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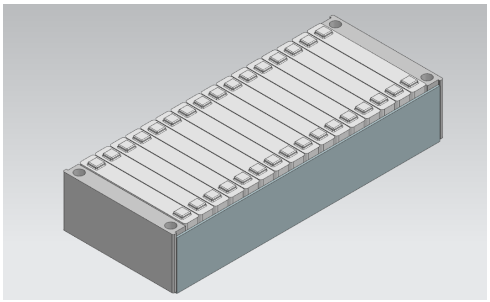
Evaluation of Welding Joint Methods for a Prismatic Battery Cell Module

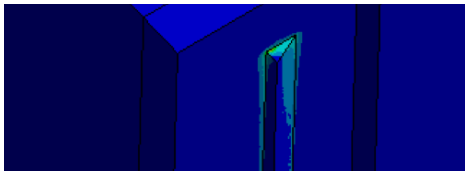


The expansion of the electric vehicle industry has rapidly increased the demands of battery pack solutions. Prismatic battery cells have started to increase in popularity. This is probably due to their high energy density, their squarish shape, their rigid casing and their large scale, which in turn means that you can fulfil the energy storage requirements with a lower number of cells. The shape and the casing of these cells also greatly facilitate the packaging of them, as compared to cylindrical cells or pouch cells which can require additional structure to mount. All cells however swell, due to a number of different reasons, and the structure holding the cells in place need to withstand the resulting forces of the swelling.

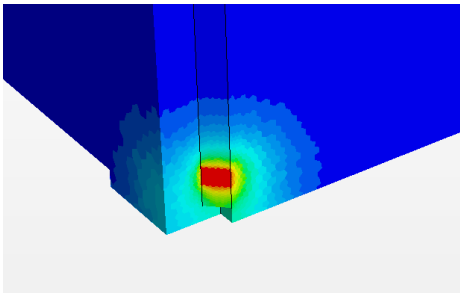
The thesis evaluates how to weld an aluminium frame holding 15 large size prismatic cells. The frame will be welded with the cells in place, which puts a requirement on the welding process. The temperatures in proximity to the cells must not reach levels that are harmful to the cells.

The three welding techniques evaluated in this report are, tungsten inert gas, friction stir, and laser welding. Which are evaluated on a basis of strength and maximum temperature development during the welding process.

The evaluation is performed by using hand calculations and Finite Element Analysis software to evaluate the strength of the welds.



The temperatures in the welding process are evaluated with a temperature simulation using a Finite Volume Method capable software.



The most promising welding method in this report is laser welding, as the research points toward a significant safety factor towards the maximum allowed temperatures on the cells. However, the strength requirement is not met with the use of the same alloys as suggested with the other techniques, but is promising with the use of alternative alloys.