sovello

Powering tomorrow



Pure Power
Solar Modules

Solar Technology from Sovello

Our highly automated production system integrates every step of the production process from wafer to cell to the finished module. The Sovello production is seamlessly connected and well balanced. This means our customers will profit from high-value and long-lasting modules, "Made in Germany".





Sustainability is at the heart of how we do business. Our STRING RIBBON™ wafers are produced in an economically and ecologically balanced production process. That's how we preserve our environment over the long term.

This is also what makes our solar modules perform so well. They are based on highly efficient technology and have the shortest energy payback time in the world compared to similar products.

For us, innovation and technological progress are the basis for a cleaner, sustainable source of energy for the future. That is why we invest in important activities in research and development. We continuously improve the performance of our products. At the same time, we ensure consistently high quality standards for our products. Sovello is already among the best in the field today.

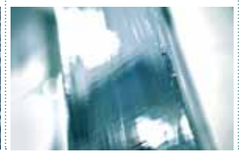
Sovello is one of the largest module manufacturers in the world. We have already produced more than one million modules at our locations. Our polycrystalline silicon PV modules have the smallest carbon footprint of all compared to other manufacturers' modules. Sovello's highly automated production system involves the entire value-added chain from drawing the wafers directly out of the silicon cast to manufacturing high efficiency cells right up to the complete operational module. With the STRING RIBBON™ wafers, we can optimally coordinate all of the stages of production and reduce the number of resourceintensive steps. The advantages of this are consistently high quality, optimum use of resources and high performance.

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Polycrystalline Silicon
- High-purity materials
- Low energy consumption in the fluidized bed process



Wafers
- Crystallization
- STRING RIBBON™ wafers with silicon-saving technology
- Low power consumption



Solar Cells
- State-of-the-art cell production
- Average cell efficiency above 15%



Solar Modules
- Power output of up to 240 Wp
- Very narrow and exclusively positive output tolerances



Systems
- Easy to install
- Durable
- Highly flexible configuration



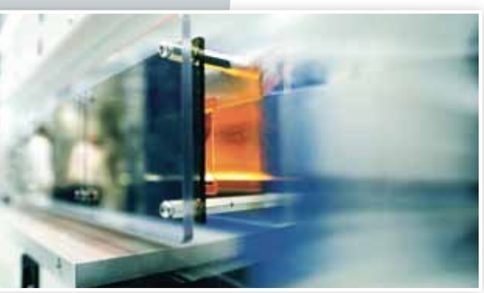
PV CYCLE

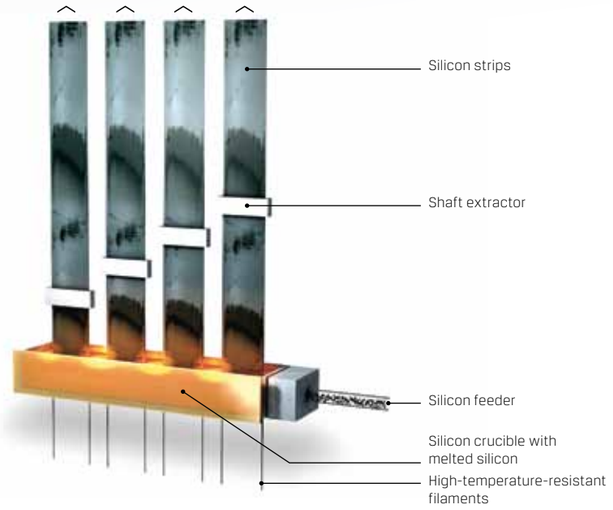
Sovello is an official member of PV CYCLE, the voluntary take-back and recycle program. We therefore take responsibility for the complete life cycle of our products. Even though the amount of old modules is still very small due to the longevity of the modules and the reliability of the technology, we plan the handling of future quantity and material flows at an early stage.

More information is available at www.pvcycle.org



STRING RIBBON™ wafers





Our patented STRING RIBBON™ wafers get results with a high level of efficiency. They are made with 50% less silicon than traditional silicon wafers. This wafer technology gives us an important competitive edge.

