# Evolion®

## Installation and operating instructions

### 1. Safety

**Make sure to study and follow all instructions. Misusing the Evolion® may cause it to overheat or ignite.**

- **Do not short-circuit the power terminals.**
- **Do not reverse connect the power cables.**
- **Do not disassemble the unit.**
- **Do not subject the unit to excessive vibrations or drop the unit.**
- **Do not immerse the unit.**
- **Do not expose the unit to fire or temperature higher than 100°C (+212°F). It may cause the cell safety vent to open which renders the unit inoperable.**
- **Use only in Telecom power systems.**
- **Refer to the Battery Information Sheet (included) for emergency response procedures.**

### 2. Important recommendations

**If smoke is emitted from a unit, stay clear of the smoke and evacuate the area until the smoke dissipates.**

**Refer to the Evolion® Technical Manual for functional details.**

**See Figure 1 for operator interface features.**

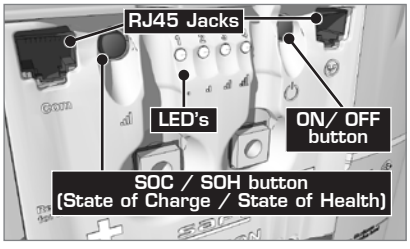



*Figure 1 - Evolion® main front access*

### 3. Unpacking and inspection

When shipped, the Evolion® is packaged in accordance with UN3480 Class 9 Group 2. Unpack and make sure all items were received. Table 1 summarizes the provided items.

If items were not received or if anything is damaged contact your local Saft representative.

*Table 1 - Provided items in Evolion® kit (771473-XX)*

| Part N° | | Qty |
|---|---|---|
| 771492-XX | Evolion® | 1 |
| 771285 | Fuse, spare | 1 |
| Note 1 | Power cable for positive terminal (800 mm length) | 1 |
| Note 1 | Power cable for negative terminal (800 mm length) | 1 |
| 772518 | Communication cable | 1 |
| 773455 | RJ45 resistor cap | 1 |

-XX: refers to the parameter file variant
Note 1: Part N° varies according to heat shrink color and cable color

If a long storage is planned, check and note the SOC (State of Charge) according to Figure 3 and Table 2. A hole in the packaging allows you to access the unit without removing it from the box. Refer to Figure 2.

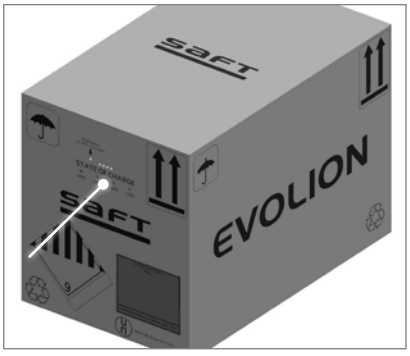



*Figure 2 - Accessing the unit*

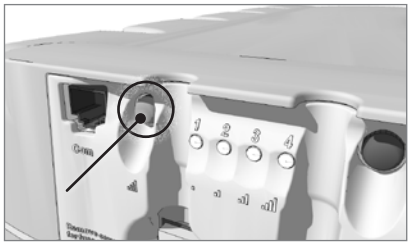


*Figure 3 - Checking SOC (State of Charge)*

- *For SOC, push and hold for 3 s or less and observe the LED's.*

This will help to plan the next refreshing charge.

Keep Evolion® in its original packaging for continued storage or for transportation.

### 4. Storage

Store the battery in its original packaging and in typical warehouse conditions. The temperature should be between 15°C to 30°C (59°F to 86°F).

The Evolion® can be stored for up to 1 year from the manufacturing date. Make sure the unit is switched OFF during storage. When OFF, the unit is in sleep mode. In sleep mode, no voltage is present on the terminals.

**NOTE:** The Evolion® unit will periodically and automatically wake-up to record its state and to initiate cell balancing if necessary.

**IMPORTANT:** If the unit is left ON, it may over discharge in a short time and render the unit inoperable. It is mandatory to check the SOC while in storage every 6 months. See Figure 3 and Table 2.

If the Evolion® is stored at a low SOC for too long, it may eventually over discharge and render the unit inoperable.

