EBZ GmbH
Fuel Cells & Process Technology

Professional SOFC testing with EBZ ProControl

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EBZ ProControl

- ✓ Flexible software for EBZ test rig automation
- ✓ Graphical programming tool that addresses experienced researchers and system developers

Outline

- ✓ Short presentation of the company profile
- ✓ EBZ ProControl – What is it?
- ✓ Requirements for using the tool
- ✓ Test on an example
- ✓ Discussion & questions

Company Profile

- ✓ Founded in 2000 in Dresden, Germany
- ✓ Member of A.S.T. Group
- ✓ Start SOFC development in 2002
- ✓ "European SOFC Capital"

  EBZ: System integrator

  Fraunhofer IKTS: Stack developer

  Staxera: Stack manufacturer

Divisions

www.ebz-fc.de

We are growing:
New customers, new products!
To meet these challenges we now decided to organise our product portfolio in two divisions:

EBZ - FUEL CELLS and **EBZ - PROCESS TECHNOLOGY**

EBZ Fuel Cells:

- **Test Rigs for SOFC** >>> PDF
  - Single Cells
  - Short-Stacks
  - Stacks
- **Testing of Staxera ISM** >>> PDF
- **SOFC Demonstration Systems**
- **Independent Stack Tester Laboratory**
- **EBZ ProControl** >>> PDF

Please take a look at our new data sheets on this homepage.
Soon there will be more information available about our ongoing developments.

If you are interested in **EBZ - PROCESS TECHNOLOGY** please visit:

For more information about our company visit:

www.ebz-pt.de

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EBZ Process Technology:

Process Components

- Humidification >>> PDF
- Electrical Gas Heater >>> PDF
- Economizer (Gas Cooler) >>> PDF
- High Temperature Heat Exchanger >>> PDF
- All Gas Porous Media Burner >>> PDF
- Reformer >>> PDF
- Desulphurizer >>> PDF
- Venturi Injector >>> PDF

Electronic

- Heater Control and Safety Unit >>> PDF
- Sensor Interface >>> PDF

Test Benches

- for Components >>> PDF
- for TEGs >>> PDF

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If you are interested in **EBZ - FUEL CELLS** please visit:

For more information about our company visit:

Test rigs and demonstrators

SOFC cell and stack test rigs

- ✓ Wide variety of fuels or synthetic mixtures
- ✓ Different reforming strategies
- ✓ Air- and gas preheating
- ✓ Afterburning and waste heat recovery

SOFC Demonstrators

- ✓ Integration of different stack technologies
- ✓ Electricity and heat generation
- ✓ Gas processing via CPO or steam reforming

Products and services - components

Design and fabrication of customer specific system components:

- ✓ Compact air and gas heaters
- ✓ Gas/gas heat exchangers and waste heat recovery
- ✓ Thermal and electrical heated evaporators
- ✓ Catalytic and volumetric burners
- ✓ Injectors
- ✓ CPO and SR reformers
- ✓ Force sensors for stack loading
- ✓ Desulphurizer

