Contacting multibusbar (mBB) solar cells at ISFH CalTeC

Technical information (21a)

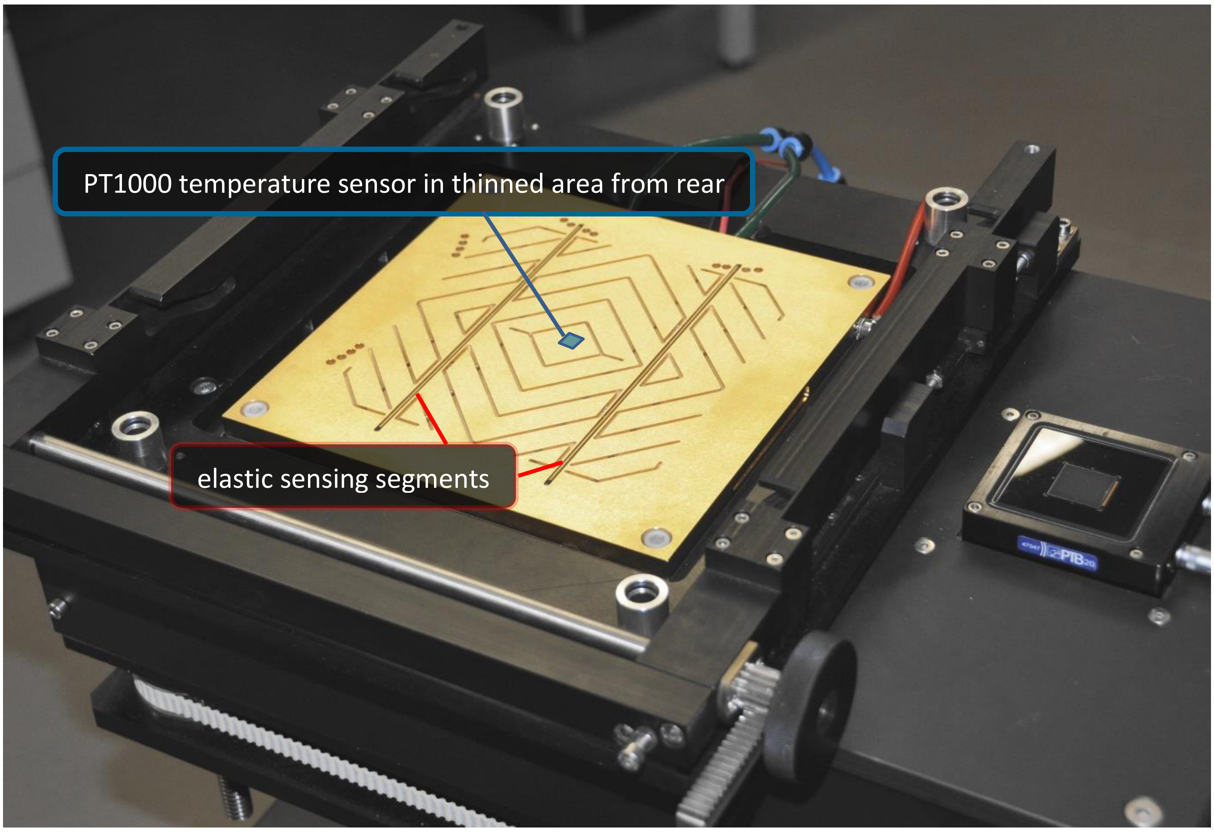

Fig. 1: Full area rear contacting unit for multibusbar (mBB) solar cells.

This contacting unit allows certified measurements of multibusbar solar cells of up to 166 mm (M6) edge length (mono- and bifacial).

The solar cells rear side is fully contacted and the sensing is performed by means of two embedded elastic sensing segments electrically isolated to the rest of the chuck. For monofacial solar cells, this contacting scheme neglects the transport resistance within the rear metal layer. For bifacial solar cells, the grid resistance of the rear metallization is neglected.

A PT1000 temperature sensor is integrated in a thinned area of the contacting unit. By this configuration, lateral temperature gradients between a sensor touching the solar cell and the surrounding temperature controlled chuck are omitted.

