

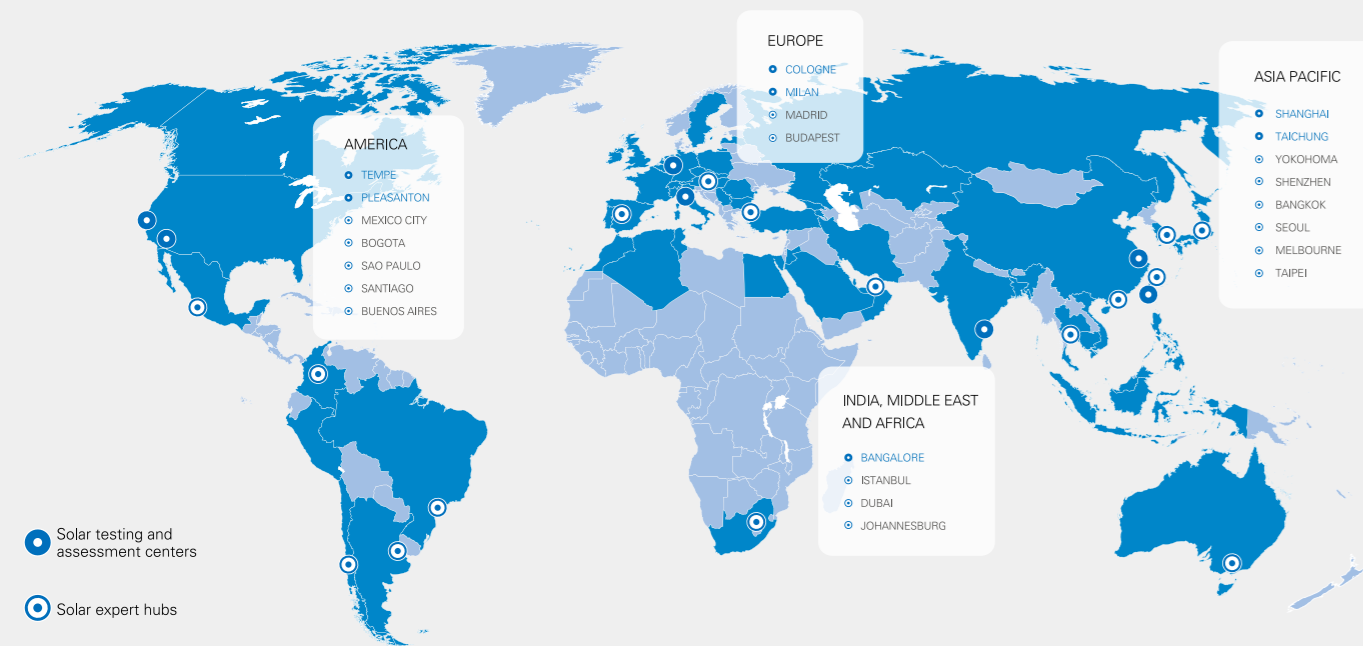
## Global network, local services.

Our seven testing centres with multiple accreditations in Cologne in Germany, Shanghai in China, Taiwan, Tempe in the US, Yokohoma in Japan, Milan in Italy and Bangalore in India consist of state-of-the-art equipment and sophisticated engineering teams. Additionally, a number of outdoor measurement sites under various conditions, including dry & hot, tropical and moderate climates, ensure a wide range of assessments on the performance of PV modules. As the premier third party certification institution for the PV industry, over 250 experts of TÜV Rheinland worldwide can rapidly respond to the local needs of manufacturers, retailers and investors, offering value beyond expectations. The combination of different competences makes us a trustworthy partner, able to advise you and play an active role in helping you achieve success in a wide range of global markets.

250+ experts

35+ years of experience

No.1 in PV products testing and certification



● Solar testing and assessment centers

○ Solar expert hubs

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 **TÜVRheinland®**  
Precisely Right.

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## PV Supply Chain Services

Mitigate sourcing risks.  
With TÜV Rheinland.



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 **TÜVRheinland®**  
Precisely Right.



## From supplier selection to final installation, PV supply chain experts from TÜV Rheinland provide all-around supports in completing successful solar projects.

Every solar project is unique, and so is our service. To meet and exceed expectations, we adjust to your individual needs. Whether you are an investor, insurer, owner, operator, EPC or a banker, our tailored services will ensure that you are comfortable with all sourcing decisions.

For over 35 years, TÜV Rheinland has provided solutions for the solar industry – testing, certifying, inspecting and auditing. At every step along the way, we have continued to learn, improve and refine our processes.

We have decades of experience providing supply chain services for PV projects of different capacities. We have built a global network of laboratories designed to meet new challenges and grown with specialists who support and advise our clients. We are thus uniquely equipped to oversee the complex relationships and different interests in PV supply chains and enable you to master any challenge your PV project encounters.



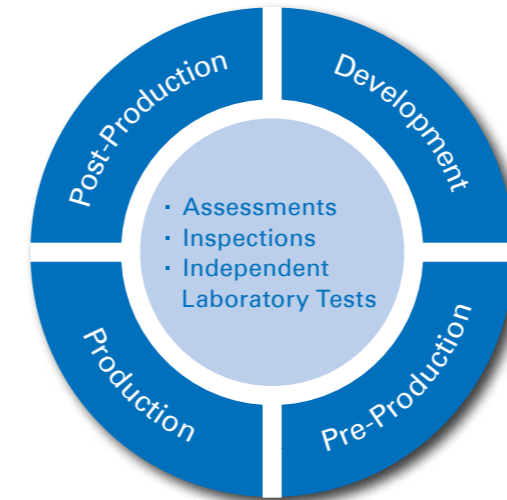
### OUR EXPERTISE. YOUR BENEFITS.

