 DIN 5033 DIN 5033
Physical	Heat conductivity W/(m*K): Specific weight, g/cm³:	210 - 220 2.7	210 - 220 2.7	
Dimensions	Width in mm (inch): Thickness in mm (inch):	max. 1.250 (49.21) 0.2 - 0.5 (.008 - .020)•	max. 1.250 (49.21) 0.2 - 0.5 (.008 - .020)•	
Delivery	Coils or sheets with: Innerdiameter 400 or 500 mm:	Paper interleave or protection foil ✓	Paper interleave or protection foil ✓	
Aging test	Passed:	✓	✓	ISO 22975–3:2014
Warranty	10 years:	✓	✓	

• = other thickness on request

Absorption

Reflection spectrum eta plus®, mirotherm® and mirosol® TS

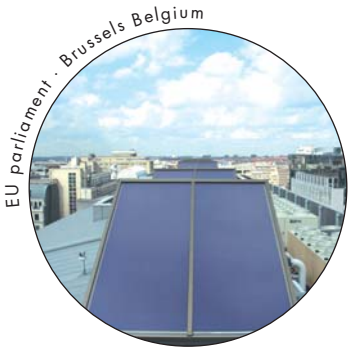


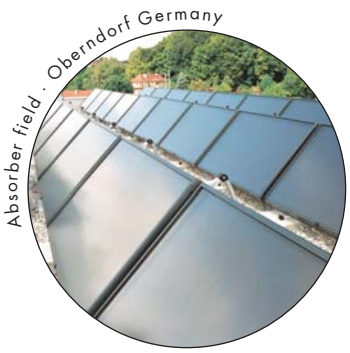
Properties	Parameter	eta plus® Cu	eta plus® Al	Norm
Mechanical	Alloy: Hardness:	Cu-DHP•, Cu-OF•, Cu-HCP Half hard•	Al 1.050• or purer Hard•	•DIN EN 13599 / •DIN EN 573-3 •DIN EN 1652 / •DIN EN 485-2
Optical	Solar absorption, α_{sol}: Thermal emission, $\varepsilon_{100\,°C}$: Colour coordinate a* (D 65): Colour coordinate b* (D 65):	0.95 ± 0.02 0.05 ± 0.02 0 to +14 -35 to -10	0.95 ± 0.02 0.05 ± 0.02 0 to +14 -35 to -10	 DIN 5033 DIN 5033
Physical	Heat conductivity W/(m*K): Specific weight, g/cm³:	295 - 395 8.9	210 - 220 2.7	
Dimensions	Width in mm (inch): Thickness in mm (inch):	max. 1.250 (49.21) 0.12 - 0.3 (.0047 - .012)•	max. 1.250 (49.21) 0.2 - 0.5 (.008 - .020)•	
Delivery	Coils or sheets with: Innerdiameter 400 or 500 mm:	Paper interleave or protection foil ✓	Paper interleave or protection foil ✓	
Aging test	Passed:	✓	✓	ISO 22975–3:2014
Warranty	10 years:	✓	✓	

• = other thickness on request

Project examples Absorption

Flat plate collector





Picture proof:
TISUN GmbH, Söll/ Austria · TISUN GmbH, Söll/ Austria · Solvis GmbH & Co. KG, Braunschweig/ Germany
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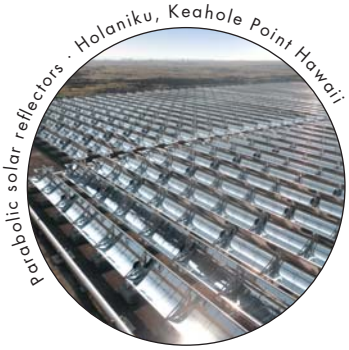
Heliodyne Inc., Richmond, CA/ USA · Stiebel Eltron GmbH & Co. KG, Holzminden/ Germany · Vaillant GmbH & Co. KG, Remscheid/ Germany

Project examples Reflection

CPC application

CSP application



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Dr. Vetter GmbH, IT·collect, Baden-Baden/ Germany · EG Solar E.V., Altötting/ Germany · WS Energia, Oeiras/ Portugal

