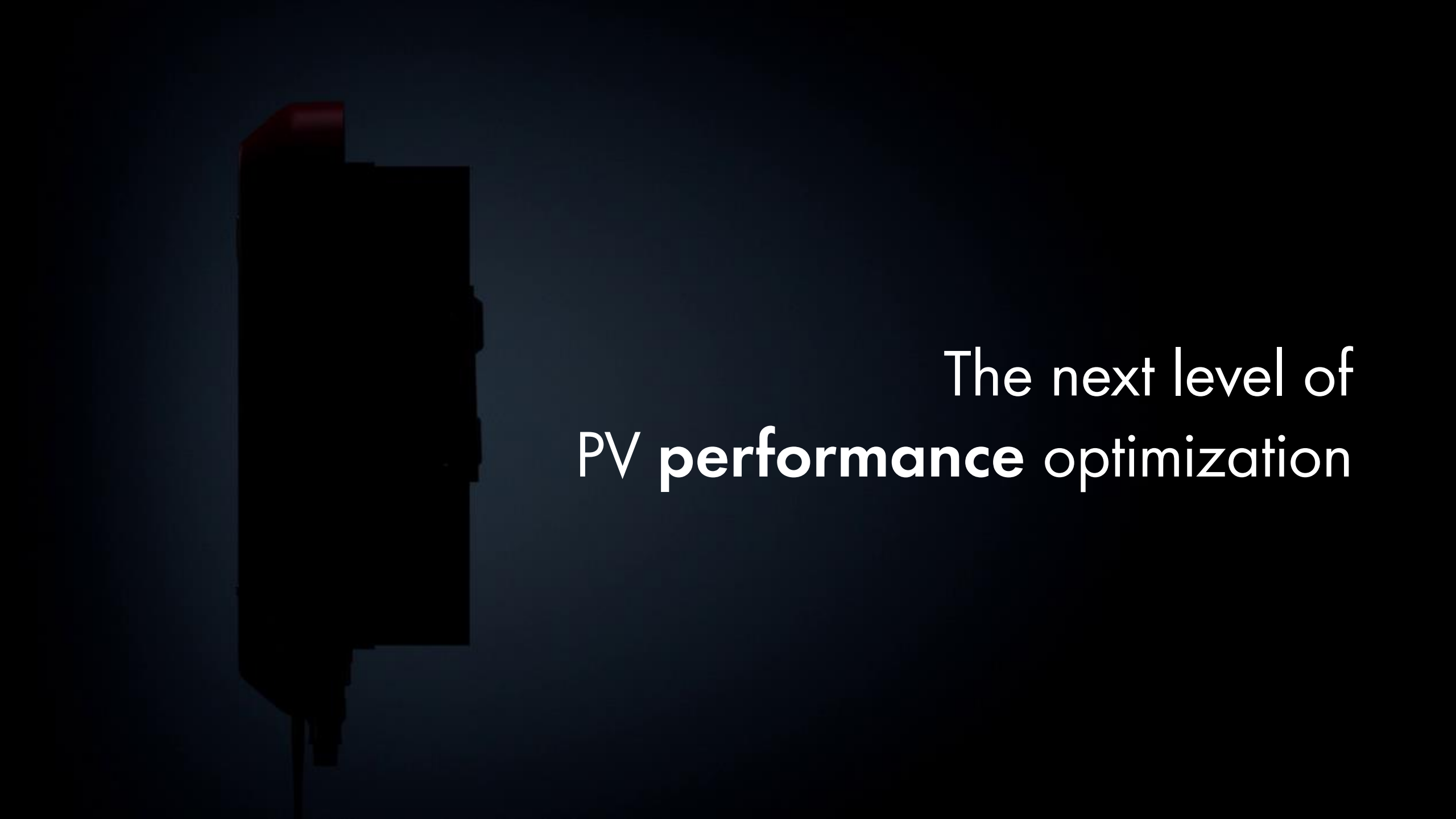
