

THE AVANT-GARDE OF PHOTOVOLTAICS.

ENGLISH





Hartmut Fischer (CEO)

Dr. Franz Karg (CTO)

TECHNOLOGY OF THE FUTUTRE: PHOTOVOLTAICS.

The sun. It's estimated to be about 4.57 billion years old. Every second, the sun's rays strike the Earth with a power of two quadrillion kW* – that's the same as around two million modern 1 gigawatt power stations. Human beings have always known that the sun gives life – as a never-dwindling source of energy.

Today, after millennia of exploiting fossil resources, we now have the technology to turn this source into economically useful energy and therefore preserve the Earth's natural resources.

But for us, AVANCIS, the sun is much more than just a source of business. Our employees burn with passion, conviction and dedication for what they do. And in many cases that fire has been burning for decades.

We are passionate about solving the special challenges associated with modern photovoltaics: maintaining the technological edge, premium quality, and reliability.

AVANCIS has risen to all these challenges – with lasting success. With German engineering in development and production; with pioneering achievements that set us apart as the avant-garde in photovoltaics. And with products and services that take their example from the sun's most important quality: continuity.

* 2 quadrillion kW = 2,000,000,000,000,000 kW.

THE IMPACT OF BIG NAMES: THE SKY'S THE LIMIT.

Siemens, Shell, Saint-Gobain. Names that we have been working with since the very early days, and that are closely associated with our successes in the field of photovoltaics.

We have had various teams carrying out research into CIS technology ever since 1981.

In 1998 we became the first company anywhere in the world to start commercial volume production of CIS in Camarillo, California. And with an annual capacity of 3 megawatts, we were able to demonstrate even then the tremendous potential of this technology.

Today, AVANCIS possesses the longest experience in the development and production of CIS solar modules. And with our international specialists in Munich and Torgau, we guarantee both high-end research and state-of-the-art production.

Of course, we utilize the resources of our parent company and benefit from the many years' experience in the coating and heat treatment of glass, two of Saint-Gobain's core areas of expertise. With the advantage of inestimable synergies in a dynamically-growing photovoltaics market. And in order to address the needs of our clients at all times – with superlative reliability.

A SUCCESS STORY – SEEN FROM ABOVE.

2011

Start of production of fab 2 in Torgau: Fab 2 has an annual production capacity of 100 MWp.

2010

Saint-Gobain and Hyundai Heavy Industries (HHI) form Hyundai-AVANCIS, a production joint venture building Fab 3, a plant in South Korea with an annual production capacity of 100 MWp.

2010

AVANCIS is building a second plant for the production of highly efficient photovoltaic modules in Torgau. The production capacity of Fab 2 will be 100 MWp per year starting in 2012.

2009

Saint-Gobain is pushing ahead with its growth in the field of renewable energies and taking over Shell's share of the previous joint venture.



2008

Start of AVANCIS volume production in Torgau: Fab 1 has an annual production capacity of 20 MWp.

2006

Shell and Saint-Gobain form AVANCIS, a joint venture company for the development, production and marketing of the next generation of CIS.

2002

Shell Solar acquires Siemens Solar: technology development programs of Siemens Solar and Shell Solar are merged.

2001

Award from the U.S. Department of Energy (DOE) for innovations in the energy sector.

1999

Recognition from American magazine R&D for one of the 100 most technologically important new product developments.

1998

World first – the start of commercial volume production of CIS in Camarillo, California.

1990

ARCO Solar is acquired by Siemens Solar.

1981

ARCO Solar begins researching CIS.

CIS – THE MOST EFFICIENT THIN FILM TECHNOLOGY.

Studies by the National Renewable Energy Laboratory (NREL) show that CIS is the most efficient thin film technology. CIS has already attained efficiency levels of around 20 % in the lab, comparable to the efficiency of multi-crystalline silicon cells.

Out of all the available thin film technologies, we chose CIS – and not just because of its outstanding performance.

The multiple efficiency records achieved by our cells and modules as well as numerous innovation prizes show we are on the right track:

2003

Efficiency world record for a CIS module: 13.1 % (TÜV certified).

