

# **Partial Discharge Test** on reverse side foils of PV modules according to IEC 60664-1, IEC61730

6. August 2009

Company / Examined foil:

|                     |            |           |
|---------------------|------------|-----------|
| <b>Madico, Inc.</b> |            |           |
| <b>TPE HD</b>       |            |           |
| Tedlar              | 38 micron  | outside   |
| Adhesive alt.       | 5 micron   |           |
| PET                 | 127 micron |           |
| Adhesive alt.       | 5 micron   |           |
| EVA alt.            | 101 micron | cell side |

\* The EVA is not part of the direct encapsulation system for the solar cells

Number of measurements: 10

Remarks: none

| Extinction voltage |      | Deviation from the mean value (%) |
|--------------------|------|-----------------------------------|
| Min. value in (V)  | 1171 | -5.8                              |
| Mean value in (V)  | 1243 |                                   |
| Max. value in (V)  | 1272 | 2.3                               |

The mean value minus the experimental standard deviation will be used to calculate the max. permissible voltage.

Experimental standard deviation: 29 V

Calculation of the max. permissible operating voltage on the basis of the ascertain values

**Basis: IEC 60664-1**

$U_{max} = U_e \times 1,414 / 1,2 \times 1,25$


1.414 Calculation of the peak value

1.2 Safety factor (humidity, temperature, etc.)

1.25 Safety factor (double or reinforced insul.)

|   |                 |
|---|-----------------|
| <b>Maximum permissible system voltage</b> | <b>1145 VDC</b> |
|---|-----------------|

Responsible for Partial Discharge Testing

  
Dipl.-Ing. S. Menzler

  
Dipl.-Ing. H. Becker

TÜV Rheinland Immissionsschutz und Energiesysteme GmbH, Am Grauen Stein, D-51105 Köln, Germany