Our modules based on STRING RIBBON™ wafers are produced with the highest level of efficiency. During the highly innovative production of our wafers, only 50% of the silicon needed for traditional wafers is used. This balanced technology is a clear market advantage for us.

The fundamental production principle of the STRING RIBBON™ wafers is as clear as the idea of generating energy from the sun. It is based on the phenomenon of surface tension. Two thin wires are pulled to the top through by a flat crucible containing melted silicon. During this process, a silicon strip about 0.2 mm thick and 80 mm wide forms between the filaments. The silicon strip becomes crystalline when it cools. As the strip is pulled up slowly, it continuously grows longer. Segments of the silicon strip are cut off in 150 mm long wafers and then processed into solar cells and modules.

Several hundred furnaces in our production lines make silicon strips from valuable solar silicon. Each of our new quad furnaces produces four strips in parallel. Less of the precious raw material is wasted in comparison to conventional technology. Simply put, we produce 100% of the energy while expending 50% less silicon and energy. Competitors usually use quartz furnaces to produce the ingots for solar wafers. This leads to a so-called light-induced degradation tendency after assembly of the solar modules, which results in a reduction in performance of up to 3% during the first weeks after assembly. Sovello therefore uses graphite furnaces in production, which significantly reduces this effect.

The resulting products originate from a production process which requires less energy, and thus have a considerably shorter energy payback period. The principle is this: simplicity and economic efficiency with high ecological benefits.

The Sovello Pure Power Series

In order to offer our customers the right solar module for systems of every size, Sovello distinguishes between High Voltage Modules (T series) and Low Voltage Modules (L series). Both series incorporate specific product features that make them particularly suitable for use in large-scale facilities or in small installations.



Sovello Pure Power T Series
High Voltage Configuration

- Optimized for power inverters in the small-system segment
- Optimal use of available roof area
- Outstanding low light performance
- Greater energy yield thanks to solar glass with anti-reflection coating
- Positive output tolerance

= maximum energy yield and optimum layout for use in **small installations.**

Sovello Pure Power L Series (NEW)
Low Voltage Configuration

- Improved shade performance due to sophisticated internal design of module
- Greater efficiency in use of space when installed in open areas and on flat roofs
- Lower BOS costs due to greater number of modules per string
- Outstanding low light performance
- Greater energy yield thanks to solar glass with anti-reflection coating
- Positive output tolerance

= maximum energy yield and optimum layout for use in **large-scale installations.**



Our Sovello Pure Power Series are manufactured in Germany in one of the most advanced and fully integrated solar factories in the world in accordance with the highest quality standards. The photovoltaic modules are extremely efficient, easy to handle and impress with a superb specific energy production as well as minimal CO_2-emissions. The fact that we can achieve 100% energy with 50% silicon and energy usage in our production system is proven by our modules all over the world with their short energy amortization times (1.25 years based on our own value creation). The Sovello products cannot thus be beaten for ecological efficiency.

Our products are awarded for their high quality and archive high energy output based on the highly automated manufacturing process and the use of high quality components such as special solar glass. Sovello modules are not only impressive because of their high performance, but also due to their longevity and high degree of flexibility regarding system configuration and installation. When they are fitted, for instance, the modules can be fixed to the short side of the frame thanks to the high level of module stability. We offer our customers greater security thanks to a 25-year linear performance guarantee from 99 % to 85 % with performance reduction by no more than 0.6 % annually; in addition, there is a 10-year guarantee on the workmanship.*

* Detailed guarantee conditions are available from Sovello or at our website www.sovello.com.

Sovello Pure Power T Series in small installations



Source: Sovello GmbH

With the High Voltage configuration, the Sovello Pure Power T Series is especially well matched to the operating parameters of commercially available power inverters in the small installation segment. This simplifies the layout of small solar power installations while optimizing the output of the entire system.

› Optimized for power inverters in the small-system segment

The short-circuit current I_{sc} of the High Voltage Sovello Pure Power T Series solar module is 8.15 A. This is inside the range for the maximum input current of power inverters available on the market for small installations and gives you greater flexibility when selecting a suitable power inverter.