2005

Achievement of a record efficiency level of 13.5 % for a CIS module, outdoor measurement by TÜV.

2009

15.1 % world record aperture efficiency on a 300 x 300 mm² monolithic CIS module, confirmed by the National Renewable Energy Laboratory.

2011

15.8 % world record aperture efficiency on a 300 x 300 mm² monolithic CIS module, confirmed by TÜV Rheinland.

CIS – SOLAR CELLS OF THE NEXT GENERATION.

CIS stands for the elements copper (Cu), indium (In), and selenium (Se).

In coating processes borrowed from glass production, AVANCIS applies these materials together with gallium (Ga) and sulfur (S) in a layer construction of around 2 μm . Two thousandths of a millimeter is all it takes to absorb sunlight.

CIS IN “LOW LIGHT” CONDITIONS.

Because CIS modules use a relatively broad spectrum of light, and because we make extremely low-defect layers in our production process, we achieve a high energy yield even in poor weather conditions and with low light levels. So even when the light is low, the technology is still very cost-effective.





PHOTOVOLTAICS REIGNS SUPREME: THIN FILM – LESS IS OFTEN MORE.

Compared with traditional crystalline, silicon-based solar cells – also known as thick film solar cells because of the thickness of the photoactive semiconductor, 180 to 350 μm – thin layer solar cells are only about one hundredth as thick at around 2 μm .*

This means much lower consumption of resources. In addition, only about half as much energy is needed to manufacture CIS modules, cutting in half the energy payback time.

What's more, AVANCIS production technology makes it possible to manufacture the modules without intermediate steps. Everything is handled in the same place, from glass to finished module, so quality is optimally ensured and continuously improved.

There are several variations of thin film cells, with different substrates and vapor-deposited materials. As a result, there is a wide range of physical properties and efficiencies.

* 1 μm = one thousandth of a millimeter

SPECTRUM OF VALUE CREATION: PREMIUM PRODUCTION.

Our production facilities in Torgau, Saxony, are located in a traditional glass-producing area – not to mention “Solar Saxony”, Germany’s center of solar technology. You might say premium quality is a given.

So it’s only natural that our experience in CIS production in California and the vision of our parent company Saint-Gobain should inspire us to make a product of unequalled quality.

In addition to the outstanding features of CIS technology itself, AVANCIS modules are characterized by their superior long-term stability – with a power warranty of up to 25 years*.

CIS solar modules are also “simpler” to produce, because the production steps are less time-consuming, material-intensive and complex than for the production of thick film modules. From the delivery of the substrate to the attachment of the wattage label to the module, AVANCIS requires just 30 steps.

* See AVANCIS Limited Warranty for PV-Modules.

PowerMax[®] PREMIUM CLASS PHOTOVOLTAICS.

PowerMax[®] **STRONG**
The solid frame line.

PowerMax[®] **SMART**
The intelligent rail line.



