

TÜVNORD

# Testing, Inspection and Certification of PV Products 光伏产品检测，检验及认证

TÜV NORD Renewable Energy  
TÜV NORD 可再生能源



# Company Profile

## 公司介绍



With over 150 branches in more than 70 countries of Europe, Asia, America and Africa, TÜV NORD is actively devoted to its national and international customers. Down its development path of more than 150 years, TÜV NORD has grown from a traditional steam boiler inspection organization to a technology service company officially authorized by German government. Expanding and improving its services unremittingly, TÜV NORD has now become a world-renowned certification authority. The core services of TÜV NORD GROUP mainly include testing, inspection, certification and assessment, which covers a wide area of expertise in industry, energy, railway, mobility, environmental protection, IT, natural resources and aerospace, etc.

TÜV NORD 在全球 70 多个国家设有超过 150 家分支机构，这些分支机构遍布欧洲、亚洲、非洲和美洲。在超过 150 年的发展历程中，TÜV NORD 从最初的“压力容器检验协会”，到成为德国官方授权的技术服务公司，持续拓展服务范畴，完善服务，迄今已发展成为全球知名认证机构。TÜV NORD GROUP 核心服务主要体现在测试、检验、认证、评估、教育及工程，涉及行业包含：工业、能源、铁路、车辆、环境保护、IT、自然资源、航空航天等。

As a professional technical provider, TÜV NORD dedicates itself to offering manufactures, installers, suppliers and investors a comprehensive range of testing and certification services covering assessing safety, performance and quality of PV products and PV system in the field of solar energy. Its capability of testing and certification of PV products is embodied in a variety of PV modules, PV components and materials, balance of system components, energy storage equipment and system, PV power plant, etc. Testing and certification of PV modules ranges from BIPV module, smart modules, flexible modules, MBB/SMBB, modules with whole cells/half-cut cells/segmented cells, mono/poly silicon modules, concentrator PV modules, etc., involving n/p type, MWT, PERC, TOPCon, HJT, IBC, CdTe, CIGS, Perovskite and other technologies.

作为一家专业的技术服务商，TÜV NORD 在太阳能领域致力于为制造商、安装商、服务供应商及投资商提供从太阳能光伏组件、零部件到光伏发电系统整个产品供应链的全方位测试和认证服务。光伏产品检测及认证能力涵盖各类型光伏组件、光伏辅材零部件、光伏系统平衡部件、储能设备及系统、光伏电站等领域。光伏组件测试认证范围已涵盖 BIPV 组件、智能组件、轻质 / 柔性组件、MBB/SMBB 组件、整片 / 半片 / 叠瓦 / 叠片组件、单面 / 双面组件、聚光组件等，涉及 n 型 / p 型、MWT、PERC、TOPCon、HJT、IBC、CdTe、CIGS、钙钛矿等新型电池技术。

# Why Choose TÜV NORD?

## 为什么选择我们?



**One-stop Service,  
Multi-certification**  
一检多证、一站式服务

As a member of IECEE-CB scheme, our test report and certificate are widely recognized. We offer services from factory construction evaluation, building quality management systems to quality management and control, supplier management, defective products analysis and optimization, foreign market access analysis.

作为 IECEE-CB 互认体系成员, 我们签发的测试报告和证书被广泛认可。从前期的工厂建设评估、管理体系的建设、到生产过程中工艺质量管控、供应商管理、产品问题分析优化、国内外市场准入分析等服务, 提供一检多证, 一站式服务。

**Satisfied  
Service Quality**  
令您满意的服务质量

With rich experience of testing and project handling, our international team provides you professional technical services. Our experts will always be your strong support and help you to reach business goals efficiently.

我们的国际团队拥有丰富的测试与项目管理经验, 向您提供专业技术服务。我们的专家一如既往地给予您强大的技术支持, 助您快速有效地达到业务目标。

**Customized  
Training Courses**  
定制化培训

Training of international standards, test methods, quality management and control on incoming material inspection, production process and warehouse, maintenance of solar simulator, power measurement, solar system, etc.

相关国际标准、测试方法、质量管理与控制(来料检验、生产工艺、仓库管理)、太阳能模拟器的维护保养、功率测量、光伏系统等培训。

**Customized Service**  
定制化服务

For example 例如:

- Outdoor annual energy yield 户外实证
- Production surveillance 生产监督
- Pre-shipment inspection 出货检验
- Supplier rating 供应商评级
- Third-party assessment service 第三方评估服务
- Others 其他客户特殊需求

# Global Resources

## 全球资源

### Worldwide Testing Laboratories

#### 全球检测实验室

TÜV NORD possesses rich resources of photovoltaic testing laboratories in China, Taiwan and Europe. Our labs with professional testing capability of PV module and components are accredited in compliance with the ISO/IEC 17025 norm, equipped with advanced testing facilities and excellent technical experts. Meanwhile, as a member of the IECCE-CB and IECRE mutual recognition system, TÜV NORD has a number of CB laboratories and a large capacity of testing facilities which ensures that your PV products could be tested immediately as soon as we receive them. Therefore, the whole period of testing and certification will be shortened and your products become more competitive at global market in short time.