**To conduct a maintenance charge:**

- Connect according to Section 6
- Make sure the set-point voltage on the rectifier is 56.0 V
- Charge for a total time according to the available charge current (see Table 3)

*Table 3 - Charging time according to the current*

| Amps per unit | Charging time | Amps per unit | Charging time |
|---|---|---|---|
| 3 | 15 h 20 min | 12 | 3 h 50 min |
| 4 | 11 h 30 min | 15 | 3 h |
| 5 | 9 h 10 min | 18 | 2 h 30 min |
| 6 | 7 h 40 min | 20 | 2 h 10 min |
| 8 | 5 h 40 min | 25 | 1 h 50 min |
| 10 | 4 h 30 min | CL mode* | 11 h 30 min |

*current limit mode

*Table 2 - SOC (State of Charge) LED legend*

| SOC LED (steady for 5 s) | | | | |
|---|---|---|---|---|
| Minimum SOC | ≥75% | ≥50% | ≥25% | <25% charge as soon as possible |

## 5. Transportation

Use the original packaging or equivalent. Follow the necessary transportation rules for Li-ion batteries by consulting with your company's standard practice and your local transportation regulations.

Secure the Evolion® to prevent violent shock and other items from falling onto it. The battery must be OFF during transportation.

## 6. Installation

See Figure 4 for Evolion® features.

Install in the upright position only.

- To complete an Evolion® installation:
  1. Connect power
  2. Connect alarms (optional)
  3. Startup
- Required tools

- 10 mm socket (for terminal)
- Voltmeter (0 to 60 V)
- Flat screwdriver (for cover removal)
- 7 mm socket (for fuse)
- Torque wrench

### Connect power

The best practice when parallel connecting Evolion® is to balance the resistance in each branch. See Figures 5 and 6 for power connections schematics and options.

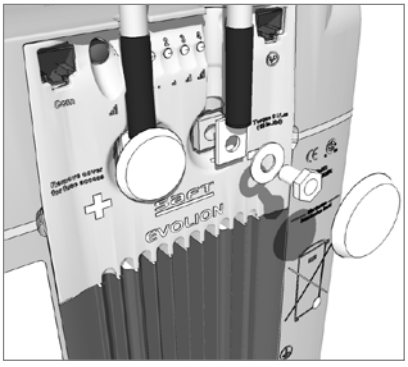


*Figure 5 - Connecting to terminals*

- *Only use the terminal bolts, washers, terminal protectors and cable lugs provided.*
- *Torque = 6 N.m (53 in.lbs)*

**IMPORTANT:** Never connect the power terminals in series with other Evolion® units.

**IMPORTANT:** Parallel connecting can be done as long as the total system discharge current never exceeds 130 A (5 kW at 42 V) continuous. In this case paralleling any number of units is allowed.

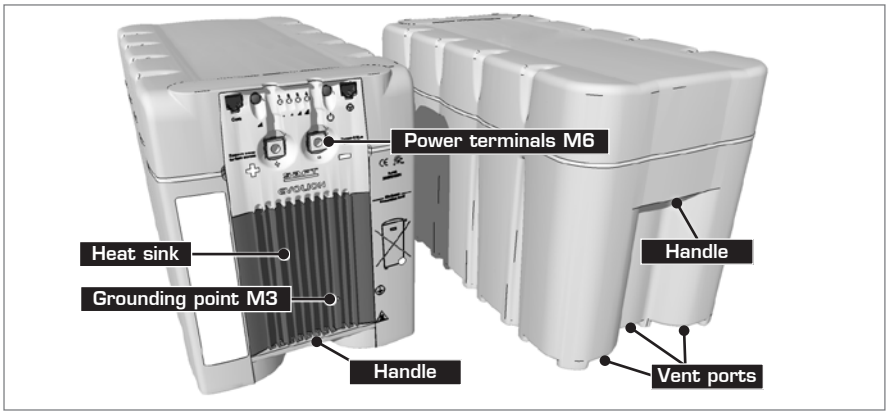
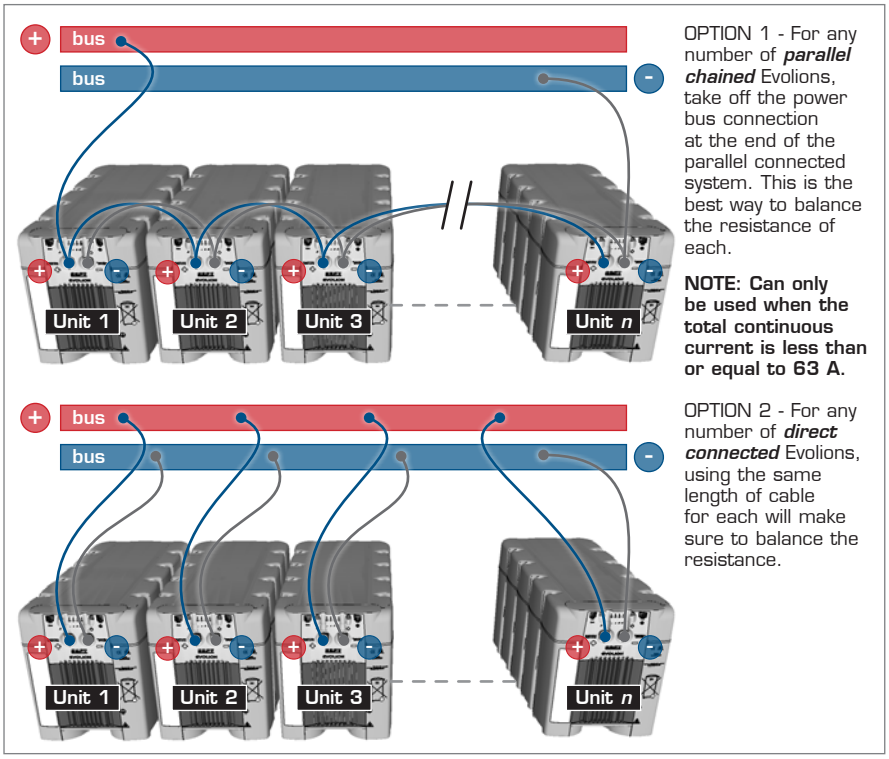



