Flex'ion®

Transportation, Storage, Installation and Operation Instructions

March 2018

1. Introduction

Flex'ion® is a Li-ion battery system that includes large format Li-ion cells and the necessary electronics for providing power backup for mission critical applications.
This quick start guide describes how to transport, store, install and operate the battery system. Within this sheet, the necessary tasks are noted with *Fx#* and they are arranged in the order that they should be executed.
Please consult the Flex'ion Installation & Commissioning and Operation & Maintenance Manuals for full instructions.

2. Safety

A battery system is an active electrical device that contains a specific quantity of energy. which The Safety Rules below must be complied with to ensure correct handling and operation.

- Saft products are designed with safety considerations; however, batteries can be dangerous if used incorrectly.
- Failing to comply with the Safety Rules described below may cause the battery system to fail and may cause serious injury.
- Improper operation of the product may cause a cell to overheat or vent.

Safety Rules:

- Read these instructions fully before installing and operating the battery system.
- Batteries MUST be installed in a restricted access area only. Only authorized personnel Trained and Certified according to the local rules (for example per NFPA 70E in US) to handle High Voltage Hazard should be allow to enter the restrict area and work on the system.
- Battery must be installed in a location that can be easily ventilated in case of misuse of batteries such as described below.
- Never short-circuit the battery terminals.
- Do not reverse the polarity
- Do not overcharge or over-discharge the battery
- Adhere to factory voltage range specification given in this manual.
- Do not open the battery module
- Do not disassemble the unit
- Do not use the battery without its electronic management system.
- Do not subject to excessive mechanical stress
- Do not expose the unit to water or condensation.
- Install the batteries in an area compatible with pollution level 2 according to EN 60664-1 (typical of office or laboratory environments)
- Do not place the batteries on or near fires or other high-temperature locations (> 70°C). Doing so may cause the batteries to overheat or ignite. Using the batteries in this manner may also result in the loss of performance and the shorten life expectancy.
- Immediately disconnect the batteries if, during operation, they emit an unusual smell, feel hot, change shape, or appear abnormal in any other way. Contact Saft immediately if any of these problems are observed.
- Connect to power systems/rectifiers with maximum rated output of Vmax only (refer to Table 1).
- Refer to the Battery Information Sheet or BIS (included) for emergency response procedures and personal protective equipment in case of an abnormal event.
- If smoke is emitted from the system, stay clear of the smoke and evacuate the area immediately.
- For normal handling and operation according to this installation and operation sheet, personal protective equipment is required.

3. Tools

The necessary installation tools are described Table 2. These tools are not provided with the battery system.

4. Unpacking and Inspection

Flex'ion components are packaged in accordance with UN3480 Class 9A.

Fx1	Check that all items are received against the packing list.	Table 3

If items were not received or if anything was damaged, do not install the component. Please contact your local Saft representative.

Fx2	Study Flex'ion® features	Figure 1,2,3

The Flex'ion® battery system is composed of one or more STRINGs (depending on the configuration), mastered by one MBMM (refer to Figure 1). One STRING is composed of following:

- Electrical cabinet
- Battery Management Module
- A minimum of five battery modules connected in series (depending on the configuration)
- An Intelli-Connect module with PLC/MBMM device
- Communications and power cables
- Documentation set

Fx3	Check the condition before and during storage and prior to installation.	Table 4

Always keep the Flex'ion components together in their original packaging.

5. Storage

Store the battery system components in their original packaging under these conditions:

- 20°C to 40°C (68°F to 104°F) recommended.
- No direct sunlight, rain or flooding (IP20).
- ≤ 95% relative humidity (RH) maximum. (non-condensing).
- The BMM circuit breaker set to opened "OFF" position.
- It is recommended to store the battery system components in a dry place exposed to temperatures less than 40°C (100°F) to optimize product lifetime.
- Check the voltage of each battery modules every three months.
- During storage, battery modules voltages must be maintained between 23.1 to 26.6V (23MFe) and 46.2 to 53.2V (46MFe and 46PFe types). Check the voltage periodically and recharge if needed.
- Recharge as required.

Maximum storage duration of battery modules:

- 315 days if the strings were fully charged before storage (SOC = 100%, string voltage depends on configuration).
- 155 days at 50% of SOC before storage.

Fx4	After 6 months check the state once per month in storage	Figure 3

NOTE:
Acceptable storage temperature range is from -20°C (68°F) to 50°C (122°F); depending on this range , a refreshing charge may be required more frequently.