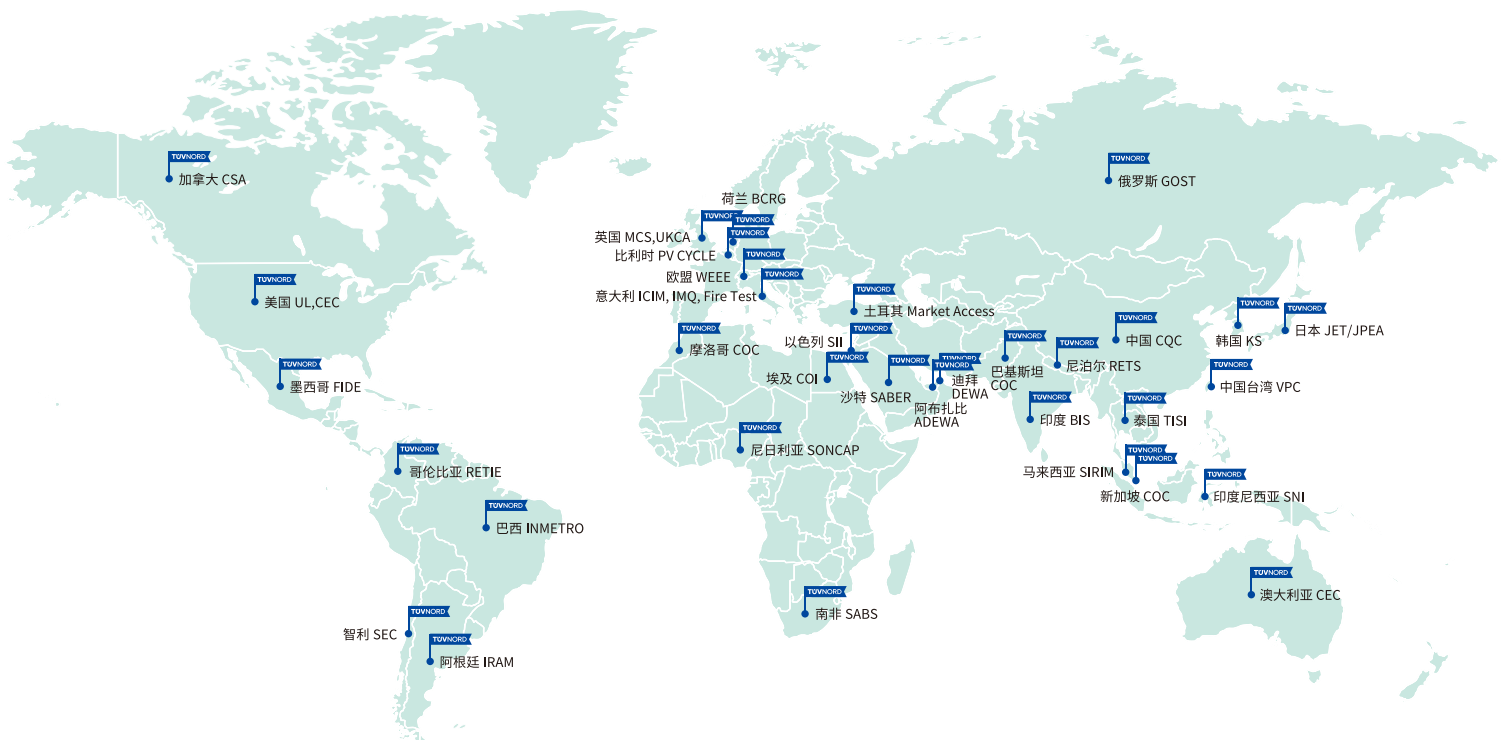
TÜV NORD 在中国大陆、台湾及欧洲本土都拥有丰富的光伏检测实验室资源，这些实验室通过 ISO/IEC 17025 规范认证、具有专业的光伏组件及零部件测试能力，并配备先进的测试设备及优秀的技术专家。同时 TÜV NORD 作为 IECCE-CB 与 IECRE 互认体系成员，拥有多处 CB 实验室以及超大的测试容量，让您的光伏产品在我们实验室可以随到随测，缩短整个测试认证周期，让您在短时间提高全球市场竞争力。

### Global Market Access

#### 全球市场准入

We keep a good cooperation with many local certification bodies all over the world, so we can help our clients get access to these international markets rapidly.

我们与全球大部分国家光伏准入机构均有良好的合作，可以为客户快速完成各个地区的市场准入。



# PV Modules

## 光伏组件

### Basic Certification 基础认证

- IEC 61215 / IEC 61730 Design Qualification and Safety for C-Si PV Modules  
晶硅光伏组件 IEC 基础认证
- IEC 61215 / IEC 61730 Design Qualification and Safety for Thin-film PV Modules  
薄膜光伏组件 IEC 基础认证
- IEC 62108 / IEC 62688 Design Qualification and Safety to CPV Modules  
聚光光伏组件 IEC 基础认证

