National Smart Grid Laboratory:

Battery test system

INTENDED USE
- Investigations of:
  - battery performance
  - battery degeneration due to cycling and aging
- Use in National Smart Grid Laboratory test setups as:
  - battery (emulated)
  - variable DC-load or DC-source
    (controlled power, current or voltage source/sink)

MAIN TECHNICAL DATA
- 32 independent channels, each 200V/30A/2.5kW
- Paralleling of channels gives up to 200V/960A/80kW
- Battery energy discharge alternatives:
  - regeneration to grid
  - charge battery on other channel
- Battery measurements:
  - DC internal resistance measurement (DCIR)
  - AC impedance up to 1000Hz (LCR-meter)
- DC side is galvanic isolated from AC grid
- 2-kvadrant operation on DC side:
  - positive and negative current
  - positive voltage
- DC-side protected against:
  - short circuit
  - battery reverse polarity connection
- Test program can be recovered after power outage and test can be continued from the point it was stopped.

SOFTWARE FUNCTIONALITY
- Test cycles can be created and utilized for each channel or channel groups:
  - constant voltage, current or power mode
  - constant resistance mode (discharge only)
  - arbitrary test cycles
  - complex drive cycle testing with dependency on measured voltage or current
  - cycles downloaded from Excel
- Programmable protection functions:
  - high / low battery voltage
  - high current
  - high temperature

COMMUNICATION INTERFACE
- Software system can be remotely controlled via network connection (LAN)
- System hardware can in addition be controlled by Labview driver and SCPI (Standard Commands for Programmable Instruments)

DATA LOGGING
- Logging and storage of measurements (10ms)
- Internal data storage provided to avoid loss of data in the event of loss of power or communication to computer
- Export of logged data to
  - personalized reports
  - files in PDF/CSV/TXT format

LOCATION
- Energy Laboratory, Room F0057, Elektro building E/F, at NTNU in Trondheim, Norway
- System is equipped with wheels and can (in principle) be moved to other locations if needed
- Climate chamber (0.6m³) available in same room.
- Battery test system can be integrated in test setups in the main laboratory of the National Smart Grid Laboratory via installed power and control cables.

HIGHER VOLTAGE AND HIGHER POWER
- Tailored test set-ups using in-house power electronic converters and a grid emulator can be used to perform tests that requires higher voltage or higher power.
Four wire connection for each channel to allow compensation of voltage drop along cable

SYSTEM DETAILS
- 1x Chroma 69200-1 Charge/discharge Controller
- 8x Chroma 69225-200-4 Regenerative Charge/discharge tester 200V/30A/2.5kW/4 Channels
- 8x Chroma DC/AC A691101 Bidirectional controller
- 1x Chroma 11021-K LCR Meter 1kHz
- 1x Chroma A110242 Battery tester ESR Test kit
- Computer with Battery Pro Software

Operation range

Software control