6. Transportation and packing

Flex'ion systems are transported disassembled. The cabinet, BMM, Intelli-Connect+PLC (MBMM) and battery modules have their own packaging for transportation.
The Li-ion battery modules are shipped from Saft in packaging compliant with the UN Recommendations for the Transport of Dangerous Goods (UN 3480) and applicable regulations such as IATA (Air), IMDG Code (Maritime), ADR (Road in Europe) and any other local regulations required.
The battery module package must display a class 9A hazard label in addition to markings identifying the applicable proper shipping name (Lithium-ion batteries) and UN number (3480).
When packing, avoid any risk of short-circuits between the terminals.
Ensure all packaged components are protected from damage during transportation.

7. Installation

Before installing, double check the condition of each battery module.

Fx5	Size the correct number of battery modules to connect to the dc bus.	Figure 1,2

Before installing, ensure the right number of battery modules are connected in series to support the dc bus.

Fx6	Check for maximum of 2V difference between battery modules operating on the same dc bus.	Figure 4

If battery modules have more than 2.0Vdc difference, then recharging is necessary. Consult the Flex'ion Installation & Commissioning Manual for full instructions.

Fx7	Configure the number battery modules in the BMM.	Figure 5

Configure the number of modules per battery string in BMM, depending on the module type (23MFe, 46MFe or 46PFe) using the correct software (SW) version.

Fx8	Connect the battery modules.	Figure 4,5,6

Before system integration, verify that all the components inside the cabinet are correctly attached to the rack and connected with relevant tightening couples.

Follow these recommendations (more details are available in the I&C manual):

- Connect power cables between BMM and Intelli Connect
- The power connections of the BMM with the first and last battery modules of each string are performed though the HV terminals "VIN-BAT" and "VIN+BAT" located on the BMM front face (refer to Figure 5).
- The power connections of each battery string, once assembled, are performed though the HV terminals "VOUT-DC" and "VOUT+DC" located on the BMM front face (refer to Figure 5).
- Connect Low Voltage cable (installed in Cabinet) to BMM
- Connect CAN bus cable between battery modules and BMM
- If the battery system is comprised of multiple parallel strings, connect BMM #01 communication port to BMM#02, etc. (refer to Figure 6).
- Connect the MBMM signals to the customer's Application. (when requested)
- Connect the electrical power cables between battery modules, BMM and Intelli-Connect using insulated tools.
- Connect the battery string to the dc bus of the application. The power connections of each battery module are performed via the high voltage (HV) "+" and "- "terminals located on the front face. Personal protective equipment is required.

Fx9	Power ON	Figure 7

- Reclose/reengage the circuit breaker on each BMM.
- According to the configuration, press the push ON/START button on the front door of the master cabinet (refer to Table 4).

IMPORTANT:
Never leave the Flex'ion® ON when it is not in use. The internal electronics will self-discharge the cells to a low voltage alarm level which may render the module un-usable.

8. Operation/Maintenance

Flex'ion provides uninterrupted standby power anytime the AC power supply is OFF. Continue trouble-free operation by complying with these instructions.
Battery modules do not require regular maintenance. Periodically checking the complete Flex'ion system during other site routines is recommended.

- LED state (refer to Table 4).
- Clean any excessive dirt build-up using a nonmetallic brush or a dry or damp cloth.
- Do not use any cleaning solvents or soaps.
- Do not immerse, bathe or hose off the Flex'ion system.
- Charge and discharge of the Li-ion battery must be monitored and managed with respect to parameters such as current, cell voltages and module temperatures. This management is performed by the battery module at the cell level and BMM at string level.

Table 1: Voltage range depending on the modules in series

Modules in series	46PFe, 46MFe				23MFe			
	Vmin	Vnom	Vmax	#	Vmin	Vnom	Vmax	#
5	175	231	266	V	88	116	133	V
6	210	277	319	V	105	139	160	V
7	245	323	372	V	123	162	186	V
8	280	370	426	V	140	185	213	V
9	315	416	479	V	158	208	239	V
10	350	462	532	V	175	231	266	V
11	385	508	585	V	193	254	293	V
12	420	554	638	V	210	277	319	V
13	455	601	692	V	228	300	346	V
14	490	647	745	V	245	323	372	V
15	525	693	798	V*	263	347	399	V
16	560	739	851	V*	280	370	426	V
17	595	785	904	V*	298	393	452	V
18	630	832	958	V*	315	416	479	V
19	665	878	1011	V*	333	439	505	V
20					350	462	532	V
21					368	485	559	V
22					385	508	585	V
23					403	531	612	V
24					420	554	638	V
25					438	578	665	V
26					455	601	692	V
27					473	624	718	V
28					490	647	745	V