*Figure 4 - Evolion® features (oriented upright with front and back view)*




OPTION 1 - For any number of ***parallel chained*** Evolions, take off the power bus connection at the end of the parallel connected system. This is the best way to balance the resistance of each.

**NOTE: Can only be used when the total continuous current is less than or equal to 63 A.**

OPTION 2 - For any number of ***direct connected*** Evolions, using the same length of cable for each will make sure to balance the resistance.

*Figure 6 - Parallel connecting Evolions*

To avoid high parasitic current between parallel connected Evolion® units, make sure that the open circuit voltage is within 2 V of each other. To check the open circuit voltage when disconnected, press the ON/OFF button for at least 2 s and measure the voltage at the terminals. Make sure to turn the unit OFF by pressing the ON/OFF button for at least 4 s.

External charge current limiters are not necessary. The Evolion® limits its own current.

The Evolion® can be connected with live power without damage. However, it is recommended to switch OFF any battery breakers before connecting to the power terminals.

It is recommended to parallel connect Evolions with the same state of charge.

The Evolion® power terminals can be connected to systems with a positive ground, a negative ground or a floating ground.

In order to prevent reverse connections, make sure to measure and note the polarity of the power bus cables.

**IMPORTANT:** A reverse connection on the power terminals may blow the internal fuse. See Section 10 if replacing the fuse is necessary.

Make sure the heat sink on the front face is not obstructed.

### Connect alarms

See Table 4 for RJ45 jack pin assignments.

*Table 4 - RJ45 pin assignments*

| | |
|---|---|
| Pin 1 | RS485+ |
| Pin 2 | RS485- |
| Pin 3 | Ground (isolated from power terminals) |
| Pin 4 | Wake up (ground referenced) |
| Pin 5 | Reserved |
| Pin 6 | Reserved |
| Pin 7 | Dry contact alarm output |
| Pin 8 | Dry contact alarm output |

Both RJ45 jacks are interchangeable and can be used to plug either the communication cable (772518) or the RJ45 resistor cap (773455).

The dry contact alarm signals are on pins 7 and 8. For both minor or major alarm, the default pin's state is:
CLOSED = ALARM/power down
OPEN = NO ALARM

Use the communication cable provided to connect the dry contact alarms. See Figures 7 and 8.

To connect several Evolions to one network alarm terminal, the RJ45 outputs of each unit can be connected in parallel.