Desulphurizer

Heat Exchanger

Reformer

Gas Cooler

Porous Burner

Electrical Gas Heater

Evaporator

Products and services

Services

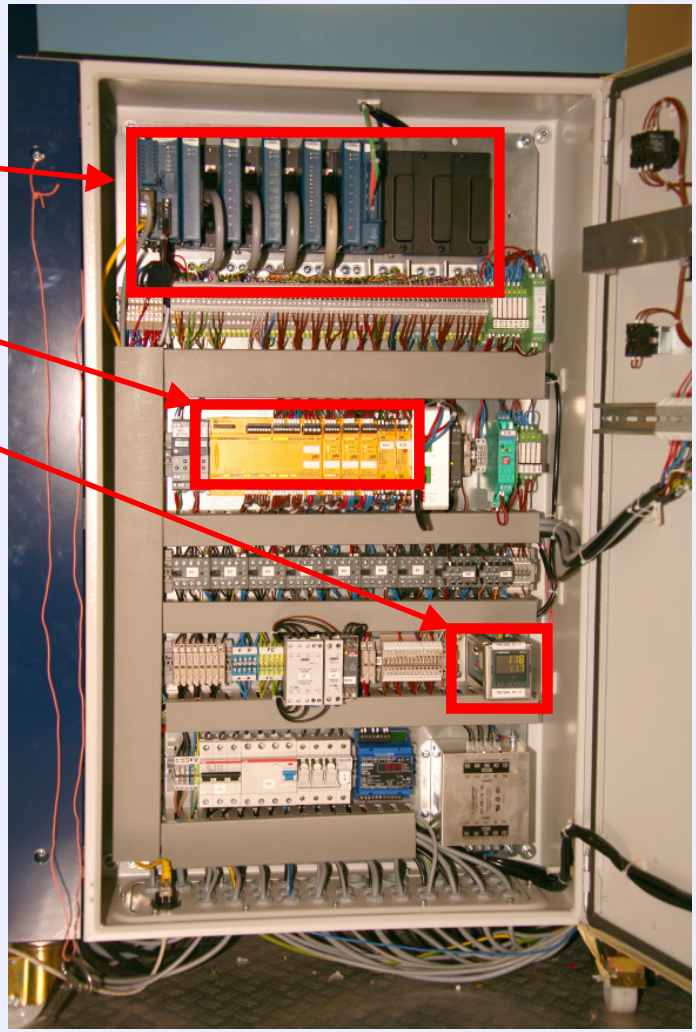
Stack testing

- ✓ Independent SOFC laboratory
- ✓ EBZ has 7 years of SOFC system development for niche and mass markets
- ✓ EBZ is involved in national and international partnerships
- ✓ Testing of stacks from different suppliers:
  - Fraunhofer IKTS
  - Staxera
  - FZ Jülich
  - HTceramix (SOFC Power)
- ✓ Different fuels and gas processing types, e.g. SR, ATR, CPO

Overview Hardware

Test rig Hardware

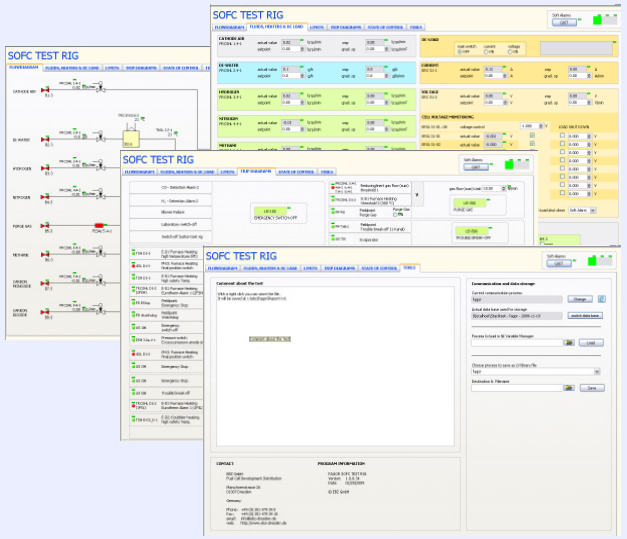
- ✓ NI Fieldpoint Module
- ✓ safety PLC
- ✓ Temperature controller
- ✓ Includes a PC with a GUI
- ✓ PC and cabinet are connected via Ethernet



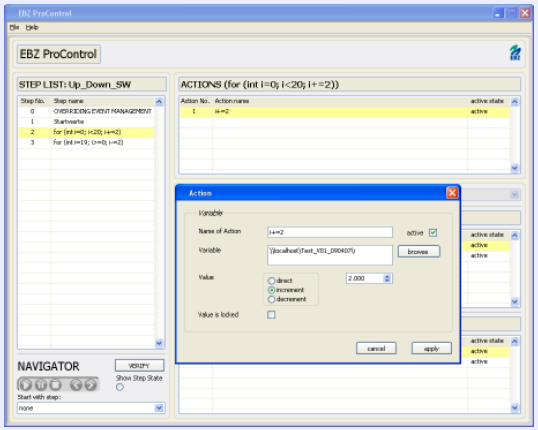
EBZ ProControl – What is it?