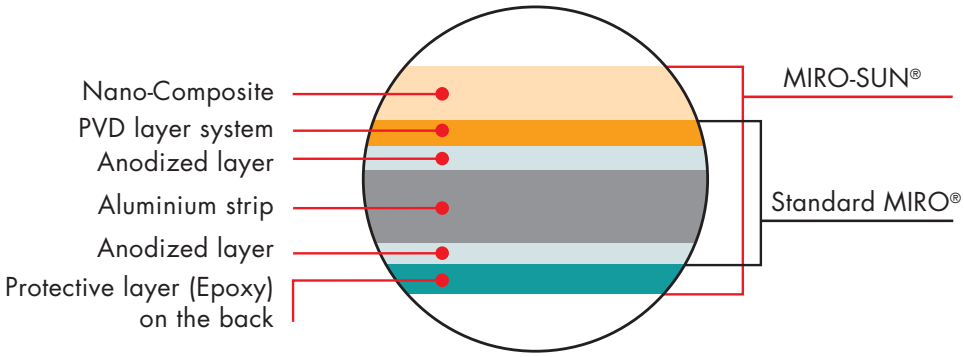
Reflection

Technical information

MIRO-SUN®

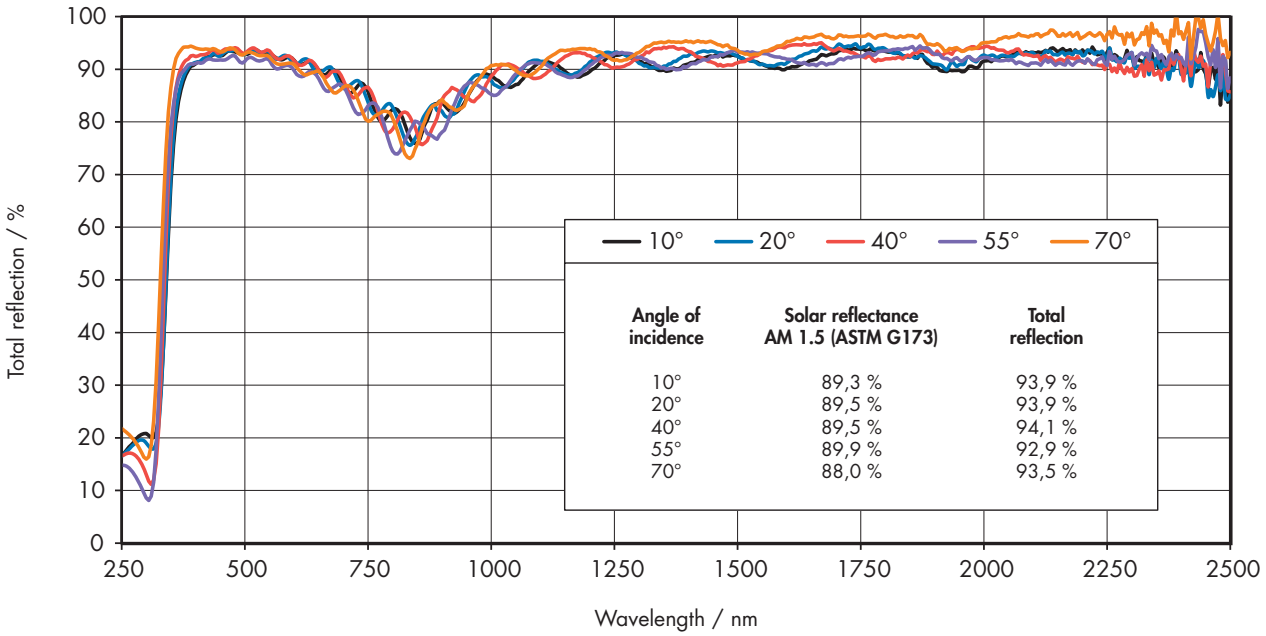
Based on our MIRO®-product range which produces approx. 95% total light reflection we have developed MIRO-SUN® especially for outdoor applications.
A continuous air-to-air PVD-process applies a super-reflective layer (MIRO®) to coil anodized material and afterwards the surface (MIRO-SUN®) is protected by a Nano-Composite in a coil-coating process.