* available only with BMM 300A

Table 2: Tools needed

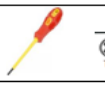
#	Tool	Use
A		Voltage/resistance measurement
B		Communication cable BMM
C		Power terminals
D		Front cover removal BMM
E		Groundng point of BMM
D		Personal safety equipment (gloves/shield/shoes/clothes)

Table 3:Battery string comprising 11 modules legend*

#	Module	Description	Qty
A	EC	Electrical cabinet	1
B	BMM	Battery Management Module	1
C	xxP/Fme	Battery modules	11
D	I-C	Intelli-Connect with Master BMM	1
E	CAB	Signal and power cables	1
F	DOC	Documentation set	1

* actual configuration is subject to design parameters

Table 4: LED push button operation legend

#	LED state	Description
A	steady	Battery in nominal mode
B	slow blink	Charging
C	fast blink	Discharging
D	steady	Battery in stand-by mode
E		OFF

Figure 1: System overview with fans configuration

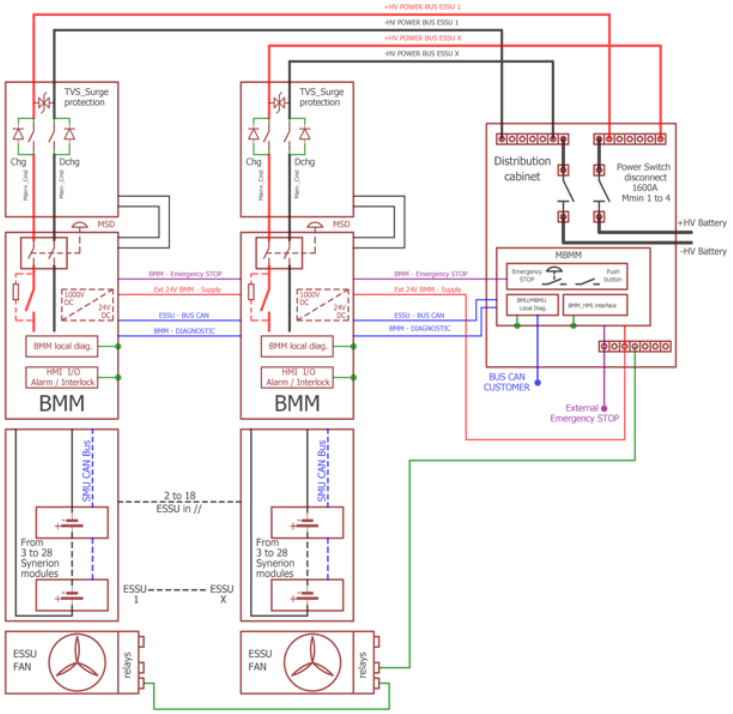


Figure 2: Example of 14S1P-11S-2P configuration

WARNING:
Always use insulated tools while working with Flex'ion® components and battery modules.

NOTE:
Always use personal safety equipment while working with Flex'ion® components and battery modules.