Software

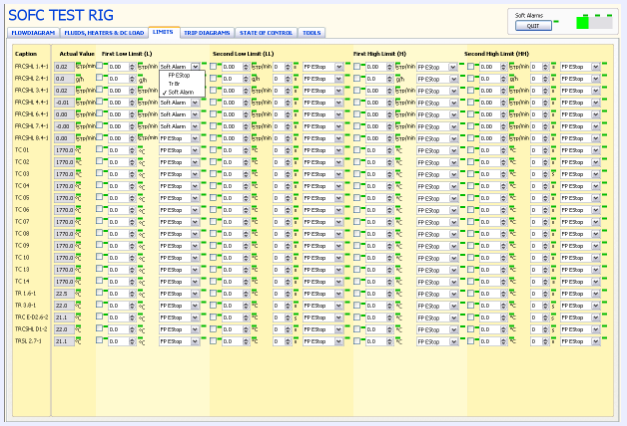
- ✓ EBZ GUI for manual test rig control and monitoring
- ✓ EBZ GUI for Threshold Monitoring
- ✓ EBZ ProControl for complete test rig automation



GUI pages

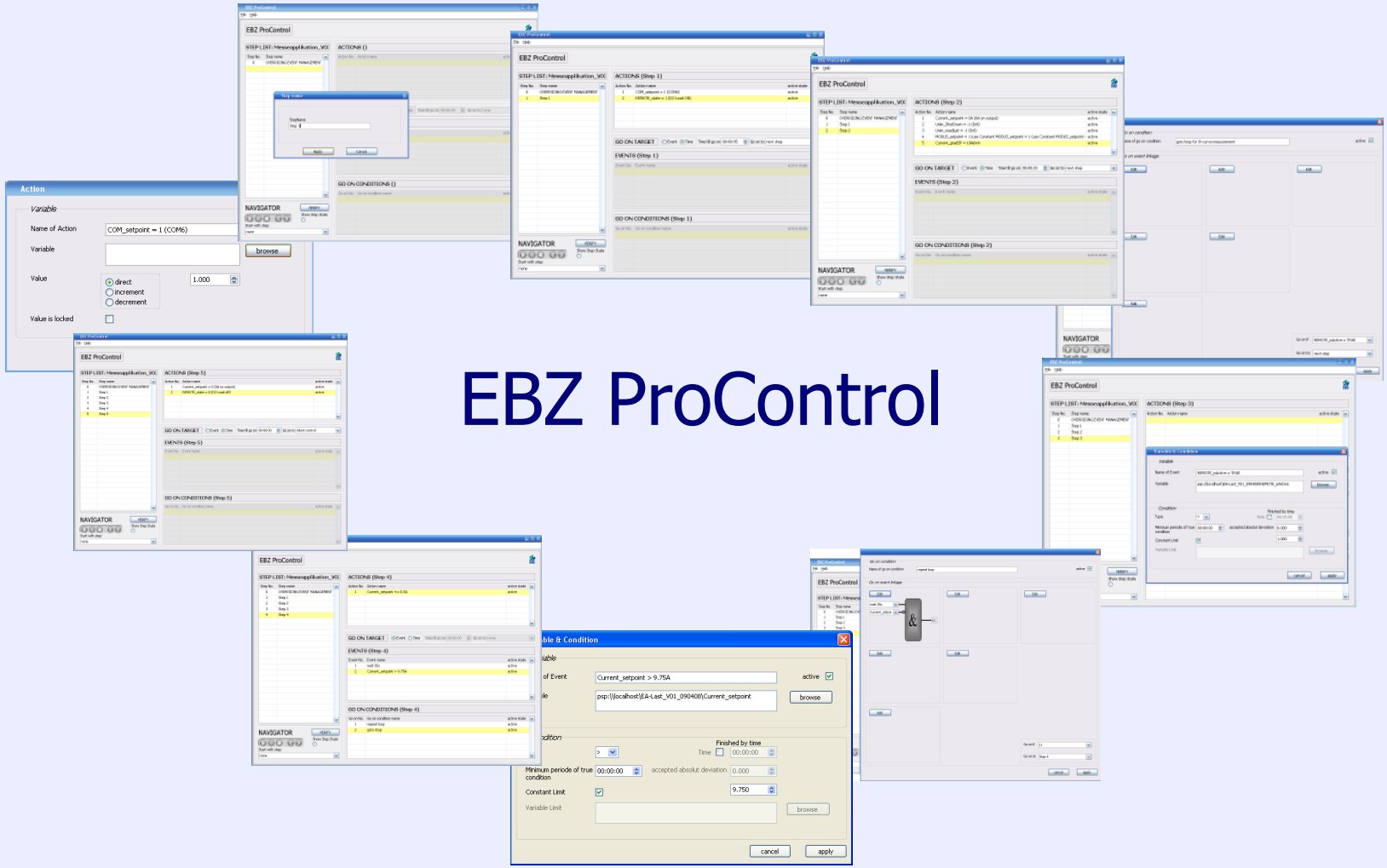


EBZ ProControl



GUI page "LIMITS"

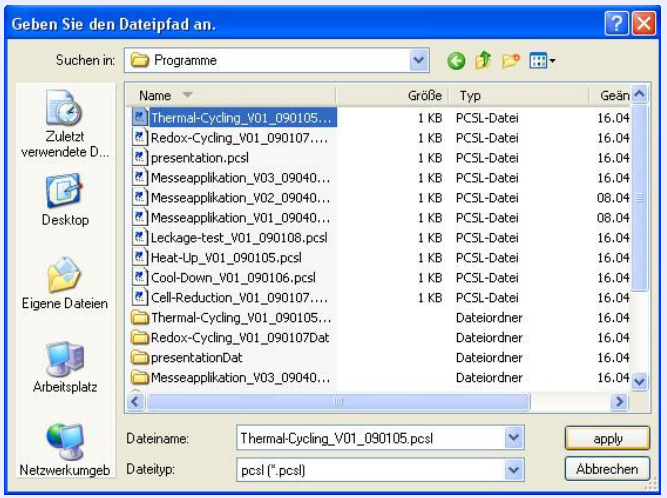
EBZ ProControl – What is it?



EBZ ProControl

Advantages for test rig control

- ✓ Comfortable graphical programming
- ✓ No script language or a special programming language
- ✓ Simulates a virtual user who is able to monitor and influence variables
- ✓ Syntax check for fail-safe operation
- ✓ Sequences can be saved, loaded and appended
- ✓ Predefined procedures with our Know-How, e.g.
  - Leakage tests
  - Cell reduction
  - Redox and thermal cycling
  - Heat-up and cool-down
  - Performance tests



