

# Overview on Norms and Standards for Solar Energy Technology Relevant for CSP Development and Implementation

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# Standards in Solar Energy

- Common definitions and nomenclature
- Common symbols
- Materials and properties
- Test standards



## Most Relevant Standards

- ISO 9488 Solar Energy – Vocabulary
- EN 410 and ISO 9050 Glass in Buildings
- EN 12975-12977 and ISO 9806 Solar Thermal Collectors, Systems, Components
  - General
  - Testing
- ISO 9459 Thermal Performance of Solar Collectors
- ISO 9060 Solar energy - specification and classification of instruments for measuring hemispherical solar and direct solar radiation
- ISO 9059 Solar energy - Calibration of field pyrheliometers



# Solar Spectrum

- ISO 9845-1 Solar energy -- Reference solar spectral irradiance at the ground at different receiving conditions
- ASTM G173 - 03 Standard Tables for Reference Solar Spectral Irradiances: Direct Normal and Hemispherical
- (ASTM E 892: withdrawn)



# Materials

- Glass in Buildings
- Optical Glass
- Aluminum
- Coatings (on materials)
- Automotive components



## Measurement and Tests

- Temperature
- Radiation DIN 5030 -5036
- Solar Irradiance
- Meteorology (WMO standards)
- Photogrammetry
- Reflectance (see materials aluminum, glass) and Gloss
- Degradation and wear
- Impact, Hail
- Safety



## Product Tests PV Modules

- IEC [61215](#) Crystalline silicon terrestrial PV modules, design qualification, and type approval
- IEC [61230](#) Safety Standards
- IEC 61730 Electrical Safety, High Voltage Tests - PV module safety qualification, Parts 1 and 2; requirements for construction and testing, including protection class II
- IEC 61646 Thin-film terrestrial PV modules, design qualification, and type approval
- IEC 62108: Design qualification and type approval of CPV (concentrator photovoltaic) modules according to IEC 62108:2007/EN 62108:2008
- IEC 61701: Salt mist corrosion test; requirements of PV modules in salt-laden air
- UL 1703 UL: Standard for safety flat-plate PV modules and panels; extended safety inspections for building-integrated photovoltaics (BIPV)





## Solar Thermal Collector Testing

- EN 12975 and SRCC standard 100: Reliability and performance tests and manufacturing site inspections
- Evaluation of open-air weathering
- Pressure testing
- Temperature testing
- Performance testing of warm water storage
- Inspection of absorbers and internal thermal shock test
- Inspection of standardized systems  
Performance and quality testing based on European standard EN 12976, for example, for integrated storage collectors and thermo-siphon systems
- Inspection of customer-specific systems  
Testing of collectors, regulators, and storage systems with component testing system simulation (CTSS) based on the European prestandard ENV 12977
- Solar Keymark (CEN, DIN CERTCO)



