MFC - MODULAR FORMATION CHAMBER

Cell Formation Made Easy With a Compact and Integrated Solution
The MFC can be used either as a stand-alone formation chamber for pilot lines, or, by combining several units, as a fully automated industrial cell formation system. The equipment allows temperature heating and conditioning of the formation docks within a standard range from 20° C to 60° C or customized wider ranges.

**SYSTEM COMPONENTS**

The MFC is comprised of two major subsystems:
1. The formation chamber partitioned into one or more docks lodging the formation trays;
2. The SMF charger unit with its AC/DC and DC/DC power conversion stages.

The Modular Formation Chamber is provided as an integrated system which has been wired and tested as a single piece of equipment and is thus delivered ready to use.

Various safety provisions are built in and can be easily customized depending on the product chemistry.

Several MFCs can be networked together with a Formation Plant Supervisor System, with the Customer’s Data Management System, and with other devices such as barcode scanners and barcode printers for traceability, and automated guided vehicles (AGVs) for cell tray loading and unloading.

**FORMATION CHAMBER**

- **Vertical Sliding Door:** It provides insulation of the charging area from the external environment.
- **Temperature Heating and Conditioning:** It keeps the temperature constant within the working range during the formation process.
- **Automated Cell Contacting System:** For each cell in the formation tray: it can be configured either for pouch or metal can cells and can accommodate cells of various dimensions and chemistries.
- **Gas Detection Sensors:** For carbon monoxide, volatile organic compounds (VOCs), volatile sulfur compounds, and nitrogen dioxide.
- **Smoke Sensor:** For early fire detection inside the formation docks.
- **Suction, Venting, and Inertization Systems:** An interface towards these system can be provided as an option.
- **Cell Tray:** Each tray can lodge up to 32 cells. Trays holding larger numbers of cells can be provided upon Customer’s request.
- **Pressure Cell Formation Tray (Optional)**

**SMF CHARGER UNIT**

It is composed of up to 256 circuits controlled by a proprietary software suite (Visual LCN) and a computer network system. Formation can be performed with various programs: constant power, constant current, constant voltage, or ramp set points for each program step. Each step can be terminated by limit conditions, including cycles, current, voltage, power, Ah, Wh, or time. The SMF charger uses state-of-the-art switching mode technology (IGBT) for superior performance, reliability, and efficiency. The energy in the discharge phase is fed back to the AC grid for cooler, and therefore more economical, operation.

**GENERAL SMF CHARGER FEATURES**

- Current Accuracy: ±0.1% FS
- Voltage Accuracy: ±0.1% FS
- Output DC/DC Stage Efficiency: ≥90%
- Input Power Factor: >0.99
- Input Current Total Harmonic Distortion (THD): ≤5%
- Regenerative Function for Excess Energy During Discharge
- Overvoltage and Overcurrent Hardware Control for Enhanced Reliability
- Single Circuit Independent Operation
- Two Independent Control Loops for Current and Voltage

**CELL CONTACTING SYSTEMS**

The picture shows two possible solutions for the electrical contact of Li-Ion pouch cells (left) and metal can cells (right) inside the formation chamber.

**INTEGRATION OF VARIOUS MFCs WITH OTHER DEVICES AND WITH THE PLANT SUPERVISOR SYSTEM**

The plant Supervisor System manages all the functions within the formation plant by exchanging information in real time with all the pieces of equipment (MFC units, barcode scanners, AGVs, additional testing instruments such as DCIR and ACIR, etc.), collects all the data, creates and stores data logs, and sends them to the plant’s Data Management System.
### MFC CONFIGURATIONS

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<th>Number of Circuits</th>
<th>Voltage (V)</th>
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CAN: for metal can cell formation; PRS: for prismatic cell formation; POU: for pouch cell formation.

Other configurations are available upon Customer's request.

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SOVEMA GROUP S.p.A.
Via Spagna 13, 37069 Villafranca di Verona VR - ITALY
Tel. +39 045 6335711 - Fax +39 045 6303911
info@sovemagroup.com

www.sovemagroup.com

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