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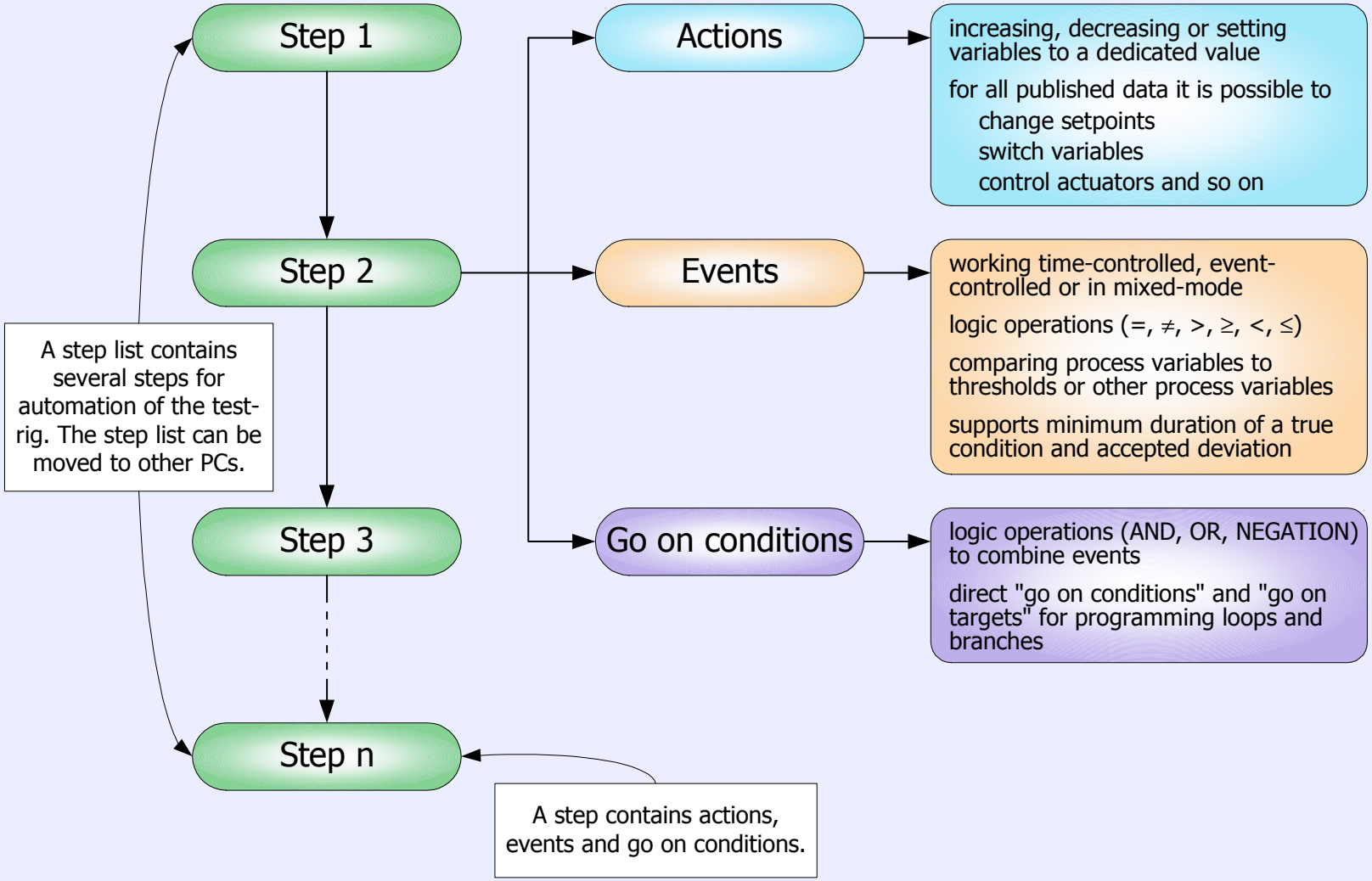


Requirements for using EBZ ProControl

- ✓ Test rig from EBZ with a standard software package including LabVIEW RT license
- ✓ EBZ ProControl software
- ✓ Ideas for your program
- ✓ About 4 hours for training on the examples and the user manual

- ! We offer a training course for the software
- ! Get complete pre-defined and tested scripts for your measurement and control tasks from EBZ GmbH
- ! Scripts from one system can be reused on other EBZ test rig PCs with little modification effort

