

from A to Z...MONO vs poly

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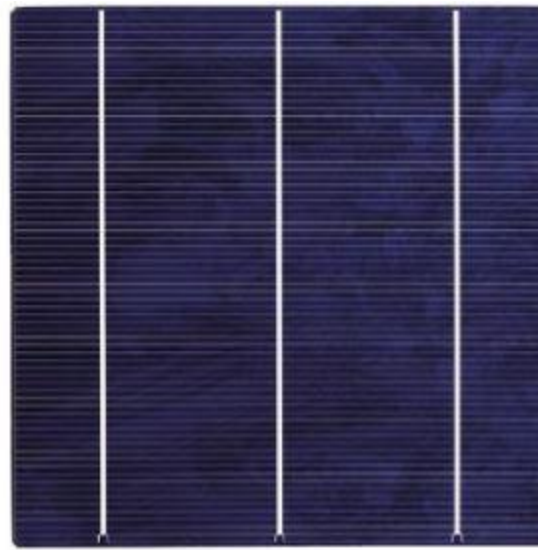
- A. Made in Germany
- B. Silicon purity
- C. Power (1660 x 990mm)
- D. Initial cost
- E. Transport cost
- F. Installation cost
- G. Space-Efficient
- H. Cells Peak
- I. Cells Efficiency
- J. Electricity/sqm
- K. Electricity Losses
- L. Heat Resistance
- M. AR Glass
- N. EVA film
- O. LHS connectors
- P. Reduction of the STC efficiency from 1000W/m² to 200W/m²
- Q. Weak Light Behavior
- R. LID (Light Induced Degradation)
- S. 25 years Linear Warranty
- T. Free replacement module
- U. Free shipping modules for replacement
- V. Full compensation on tasks that fall in guarantee issues
- W. TOP PV BRAND in Germany and UK
- X. PID free
- Y. Carbon Footprint
- Z. Aesthetic

from A to Z...MONO vs poly

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Monocrystalline
silicon solar cell



Polycrystalline
silicon solar cell



Made in
Germany

aleo



aleo



Marius-Eriksen-Straße 1 |
17291, Prenzlau, Germany

 **IHK Ostbrandenburg** Business Unit Economics
Head: Andreas Zintzsch

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An Order

Hellenic Republic

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Confirmation of Membership

This is to certify that

aleo solar GmbH
Marius-Eriksen-Straße 1
DE-17291 Prenzlau
Federal Republic of Germany

is registered with the Industrie- und Handelskammer Ostbrandenburg (Chamber of Commerce and Industry East Brandenburg) under registration number 771414 as manufacturer of solar cells and solar modules with its factory site based in Prenzlau, Germany.

Yours sincerely

H. Trusch

b. o. Heike Trusch
Senior consultant
International Business



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Τα πάνελ της aleo έρχονται με
πιστοποίηση κατασκευής
εργοστασίου από το Γερμανικό
Βιομηχανικό Επιμελητήριο.