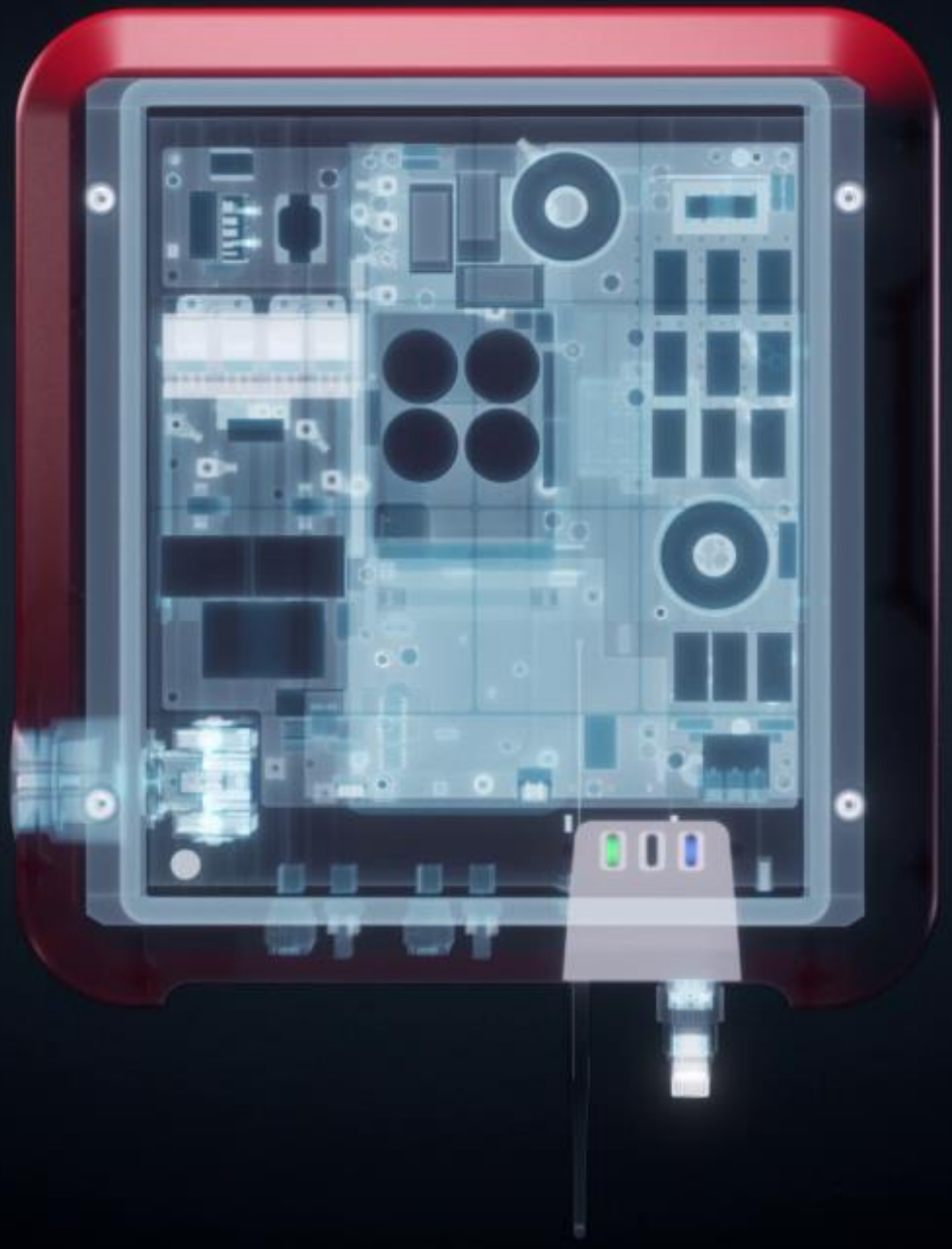
SMA ShadeFix