### Emerging Technology Certification 前沿技术认证

- High Efficient PV Modules  
高效光伏组件 (MWT、PERC、TOPCon、HJT、IBC、Half-cut、Shingled、MBB/SMBB)
- HOT** IEC 63092 Building-integrated PV Modules  
光伏建筑一体化 (BIPV)
- HOT** EN 50583 Photovoltaics in buildings  
光伏建筑一体化 (BIPV)
- Perovskite PV Modules  
钙钛矿电池组件
- Smart PV Modules  
智能光伏组件

### Specified Testing for PV Modules 光伏组件单项测试

- HOT** IEC 61701 Salt Mist Corrosion Testing  
光伏组件盐雾测试 / 认证
- IEC 62716 Ammonia Corrosion Testing  
光伏组件氨气测试 / 认证
- IEC 60068-2-68 Dust and Sand Test  
光伏组件沙尘测试 / 认证
- IEC TS 62804-1 Test for the Detection of Potential-Induced Degradation  
光伏组件电势差诱导衰减测试 / 认证 (PID)
- HOT** Energy Efficiency Rating of PV Modules  
光伏组件户外发电能效评级
- HOT** IEC TS 63209 Accelerated Stress Test for PV Modules  
光伏组件加速老化测试 / 认证
- HOT** Wind Tunnel Test  
风洞测试
- Anti-glare Test  
防眩光测试
- HOT** LID Test / LET ID Test  
光诱导衰减测试 / 热辅助光诱导衰减测试认证
- UL 790 / UNI 9177 Fire Test  
光伏组件防火测试 / 认证 (北美 / 意大利)
- IEC TS 62782 (Low Temperature) Cyclic Dynamic Mechanical Load Testing  
光伏组件 (低温) 动态机械载荷测试 / 认证
- IEC 62759-1 Transportation Testing  
光伏组件模拟运输测试 / 认证
- IEC 62938 Non-uniform Snow Load Testing  
光伏组件不均匀雪载测试 / 认证
- ISO 6988 SO<sub>2</sub> Resistance Testing  
光伏组件酸雾测试 / 认证
- PANFILE for PVsyst according to IEC 61853 Series Standards  
光伏组件 PANFILE 测试
- Guidelines for Qualifying at High Temperatures  
IEC TS 63126 高温运行环境下光伏组件认证

### Others 其他服务

- Utilization of Customer's Testing Facilities (CTF)  
实验室认可计划
- IEC 60904 Series STC Measurement on Cells and Modules  
电池片或组件功率标定测试
- IEC 62941:2019 Quality System for PV Module Manufacturing  
光伏组件制造过程的质量管理体系认证
- Carbon Footprint Certification for Photovoltaic Modules (ECS, EPD, etc.)  
光伏组件碳足迹认证 (法国碳足迹, 意大利 EPD, 国际 EPD 等)

# Light and elevated Temperature Induced Degradation (LETID)

## LETID 热辅助光致衰减



LETID, as known as Light and Elevated Temperature Induced Degradation. With the PV modules using high efficiency technology such as PERC/TOPCon/HJT dominating the market, the phenomenon of LETID has become a hot topic. Compared to the LID, LETID continues to occur for months or even years after installation and recovers more slowly, with a power degradation of even more than 10%. TÜV NORD provides testing and certification services for LETID in accordance with IEC TS 63342:2022, testing the LETID sensitivity of PV modules.

LETID, 又称为热辅助光致衰减。随着使用 PERC/TOPCon/HJT 等技术的高效太阳能组件已占据市场主导地位, 关于高效电池组件的 LETID 现象成为一个热议的话题。相比于熟知的 LID, LETID 会在安装后几个月甚至几年内持续发生且恢复速度更加缓慢, 其功率衰减甚至会超过 10%。TÜV NORD 根据 IEC TS 63342:2022 标准, 为客户提供 LETID 的相关测试认证服务。

# Accelerated Stress Test for PV Modules

## 光伏组件加速老化测试

PV modules are intended to be used outdoors for 25 or 30 years. Its degradation will directly affect the power generation and revenue. Whether the module can be safe and reliable under the actual use of the external environment, and ensure its power performance to maintain above a certain level, especially the power degradation of the module under long-term use, has been widely concerned in the photovoltaic industry.

光伏组件在户外使用 25 或 30 年，其衰减率直接影响发电量和收益。组件能否在实际使用的环境条件下安全、可靠，并保证其发电性能保持在一定水平之上，尤其是组件长期使用下的发电功率衰减问题，受到广泛关注。

IEC 61215 and IEC 61730 series only can evaluate the basic performance and reliability requirements of the PV modules. Based on years of experience in outdoor / laboratory tests and IEC TS 63209 series standard, TÜV NORD provides extended stress test and certification services according to the climate characteristics of different module types and installation environment to those customers who crave for higher quality and reliability.

IEC 61215、IEC 61730 系列标准，只能评估光伏组件基本的性能和可靠性要求。TÜV NORD 根据多年户外与实验室检测经验和 IEC TS 63209 系列标准，参考不同组件类型与安装环境气候特征，为有着更高质量与更高可靠性要求的客户定制光伏组件加速老化测试认证服务。



# Energy Efficiency Rating of PV Modules

## 光伏组件户外发电能效评级

### Test Purpose

#### 测试目的

TÜV NORD has proposed a new solution which is based on outdoor performance analysis. Integrating the outdoor performance data, lab testing results and software simulation of PV systems, we provide accurate and reliable Energy Yield Rating Certificate for investors. At the same time, it is easier to find some tough issues during outdoor degradation test compared with laboratory test, such as water penetration of PV module, seal failure, EVA yellowing, finger oxide, etc.