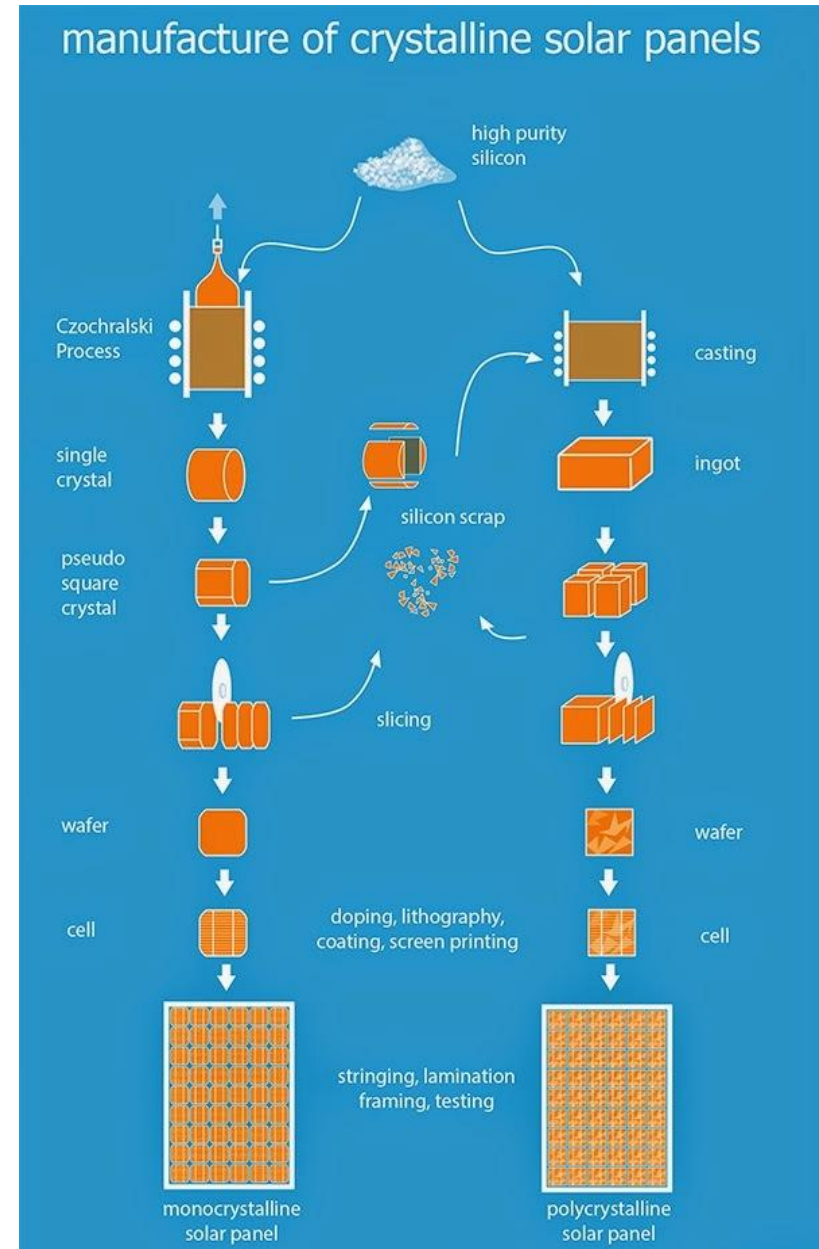
Σε ποιο εργοστάσιο κατασκευάστηκαν,
με ποιο σειριακό αριθμό και πότε.



B. Silicon Purity

► **Mono**
High grade silicon purity

► **Poly**
Lower silicon purity





Solar value chain

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Silicon

Ingot

Wafer

Cell

Module

BoS

D2D
Sales



Τεχνολογία Dss

Multi-wire Cut

High Eff.
Mono-cell
Celco

Premium
Κατηγορία
made in Germany

Συνεργασία με
BoS partners

Εξουσιοδοτημένοι
συνεργάτες

900MW
παραγωγή
στη Taiwan

850 MW
παραγωγή
στη Taiwan

350 MW
παραγωγή
στη Taiwan

510 MW παραγωγή
στο Prenzlau

Πάνω από
2000 πελάτες
παγκοσμίως

C. More power – same dimension

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P18



S79



S19

- ▶ Poly: 2.5 – 3.5% cheaper

E. Transportation cost

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- ▶ Mono

Up to **9kw/pallet**

- ▶ Poly

Up to 7,5kw/pallet



F-G. Installation cost / Space Efficient



- ▶ More installed total power in the same space
- ▶ Ability to increase the installed total power in the future
- ▶ Less Mounting Systems and rest materials,
- ▶ Less Installation effort,
- ▶ Less working hours,
- ▶ Reduced possibilities of a failure (statistic failure)
- ▶ Increased possibilities in replacing with the exact same power class module in the future