Although Low Voltage solar modules have a host of advantages in the large-scale plant segment, they cannot be used for some small installations with a limited number of solar modules per string. Their low output voltage may not meet the PV voltage range of the required power inverters. High Voltage Sovello Pure Power solar modules of the T Series allow you to reach the power inverter's required input voltage by using only a small number of modules (See the sample calculation on the right).

By doing so, you also optimize the output of the entire system. After all, the higher the voltage is within the specified range of the power inverter, the more efficiently the inverter will operate, thus improving the performance of the solar power system.

› Optimal usage of available roof area

When the roof area is limited or characterized by different shapes and angles, it is frequently necessary to install small module arrays with short module strings. Due to the High Voltage configuration and the smaller dimensions of the Sovello Pure Power SV-T Series modules, you have greater flexibility with regard to the arrangement and the electrical connection of the solar modules.

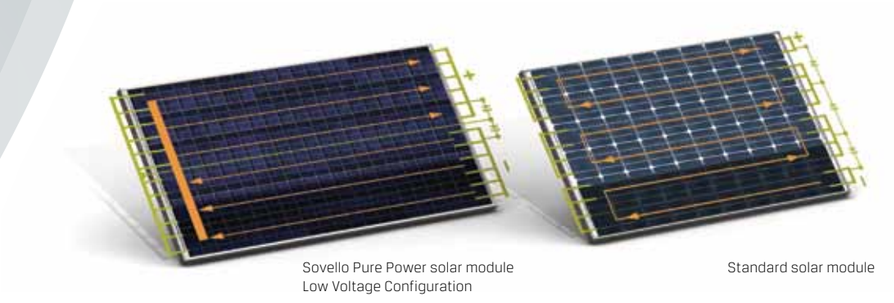
Example of power-inverter configuration:

	Power inverter Sunny Boy 2000HF-30	Sovello Pure Power SV-T-195 Low Voltage (old)	Sovello Pure Power SV-T-195 High Voltage
Max. DC output	2,100 Watt	11 modules each with 195 Wp = 2,145 Wp	11 modules each with 195 Wp = 2,145 Wp
Off-load voltage	–	U_{oc} -15°C = 24.6 V	U_{oc} -15°C = 37.2 V
MPP voltage	–	U_{mpp} +70°C = 14.3 V	U_{mpp} +70°C = 22.0 V
Rate of utlization		2,145/2,100 = 102%	2,145 / 2,100 = 102%
Max. DC system voltage	700 V	11 modules each with 24.6 V = 270.6 V ✓	11 modules each with 37.2 V = 409.2 V ✓
PV-voltage range, MPPT	175 V – 560 V	11 modules each with 14.3 V = 157.3 V !	11 modules each with 22.0 V = 242.0 V ✓
Max. input current	12.0 A	I_{mpp} = 11.1 A ✓	I_{mpp} = 7.2 A ✓

Representation of technical design data of a common power inverter for small installations in combination with Sovello Pure Power SV-T-195 Low Voltage and SV-T-195 High Voltage solar modules.

Sovello Pure Power L Series (NEW) in large-scale installations

› Improved shade performance

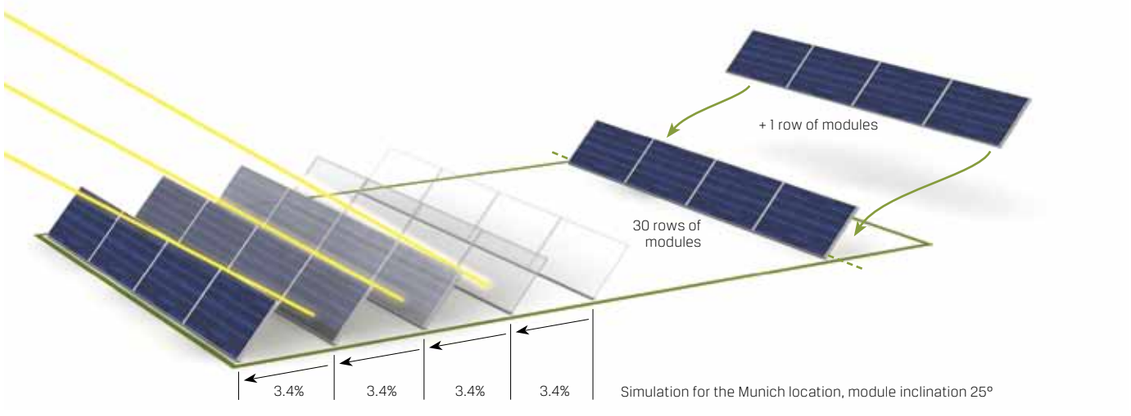


String interconnection scheme of the Sovello Pure Power solar modules as compared to crystalline standard solar modules