Layer-System



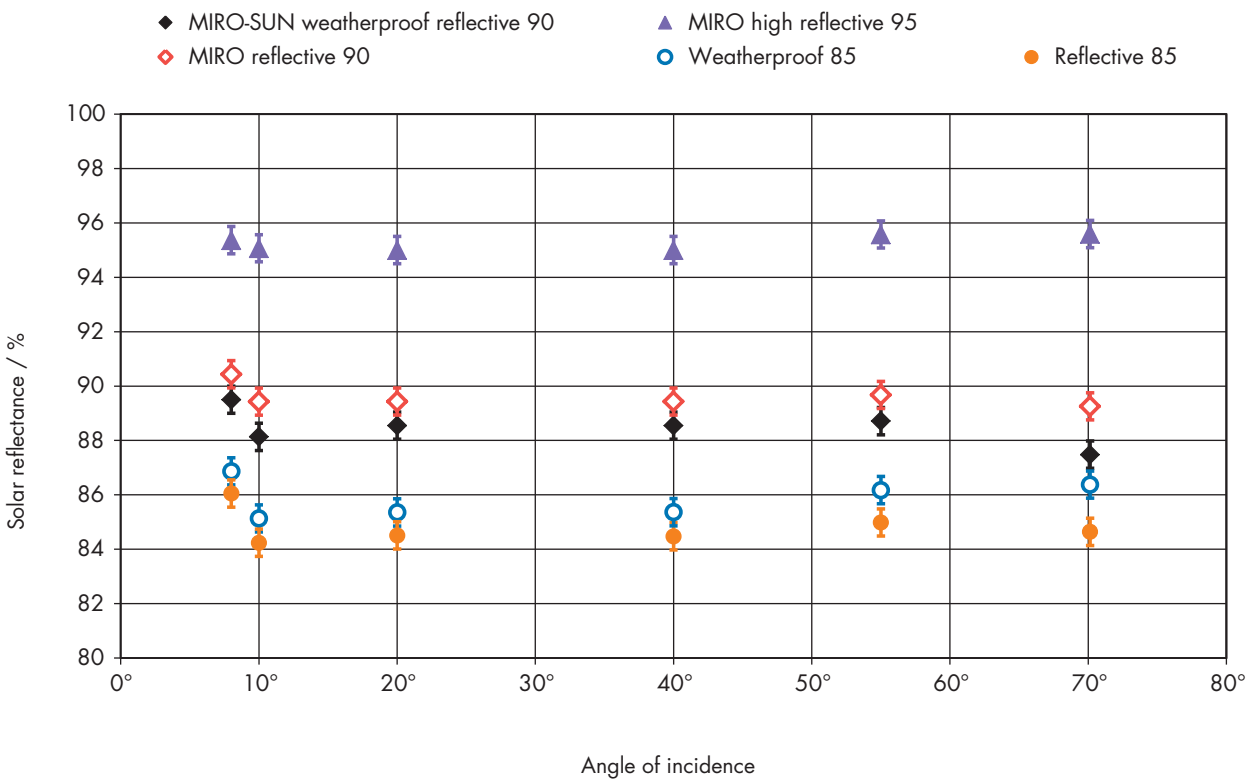
Solar Reflectance

MIRO-SUN® weatherproof reflective 90



Angle of incidence	Solar reflectance AM 1.5 (ASTM G173)	Total reflection
10°	89,3 %	93,9 %
20°	89,5 %	93,9 %
40°	89,5 %	94,1 %
55°	89,9 %	92,9 %
70°	88,0 %	93,5 %

Solar reflectance as function of angle of incidence



Reflection

Properties	Parameter	reflective 85	MIRO reflective 90	MIRO high reflective 95	Norm
Mechanical	Tensile Strength (Mpa):	160 - 200	160 - 200	160 - 200	EN 485-2
	Yield Strength (Mpa):	140 - 190	140 - 190	140 - 190	EN 485-2
	Elongation A 50 %:	≥ 2	≥ 2	≥ 2	EN 485-2
	Bending radius:	≥ 1.5 fold thickness	≥ 1.5 fold thickness	≥ 1.5 fold thickness	
Optical	Total solar reflectance %:	≥ 85	≥ 90	≥ 95	ASTM G 173 • •
	Solar weighted specular reflectance (R^s_{solar}) %:	≥ 72	≥ 85	≥ 92	ASTM G 173 • •
	Solar weighted diffuse reflectance %:	~12 %	~3 %	~2 - 3 %	ASTM G 173 • •
	Total light reflectance %:	≥ 86	≥ 95	≥ 98	DIN 5036-3
	Specular reflectance %:	80 / 76 along/across	91 / 90 along/across	93 / 92 along/across	ISO 7668 60°
	Front side:	anodised	PVD - improved	PVD - improved	
	Reverse side:	anodised	anodised	anodised	
Physical	Density, g/cm³:	2.7	2.7	2.7	
	Coefficient of heat expansion ($10^{-6}/K^{-1}$):	23.5	23.5	23.5	
	Heat resistance (1000h):	250 °C	250 °C	180 °C	
	Heat conductivity, W/(m∗K):	≥ 220	≥ 220	≥ 220	
Dimensions	Width in mm (inch):	max. 1250 (49.21)	max. 1250 (49.21)	max. 1250 (49.21)	
	Thickness in mm (inch):	0.3 - 0.8 (.012 - .031)	0.3 - 0.8 (.012 - .031)	0.2 - 0.5 (.008 - .020)	
Delivery	Coils or sheets with:	protective film	protective film	protective film	•
	Innerdiameter 400 oder 500 mm:	✓	✓	✓	
Corrosion and Weather Resistance					
Warranty					

