

# Long-Term Sequential Testing (LST) of PV Modules

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# Quality Assurance Testing @ TÜV Rheinland

## One-Stop Solution: From Components to Power Plants

### Global PV Component and PV Module Certification

Junction Boxes, Cables, Connectors, PV & CPV Modules, Rack and Mounting

Consultation

Testing

Certification

#### Junction Box

DIN V VDE 0126-5; 2008

#### Cable

TÜV 2Pfg1169; 2007

#### Connector

EN 50521; 2008

#### PV/CPV Module

IEC 61215

IEC 61646

IEC 61730

IEC 62108

**ANSI/UL 1703 (NRTL)**



- Periodic inspection
- Qualified, IEC 61215
- Safety tested, IEC 61730
- Long-term sequential testing

Seal  
with Plant-ID

1000105555

検索

Installer  
Training

Global PV Power Plant Certification

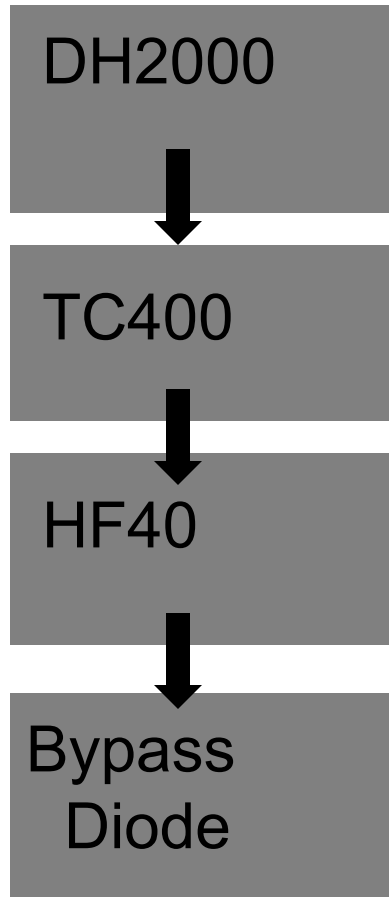
Planning

Installation

Operation

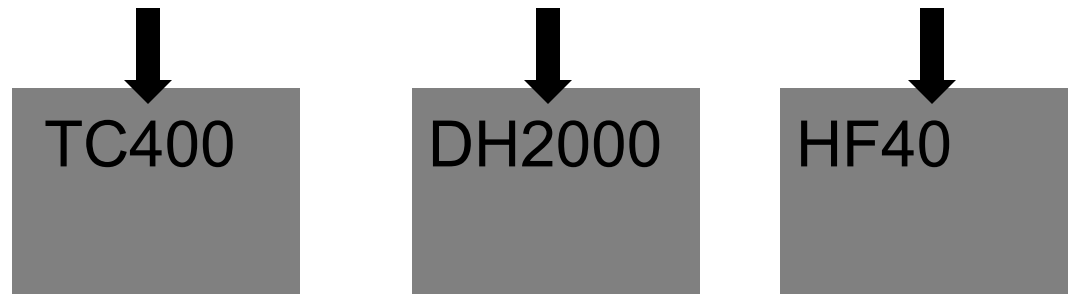
# Comparative Testing: Types

Long-Term Sequential Testing



vs.

Conventional Extended Testing



Sequential	Extended
Multi-variable & variable preconditioning	Single-variable & No variable preconditioning