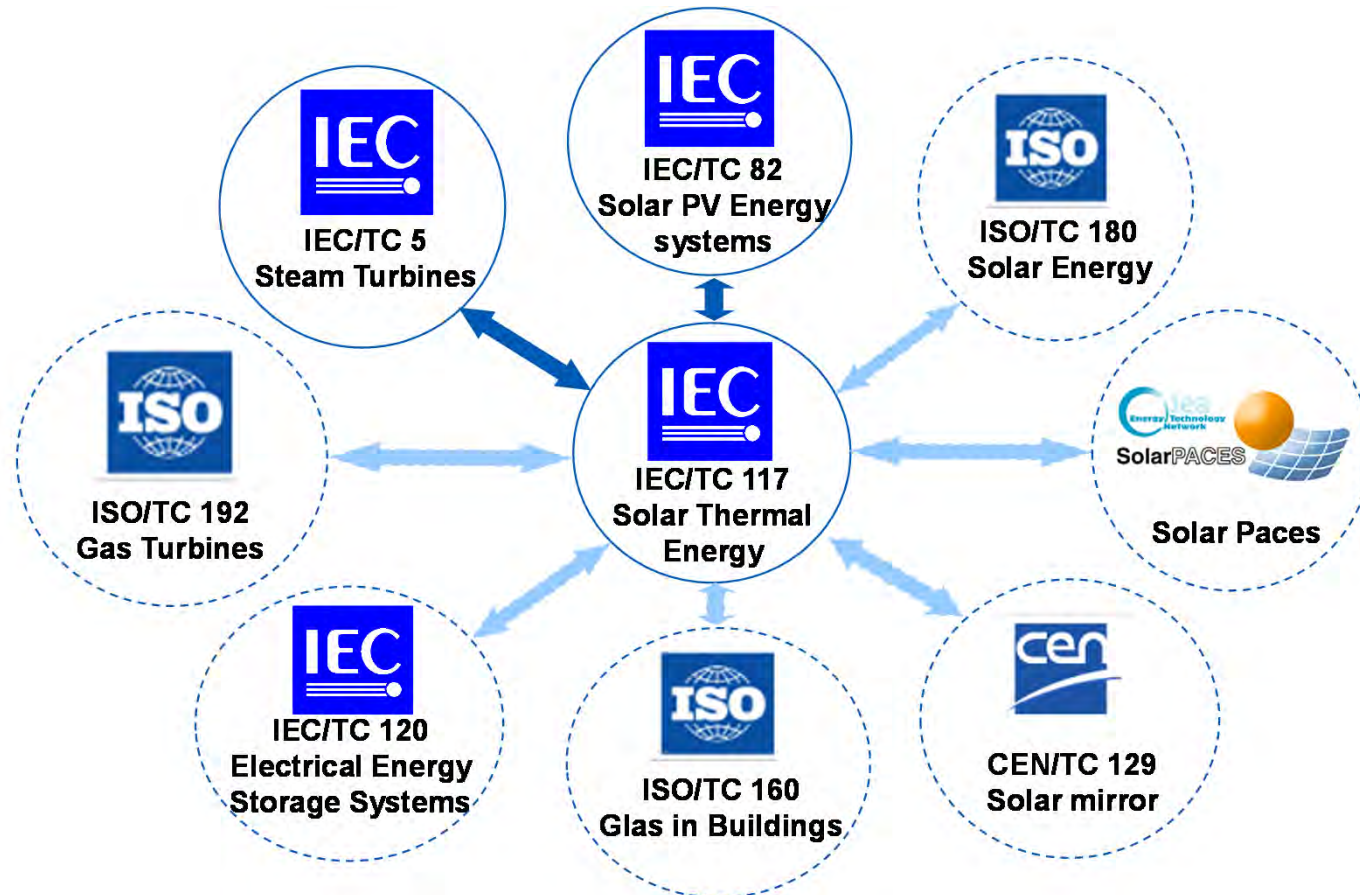


## Involved stake holders

- National and international standardization organizations
  - AENOR
  - AFNOR
  - UNI
  - SNV
  - DIN/DKE
  - BSI
  - ...
  - CEN
  - CENELEC
  - ISO [www.iso.org](http://www.iso.org)
  - IEC [www.iec.ch](http://www.iec.ch)
- Testing institutions, certification bodies



# Standards for Solarthermal Electric Power Plants



## Other related committees

### Europe:

- CEN/TC 312 Thermal solar systems and components
- CEN/TC 312, EN12975-2 “Thermal solar systems and components - Solar collectors - Part 2: Test methods”
- AEN/CTN 206/SC1: AENOR sub-committee on “thermoelectric solar energy systems”