TÜV NORD 推出了以户外实证为基础的全新的解决方案。基于户外实证采集到的数据，结合实验室的检测结果，再通过光伏系统模拟软件，给客户id提供准确可靠的光伏组件发电能效评级证书。同时户外测试可以发现实验室内比较难发现的一些组件问题，例如组件渗水、密封失效、EVA 黄变和栅线氧化等。

### Example: PV Modules with Bifacial Solar Cells

#### 实际案例：双面发电光伏组件



# Building-integrated PV Modules (BIPV)

## 光伏建筑一体化

BIPV is a technology that integrates solar power generation products into buildings. PV Modules can be directly used as building materials such as factory roof and curtain wall. In addition to the power generation function, BIPV also need to be building materials, aesthetics and other functions. The building envelope functions shall be, depending on the application, one or more of following: mechanical rigidity or structural integrity, primary weather impact protection (rain, snow, wind, hail), shading, daylighting, thermal insulation, fire protection, noise protection, separation between indoor and outdoor environments, security, shelter or safety.

光伏建筑一体化是一种将太阳能发电（光伏）产品集成到建筑上的技术，也就是说可以将光伏组件直接用作厂房屋顶、幕墙等建筑材料的形式。除了发电的功能之外，BIPV 组件还需兼具建材、美观等功能于一身。作为建筑围护结构，必须满足以下一项或多项功能：机械刚性或结构完整性；主要天气影响防护（雨、雪、风、冰雹）；遮阳、采光、保温；消防、防火；噪音保护；室内外环境隔离；保密、保护或安全。

TÜV NORD uses our global resources to integrate IEC/ ISO / EN / GB standards to provide reliability test and global access certification services for BIPV products and systems.

TÜV NORD 利用全球资源整合 IEC、ISO、欧洲及国内相关标准，提供 BIPV 产品和系统的可靠性测试、评估和世界各国准入认证服务。



# PV Components and Materials

## 光伏辅材与零部件



'TÜV NORD Type Tested' Mark  
“零部件型式认证”标志

We assure that PV components with 'TÜV NORD Type Tested' mark on the market also meet the requirements of related international standards or recognized engineering regulations. For the manufacturers of PV modules, it is also an optimal choice of using PV components with 'TÜV NORD Baumuster geprüft' mark to assemble their PV modules.

我们确保市场上印有“TÜV NORD 型式认证”标志的光伏零部件同样符合相关的国际标准与规范。对于光伏组件的生产商而言，采用标识有“TÜV NORD 型式认证”标志的零部件来组装光伏组件是最佳选择。

### PV Components 太阳能光伏零部件

- Junction boxes for PV modules  
光伏接线盒 (IEC 62790)
- Smart-junction boxes for PV modules  
光伏智能接线盒 (IEC 62109)
- Bypass Diode – Thermal runaway test  
旁路二极管热逃逸测试 (IEC 62979)
- Extended-stress testing – Polymeric component materials  
零部件材料加严测试 (IEC 63209-2)
- Connectors for DC-application in PV system  
光伏连接器 (IEC 62852)
- PV cables  
光伏用电缆线 (IEC 62930 & EN 50618)
- Guidelines for qualifying PV modules, components and materials for operation at high temperatures  
高温地区用光伏零部件辅材测试 (IEC TS 63126)

### PV Materials 太阳能光伏用材料

- PV glass  
太阳能光伏用玻璃
- PV encapsulant material (EVA, POE, etc.)  
太阳能光伏用封装材料 (P12.4-AA-09)
- PV ribbon  
太阳能光伏用焊带
- PV silicon gel, tape  
太阳能光伏用硅胶、胶带
- New alloy/Composite frame  
新型合金 / 聚合物复合边框
- Silver paste for solar cell  
太阳能电池用正银 / 背银
- PV flexible front and backsheets (IEC 62788-2-1)  
太阳能光伏用柔性前板和背板

### PV BOS Products 太阳能光伏平衡部件产品

- PV Systems- Design qualification of solar trackers  
太阳能光伏用跟踪支架 (IEC 62817)
- Floating buoy used in floating PV plants  
太阳能光伏用浮体 (P33.3-AA-02)
- Fixed new alloy/composite mounting bracket for photovoltaic(PV) modules  
太阳能光伏用固定支架 (P33.3-AA-01)

