



SCHOTT
solar

SCHOTT PTR[®]70
Receiver

The 4th Generation

SCHOTT is an international technology group with more than 125 years of experience in the areas of specialty glasses and materials and advanced technologies. With our high-quality products and intelligent solutions, we contribute to our customers' success and make SCHOTT part of everyone's life.

SCHOTT Solar CSP with its high performance receivers – which comprise the core of all solar power plants using parabolic trough and linear Fresnel technologies – contributes decisively to making tomorrow's energy production possible today. We rank as market and technology leader for receiver tubes and have supplied more than 1 Million receivers to power plants all over the world.



SCHOTT Solar CSP: the most bankable receiver supplier

Outperforming technology, excellent production and service and an unmatched track record

Technology	Excellence in production and service	Track record
<ul style="list-style-type: none"> • Superior product durability and lifetime • Benchmark product performance • Strong product development capabilities 	<ul style="list-style-type: none"> • Lean manufacturing • Reliable high volume capability • Technical customer service on-site • After-sales service 	<ul style="list-style-type: none"> • 3 GW installed base (out of 4 GW total) • More than 50 projects supplied around the globe • More than 1 Million receivers delivered

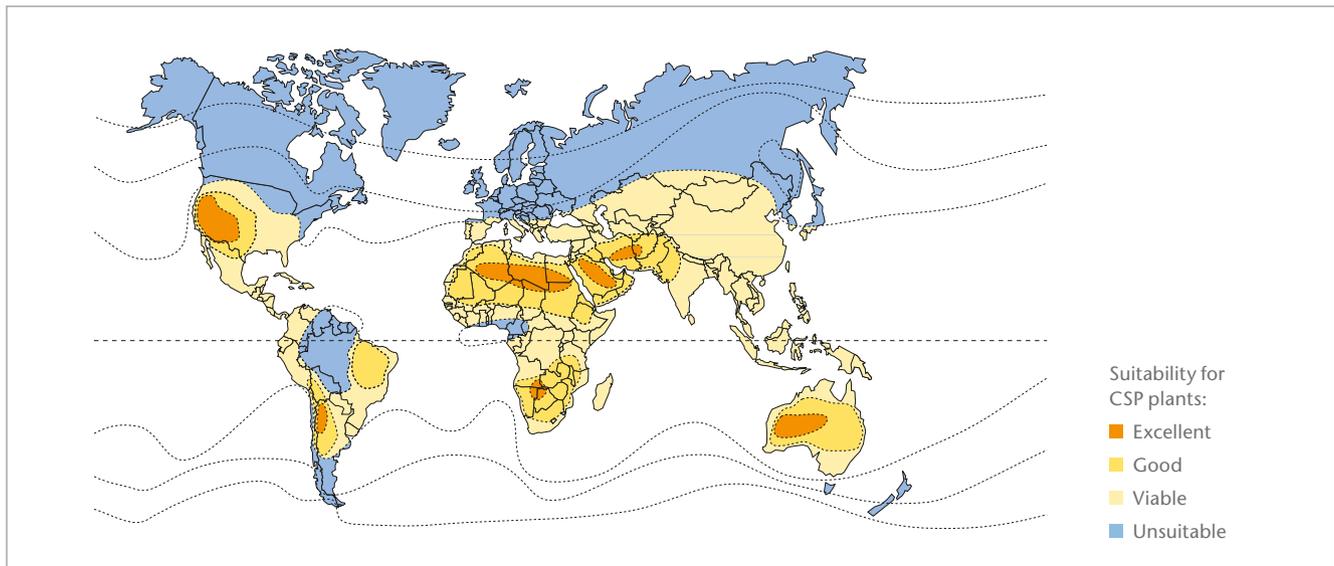
Parabolic trough technology

The first choice for large-scale solar power generation

Concentrated Solar Power – Clean and predictable electricity generation around the clock

Concentrated Solar Power (CSP) technology uses energy from the sun to generate heat, which is used in steam cycles to produce electricity. The technology is particularly efficient in regions with high direct solar irradiation, encompassing the earth's sunbelt on both sides of the equator to 35 degrees latitude.

CSP plants are used in a similar manner like conventional steam power plants. The key difference is that CSP plants use emission-free, clean solar radiation to produce heat instead of fossil or nuclear fuels. Amongst all CSP technologies, the parabolic trough technology has the longest commercial track record of almost 30 years. Parabolic trough power plants are suitable for large-scale use in the range of 10 to 300 megawatts electrical output and can replace conventional thermal power plants without any qualitative changes in the electricity grid structure. Due to the option of thermal storage or hybridization, the turbines of CSP plants can also produce power in low solar radiation periods and at night, delivering power reliably, on a planned schedule and in a way that keeps the grids stable.