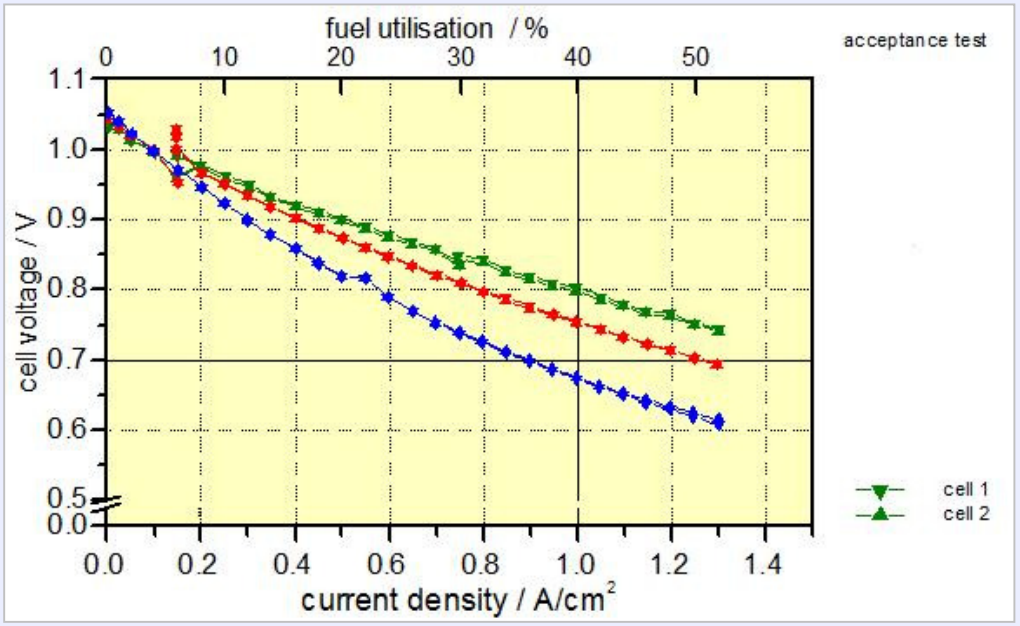
Test case

Task

- ✓ Recording a characteristic IV-curve of a fuel cell stack

Pre-conditions

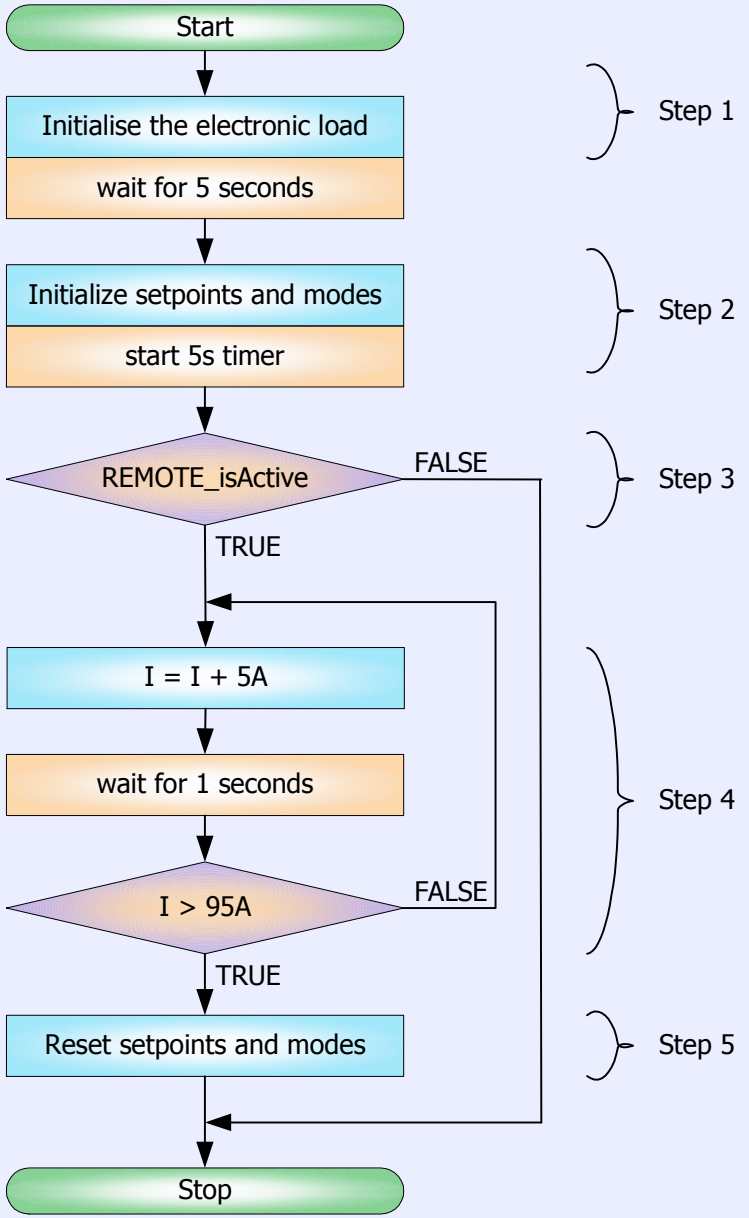
- ✓ Stack is already on operating temperature
- ✓ Correct moisturized fuel gas flow on the anode side
- ✓ Appropriate air flow on the cathode side



typical IV-curve of a SOFC-cell

Test case

Lets go – learning by doing



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