The next level of PV performance optimization


The next level of
PV **performance** optimization

SMA ShadeFix



SMA ShadeFix is a patented, integrated software solution that optimizes energy yield in PV plants.

SMA ShadeFix outperforms most conventional hardware solutions for shade management in PV systems.

SMA ShadeFix

No compromises on performance, safety and lifetime

Performance & Yield

SMA ShadeFix offers highest performance and yield for PV plants – even under shaded conditions.*[1]

Safety & Risk

Slim plant design with no electronics on the roof reduces the risk of fires or serious injuries.*[2]

Quality & Lifetime

Only ONE central piece of electronics in the system, considerably cost and complexity of the PV system. Proven SMA quality and automatic inverter monitoring SMA Smart Connected ensures minimum downtime, investment & service costs

1. Assoc. Prof. Dr. W.-Toke Franke, University of Southern Denmark: „The Impact of Optimizers for PV Modules – A comparative study"
2. Evaluation of fire risk in photovoltaic systems and development of safety concepts for risk minimization, TÜV Rheinland, Fraunhofer ISE, 2015 (p. 206)

SMA ShadeFix

How does it work?

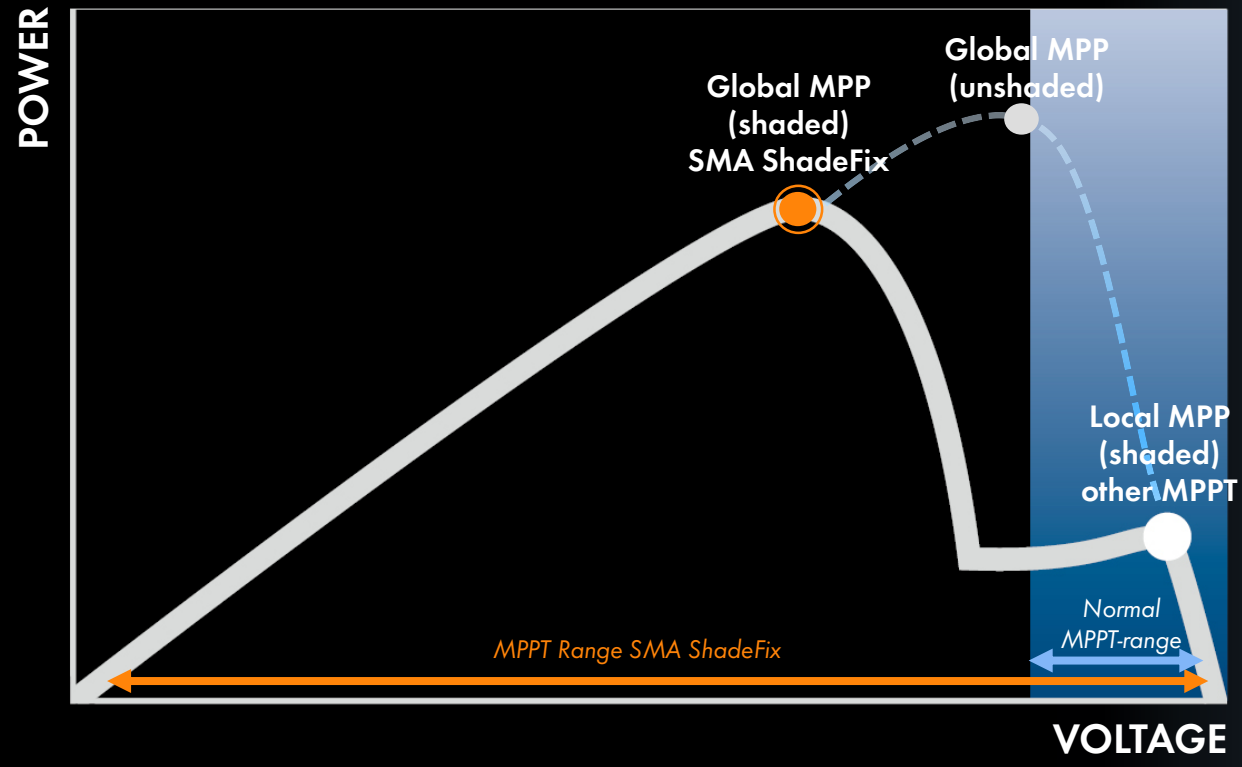
SMA ShadeFix scans the power curve of the PV system at regular intervals within milliseconds for the global Maximum Power Point (global MPP).

In case of shading, several local Maximum Power Points (local MPP) occur in the course of this power curve, which – without SMA ShadeFix – would lead to a reduction in yield.

SMA ShadeFix ensures that the inverter always finds the global Maximum Power Point (global MPP) and thus always generates the highest possible yield from the solar supply.

Some competitors' MPPT might try to achieve the same thing, but SMA ShadeFix works (analyzes, changes operating point/MPP) faster and therefore more efficient. SMA's patented ShadeFix is the only MPPT solution which always finds the global MPP with neglectable impact on energy yield.

Power curves of PV array

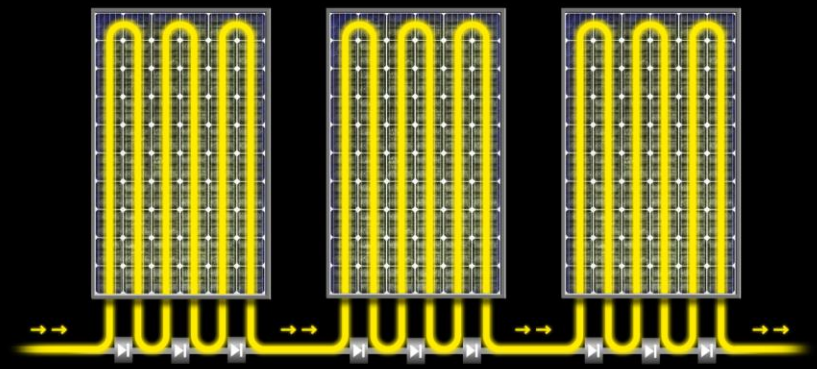


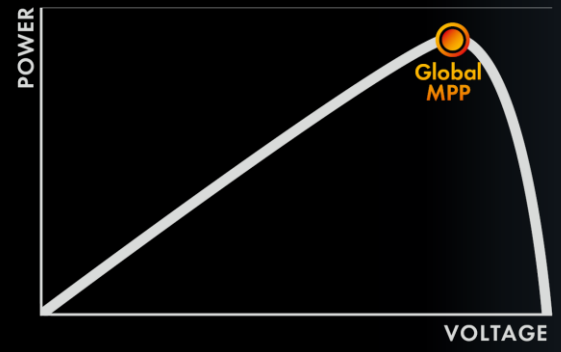
SMA ShadeFix

How does it work?