The intelligent connection of the cell strings in our Sovello SV-L solar modules significantly reduces the undesirable effect of shadows on solar systems with solar modules in a landscape arrangement. In the design of the Sovello module three strings are connected in parallel and two triple strings in a row. With diffused shadowing, parallel to the energy path Sovello Pure Power SV-L solar modules perform up to 10% better than other solar modules.
As the energy reduction can affect all other solar modules interconnected in rows, this clever arrangement can significantly improve performance and output.


Source: Volkswagen AG

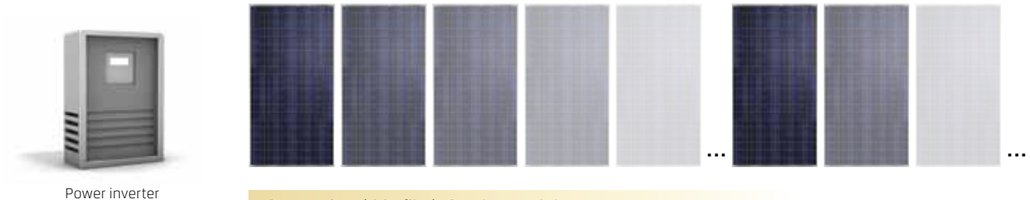
› Greater efficiency in use of space



In practice there is a decisive advantage here: if the solar modules are mounted with supports, for example on flat roofs or in open country, then optimization of planning according to the shadowing approach is worthwhile.
In order to achieve the best possible performance output even at low sunlight levels large gaps are often necessary between the individual rows of modules. As Sovello solar modules are significantly less sensitive to partial shadowing, these gaps can be decreased and more rows of modules installed in the same space.
Increase your space efficiency by up to 3.4% with Sovello Pure Power solar modules. This means more solar energy for you – and more revenue!

› Lower BOS costs

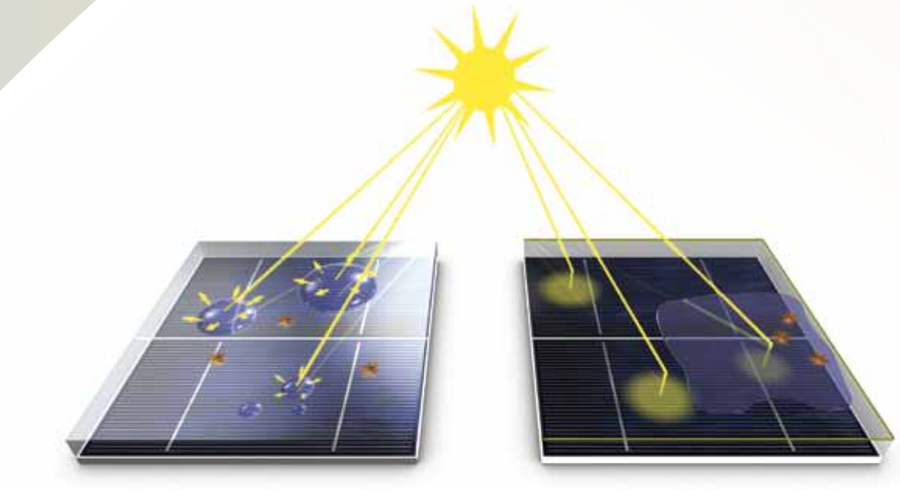
Example: 900 V string



Competitor (thin film): 9 solar modules
Competitor (crystalline): 24 solar modules
Sovello Pure Power L (Low Voltage): 34 solar modules

By using Sovello's Low Voltage solar modules, you can install more modules per string in large-scale installations. This means lower installation costs for your solar power system as less time is required for installation, there is less cabling and fewer connectors are needed.