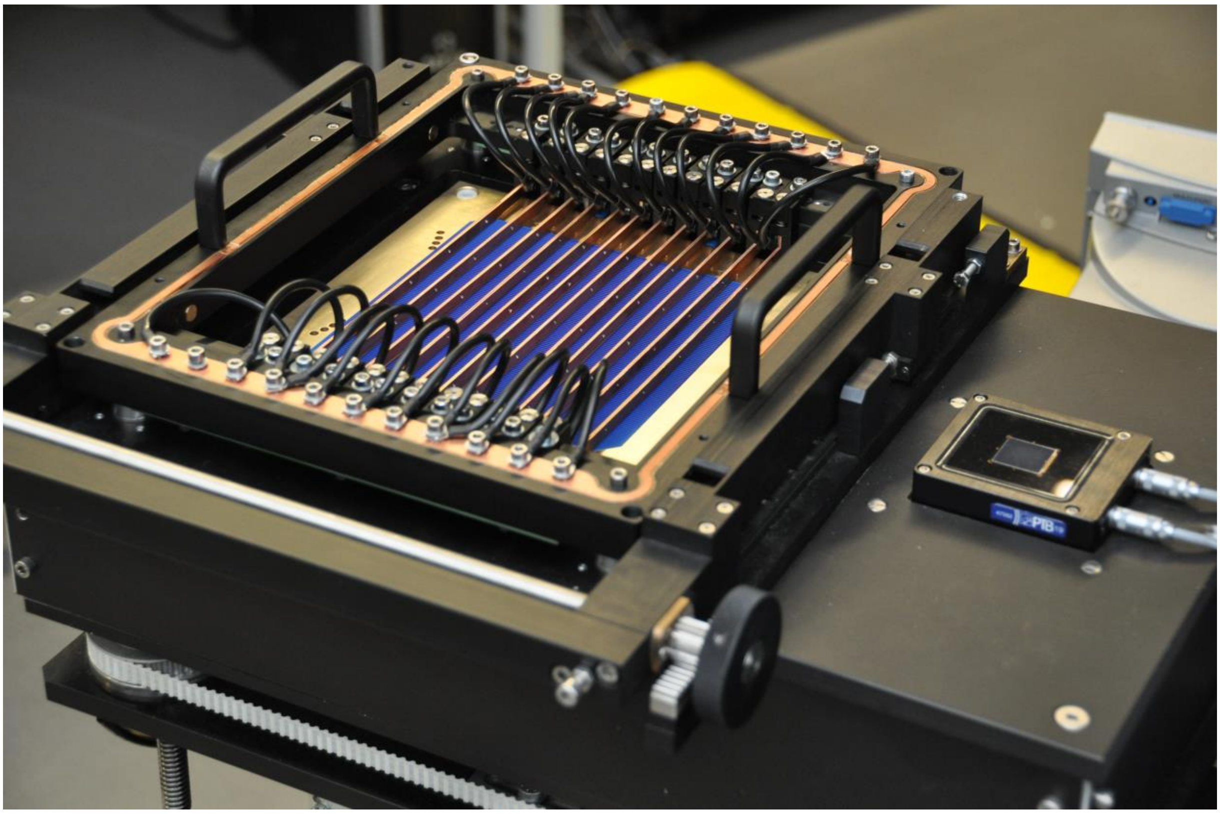

Fig. 2: Contacting the front side of multibusbar solar cells using elastic contact bars.

The solar cells front side is contacted by 12 contacting bars made from gold plated metallic foil wrapped around an elastic core as shown in Fig. 3. The contacting bars are designed and manufactured by pv-tools (www.pv-tools.de).