Unshaded PV array:

- All modules full power
- Bypass diodes not active

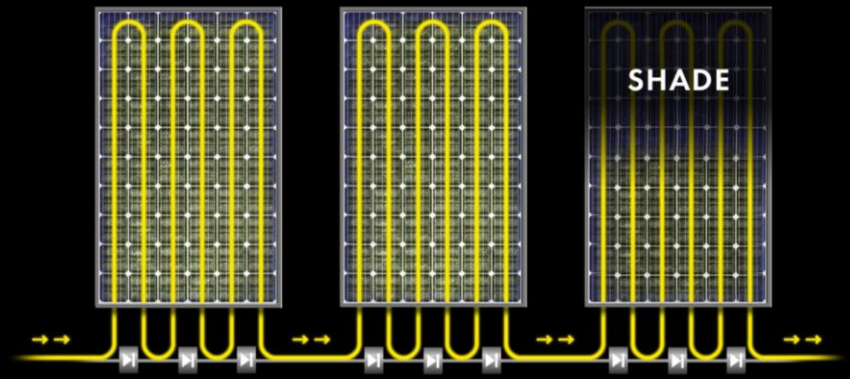


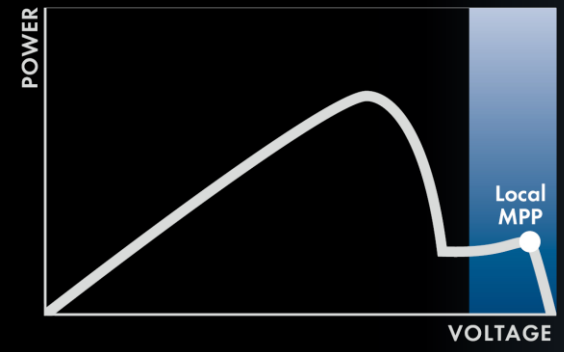


Partially shaded PV array:
(Standard MPP Tracking)

- All modules limited to power of the shaded module
- Bypass diodes not active

→ Up to 20% energy losses p.a.



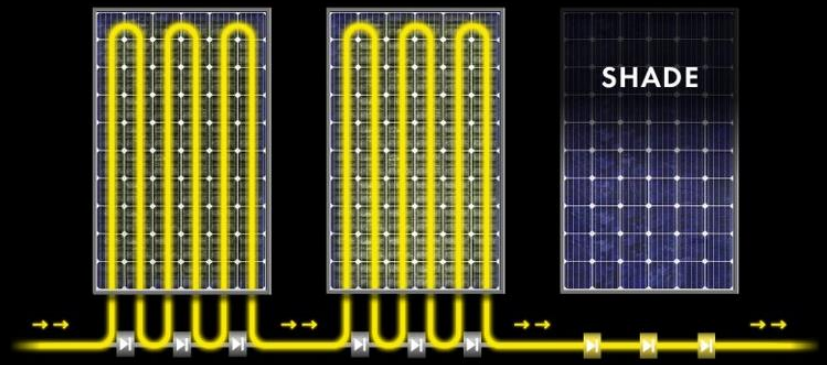


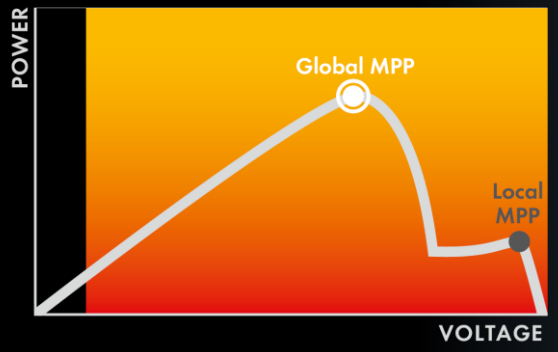
SMA ShadeFix
How does it work?

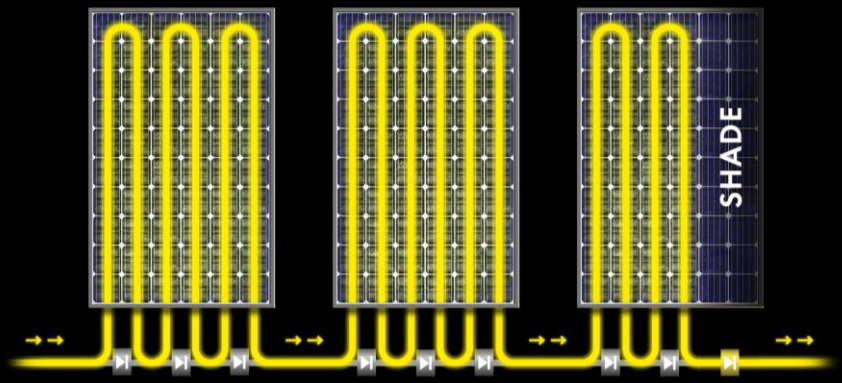
Partially shaded PV array:
(SMA ShadeFix)

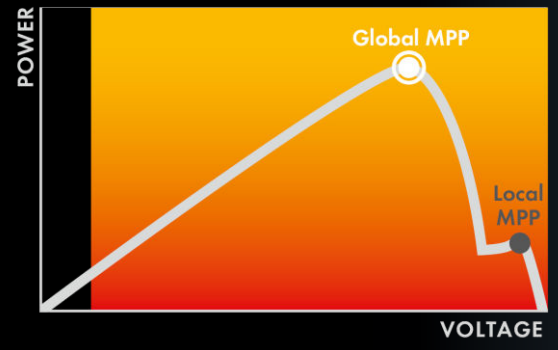
- All modules except the shaded full power
- By choosing the best working voltage, SMA ShadeFix forces bypass diode to bypass shaded module