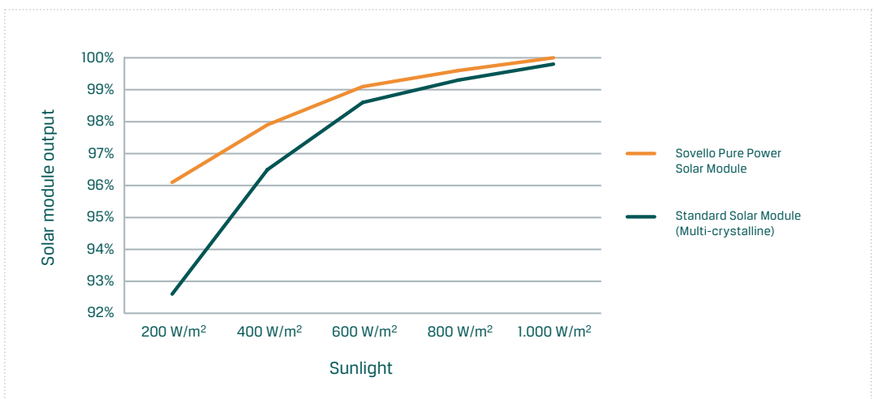
Only a first-class module guarantees first-class output. This is why we focus so strongly on R&D at Sovello – to continually increase the quality, safety and performance of our solar modules in photovoltaic systems. Our customers are already profiting from maximum output and their investments in energy being secure and future-proof.



〉Outstanding low light performance

Sovello's Pure Power solar modules stand out from the crowd because of their excellent behaviour in weak light. It is important to get the most out of the sun's rays and turn these into electrical energy, particularly on overcast days. Compared to alternative multi-crystalline solar modules, Sovello solar modules achieve above-average results in low light. Even in the case of solar radiation of a mere 200 W/m², the loss of effectiveness is less than 4%.*
Sovello solar modules therefore provide efficient electricity production and guarantee maximum yield even when radiation is low.

* The measurements were taken by the Fraunhofer Institute for Solar Energy Systems. Module temperature: 25°C



Greater output under weak light conditions compared to our competitors

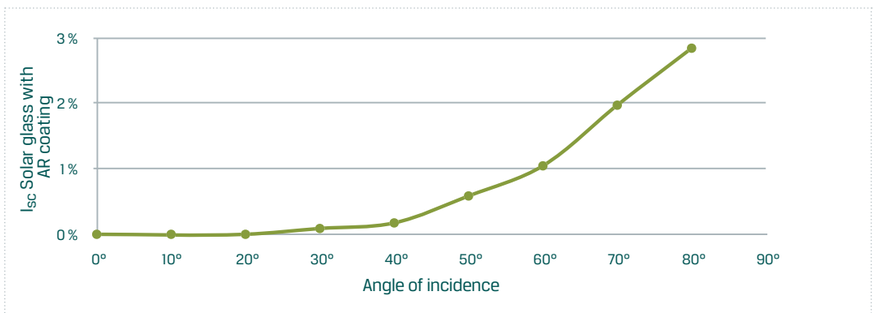
〉Solar glass with anti-reflection (AR) coating

We use a highly transparent solar glass with a special "nano-power anti-reflection coating" to manufacture Sovello solar modules.

In addition to having superb optical properties, this AR coating produces a better self-cleaning effect. When it rains, the film of water spreads over the glass surface evenly, at the same time efficiently washing off dust particles and other dirt.

The AR coating also improves the performance of the module when light falls on it at an angle. In tests, it was shown that the amount of electricity generated by light striking the pane at an incidence of only 25° was higher than in a similar module made of solar glass without an AR coating. At an incidence of 80° the increase in output is about 3%.

Every sun ray is used optimally and contributes to the fact that our Sovello Pure Power Solar modules rank among the highest-yielding solar modules available on the market.



