Contacting multi-busbar (mBB) solar cells at ISFH CalTeC

Technical information (24a)

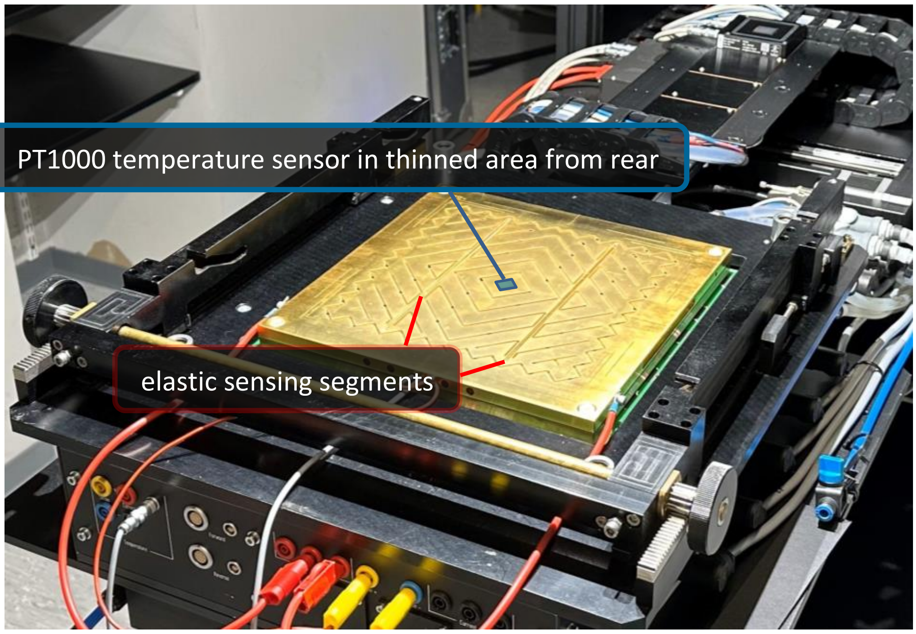

Fig. 1: Full area rear contacting unit for M6, M10 and M12 multi-busbar (mBB) solar cells.

This contacting unit allows calibrated measurements of multi-busbar solar cells of up to 210 mm (M12) edge length (mono- and bifacial). The unit can be used for full, have or other cell cut formats.

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 contacting unit. 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.

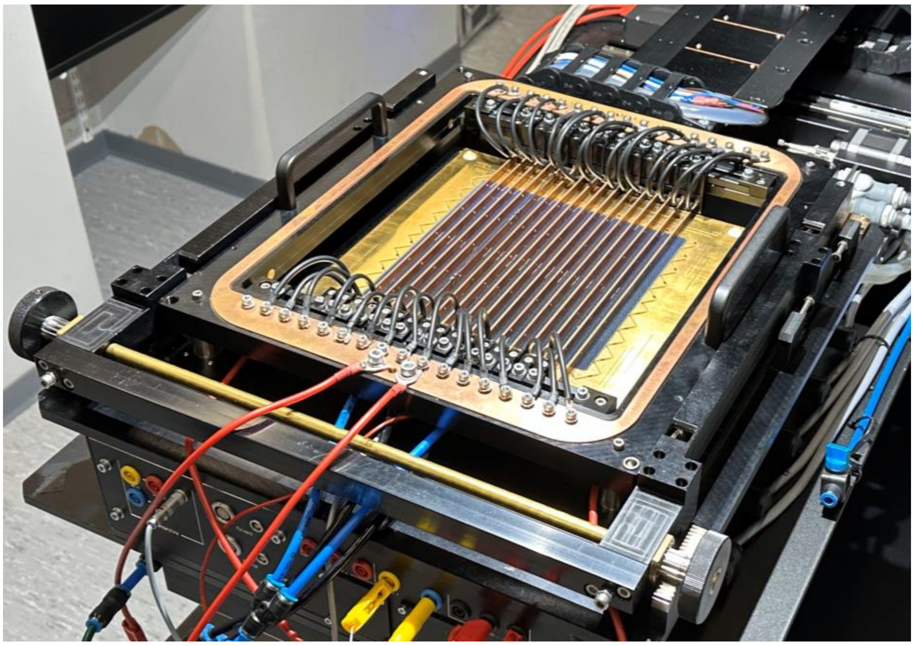

Fig. 2: Contacting the front side of an M10 multi-busbar solar cells with 16 busbars using elastic contact bars.

The solar cells front side is contacted by 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). In order to contact every busbar, the distance between the busbars must be at least 10 mm.

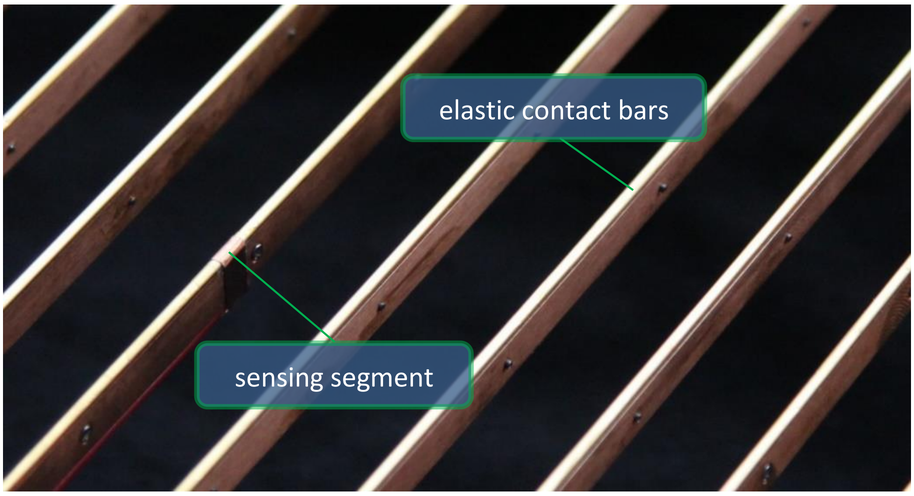

Fig. 3. Contacting bars made from gold plated metallic foil wrapped around an elastic core. The sensing segment is wrapped around an electrically isolated part of the contacting bars.

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 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 for all busbars are mounted and the light intensity of the solar simulator is increased until $I_{SC.0}$ is reproduced.

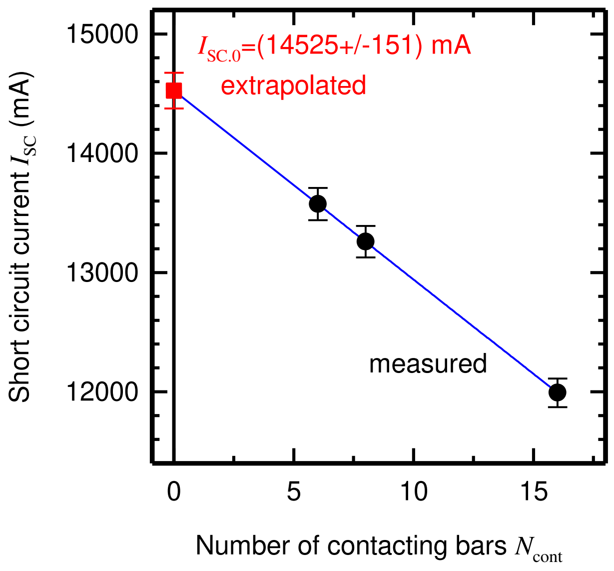

Fig. 4. Short circuit current as a function of the number of contacting bars. Measured values are shown as black circles. The shading-free short-circuit current $I_{SC.0}$, shown as red square, results from extrapolation to zero contact bars.

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