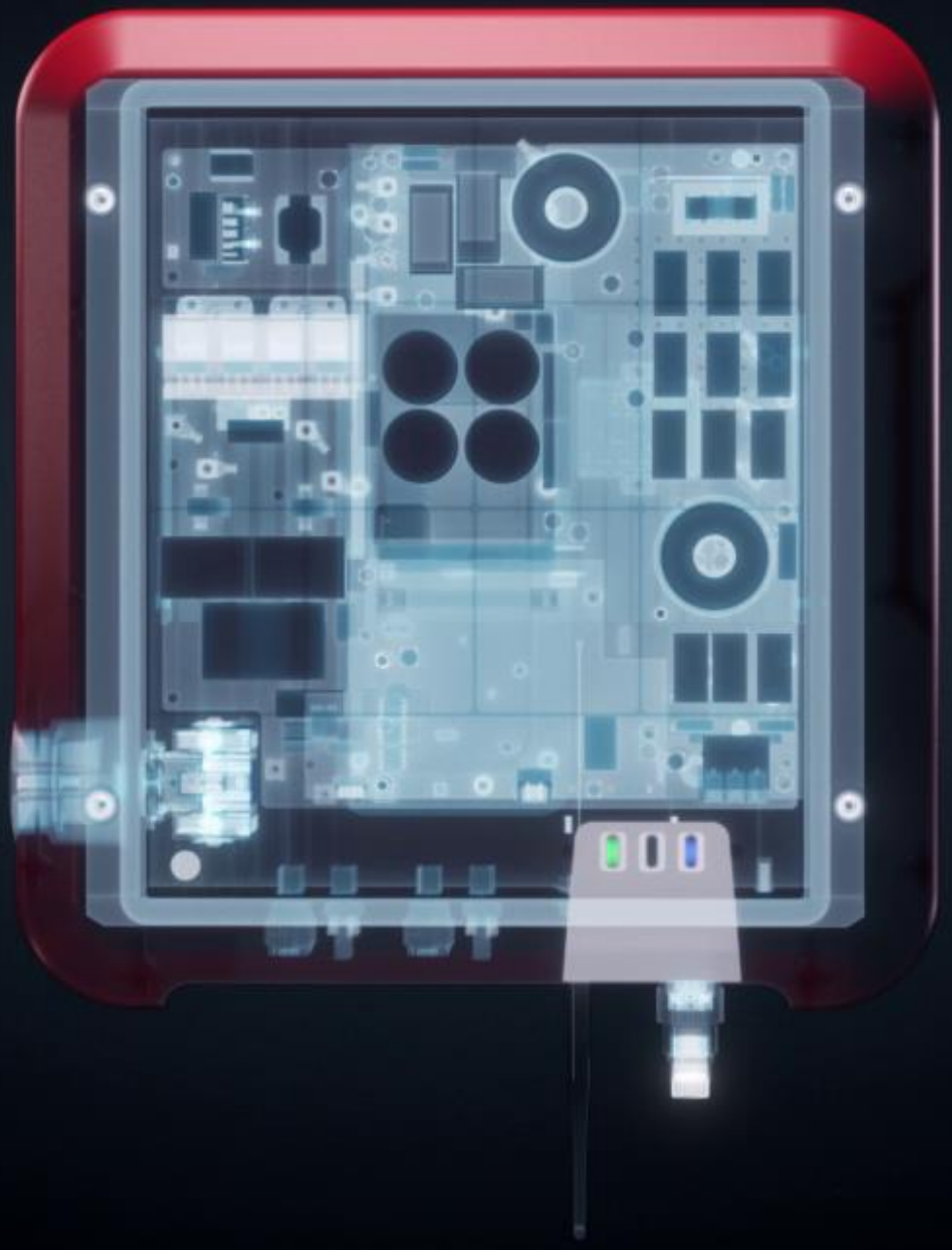
→ 0 % to 2 % energy losses p.a.