# Your Reliable Technical Advisor

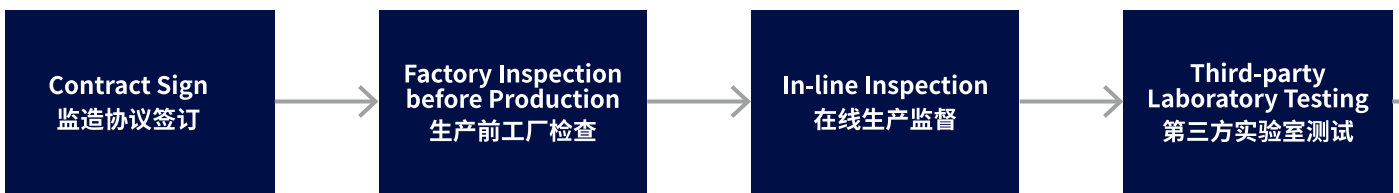
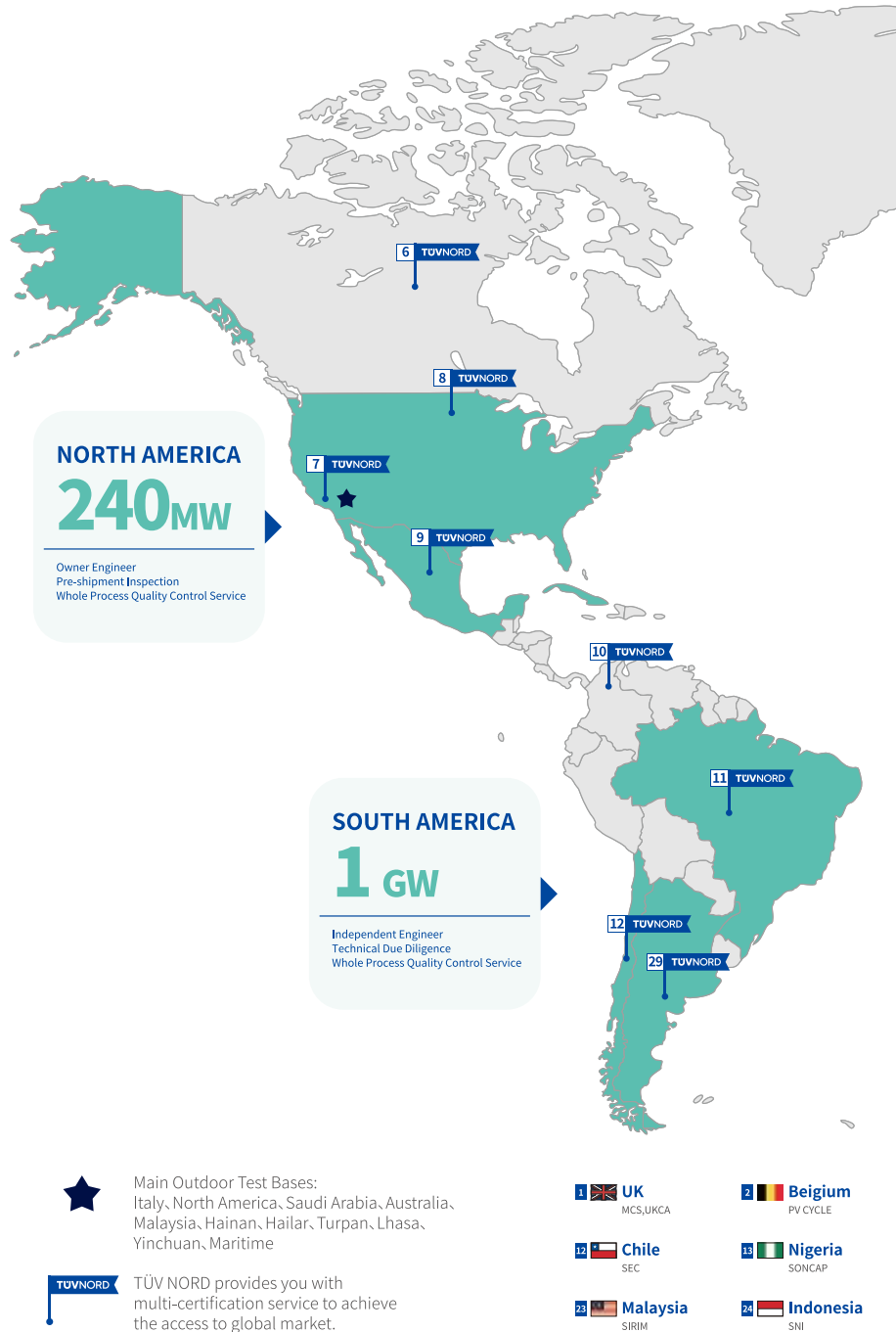
## 您的可靠技术顾问