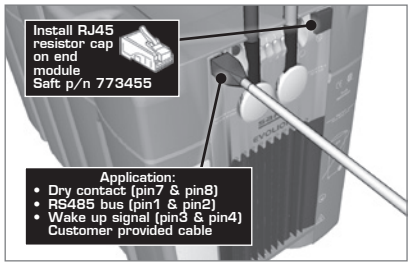



*Figure 7 - Communication connecting with one module*

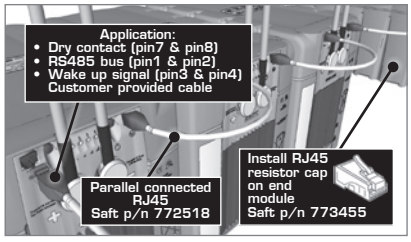



*Figure 8 - Communication connecting with parallel modules*

**NOTE:** The communication cable uses straight through wiring in order to parallel connect the pins for each Evolion®.

**To start up the Evolion®:**

- Switch ON the rectifier/breaker output, or
- Push the Evolion's ON/OFF button for at least 2 s (only when power not connected to application), or
- Send a 12 V signal to pin 4 on the RJ45 (ground is pin 3)

When the Evolion® is ON, the LED's are active indicating its operational status (see Table 5).

*Table 5 - Operating LED legend*

| | | |
|---|---|---|
| NORMAL | slow blink | Floating |
| | fast blink | Charging |
| | steady | Discharging |
| ABNORMAL | steady | Low health |
| | steady | Warning |
| | steady | Alarm |

**To shutdown the Evolion®:**

- Push the Evolion's ON/OFF button for at least 4 s.

When the Evolion® is OFF, the LED's are inactive.

**IMPORTANT:** If the Evolion® is switched OFF while the rectifier output is charging, it will not start up again with its ON/OFF button. It will only start up again if the rectifier output power is cycled OFF and then ON again.

## 7. Operation

The Evolion® is a "smart battery" and will allow only safe operation. If a key operating parameter is exceeded, the Evolion® will automatically interrupt or restrict its operation until the key operating parameter is back within acceptable limits. In this case the alarm will be reset and operation will continue normally. Some alarms are not resettable.

The Evolion® can communicate with other network devices using RS485 protocol and offers supervision diagnostics with its BMS software (called WinBMS). See the Evolion® Technical Manual for more details.

The Evolion® is equipped with an internal heater. It operates as needed when the rectifier power is present or not.

During operation, the LED's are active and indicate the Evolion's status. See Table 5.

### Charging

Make sure that output of the rectifier is set as 56.0 V ± 1%.
It must be set higher than 49.0 V to allow cell balancing during re-charge.

Temperature Compensated Voltage (TCV) should be disabled. The Evolion® is not harmed by TCV control but the runtime will be decreased by 10% for every 1 V below 56.0 V.

- When Evolion® is used in "floating operation", for which re-charge time is not critical, the charge current can be limited to 16 A per Evolion® module.
- When Evolion® is used in "cycling operation" the maximum current will depend on the operating temperature. Please refer to the Evolion® Technical Manual for more details. As a general rule, the charge current should be limited to 24 A per Evolion® module if the operating temperature is anticipated to be mostly higher than 30°C. If the maximum allowed charged current is exceeded, the Evolion® will automatically regulate its own charge current by switching to regulated charge. In that case, the charge can last 24 h.

The Evolion® will accept charge current only when the temperature is above - 30°C and below +75°C (- 22°F and +167°F).

**CAREFUL:** When the charge regulation mode is active, the heat sink will be hot to the touch.

### Discharging

The Evolion® will discharge above - 30°C and below +75°C (- 22°F and +167°F). The maximum allowed discharge current is a function of temperature.

**IMPORTANT:** If an Evolion® is subjected to more than 130 A (5 kW @ 42 V) of continuous discharge current, the fuse may need to be replaced.

The Evolion® will continuously discharge until one of the following is encountered.

- The rectifier output returns, or
- The battery reaches the minimum set SOC (0% by default), or
- No discharge current is present for a set time duration (default is 0), or
- The ON/OFF button is pushed for at least 4 s, or
- The maximum allowed discharge current is exceeded, or
- The low voltage disconnect is reached (default is 42.0 V).

When the end of discharge is encountered, the Evolion® will go into sleep mode.

**IMPORTANT:** After the end of discharge, the Evolion® can remain in sleep mode for a maximum of 14 days. If re-charge does not begin

within this time, the Evolion® may be over discharged due to its internal self-discharge. If over discharged, it will not startup and will indicate a major alarm that is not resettable. The unit will need to be replaced.

## 8. Maintenance

The Evolion® requires no maintenance, but checking its state and taking necessary action during periodic site routines is recommended.

The SOC can be checked while in operation. Refer to Figure 3 and Table 2.