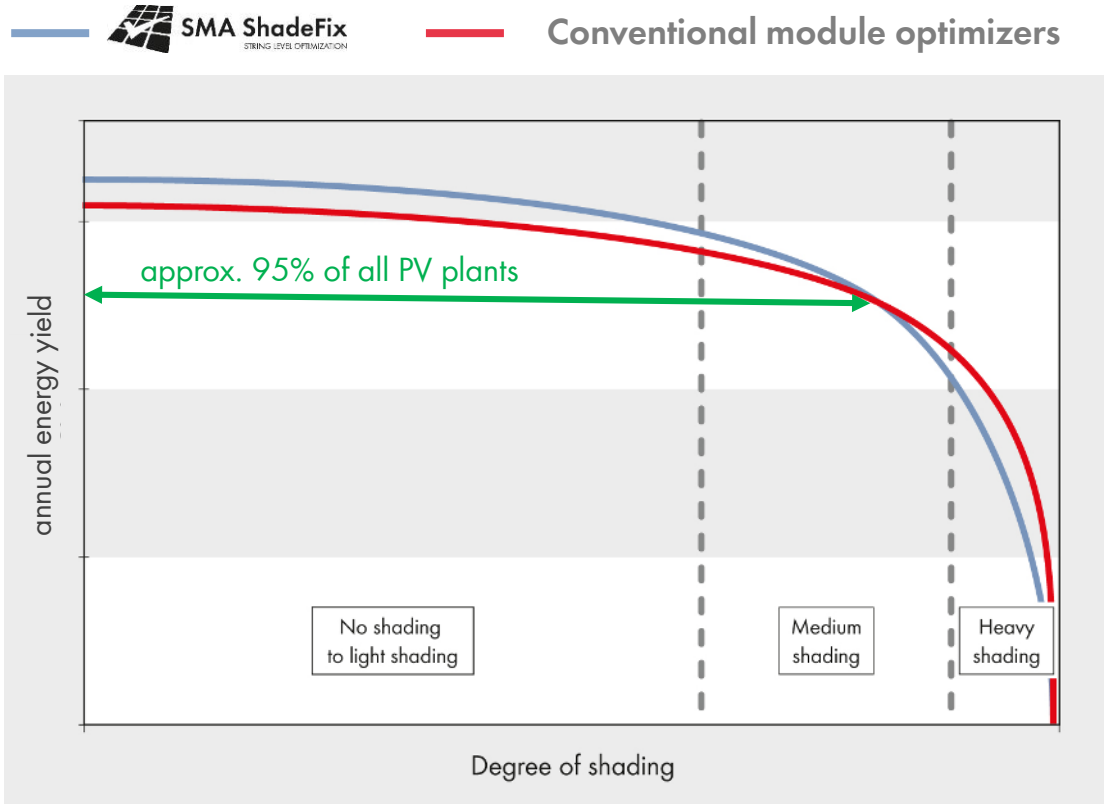




SMA ShadeFix
outperforms most conventional
hardware solutions
without any compromise on
performance, safety and lifetime

PROOF

SMA ShadeFix
Outperforms most conventional hardware solutions



Yield simulation over entire operating time for 150 different plant scenarios (internal SMA simulation).

For heavily or permanently shaded PV systems, SMA recommends the selective deployment of TS4-A-O optimizers on the affected modules

Assoc. Prof. Dr. W.-Toke Franke: *The Impact of Optimizers for PV Modules, a comparative study*[1]

"The common marketing claims of additional energy production by applying optimizers could **not be confirmed** by this experiment. In fact, there are only **very few scenarios where the use of optimizers improves the system performance**."

"In addition, the **risk** of a **failing component** in one of the many MLPEs should not be underestimated. Finally, the additional connectors for the optimizers come with risk of bad connections that could lead to a **failing system** or even worse be the root cause for a fire."

University of Southern Denmark

1. https://www.sdu.dk/en/om_sdu/institutter_centre/centre+for+industrial+elektronics/research+publication

SMA ShadeFix

No compromises on performance

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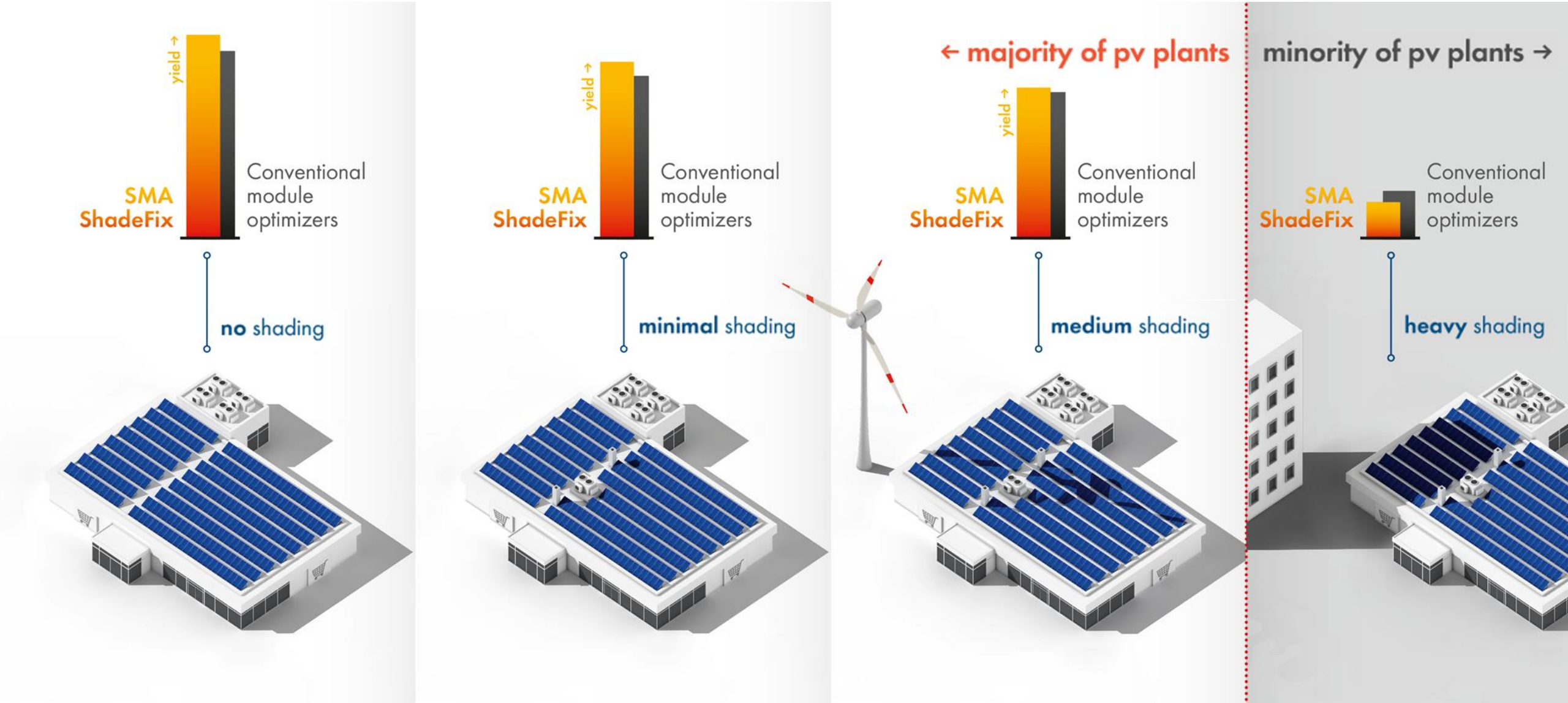