# LST: Test Samples (3) and Stress Test Blocks (13)

	Sample 1	Sample 2	Block		
Blocks					
	Receiving	Receiving		6 TC200-Teardown	6 TC200-Teardown
	PreCon-Setup	PreCon-Setup		Visual Insp	Visual Insp
	PreCon-Test	PreCon-Test		MaxPower	MaxPower
	PreCon-Teardown	PreCon-Teardown		DielWithstd	DielWithstd
	Visual Insp	Visual Insp		WetLeak	WetLeak
	MaxPower	MaxPower		TC300-Setup	TC300-Setup
	DielWithstd	DielWithstd		7 TC300-Test (+100 cycles)	7 TC300-Test (+100 cycles)
	WetLeak	WetLeak		TC300-Teardown	TC300-Teardown
	DampHeat-Setup	DampHeat-Setup		Visual Insp	Visual Insp
1	DampHeat-Test 1000h (accumulated)	DampHeat-Test 1000h (accumulated)	1	MaxPower	MaxPower
	DampHeat-Teardown	DampHeat-Teardown		DielWithstd	DielWithstd
	DielWithstd	DielWithstd		WetLeak	WetLeak
	WetLeak	WetLeak		TC400-Setup	TC400-Setup
	Visual Insp	Visual Insp		8 TC400-Test (+100 cycles)	8 TC400-Test (+100 cycles)
	MaxPower	MaxPower		TC400-Teardown	TC400-Teardown
	DampHeat-Setup	DampHeat-Setup		Visual Insp	Visual Insp
2	DampHeat-Test 1250h (+250 h)	DampHeat-Test 1250h (+250 h)	2	MaxPower	MaxPower
	DampHeat-Teardown	DampHeat-Teardown		DielWithstd	DielWithstd
	DielWithstd	DielWithstd		WetLeak	WetLeak
	WetLeak	WetLeak		HumFreez-Setup	HumFreez-Setup
	Visual Insp	Visual Insp		9 HumFreez-Test 10 (accumulated)	9 HumFreez-Test 10 (accumulated)
	MaxPower	MaxPower		HumFreez-Teardown	HumFreez-Teardown
	DampHeat-Setup	DampHeat-Setup		DielWithstd	DielWithstd
3	DampHeat-Test 1500h (+250 h)	DampHeat-Test 1500h (+250 h)	3	Visual Insp	Visual Insp
	DampHeat-Teardown	DampHeat-Teardown		MaxPower	MaxPower
	DielWithstd	DielWithstd		WetLeak	WetLeak
	WetLeak	WetLeak		HumFreez-Setup	HumFreez-Setup
	Visual Insp	Visual Insp		10 HumFreez-Test 20 (+10 cycles)	10 HumFreez-Test 20 (+10 cycles)
	MaxPower	MaxPower		HumFreez-Teardown	HumFreez-Teardown
	DampHeat-Setup	DampHeat-Setup		DielWithstd	DielWithstd
4	DampHeat-Test 1750h (+250 h)	DampHeat-Test 1750h (+250 h)	4	Visual Insp	Visual Insp
	DampHeat-Teardown	DampHeat-Teardown		MaxPower	MaxPower
	DielWithstd	DielWithstd		WetLeak	WetLeak
	WetLeak	WetLeak		HumFreez-Setup	HumFreez-Setup
	Visual Insp	Visual Insp		11 HumFreez-Test 30 (+10 cycles)	11 HumFreez-Test 30 (+10 cycles)
	MaxPower	MaxPower		HumFreez-Teardown	HumFreez-Teardown
	DampHeat-Setup	DampHeat-Setup		DielWithstd	DielWithstd
5	DampHeat-Test 2000h (+250 h)	DampHeat-Test 2000h (+250 h)	5	Visual Insp	Visual Insp
	DampHeat-Teardown	DampHeat-Teardown		MaxPower	MaxPower
	DielWithstd	DielWithstd		WetLeak	WetLeak
	WetLeak	WetLeak		HumFreez-Setup	HumFreez-Setup
	Visual Insp	Visual Insp		12 HumFreez-Test 40	12 HumFreez-Test 40
	MaxPower	MaxPower		HumFreez-Teardown	HumFreez-Teardown
	TC200-Setup	TC200-Setup		DielWithstd	DielWithstd
				Visual Insp	Visual Insp
				MaxPower	MaxPower
				WetLeak	WetLeak
				BypassD-Setup	BypassD-Setup
				13 BypassD-Test	13 BypassD-Test
				BypassD-Teardown	BypassD-Teardown
				Visual Insp	Visual Insp
				MaxPower	MaxPower
				DielWithstd	DielWithstd
				WetLeak	WetLeak

# 1 YEAR SEQUENCE

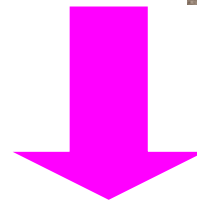
# Eventual Goal: Acceleration Factor

Accelerated Testing  
(LST)



+

Field Testing  
(LST PLUS)



## Acceleration Factor

# Field Test Locations

**Test  
Locations**

## **LST Locations:**

**TÜV Japan  
(Competence)  
TÜV PTL (USA)  
TÜV Germany  
TÜV Shanghai  
TÜV Taiwan  
TÜV India**

## **Outdoor Locations:**

**Hot-Dry  
Cold-Dry  
Hot-Humid**