Monocrystalline cell

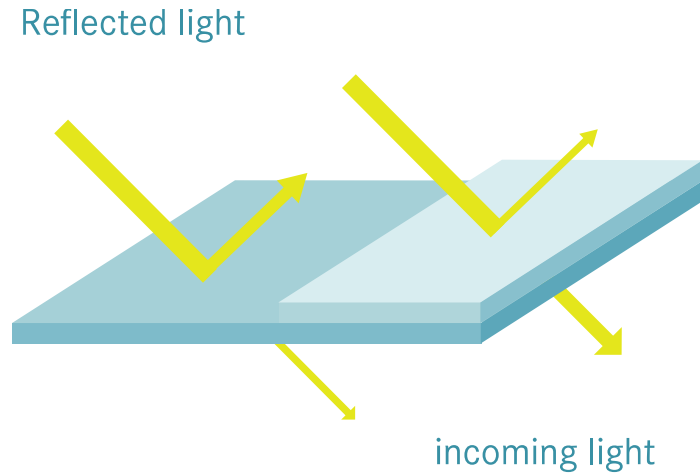
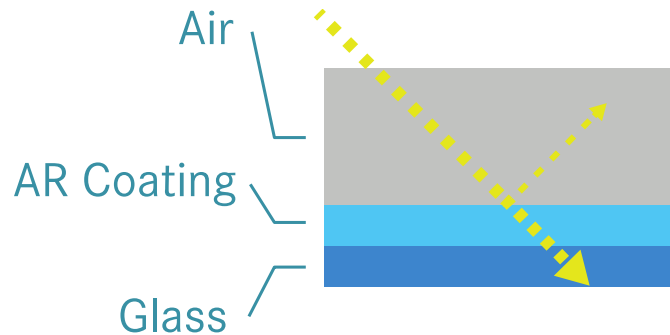


- ▶ Peak 5w
- ▶ Cell Efficiency 20,54%
- ▶ More Electricity/sqm
- ▶ Less Electricity Losses
- ▶ Temperature coefficient-0,40

Polycrystalline cell



- ▶ Peak 4,16
- ▶ Cell Efficiency 17,1 %
- ▶ Less Electricity/sqm
- ▶ More Electricity Losses
- ▶ Temperature coefficient-0,43