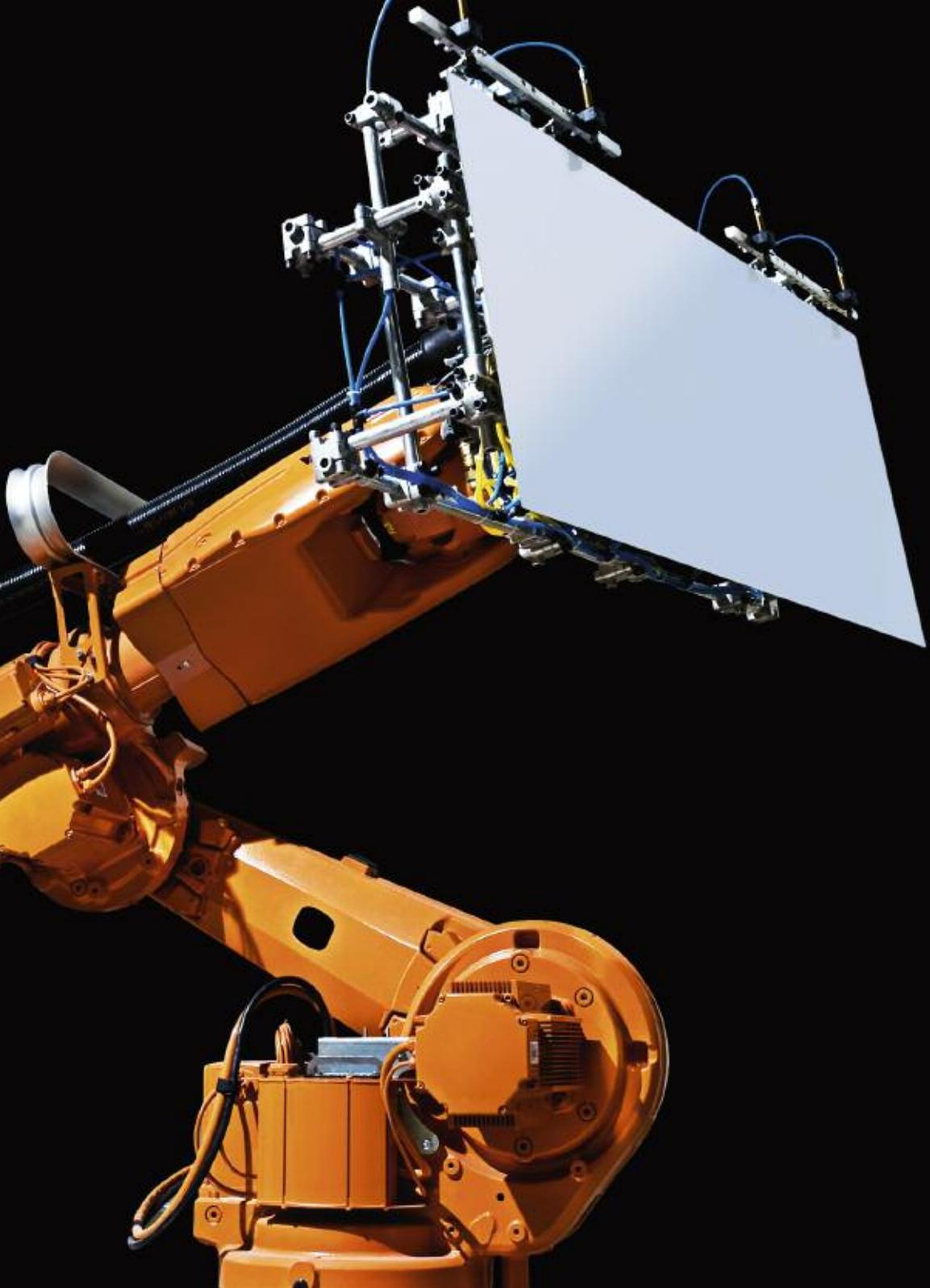
MATERIALS, TECHNICAL DESIGN,
ESTHETICS – FROM THE BEST.

AVANCIS doesn't just pay lip service to quality – our high quality standards apply at every level of production. For example, we use top-quality glass from Saint-Gobain, top-of-the-range adhesives and films from the automotive industry – to name just a few of our premium materials.

The successful AVANCIS brand is well known on the market under the name PowerMax®. Beneath this umbrella brand all of our product lines are brought together and have one very important thing in common: An extremely high energy yield (kWh per kWp) possible due to spectral sensitivity, excellent low light performance and a low temperature coefficient.

All PowerMax® modules not only meet the highest technological and aesthetic requirements, they are also among the most economical on the market. The basis for this success is our fully integrated industrial production process.





ELEMENT OF SUCCESS: ZERO-COMPROMISE QUALITY

No question about it: AVANCIS knows that quality control comes before success. We have implemented 60 quality checks in our module production system – and 88 measuring points for continuously monitoring the process data.

But that isn't enough for us. To achieve continuous improvement and make optimum use of the recorded values, we use the data-based statistical quality management method Six Sigma. This accelerates technological development and guarantees that our customers receive technically perfected products. Even before production started, we were certified according to the industrial quality management standard ISO 9001 in all locations.



Y ASSURANCE.