SMA ShadeFix
No compromises on safety

TÜV Rheinland, Fraunhofer ISE, 2015 (p.206)[2]
Evaluation of fire risk in photovoltaic systems and development of safety concepts for risk minimization:

"Safety components such as fuses or switches are often integrated into the DC part of PV systems. You should always check on a case-by-case basis whether this is really necessary. **Each additional component entails the risk of additional contact points and fault sources**.
A **"slimline"** system containing **as few components as possible** has the advantage of fewer points at which the system can be damaged."

Furthermore, additional electronics on the roof massively increase the risk of service cases in local climatic conditions. A slim system design with string inverters is therefore recommended for the long term.

TÜVRheinland®

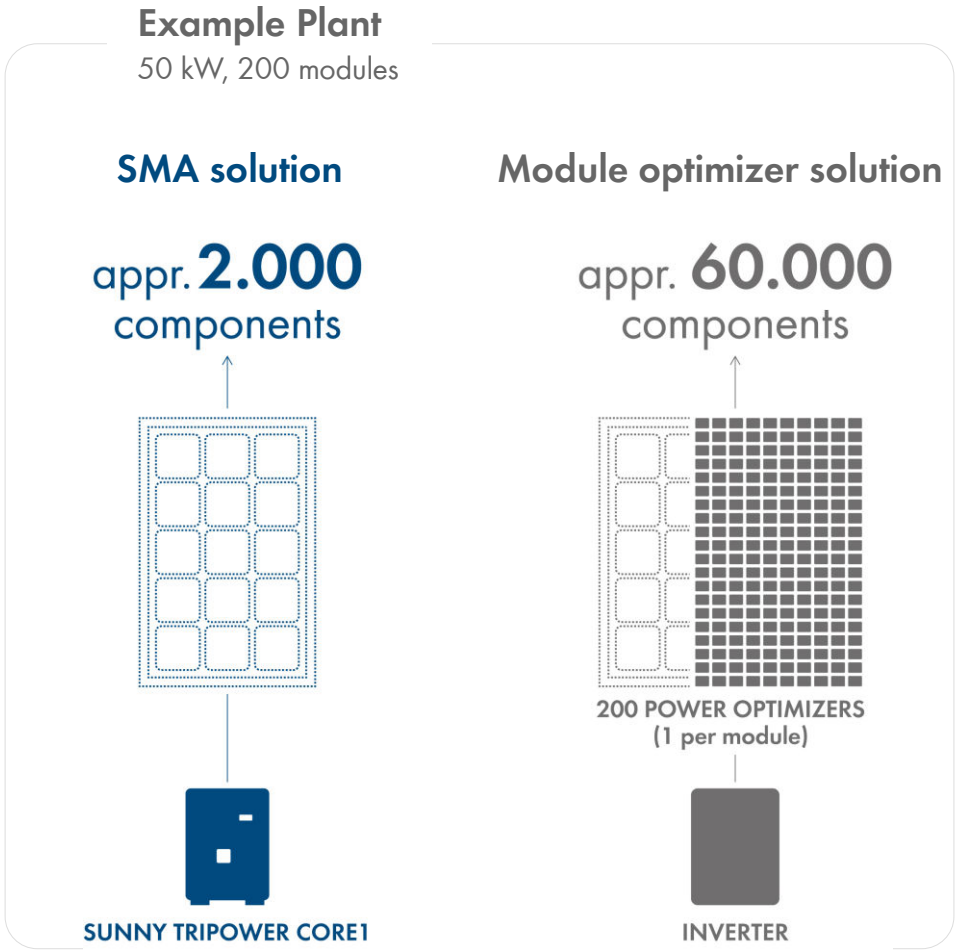
2. Evaluation of fire risk in photovoltaic systems and development of safety concepts for risk minimization, TÜV Rheinland, Fraunhofer ISE, 2015 (p. 206)

