Scuola universitaria professionale della Svizzera italiana
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SUPSI

EXTENDED MECHANICAL TEST

1. STATIC LOAD TEST on PV MODULES
2. STATIC LOAD TEST on PV MODULES and STRUCTURES
3. EXTENTED HAIL TESTS on PV MODULES

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Accreditated ISO 17025
by SAS under n.531

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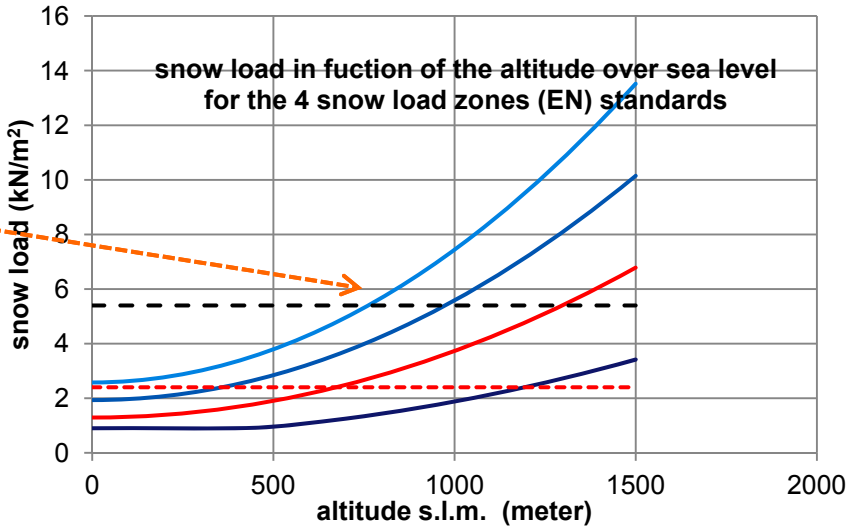
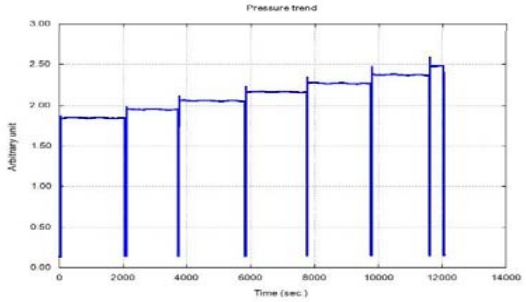
Extended mechanical load test

Why: IEC snow load test is not enough for all regions



Solution: Static testing on the front of the module for heavy snow load in dependence of the local requirements and PV system configuration!



$$s = \mu * C_e * C_t * s_k$$

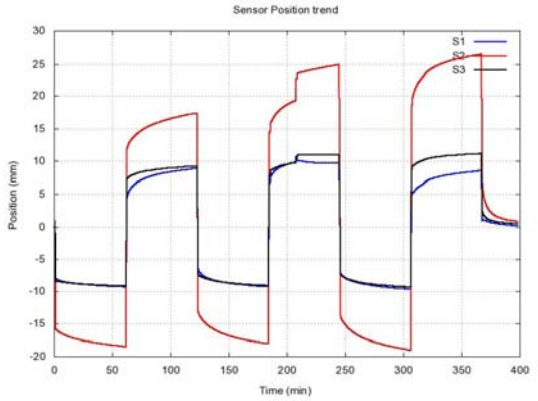
s_k	horizontal snow load on ground
C_e	exposure coefficient (0.8 – 1.2)
C_t	thermal coefficient (0.8 – 1.2)
μ	inclination of modules (°)

Test procedure:

Incremental load on the front for max. load determination

End of test: broken or max. permitted deflection ?

Conditioning (TC – DAH ??)



Control measurements:

EL – power at STC – WL – INS - deflection

STATIC MECHANICAL LOAD TESTING WITH STRUCTURE

Special requirements – related problems:

PV mounting structures under high loads → regulated by building codes

But:

PV modules with clamping (glass) and high snow load → no tests

Frame / laminate resistance under cold conditions and ice – snow loads

Structures with snow retaining systems (or similar safety installation)

Clamping (type – clamping force – geometry – positions) is important in traction and in pressure

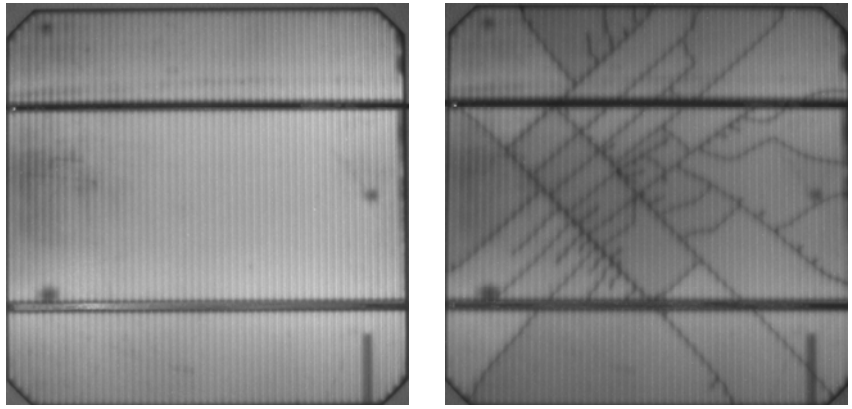
HAIL TESTING

Switzerland		IEC Standard	
DIAMETER (mm)	Kinetic Energy (J)	DIAMETER (mm)	Kinetic energy(J)
10	0.04	15	0.25
20	0.7	**25**	**1.9**
30	3.5	35	7.65
40	11.1	45	20.7
50	26.9		

Testing with extend conditions in accordance to the local requirements – hail classes

Test parameters:

- Ice temperature
- Hail diameter
- Speed
- Impact angle
- Number of impacts



before **after impact**

35 mm – 50 m/sec – 45° - Ice temp -1° – 5 impact on cell
Backsheet - 4 mm tempered glass – mc-Si cells

Possible reference values:

Kinetic energy to simplify the comparison
Correction for different ice temperature

Control measurements:

EL – power at STC - VI