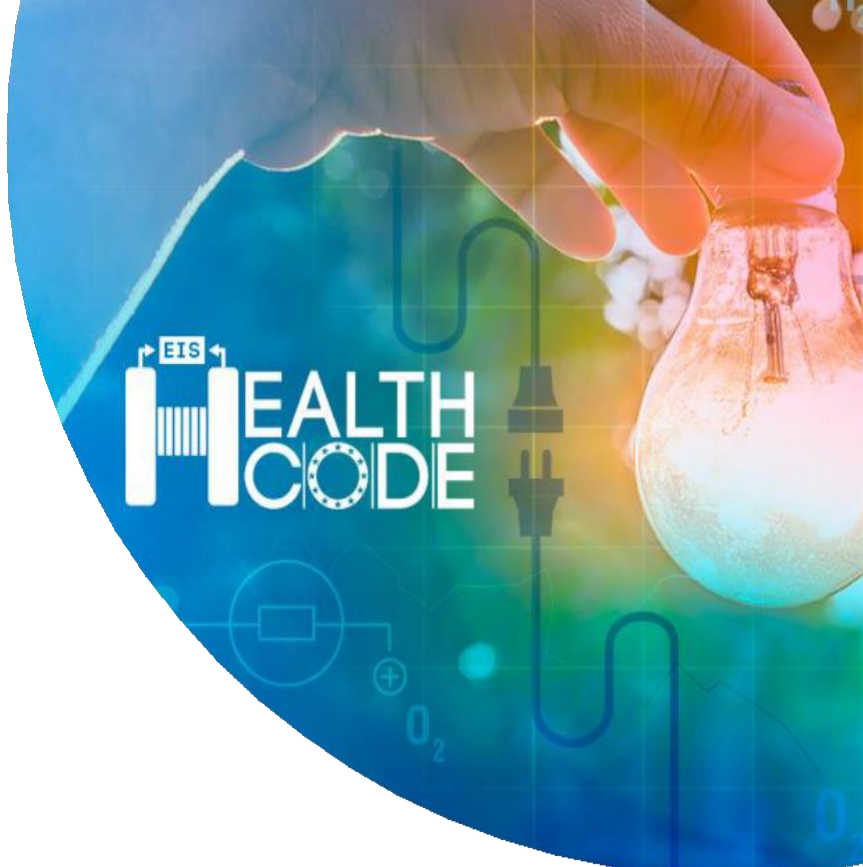


# Deliverable D5.1 System Testing Procedure



In the framework of the HEALTH-CODE project, two different technologies (H<sub>2</sub>/air and H<sub>2</sub>/O<sub>2</sub>) of PEMFC stacks are characterized and tested. The aim of this deliverable is to define tests protocol and EIS measurement techniques for the characterization of a PEM systems ( $\mu$ -CHP and backup) in faulty conditions.

The most relevant faults for the studied technologies and applications are the following five:

- Major change in fuel composition
- Air starvation
- Fuel starvation
- Sulphur poisoning
- Water management: Flooding and Drying.

## BACK UP system

The system is mainly composed of 2 units the electrolyser (P2G) and the PEMFC (G2P). The P2G converts energy from electrical power to gas, while the second one from gas to electrical power. When one unit is operating the second one is stopped.

### EPS fuel cell system technical specifications

Electro Power System - Backup	
Commercial name	ElectroSelf™ 3 DOX
Application	Backup and grid balancing
Anode gas	Hydrogen
Cathode gas	Oxygen
Efficiency	50%
Auxiliary devices	Electrolyser, Battery (start-up units)

### Validation test matrix at 120 A.

Operating Condition	Temperature [C]	H <sub>2</sub> Pressure [mbar <sub>g</sub> ]	O <sub>2</sub> Pressure [mbar <sub>g</sub> ]
Nominal	53	360	420
Drying	60*	360	420
Flooding	45*	360	420
H <sub>2</sub> Starv.	53	360	420
O <sub>2</sub> Starv.	53	360	420

Specifications are given by EPS in order to schedule the system installation and modifications to allow the HEALTH-CODE project tests

# Public Abstract

## μCHP system

The μCHP system from BPSE, Ballard Power Systems Europe (former Dantherm Power) is a μ-CHP for cogeneration of heat and electricity. The 46 cells PEM fuel cell stack is coupled with the natural gas reformer, heat integration and DC/AC inverter. The system is controlled via LabView interface. In order to acquire EIS spectra on the system a brand-new DC/AC inverter was built by Micropi and coupled with the system.

## BALLARD fuel cell system technical specifications

BPSE -μCHP	
Commercial name	μ-CHP LSN1
Application	Cogeneration of heat and electricity
Anode gas	Reformate
Cathode gas	Air
Efficiency	32%
Auxiliary devices	Reformer, heat integration, DC/AC inverter

## Validation test matrix

Operating Condition	CURRENT [A]	AIR λ
NOMINAL	15 – 25 – 35	2
FLOODING	35	2
AIR STARVATION	35	1.9 – 1.8 – 1.7 – 1.6 – 1.5 – 1.4
CO CONTAMINATION	35	2