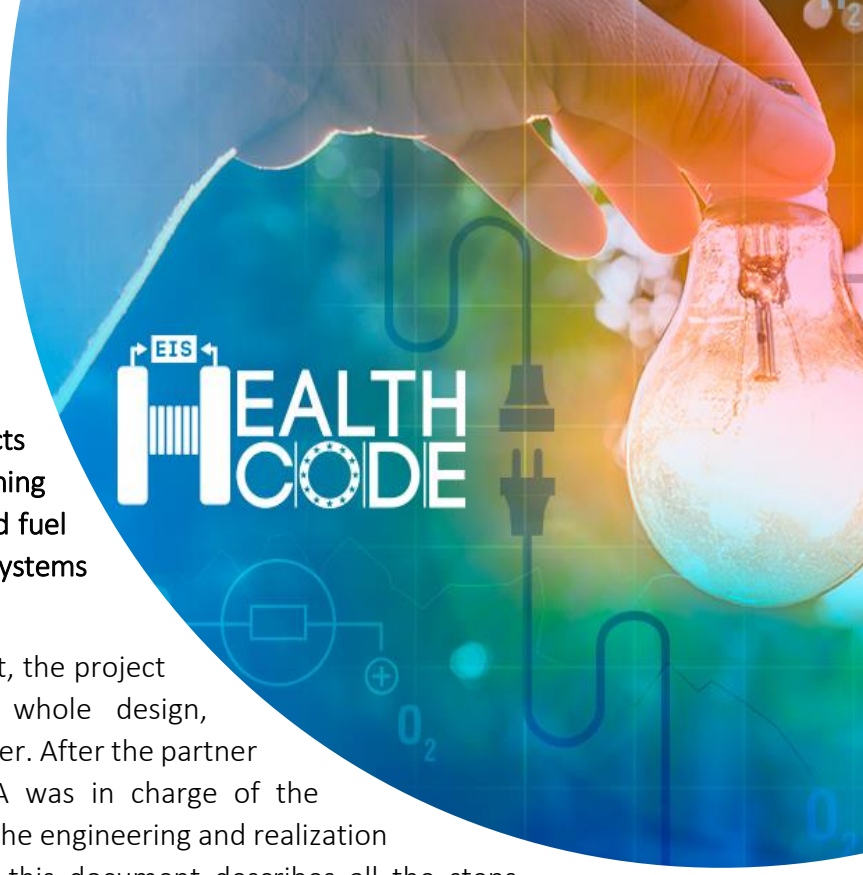
- Public Abstract -

Deliverable D3.2

HV Power conversion stage(s) design report



This Deliverable is focused on all the aspects concerning the design of the DC/AC switching converter dedicated to the grid connected fuel cell system provided by Ballard Power Systems Europe.

According to the initial plan of the project, the project partner TOE was in charge of the whole design, engineering and realization of the converter. After the partner TOE was substituted by BITRON, UNISA was in charge of the converter design, while it is planned that the engineering and realization will be assigned to a third party. Thus, this document describes all the steps followed from the definition of the converter specifications up to the final choices in terms of conversion topologies and control. Further steps towards the engineering of the converter and its physical implementation will be done in the frame of the Task 3.3, by working towards the D3.4, when the engineering and the realization of the switching converter will be assigned to the third party. A strict cooperation with the producer, which will profit from the results given in this document and of the further material that also includes the simulation files, will allow that a specific implementation of each part of the converter complies with the fixed specifications.

In order to pursue the objective of developing a commercial product as an outcome of the project and also for avoiding any unexpected malfunctioning deriving from cascading a HEALTH-CODE dedicated DC/DC converter with a commercial (e.g. photovoltaic) inverter, it has been decided to develop the whole DC/AC converter for the EIS application.

The inverter has been conceived as a classical full bridge ensuring the grid connection and the injection of the produced power into the AC mains.

The DC/DC converter, which is placed between the stack and the inverter and performing the EIS function, has been structured with two interleaved full bridges phase shift converters. These stages include high frequency transformers providing galvanic isolation and the desired voltage step up. A soft switching technique is also implementable through available integrated circuits in order to achieve a higher conversion efficiency.

Simulation tests have demonstrated the possibility of stimulating the converter in order to perform the EIS analysis in the desired range of frequency with a small detrimental effect of the switching harmonics thanks to the interleaved topology. The filters have been also properly dimensioned in order to ensure a correct operation of the converter during the EIS analysis.
The results achieved are the basis of the converter engineering and construction which will be done by a third party that has demonstrated its experience in realizing switching converters for EIS measurements in the past D-CODE project.