- Services are tailored to meet your project-specific requirements.
- Objective information helps you determine final suppliers.
- Increase investor, lender and insurance confidence.
- Reduced risk of faulty products at the construction site, helping you maintain project quality.
- World-class solar experts and local laboratories provide support wherever and whenever needed.

## Comprehensive service portfolio along the PV supply chain.

Our audits and inspections of production lines identify potential weaknesses and risks, ensuring safe and qualified final products, thus a profitable yield. Moreover, we test PV modules and other components in our accredited laboratories for durability, verifying that BOS components (such as mounting structures and inverters) match specifications and perform as expected. This helps improve quality, performance and compatibility by reducing the risk of serious defects and critical safety issues.

The result of this systematic quality assurance is not only the development of a technically safe and efficient PV power plant, but also bankability: investors and lenders can feel confident that your project is accounting for and addressing inevitable risks.



	Development	Pre-production	Production	Post-production
TÜV Rheinland expert team	<ul style="list-style-type: none"> <li>• Supplier evaluation</li> <li>• Technical advisory</li> </ul>			
At factory	<ul style="list-style-type: none"> <li>• Factory audits</li> </ul>	<ul style="list-style-type: none"> <li>• Capability assessment</li> <li>• Pre-production inspection</li> </ul>	<ul style="list-style-type: none"> <li>• DuPro factory inspection</li> <li>• Inline quality assurance</li> </ul>	<ul style="list-style-type: none"> <li>• Pre-shipment factory inspection</li> <li>• Loading supervision</li> </ul>
In TÜV Rheinland's laboratory	<ul style="list-style-type: none"> <li>• Module benchmarking</li> </ul>	<ul style="list-style-type: none"> <li>• Reliability tests</li> <li>• Reference module creation</li> </ul>	<ul style="list-style-type: none"> <li>• Fast verification sample tests</li> </ul>	<ul style="list-style-type: none"> <li>• Final random sample tests</li> </ul>
On construction site				<ul style="list-style-type: none"> <li>• Post-shipment inspection</li> <li>• Pre-installation testing</li> </ul>

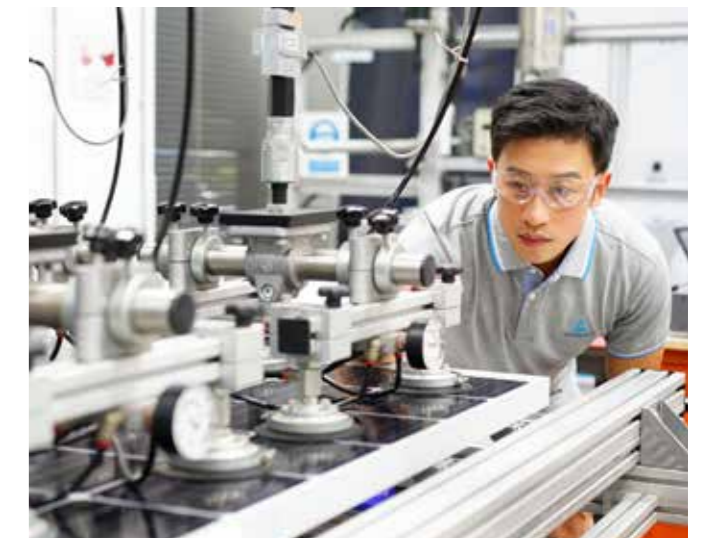


## Independent laboratory tests

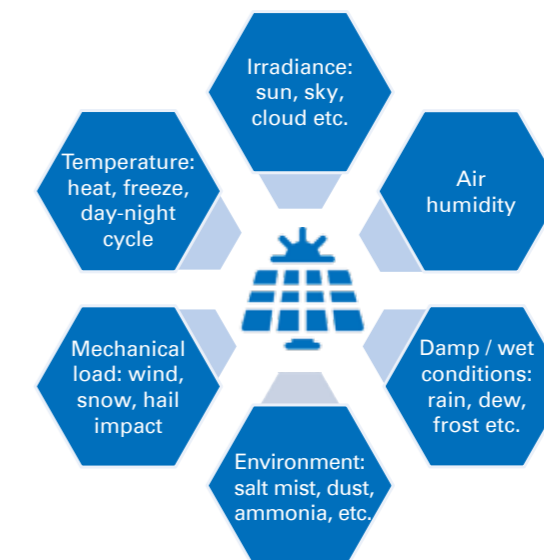
Independent tests can be performed in one of our seven accredited (ISO 17025) laboratories: Shanghai (China), Cologne (Germany), Yokohama (Japan), Bangalore (India), Arizona (USA), Milan (Italy) and Taichung (Taiwan). All tests are performed under IEC standards, if applicable, and customised test sequences are offered.

### PRE-SHIPMENT TESTS

- Visual inspection
- Power determination
- Electroluminescence (EL) test
- Safety tests
- Highly accurate STC measurement
- Performance at different irradiance/temperature
- EVA gel content & peel-off tests
- Thermographic inspection
- Potential induced degradation (PID)
- Light induced degradation (LID)
- Static mechanical load
- Thermal cycling / damp heat



### IEC RELIABILITY TESTS AND EXTENDED RELIABILITY TESTS



- Damp heat test (DH)
- Thermal cycling test (TC)
- Humidity freeze test (HF)
- Static mechanical load
- Impulse voltage test
- Hail impact
- Bypass diode thermal test
- Hot-spot endurance test
- Outdoor exposure test
- Salt mist
- Ammonia corrosion test
- Dynamic mechanical load
- UV precondition test