PowerMax® – EXTREMELY ECONOMICAL AND RELIABLE.

Naturally, PowerMax® is a product of the quality assurance so typical to AVANCIS. PowerMax® is a CE-compliant module – certified to IEC 61646 Ed. 2 and IEC 61730 Class A as well as UL 1703 and MCS – with long-term warranties.







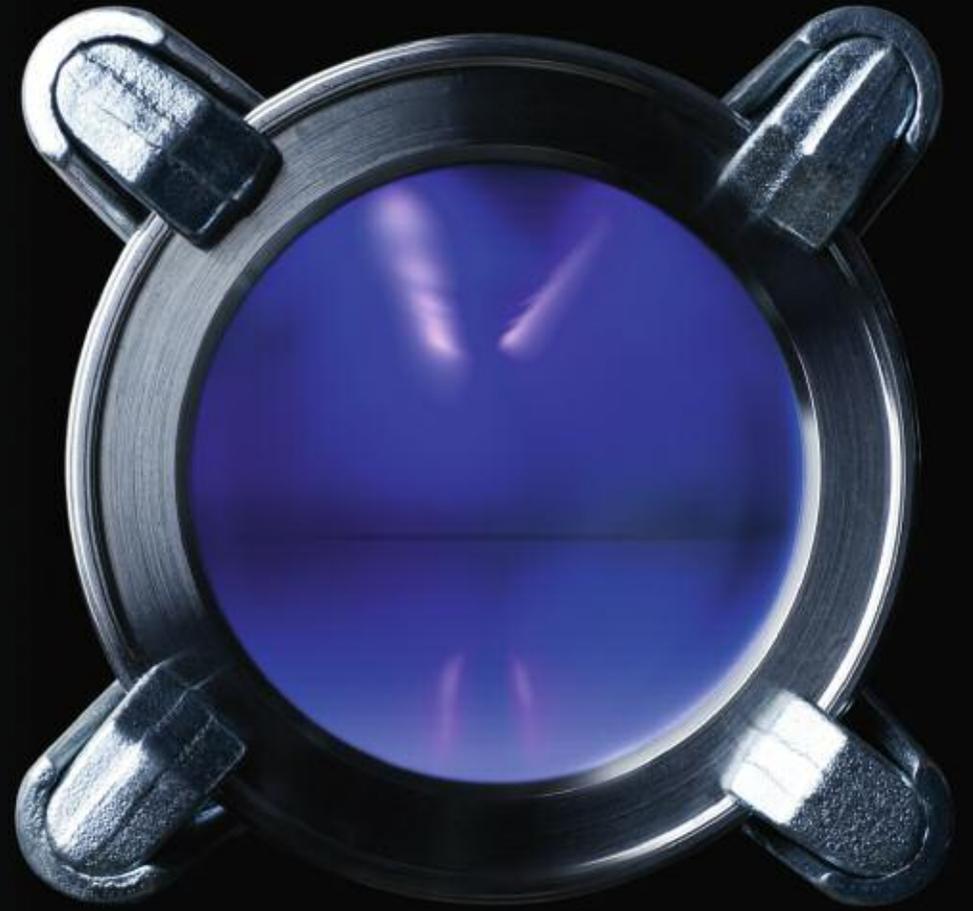
BURNING ISSUE OF RESPONSIBILITY: UTILIZING NATURE – PROTECTING NATURE.

The substantial global growth of the photovoltaic market makes sustainability a very important issue. Responsible production that minimizes resource consumption and environmentally friendly disposal are touchstones of corporate ethics.

Part of our long-term environmental strategy is the creation of a closed loop recycling management system. AVANCIS is a founding member of the European Association for the Recovery of Photovoltaic Modules AISBL, known as PV CYCLE, an initiative of European photovoltaics manufacturers for the voluntary return and reconditioning of used solar modules. Even before production got underway, AVANCIS committed itself to environmental monitoring. So the international environmental management standard ISO 14001 with its globally recognized requirements is a fundamental part of our company.