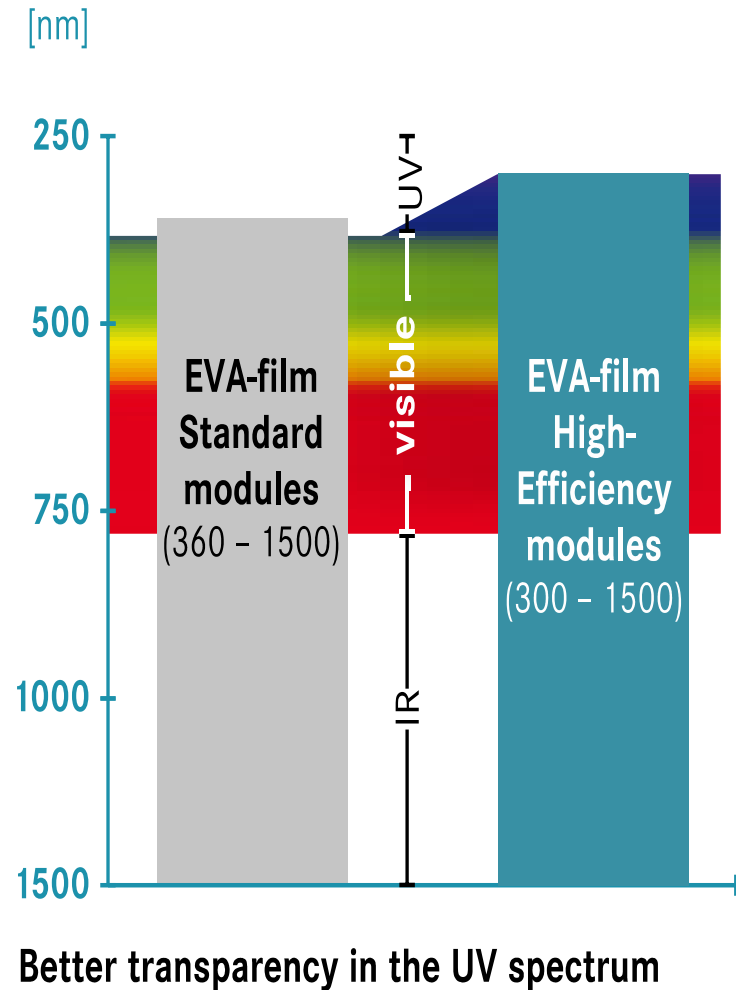


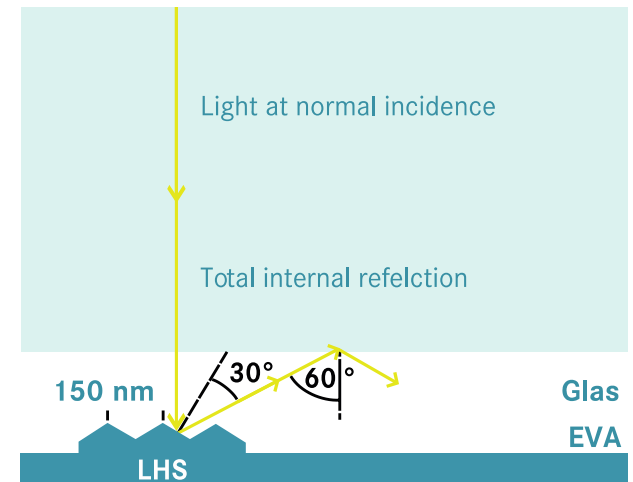
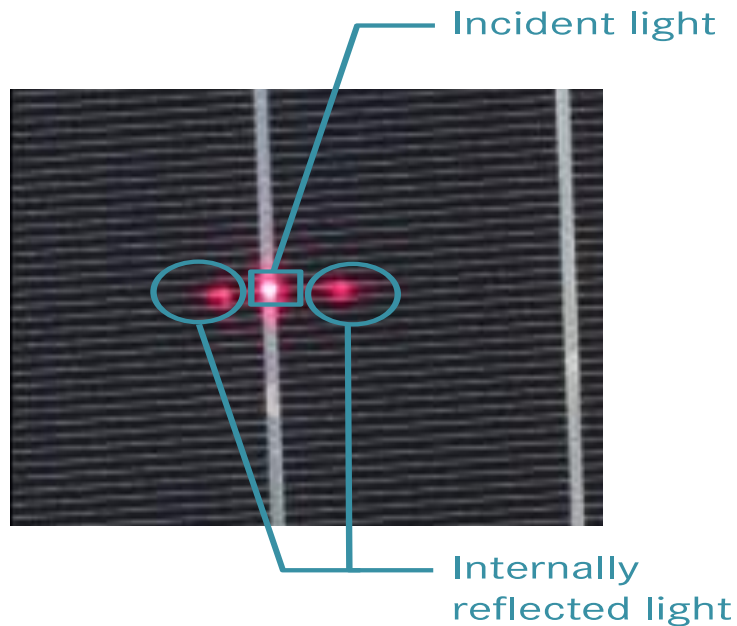
- ▶ Mono modules capture **more light**.

This is made possible by a thin film made of silicon dioxide, which covers the front glass. The thin silicon dioxide coat reduces the refractive index on the glass surface and consequently light reflection.

- ▶ The highly transparent EVA film extend the transmitted radiation spectrum and enhance its transmission.

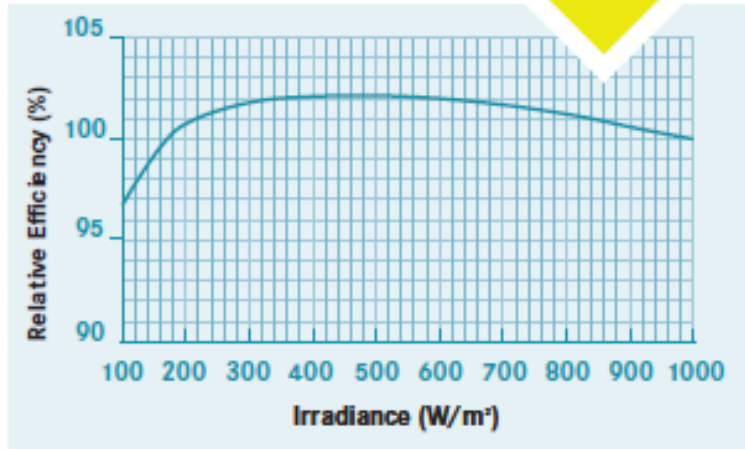
This process enables a **greater quantity of light** to get to the cells, passing through the film from the front side of the panel.



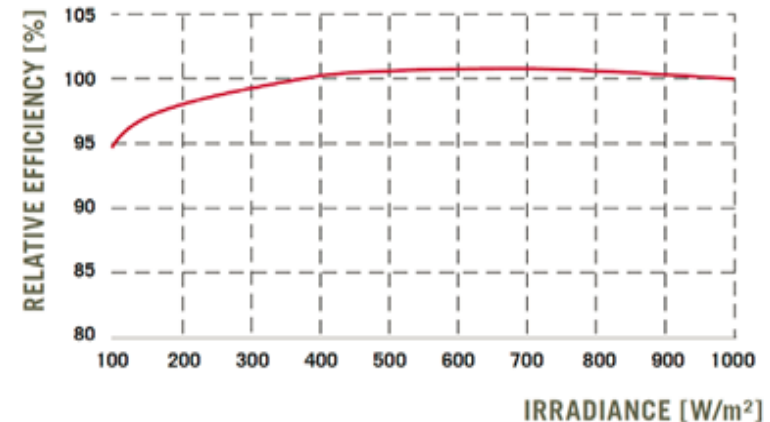


- ▶ Special cell interconnections, called **“Light Harvesting String”** (LHS) technology.
- ▶ It was first developed by the Massachusetts Institute of Technology (MIT) and directs more light to the cells.