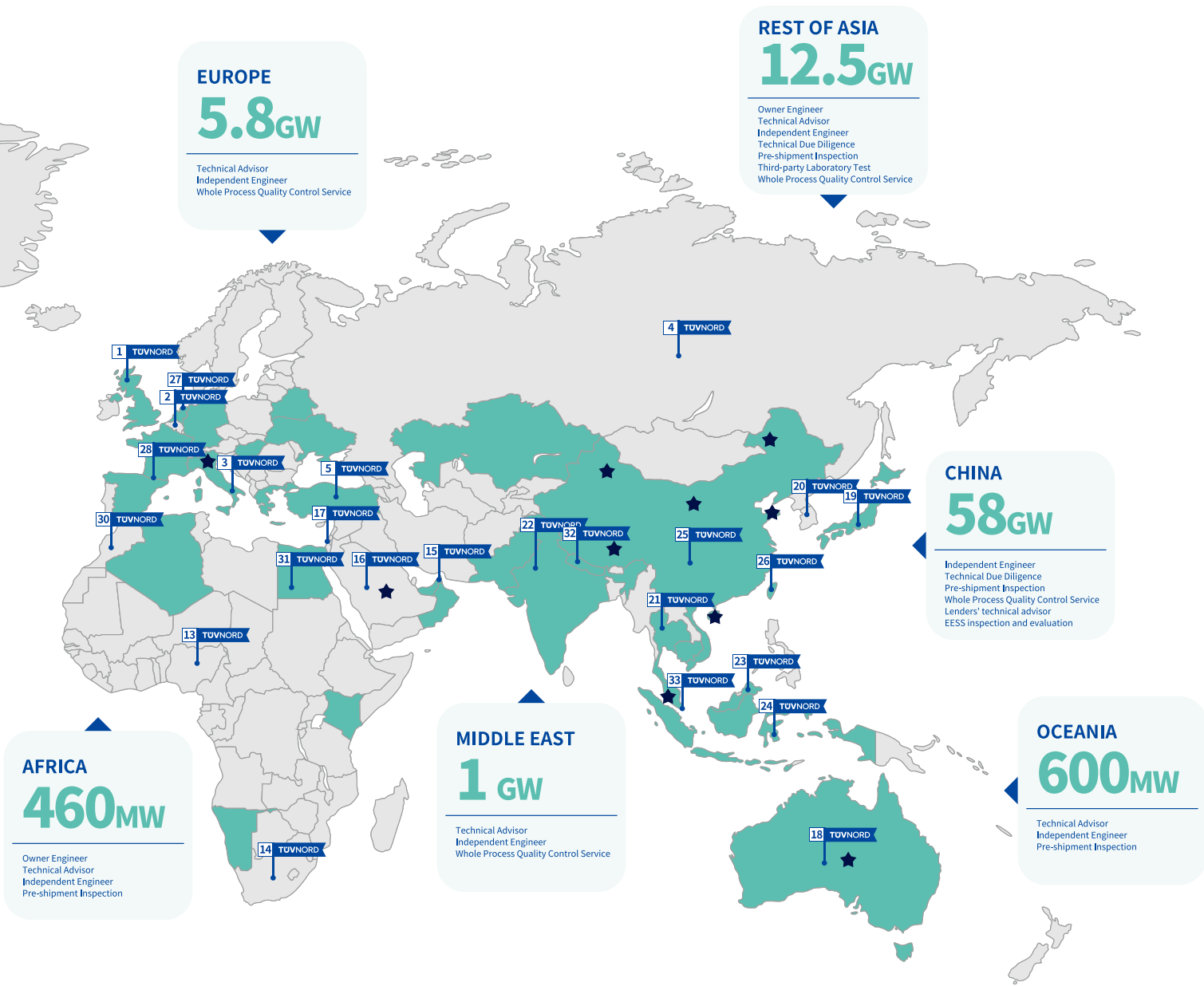
### Whole-process Quality Surveillance Program

#### 全过程质量控制监督计划

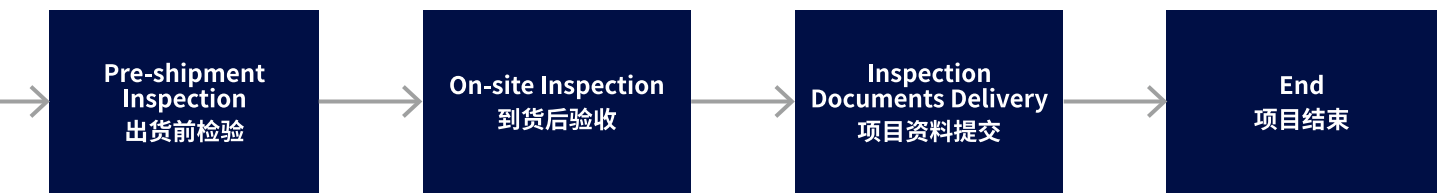
The energy yield depends considerably on the quality of each equipment in a PV power plant, including PV modules, PV components, combiner boxes, inverters, mounting brackets, etc. Due to differences on capability of production process and quality assurance among different manufacturers, it requires rich experiences to identify the diversities. Since each buyer has its unique requirements on quality of products and details of techniques, introducing an expertized and independent third party for surveillance on production process quality control is critical to assure the usage of good raw materials, the utilization of fine production lines and the delivery of qualified products. Until the end of May, 2023, TÜV NORD has completed 80GW worldwide PV product and PV system performance evaluation, ensuring high quality products in the market.