Check if the heat sink area is obstructed or accumulated with dirt and debris. As necessary, un-obstruct or clean using a non-metallic brush or a dry or damp cloth. Do not use any cleaning solvents or soaps. Do not immerse, dunk, bathe or hose off the Evolion®.

Check the rectifier output. It should be set at 56.0 V.

Check the LED and verify that the operating status is normal. Refer to Table 5.

If an abnormal operation status is noticed, see Section 10.

## 9. Resetting the software

If an alarm that is not automatically resettable or software trap is encountered then push the reset button using a pointed object. After the unit can be restarted normally. See Figure 9 below.

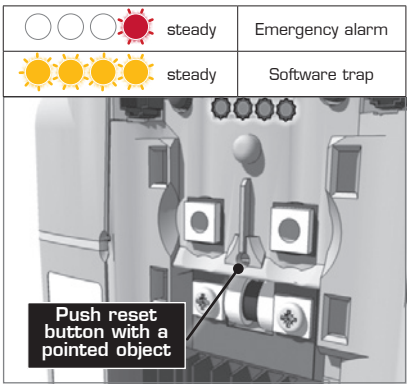



*Figure 9 - Reset button*

## 10. Troubleshooting

The DiagWinBMS supervision software is the best way to interrogate an Evolion® during troubleshooting. See Evolion® DiagWinBMS & Bootloader communication software I&O for details. Refer to the "Evolion technical manual" alarms and troubleshooting section.

If an abnormal operation status is noticed or the unit's operation is questionable, conduct the following procedure:

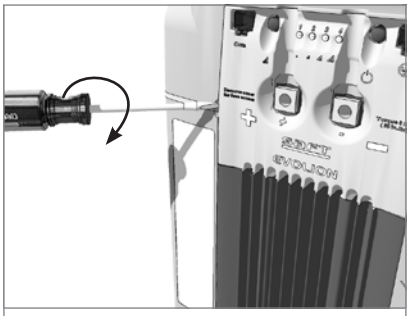
1. Allow the unit to continue operating.
2. Take note of the operation status on the LED (see Table 5).
3. Push the SOC/SOH button for less than 3 s and note the SOC LED status (see Table 2).
4. Measure and note the Evolion® terminal voltage.
5. Call your local Saft representative for further assistance.

If the Evolion® emits an unusual smell, feels hot, changes shape or appears abnormal in any other way, conduct the following procedure:

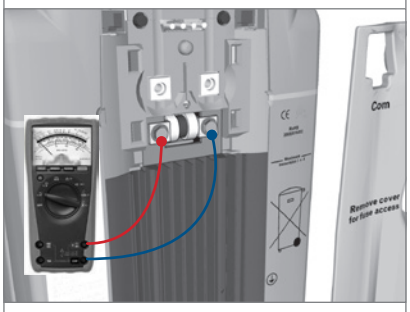
1. Disconnect the Evolion® from power.
2. Shut-down the Evolion® by pushing the ON/OFF button for at least 4 s.
3. Leave the Evolion® in place.
4. Call your local Saft representative for further assistance.

To check and replace the fuse, conduct the following procedure:

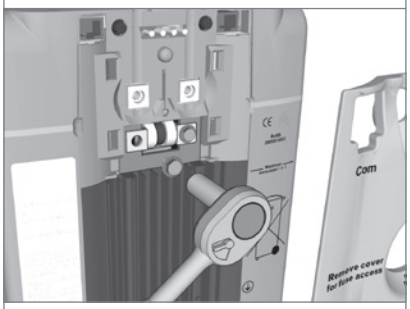
1. Shut-down the Evolion® by pushing the ON/OFF button for at least 4 s.
2. Disconnect and un-install the Evolion®.
3. Check and replace the fuse according to Figure 10.
4. The Evolion® is now ready for service.



- *Remove fuse cover by inserting, on either side, a flat head screwdriver and twisting.*



- *Measure continuity. If good continuity, the fuse is good. Re-install the cover.*



- *If no continuity, remove and replace the fuse using a 7 mm socket and torque wrench with a torque of 3 N.m (26.5 in.lbs). Re-install the cover.*

*Figure 10 - Replacing a fuse*

## 11. Removal and recycling

1. Shut-down the Evolion® by pushing the ON/OFF button for at least 4 s.
2. Disconnect the power terminals.
3. Disconnect alarm/communication cables.
4. Remove the Evolion® and stage for recycling.
5. Call your local Saft representative for further assistance.

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