P. Reduction of the STC efficiency



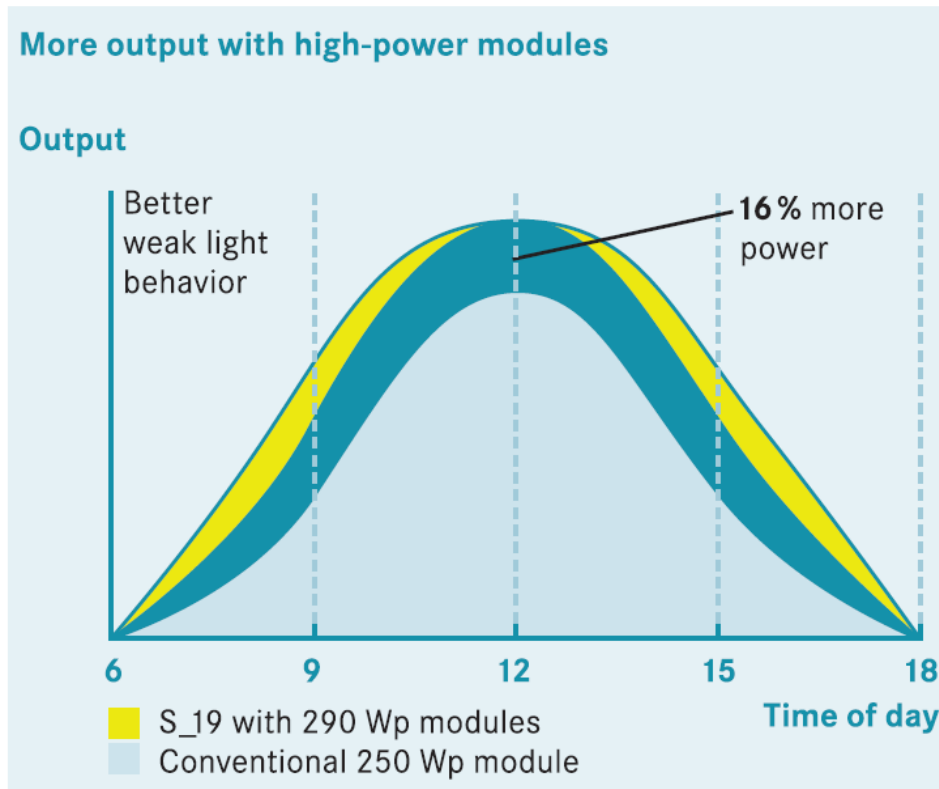
aleo mono module



conventional Poly

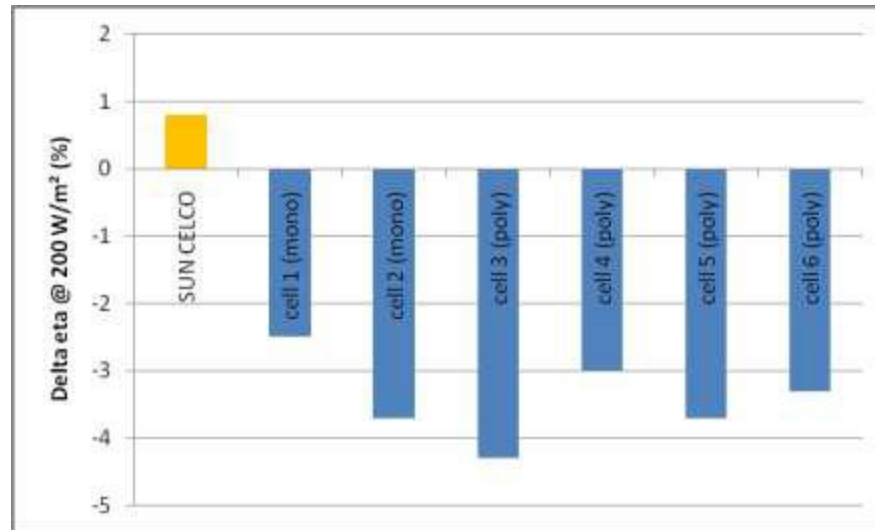
- ▶ **0% of rel. reduction** of the STC efficiency from 1000W/m² to 200W/m²
- ▶ While modules with conventional poly or mono crystalline cells usually suffer from efficiency losses between 2 and 5%, our modules even give an efficiency gain for 200 W/m² thereby ensuring high yield under real conditions.