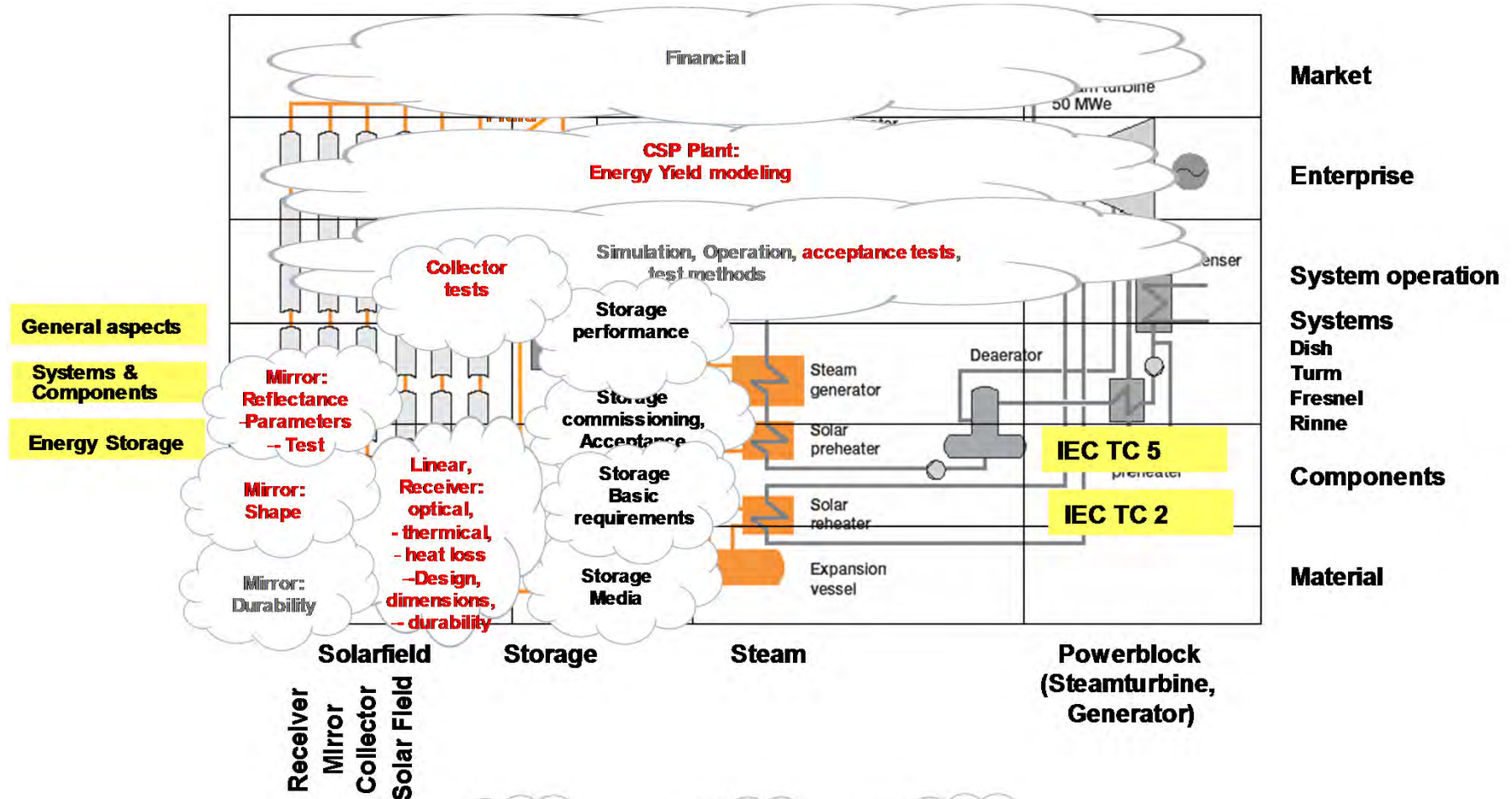
### Germany:

- NA 041-01-56 AA Solaranlagen des Normenausschusses Heiz- und Raumlufttechnik (NHRS) im DIN Deutsches Institut für Normung e.V.

### US

- ASME PTC 52 Thermo Solar Power Plant Performance Measurement





Already defined in Tel Aviv Meeting

Priority topic proposals DKEK 374

Further proposals DKEK 374



## Status in CSP / STE Standardization

- IEC Technical Committee 117 founded in 2011
- National Committees and Working groups
  - System
  - Components
  - Storage
- Activities
  - Typical Meteorological Year
  - Performance Test for Solar Fields / Acceptance Tests





## Status in CSP / STE Standardization (2) Working Group Activities

### Working groups

- Definitions, Tests
  - Receivers (e.g. geometry, materials, optical performance, heat loss measurement, durability testing)
  - Reflectors (e.g. reflectance, shape, durability)
  - Support Structures
  - Tracking
  - Collectors and Testing
  - Heat Transfer Fluids (e.g. properties, safety)
  - Sensors (e.g. angular encoders, irradiance)
  - Joints



## Summary

- Basic set of standards are existing from technology areas
- PV module testing is state of the art and has standards
- thermal collector testing is state of the art and has standards
  
- international activities for CSP technology have started in 2011
  - important contributions from AENOR (Spain) and
  - Solarpaces (Task III)
  
- International agreement is required to proceed
  
- Don't invent your own nomenclature, take what is existing
- Towards product standards and industrialization more work needed