Not to mention the environmental benefits of CIS production compared with the production of thick film technology: A 50 % shorter energy payback time and a much smaller number of production steps. And because the production process takes place on a single production line, from the delivery of the substrate glass to the finished module, we avoid environmentally costly transportation.

As a result, our environmental indicators are considerably lower than all legal limits.



View of the plasma in one of our coating systems.

A professional photograph of four men in dark suits and ties, standing behind a dark table. They are arranged from left to right. The background is dark, and the lighting is focused on the men. The table in front of them has a thin blue light strip along its edge.

DR. DAVID PENDER,
SENIOR MANAGER
PRODUCTION

"I know the people who work on our machines. It's no surprise to me that we achieve high productivity and everything functions so smoothly."

DR. JÖRG BAUMBACH,
SENIOR PROJECT LEADER
PLANT DESIGN & EXECUTION

"I think the unique story of AVANCIS can be summed up in a quotation from Henry Ford: „Coming together is a beginning. Keeping together is progress. Working together is success.“"

WOLF-DIETER MEIER,
SENIOR PLANT MANAGER
TORGAU

"Years of experience and painstaking attention to detail in production – that means durable products and long-term profits for the customer."



DR. PAUL MOGENSEN,
SENIOR MANAGER ENGINEERING &
EQUIPMENT DEVELOPMENT

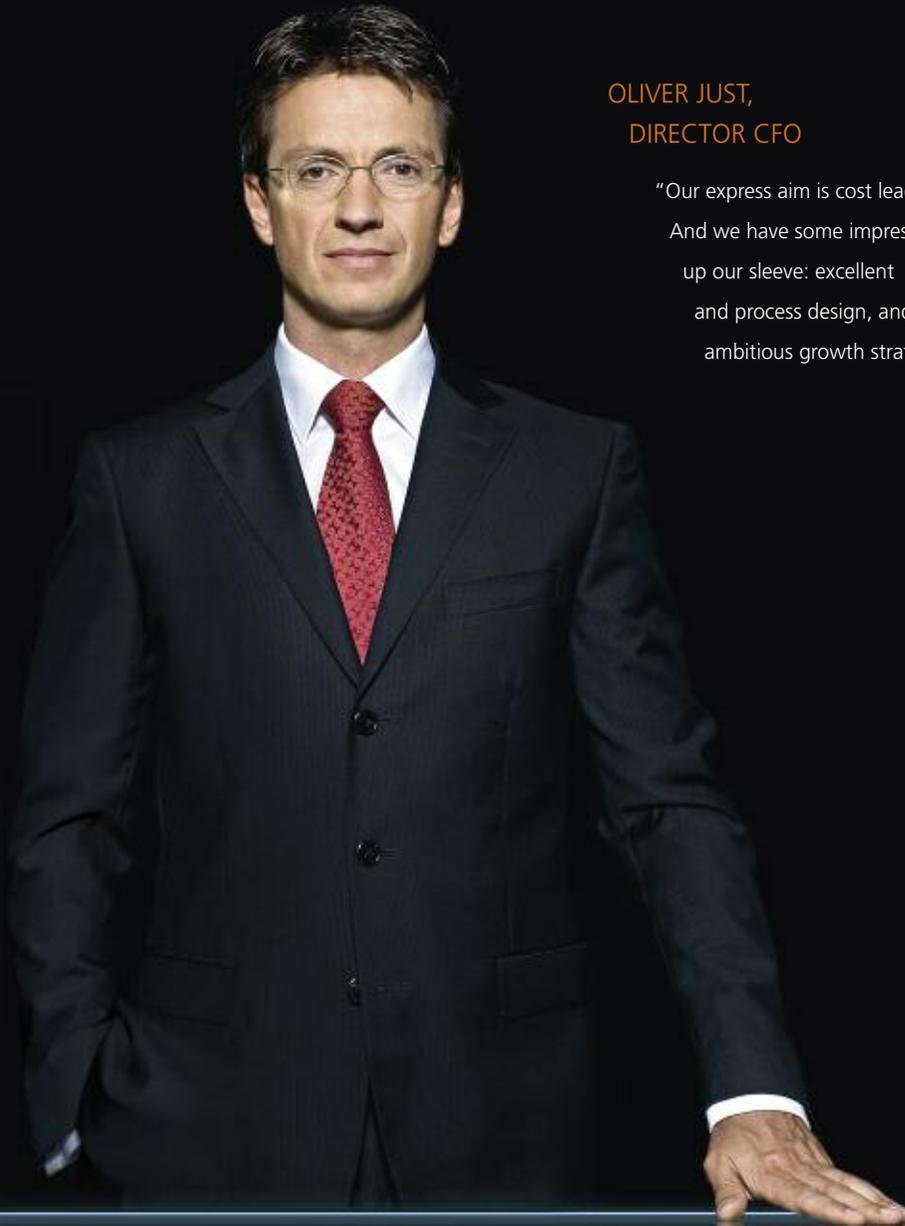
“For this project I dragged my family
halfway across Europe. Would I have
done that if I didn’t believe in it?”