光伏电站的每一个组成部件，无论是光伏组件、光伏零部件，还是汇流箱、光伏逆变器，甚至支架的质量优劣，都会影响到电站的发电性能，最终直接导致了电站的收益减少。由于各设备生产商的生产能力及质量保证体系存在差异，需要丰富的经验才能进行甄别。同时，各业主单位对产品质量要求及技术细节等方面各有不同，由专业且独立的第三方机构进行生产监造，可以保证生产商在原材料使用、生产过程及最终成品质量各环节均能符合业主要求。截止到 2023 年 5 月底，TÜV NORD 已完成 80GW 全球光伏产品及光伏系统评估，为您能购买到高质量的光伏产品保驾护航。





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|--------------------------------|---------------------------|----------------------------|-------------------|-----------------------|-----------------------|-------------------|-----------------------|-----------------------|
| 3  Italy<br>ICIM,IMQ,Fire Test | 4  Russia<br>GOST         | 5  Turkey<br>Market Access | 6  Canada<br>CSA  | 7  California<br>CEC  | 8  USA<br>UL          | 9  Mexico<br>FIDE | 10  Columbia<br>RETIE | 11  Brazil<br>INMETRO |
| 14  South Africa<br>SABS       | 15  Dubai<br>DEWA         | 16  Saudi Arabia<br>SABER  | 17  Israel<br>SII | 18  Australia<br>CEC  | 19  Japan<br>JET,JPEA | 20  Korea<br>KS   | 21  Thailand<br>TISI  | 22  India<br>BIS      |
| 25  China<br>CQC,CGC           | 26  Chinese Taipei<br>VPC | 27  Netherlands<br>BCRG    | 28  WEEE          | 29  Argentina<br>IRAM | 30  Morocco<br>COC    | 31  Egypt<br>COI  | 32  Nepal<br>RETS     | 33  Singapore<br>COC  |



# Your Reliable Technical Advisor

## 您的可靠技术顾问



### Factory Inspection before Production

#### 生产前工厂检查

Conduct factory inspection in designated workshop before production starts and eliminate all non-conformities.

在正式供货之前，对预定生产的工厂（车间）进行工厂检查，正式生产在所有缺陷消除之后才能进行。

### Basis

#### 依据

- Purchase Order, Technical Agreements, Quality Plan (QP)  
采购协议、技术协议、质量保证计划 (QP)
- Related standards and requirements of IEC/ISO  
IEC 和 ISO 对应的标准和要求
- Rich factory inspection experiences of TÜV NORD  
TÜV NORD 丰富的工厂品质审核经验

PV Devices  
光伏设备

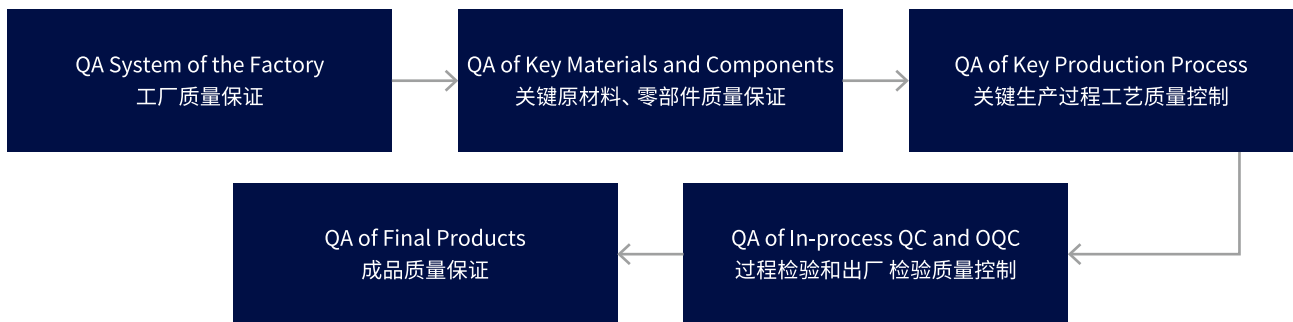
PV Module  
光伏组件

PV Inverter  
逆变器

Mounting Bracket  
边框支架

Battery  
电池

## In-line Inspection 在线生产监督



## Third-party Laboratory Testing 第三方实验室测试

### In-line Verification 线上测试

Some processes can be verified in-line measurements such as pull strength of soldering ribbons, dimension, etc.

一些过程可以通过在线监督得到验证，比如电池片焊接拉力，组件尺寸测量，EL 测试等。

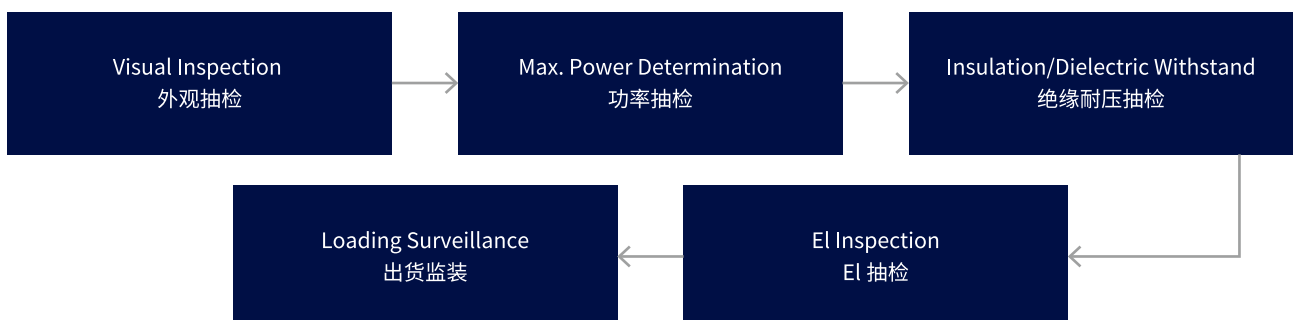
### Third-party Laboratory Test 第三方实验室验证测试

Some process cannot be verified by in-line measurements such as LID/LETID, Potential Induced Degradation Test, Gel Content Test, Peel-off Test etc.