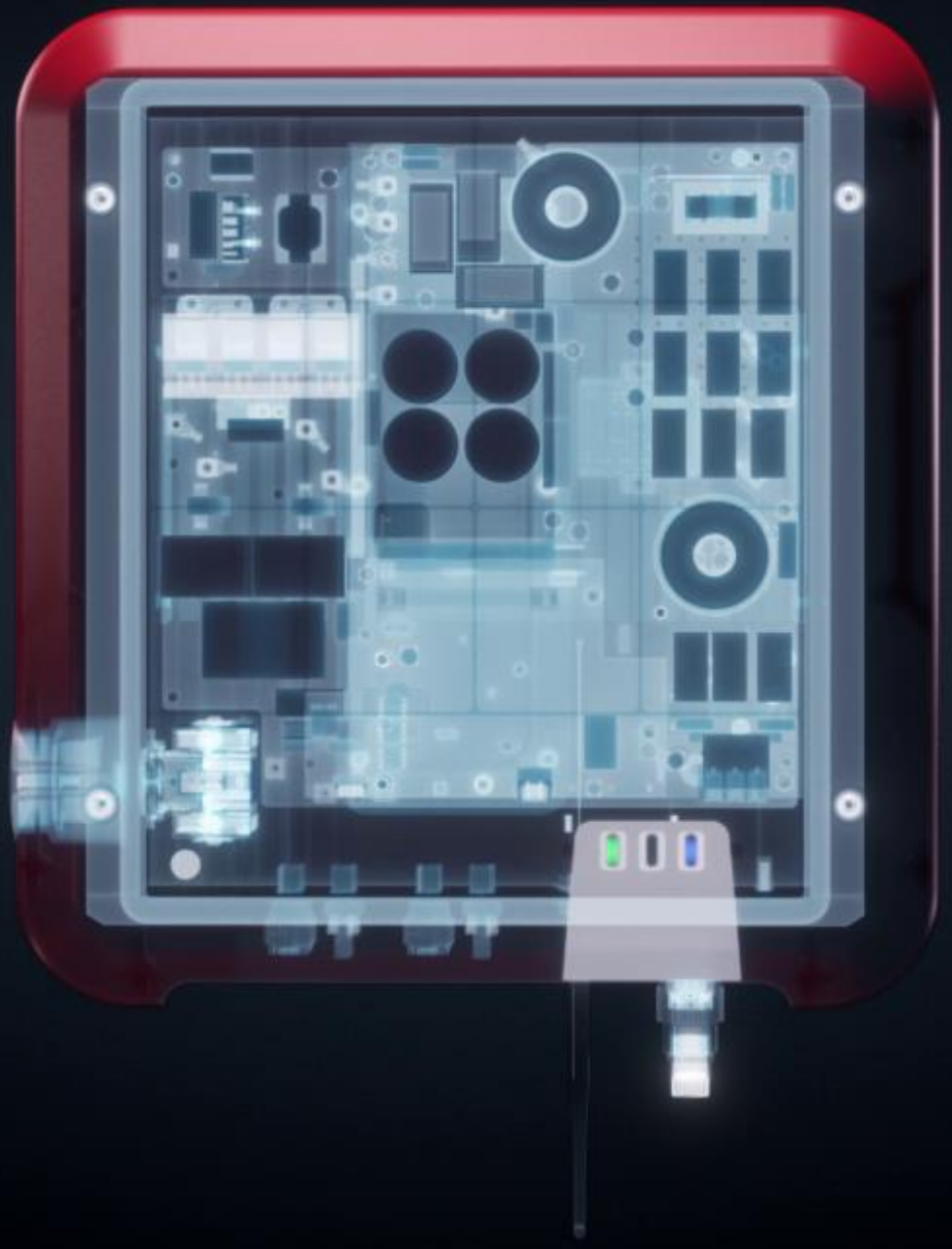
SMA ShadeFix
No compromises on lifetime

SMA avoids (whenever possible) the use of unnecessary electronic components that are installed directly under the roof. **All necessary yield-securing and yield-increasing technologies are therefore integrated directly into the inverters on a software basis**.

The reduction of components in the PV system ensures (due to the low number of potential sources of error) a **maximum lifetime for SMA products**. Should the inverter nevertheless fail, our intelligent service ensures immediate replacement.

This strategy has been proven by over more than 30 years of experience, in almost 80 GW installed capacity.





SMA ShadeFix

STRING LEVEL OPTIMISATION

SMA ShadeFix optimises PV performance without compromising safety or the lifetime of a PV system. It reduces cost and complexity of a PV system as it is integrated into all SMA inverters.

- **Increased Performance & Yield**
- **Increased Safety with reduced Risk**
- **Improved Quality & Extended Lifetime**

Thank you!

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