Q. Weak light behavior



- **Higher yield** under non ideal illumination conditions (under angle, morning, afternoon, cloudy weather etc.)

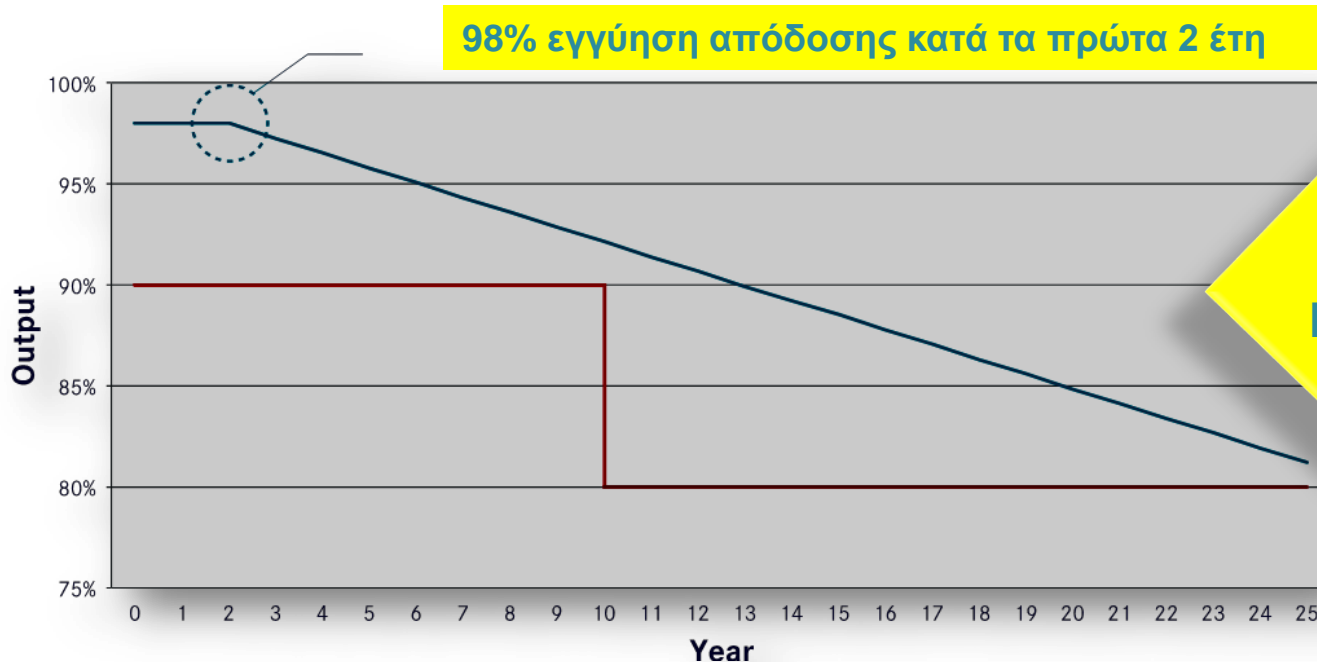
R. Light Induced Degradation (LID)



- ▶ During their first several weeks exposed to light, solar panels suffer from the so called light induced degradation process, which reduces the efficiency of the PV panels continually until they stabilize at a lower efficiency level. Usually, the reduction of conventional panels is as high as 1 to 4% of the initial power output after 50 kWh.
- ▶ aleo Monocrystalline series show a minor degradation effect only – **about 0.6%.**

S. Linear Power Warranty

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25 χρόνια
Γραμμική εγγύηση
ισχύος