• = We guarantee for a period of 6 months from the ex-works delivery date, when stored under normal conditions (temperature between 15°C and 25°C and relative humidity of not more than 60%), that the protective tape retains the same peel off conditions as when first delivered, and no tape residues will occur on peel-off. Protection from direct sunlight and other heat sources is required. The protective tape is not UV stable.

• • = SolarPaces Reflectance Guide V2.5
http://www.solarpaces.org/tasks/task-iii-solar-technology-and-advanced-applications/reflectance-measurement-guideline

Reflection

Properties	Parameter	weatherproof 85	MIRO-SUN weather-proof reflective 90	MIRO-SUN PV weather-proof reflective 90	Norm
Mechanical	Tensile Strength (Mpa):	130 - 160	130 - 160	130 - 160	EN 485-2
	Yield Strength (Mpa):	125 - 155	125 - 155	125 - 155	EN 485-2
	Elongation A 50 %:	≥ 2	≥ 2	≥ 2	EN 485-2
	Bending radius:	≥ 2 fold thickness	≥ 2 fold thickness	≥ 2 fold thickness	
Optical	Total solar reflectance %:	85	90	90	ASTM G 173 ••
	Solar weighted specular reflectance (R^{s}_{solar}) %:	≥ 80	≥ 84	≥ 84	ASTM G 173 ••
	Solar weighted diffuse reflectance %:	~5 - 6 %	~5 - 6 %	~5 - 6 %	ASTM G 173 ••
	Total light reflectance %:	≥ 85	≥ 92	≥ 87	DIN 5036-3
	Specular reflectance %:	75 - 85 / 70 - 80 along/across	87 / 87 along/across	86 / 86 along/across	ISO 7668 60°
	Front side:	anodised & protected	PVD & protected	PVD & protected	
	Reverse side:	anodised	anodised	anodised	
	Backside lacquered:	on request	on request	on request	
Physical	Density, g/cm³:	2.7	2.7	2.7	
	Coefficient of heat expansion ($10^{-6}/K^{-1}$):	23.5	23.5	23.5	
	Heat resistance (1000h):	200 °C	200 °C	200 °C	
	Heat conductivity, W/(m∗K):	≥ 220	≥ 220	≥ 220	
Dimensions	Width in mm (inch):	max. 1250 (49.21)	max. 1250 (49.21)	max. 1250 (49.21)	
	Thickness in mm (inch):	0.3 - 0.8 (.012 - .031)	0.3 - 0.8 (.012 - .031)	0.3 - 0.8 (.012 - .031)	
Delivery	Coils or sheets with:	protective film	protective film	protective film	•
	Innerdiameter 400 oder 500 mm:	✓	✓	✓	
Corrosion and Weather Resistance	Fit for Outdoor use:	✓	✓	✓	
	Salt spray test:	✓	✓	✓	DIN 50 021
	Δ T-Test:	✓	✓	✓	DIN 50 928, chapt. 9.5
	500 h QUV-B-Test:	✓	✓	✓	DIN EN ISO 4892-3
	24 h boiling test:	✓	✓	✓	GSB-guideline
Warranty	10 years:	✓	✓	✓	

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•• = SolarPaces Reflectance Guide V2.5
http://www.solarpaces.org/tasks/task-iii-solar-technology-and-advanced-applications/reflectance-measurement-guideline

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Alanod-Solar is Member of:

BSW Bundesverband Solarwirtschaft

ESTIF European Solar Thermal Industry Federation

ISES International Solar Energy Society