DR. TOM CLARIUS,
DIRECTOR Q-HSE

“We achieve success with
the AVANCIS Excellence
Process, because it stands
for quality, sustainability
and cost-effectiveness.”

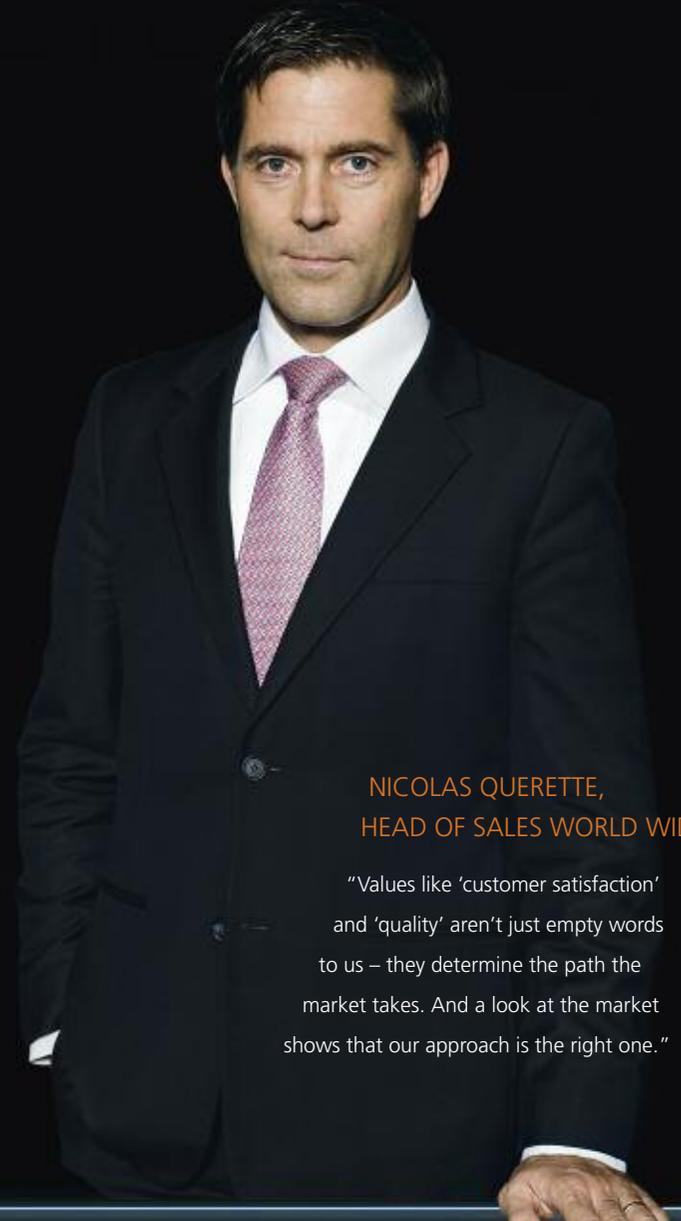
HEIKE DEGEN,
DIRECTOR HUMAN
RESOURCES

“A shared vision, commitment
on the part of every individual,
and the quality of our teamwork –
those are the ingredients of
excellence.”