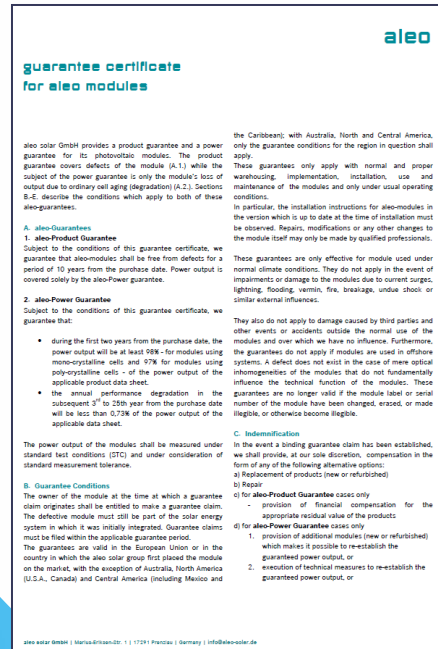
2 χρόνια
Νομική
εγγύηση

10 χρόνια
Εγγύηση
προϊόντος

- ▶ **Mono 98%**
- ▶ **Poly 97%**

Immediate and free replacement module

Full compensation on tasks that fall in guarantee issues



Direct and free shipping modules for replacement



EuPD Research and the Hoehner Research & Consulting Group

The company aleo solar ranks among the top PV brands in Germany and UK according to the results of a survey carried out by EuPD Research among installers on brand awareness, customers' choice and distribution.



Combination of thoroughly qualified cells, glass, and embedding materials.

PID-free upon application of a negative bias of 1000V (maximum system voltage) for 96h at 60°C and 85% relative humidity. Tests were performed at Fraunhofer ISE (11/2014).

PID affects mainly Poly modules.

No PID problem has been record in aleo Mono modules.

Y. Low Carbon Footprint

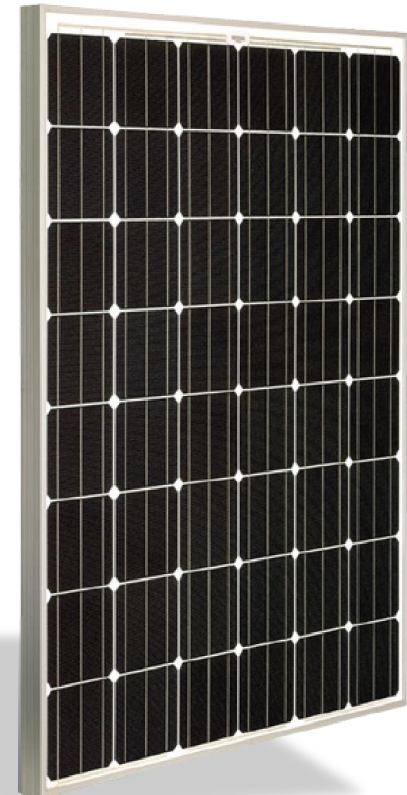
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In **10months** our modules are completely neutral and in about 20 years you'll save 5 Tons CO₂*

The term "Carbon Footprint" means a certain amount of gaseous emissions (CO₂) produced by human activities or cumulated over the life cycle of a product.



215Kg CO₂ eq



*depending from module type and location of the module

Z. Aesthetics

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Basic topics		Mono	Poly
a.	Made in Germany	✓	✓
b.	Silicon purity	✓	–
c.	Power (1660 x 990mm)	✓	–
d.	Initial cost	–	✓
e.	Transport cost	✓	–
f.	Installation cost	✓	–
g.	Space-Efficient	✓	–
h.	Cells Peak	✓	–
i.	Cell efficiency	✓	–
j.	Electricity/sqm	✓	–
k.	Electricity Loss	✓	–
l.	Heat Resistance	✓	–
m.	AR Glass	✓	–
n.	EVA film	✓	–
o.	LHS connectors	✓	–
p.	Reduction of the STC efficiency from 1000W/m ²	✓	–
q.	Weak light behaviour	✓	–
r.	LID (Light Induced Degradation)	✓	–
s.	25 years Linear Warranty	✓	✓
t.	Free replacement module	✓	✓
u.	Free shipping modules for replacement	✓	✓
v.	Full compensation on tasks that fall in	✓	✓
w.	TOP PV BRAND in Germany and UK	✓	✓
x.	PID free	✓	✓
y.	Carbon Footprint	✓	✓
z.	Aesthetic	✓	–