An increase in electricity by using an AR coating depending on the angled incidence of the light

Sovello Pure Power T and L Series

Standard Test Conditions (STC)[1]

		SV-T-190	SV-T-195	SV-T-200	SV-T-205	SV-L-225	SV-L-230	SV-L-235	SV-L-240
		High Voltage Configuration				Low Voltage Configuration			
Nominal Power[2]	W	190	195	200	205	225	230	235	240
Output Tolerance	W	0/+5	0/+5	0/+5	0/+5	0/+5	0/+5	0/+5	0/+5
P_{mpp}[3], max	W	194.9	199.9	204.9	209.9	229.9	234.9	239.9	244.9
P_{mpp}[3], min	W	190.0	195.0	200.0	205.0	225.0	230.0	235.0	240.0
Module Efficiency	%	12.9	13.2	13.6	13.9	13.2	13.5	13.7	14.0
U_{mpp}[3]	V	26.9	27.3	27.7	28.0	20.3	20.4	20.5	20.5
I_{mpp}[3]	A	7.15	7.24	7.33	7.42	11.18	11.39	11.60	11.81
U_{oc}[3]	V	32.8	33.0	33.1	33.2	25.4	25.5	25.7	25.8
I_{sc}[3]	A	8.08	8.20	8.31	8.43	11.90	12.05	12.19	12.33

[1] 1,000 W/m², 25°C cell temperature, AM 1.5 spectrum
[2] Maximum output or nominal output
[3] Measurement tolerances STC: ± 3 % (P_{mpp}); ± 10 % (I_{sc}, U_{oc}, I_{mpp}, U_{mpp})



THE SOVELLO QUALITY COMMITMENT

Quality, Made in Germany
Every Sovello Pure Power solar module passes through 130 quality checks.

Stability
Our solar modules can withstand high wind and snow loads of up to 5.4 kN/m² (minimum requirement pursuant to IEC 61215: 2.4 kN/m²).

Simple handling
Sovello Pure Power solar modules are robust and lightweight modules.

Sustainability
Sovello builds the world's most sustainable modules with the shortest energy payback time.

Warranty
Greater security thanks to a 25-year linear performance guarantee from 99% to 85% with performance reduction by no more than 0.6% annually; in addition, there is a 10-year guarantee on the workmanship.

High earnings
100% positive output tolerance and best specific energy yield.



Sovello Pure Power L series

Sovello Pure Power T series

〉Positive output tolerance

We always keep a promise.
The output of the Sovello Pure Power range is graded in 5-Watt steps and is based exclusively on positive output tolerances. So you can be sure that when you buy Sovello solar modules, you will at least be getting the output you pay for (generally even more, in fact). A Sovello solar module with a module output of between 230 W and 234.9 W is categorized in the 230 W output class. This ultimately increases expected profits and therefore guarantees the calculated return on the investment.

ÖKO-TEST LIFE WORTH LIVING
Sovello Pure Power SV-X-205
excellent
Issue 04/2010

Independent Photovoltaics Module Test by Solarpraxis and TÜV Rheinland
PV Test
Sovello SV-X-195-fa1
GOOD
pv magazine 02/2011

FOKUS TEST
March 10 Ammonia resistance

〉Sovello's Commitment to High Quality

Sovello views sustainability as a holistic principle that is practised with regard to social, technological, economical and ecological aspects. In order to translate this sustainability into corporate success, we focus our attention on professionalism and quality. Each module undergoes 130 quality tests as it passes through the production process, starting with the incoming goods inspection and ending in a final 100% inspection of the finished modules. Various quality gates have to be passed during the course of the production process. That's why all Sovello products comply with well-defined and proven quality standards. Sovello is certified to ISO 9001:2008, ISO 14001:2004 and EN 16001:2009.

In addition to that, Sovello's outstanding quality has been confirmed by leading test laboratories and trade publications. For instance, the Sovello Pure Power X Solar module was rated as "excellent" in Issue 4/2010 of the German magazine 'Ökotest'. Moreover, the German Agricultural Society (DAG) awarded it the best rating of ++ in its "ammonia resistance focus test", thus confirming the module's particular suitability for use in agricultural operations. Our Pure Power SV-X product range, having successfully passed the TÜV (Rheinland) saltwater test (DIN EN 61701:1995), is suitable for photovoltaic units in offshore regions and in maritime applications.

For Sovello, quality also means that our products satisfy the requirements and demands of our customers and that they are constantly being further developed in this respect. Applying this high standard to our workmanship and our products puts us in a position to guarantee the highest quality for every module delivered.
You can take our word for it!

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