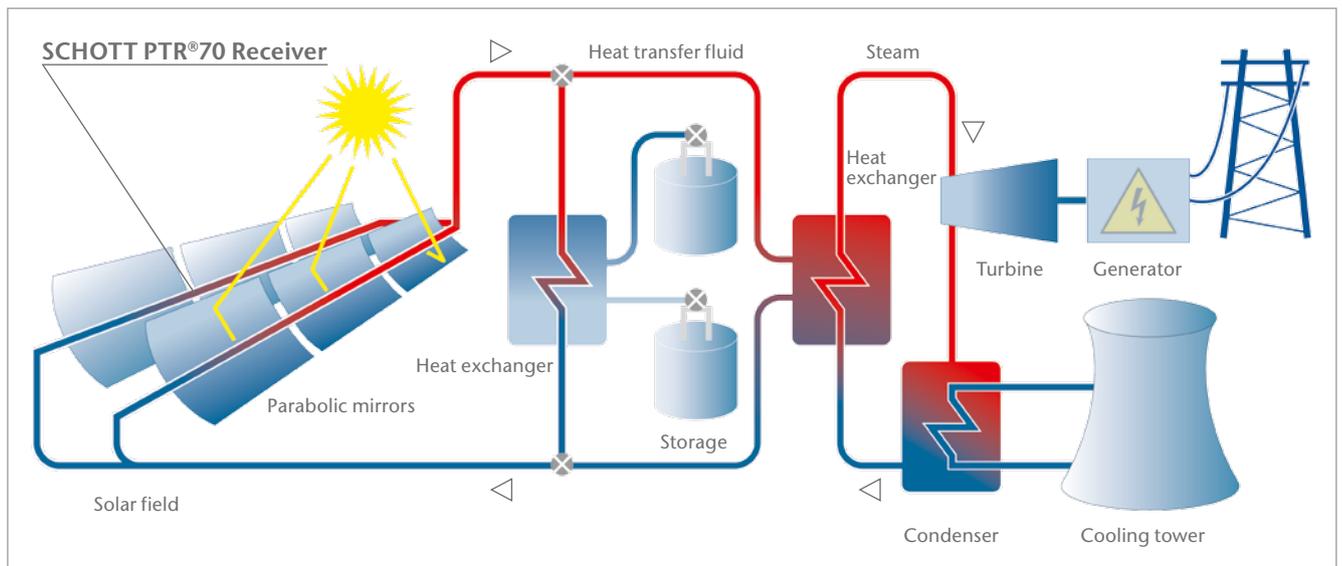


Solar irradiation world map

How parabolic trough power plants work

In a CSP plant, the generation of heat mostly depends on the level of solar irradiation. In order to achieve the necessary temperatures, solar radiation is concentrated in parabolic trough arrays. These troughs can be more than 600 meters in length and are made of parabolic shaped mirror segments. The troughs track the sun over the course of the day and focus the solar radiation along the focal point of the mirrors onto the “heart” of a CSP plant: specially coated, evacuated receiver tubes. The receiver tubes convert solar radiation into thermal energy, and therefore their durability and efficiency are crucial for the sustainable profitability of the entire solar plant. A heat transfer fluid, which circulates through the receiver, is heated up and then used to generate steam.

The overall power plant efficiency is determined by the maximum operating temperature of the heat transfer fluid used. The most commonly used oil-based heat transfer fluids operate at temperatures up to 400 °C. A key innovation to further improve the plant efficiency is the usage of heat transfer that allows operation up to 550 °C, such as molten salts or direct steam.



Working principle of parabolic trough power plants

SCHOTT Solar CSP – Your partner for sustainable profitability

The receiver, being the key component of a CSP plant, has a decisive influence on the overall efficiency of the plant and has to withstand drastic temperature changes and mechanical stresses throughout its lifetime. The SCHOTT PTR®70 Receiver responds to this challenge and allows SCHOTT not only to claim technology leadership, but also to be the clear market leader in solar receivers. More than 1 Million SCHOTT PTR®70 Receivers have been delivered to power plants all over the world. High solar absorptance, low thermal losses and a durable vacuum body are crucial and in all aspects, the SCHOTT PTR®70 Receiver delivers outstanding results.

The SCHOTT PTR[®]70 Receiver Platform

Three receiver products – one technology base

SCHOTT introduces the 4th generation of receivers which collects the experience of more than 1 Million receivers installed in over 50 CSP projects worldwide. The 4th generation receiver products are built upon a common technology platform. With the base product, the platform already provides best-in-class optical and thermal performance. The Premium receiver includes an integrated noble gas capsule and facilitates sustainable profitability far beyond 25 years of operation. The Advance receiver paves the way to the next technology leap in CSP: Molten Salts as heat transfer fluid operating at temperatures up to 550 °C.



SCHOTT PTR[®]70 Advance

The technology leap towards Molten Salts

SCHOTT PTR[®]70 Premium

The profitability booster

SCHOTT PTR[®]70

The receiver benchmark in CSP industry

SCHOTT PTR[®]70

for usage with oil-based heat-transfer fluids

- New bellow design, suitable for high-temperature operation
- Glass-to-metal seal with matching coefficients of thermal expansions
- Protection cap for improved robustness and easy handling

SCHOTT PTR[®]70 Premium

for usage with oil-based heat-transfer fluids

- SCHOTT PTR[®]70
- plus
- Integrated noble gas capsule as lifetime extender

SCHOTT PTR[®]70 Advance

for usage with Molten Salts heat-transfer fluids

- SCHOTT PTR[®]70
- plus
- New steel grade for 550 °C operation
- Novel absorber coating
- Stress-optimized bellow configuration

**Global
presence**

Pilot line for
prototypes & small series

Superior
durability
& lifetime

Optical
performance 6% above
DLR reference

1.000.000

600 MW
annual capacity

receivers delivered

**Technical
Service**

Benchmark
product
performance

**Your innovation
partner**

3GW
installed

100% delivery
reliability

Profitability
booster

Over 50 commercial
plants world wide

**Technology
& Market
leader**

Bankability

SCHOTT Solar CSP GmbH

Hattenbergstrasse 10

55122 Mainz

Germany

Phone +49 (0)6131/66-14158

Fax +49 (0)3641/2888-9192

csp@schottsolar.com

www.schott.com/csp