Figure 3: Power and signal connectors

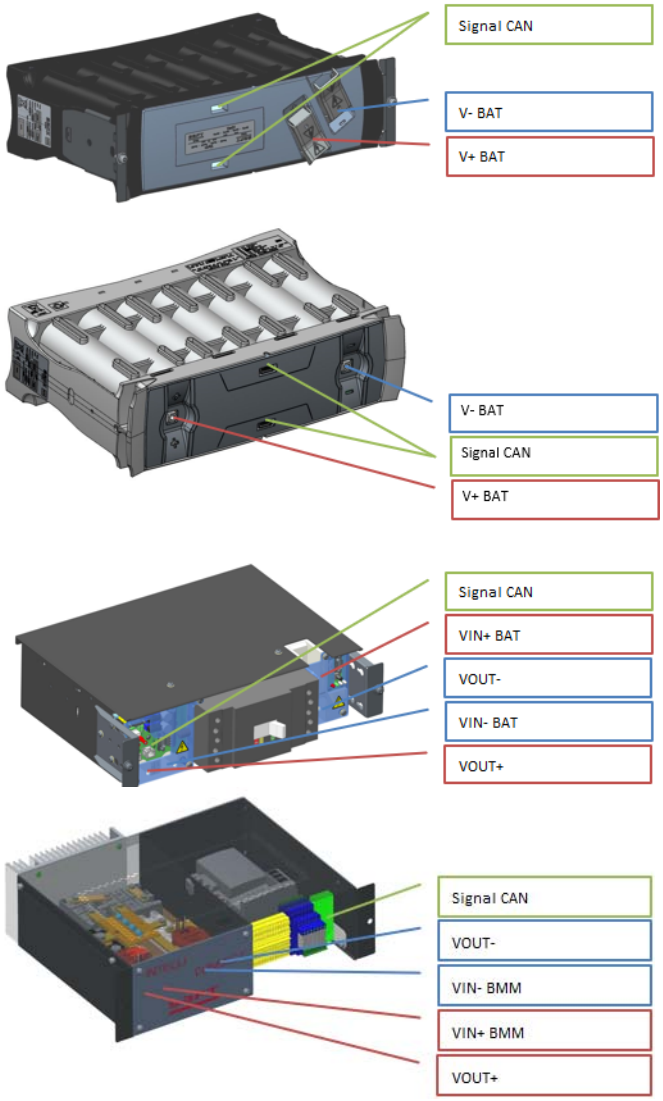


Figure 4: Check the maximum voltage on modules

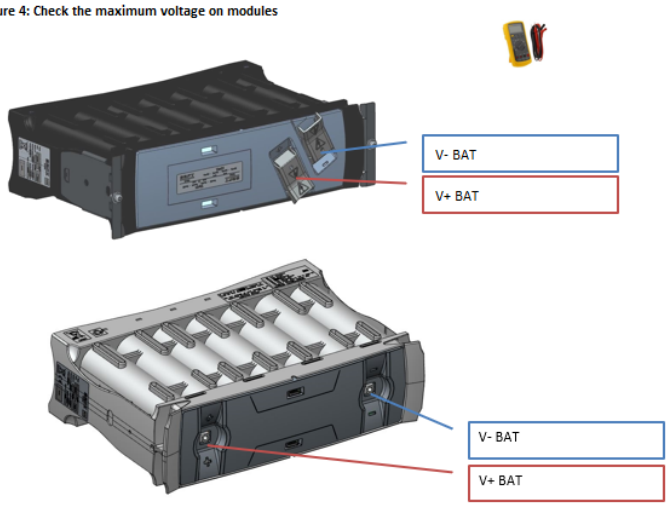


Figure 5: BMM overview

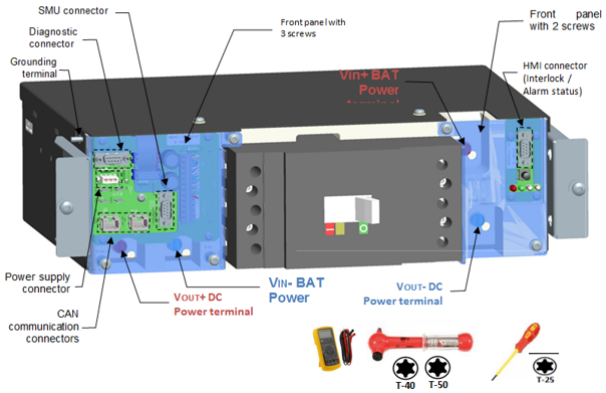


Figure 6: CAN connectors

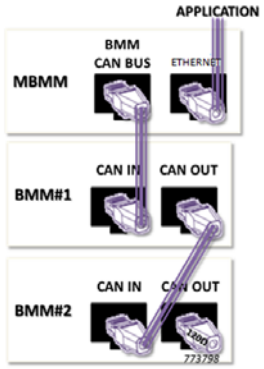
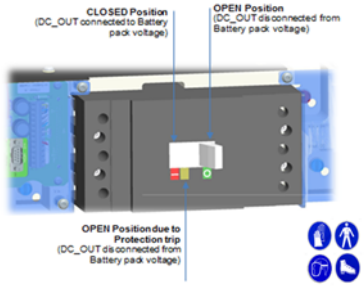


Figure 7: POWER ON main switch



IMPORTANT:
Full instructions are provided in the Flex'ion Installation & Commissioning and Operating and Maintenance Manuals. Available on request.

NOTE:
Always use trained personnel when working with Flex'ion systems, components and battery modules.

Saft Ferak
Industrial Standby Division
Raskovice 247
739 04 Prazmo
Czech Republic
Tel: +420 558 426 265

Saft America Inc
Industrial Standby Division
3 Powdered Metal Drive
North Haven, Connecticut, 06492
United States of America
Tel: +1 203 985 2700
Fax: +1 203 985 2739
www.saftbatteries.com

Edition: March 2018

Société par Actions Simplifiée au capital de 31 944 000 €
RCS Bobigny B 383 703 873

Produced in the CZ by SAFT FERAK