OLIVER JUST,
DIRECTOR CFO

"Our express aim is cost leadership. And we have some impressive cards up our sleeve: excellent product and process design, and an ambitious growth strategy."



NICOLAS QUERETTE,
HEAD OF SALES WORLD WIDE

"Values like 'customer satisfaction' and 'quality' aren't just empty words to us – they determine the path the market takes. And a look at the market shows that our approach is the right one."

A photograph of three men in dark suits standing against a dark background. The man on the left has his arms crossed. The man in the middle has his hands on a surface in front of him. The man on the right also has his hands on the surface. The lighting is dramatic, highlighting their faces and suits.

DR. JÖRG PALM,
SENIOR MANAGER
PROCESS DEVELOPMENT

“When it comes to new processes and materials, we have a clear set of requirements: more performance, more efficiency, more reliability.”

JAAP VAN DER BURGT,
SENIOR MANAGER
BUSINESS DEVELOPMENT

“The interface between the customer and the company – that’s where innovation happens. What gives us the edge is the active dialog we maintain with the customer.”

CARSTEN PETERS,
SENIOR MANAGER SUPPLY
CHAIN MANAGEMENT

“The key to our success? Recognizing potential early on and consistently exploiting it. Be it in the area of costs, material flow or internal processes.”

ENERGIES OF THE FUTURE: PIONEER SPIRIT AND RELIABILITY.

We have been researching CIS technology ever since 1981, with a proven successful track record. Since then we have filed numerous patent applications and received countless awards for innovation. Furthermore, our pilot line in Munich is continuously enhancing the performance and environment-friendliness of our products.

But all these efforts are to achieve one single goal: to provide human beings with a technically mature, premium-quality and extremely cost-effective product. So of course, in addition to fundamental research we also focus on system aspects such as wiring and assembly.

The future of photovoltaics lies in the combination of sound technical knowledge and corporate responsibility. Our specialists, recruited from all over the globe, aren't just experts in their field, they are also the people who put into practice a key AVANCIS principle: doing things in a way that meets the expectations of even the most discerning customers, both today and tomorrow.

THE POWER OF PERSUASION: STELLAR TRACK RECORD.

Our many years of experience in research, development and production can be documented in various ways. Our CIS solar modules are designed in such a way that they can be universally used – from small rooftop systems for private homes to large PV plants on commercial properties and power plants.

ROOFTOP SOLAR SYSTEMS FOR PRIVATE HOMES

Solar systems with PowerMax® modules provide the best yields on the roofs of private homes and also have a very attractive appearance.



Year of installation: 2009

Modules: 60 PowerMax® STRONG 100 Wp

System rated power: 6.0 kWp.

CIS SYSTEMS FOR AESTHETICALLY ATTRACTIVE AND BUILDING INTEGRATED SOLUTIONS

Our CIS solar modules are convincing through their black pinstripe look and uniform black surface – it's a first class design: which makes them the first choice when it comes to combining modern architecture and renewable energy.



Year of installation: 2011

Modules: 906 PowerMax® STRONG 120 Wp

System rated power: 108.7 kWp.

Photovoltaics converts the inexhaustible energy of the sun into electrical current. An intelligent process that has long been providing notable profits. And from which you should profit, through the installation of your own photovoltaic system. Use your roof as an additional source of income.

PV SYSTEMS FOR COMMERCIAL PROPERTIES

Warehouses, industrial sites or office buildings: large roof areas enable companies to realise attractive revenues over and above their daily business.



Year of installation: 2010

Modules: 1988 PowerMax® STRONG 100 Wp

System rated power: 198.8 kWp.

SOLAR POWER PLANTS/SOLAR PARKS

Generating solar energy on large areas also means utilising these areas as efficiently as possible. Solar power plants with CIS photovoltaic modules offer high returns for optimised costs.



Year of installation: 2011

Modules: 2000 PowerMax® STRONG 120 Wp

System rated power: 240.0 kWp.

THE CONSISTENT NEXT STEP: DIALOG.

You can find us at the following locations:

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