一些过程没有办法通过在线监督得到验证，比如 LID/LETID、PID 测试、封装材料交联度和剥离强度测试等。

## Pre-shipment Inspection 出货前检验

Based on shipment plan, take certain amount of samples and conduct pre-shipment inspection.  
根据出货量，抽取一定数量的样品，进行复检。



# TÜV NORD PV Lab

## 戎得光伏实验室



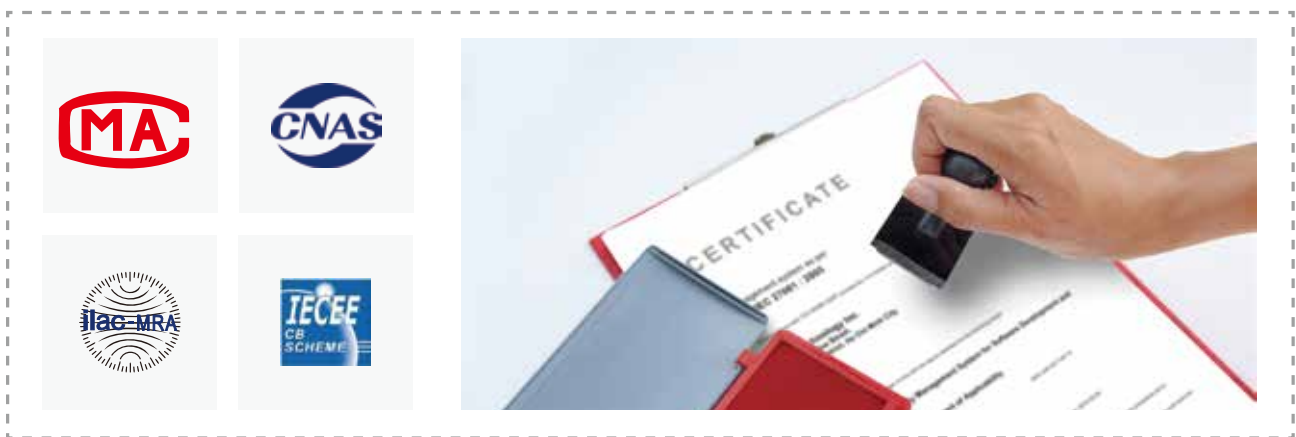
TÜV NORD PV Science and Technology Co, Ltd., whose mother company is TÜV NORD Group, is a third-party testing lab committed to PV testing and inspection, research and development as well as other PV technical services. In recent years, our team has accumulated abundant experiences in testing and certification of PV products and evaluation services of PV plant with immense market-oriented practice in offering the services. TÜV NORD PV lab is built to extending the lead in the market.

戎得（苏州）光伏科技有限公司是 TÜV NORD 集团旗下一家专注于光伏检测、研发及相关技术服务的第三方检测实验室。近年来，我们的团队通过大量面向市场的工作实践，在各类光伏产品测试、认证以及光伏电站的评估服务方面积累了丰富的经验，并在原有技术和运营团队的基础上，建立了戎得光伏实验室。

With a great support from TÜV NORD PV technical team, TÜV NORD PV lab has gathered a strong strength internationally and domestically in the field of testing and certification with advanced testing equipments, reliable inspection capability and broad industrial resources. TÜV NORD PV Lab will strengthen TÜV NORD's comprehensive service capability in all dimension based on the original technical advantages. Located in Wuzhong District, Suzhou and covering an area of 1800 m<sup>2</sup>, TÜV NORD PV Lab has been established and operated according to the ISO/IEC 17025 testing lab quality control system, and it could offer high-end customized technical solutions to customers according to different market demands.

戎得光伏实验室集先进的检测设备、可靠的检测能力、强大的技术团队和资源网络于一身，在检测认证领域具备国际化和本土化两方面的优势。作为 TÜV NORD 旗下全资子公司，戎得光伏实验室将依托原有的技术优势，进一步扩大 TÜV NORD 的综合服务能力。戎得光伏实验室座落于苏州市吴中区，占地面积 1800 平方米。按照 ISO/IEC 17025 实验室管理体系要求建立及运营，能够根据不同的市场需求，为客户提供高端定制化技术解决方案。

## Lab Qualification 实验室资质



## Procedure 测试流程

01	Application form	申请测试
02	Project setup	建立测试项目
03	Test plan	制定测试计划
04	Receive & check the samples	样件接收与检查
05	Testing	执行测试
06	Data and record	数据整理
07	Test report preparation and review	报告编写与审核
08	Test report issue	出具测试报告

80 GW

全球光伏产品及光伏系统评估量  
Worldwide PV Product and PV System Performance Evaluation

30+

全球市场准入  
Global Market Access

150+

全球分支  
Global Branches

280+

全球覆盖区域  
Global Regions

400+

年度工厂检查  
Annual Factory Audit

800+

并网认证  
Grid-connection

5000+

项目总数  
Project Amounts

4000+

证书签发  
Certificates

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