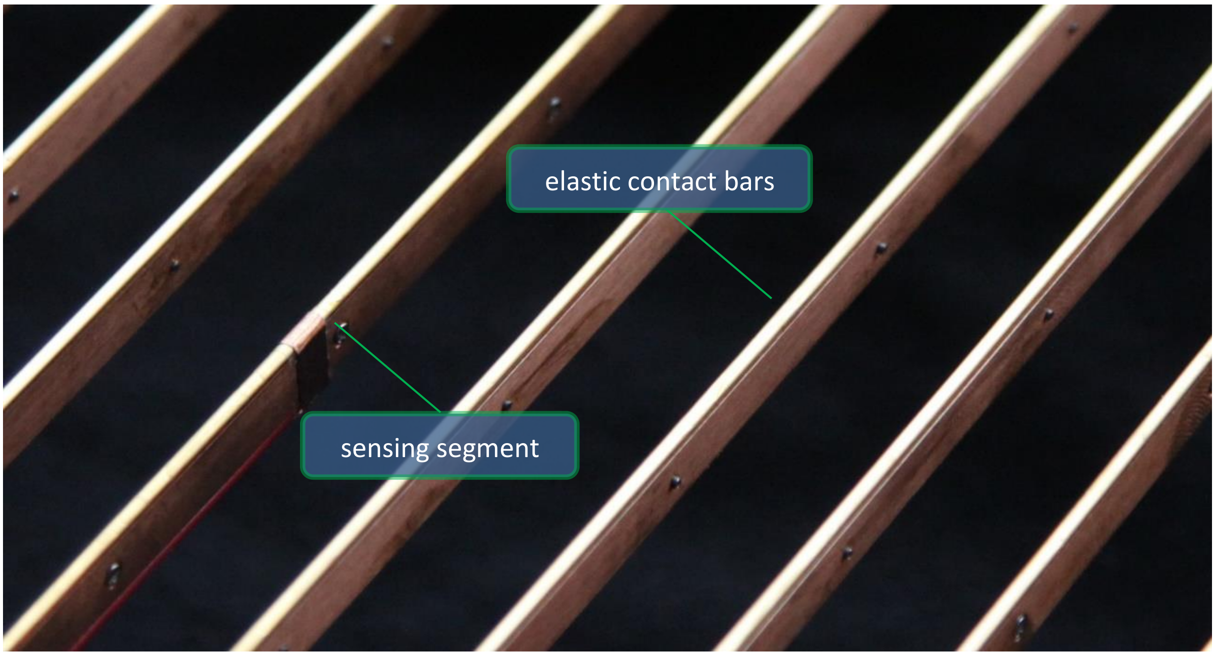

Fig. 3. Contacting bars made from gold plated metallic foil wrapped around an elastic core. The sensing segment is wrapped around an electrically isolated part of the contacting bars.

Since the elastic contact bars as shown in Fig. 3 touch the entire bus bar, they can be regarded as the best possible approximation for busbar resistance neglecting contacting. A contacting scheme aiming at providing the same fill factor FF_{infcp} as one would get if one had contacted the entire busbar of the solar cell. This concept enables reproducible measurements between different laboratories and measuring facilities using the same approach. Series resistance effects of the busbars are effectively cancelled out.

To determine the shading free short-circuit current $I_{SC.0}$, we use one of two available approaches. Either we contact the solar cells at the outer edges of the busbars with Kelvin probes or we measure with contact bars whose number we vary. The first approach is used as long as the potential at the centre of the busbar is below 100 mV under short circuit conditions and contacting at the outer edges. We can than apply a reverse voltage to extract the whole light generated current. In case of lowly conductive busbars or solar cells without busbars, we measure the short circuit current as a function of the number of contact bars used. $I_{SC.0}$ follows from extrapolation to zero bars as shown in Fig. 4. Afterwards contact bars are mounted and the light intensity of the solar simulator is increased until Isc.o is reproduced.

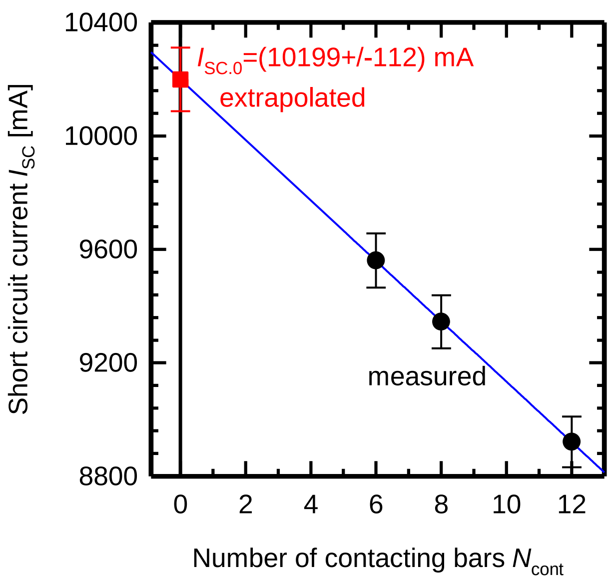

Fig. 4. Short circuit current as a function of the number of contacting bars. Measured values are shown as black circles. The shadow-free short-circuit current $I_{SC.0}$, shown as red square, results from extrapolation to zero contact bars.

Contact

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