

# Medium Prismatic lithium-ion batteries

Summer 2001 edition



**S A F T**

THE BATTERY COMPANY

# Saft MP batteries: an original concept in rechargeable lithium technology

*Private mobile radio*

*Notebook computer*

*Hand held terminal*

*Office automation*

*Video & camcorder*

*Medical equipment*

*Military radio communications*

*Cellular phone*

*GPS locator*

*Model aircraft*

*Unmanned aerial vehicles (UAV)*

*Mobile energy*

*Portable instruments*

*Back up systems*

*Unmanned underwater vehicles (UUV)*

*Electric bikes and scooters*

*Missile*

*and others...*

**The European leader in battery technology takes you to the cutting edge of innovation: Saft Medium Prismatic lithium-ion batteries.**

## High performance in a compact format

The industry's first Medium Prismatic (MP) batteries, the Saft MP144350, MP174865 and MP176065 give you the highest energy density in a single cell. This means that Saft MP batteries provide unparalleled autonomy for the most demanding mobile devices.

## Medium Prismatic advantages

Saft Medium Prismatic batteries put unrivaled performance in the palm of your hand. They provide:

- High energy: some 20% higher capacity than cylindrical cells assembled in parallel
- Simple, low cost assembly: no need for parallel assembly or cell interconnecting
- Solid reliability: fewer components mean more dependable battery performance
- Excellent charge retention: 95% of initial capacity after 1 month at room temperature
- High cycling capacity: more than 85% of initial capacity after 500 cycles
- High pulse capability: up to 4C during limited periods of time.



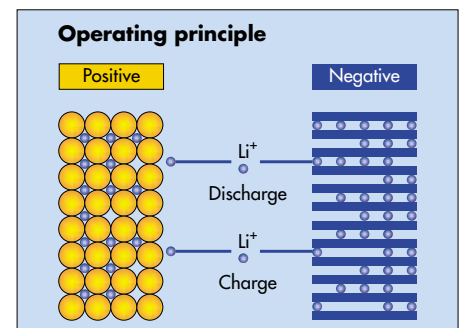
## Lithium-ion technology

Saft MP cells marry the power of rechargeable lithium (Li-ion) technology to advanced battery construction: they are strongly built, corrosion resistant and low magnetic thanks to their stainless steel casing. They do not contain lithium metal. Rather, they operate on the insertion and extraction of lithium ions into and out of their electrodes. The negative electrode is made of a graphite blend. The positive electrode is made of a lithiated cobalt oxide.

Each Saft MP cell features:

- A laser-welded stainless steel can and cover
- A circuit breaker
- A safety vent
- An electronic protection circuit

Each cell is connected to the battery protection circuit.



## Technology defining the 21st century

**Saft Medium Prismatic lithium-ion batteries incorporate state-of-the-art technology at every level.**

### Charging

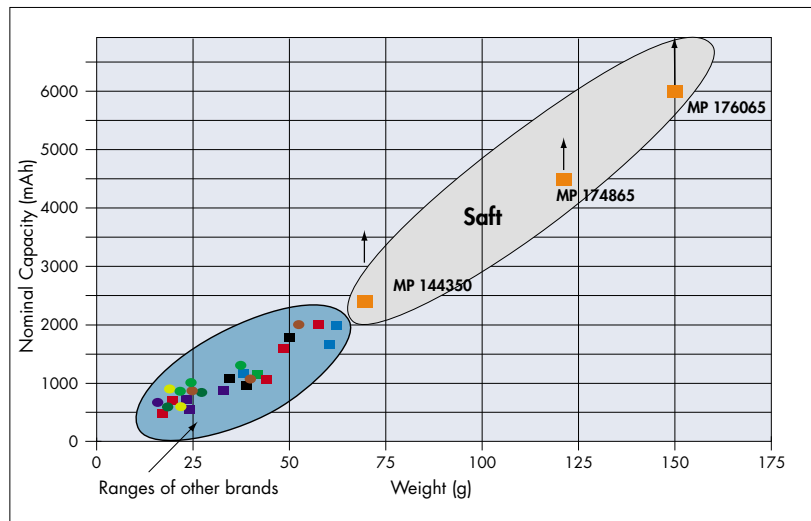
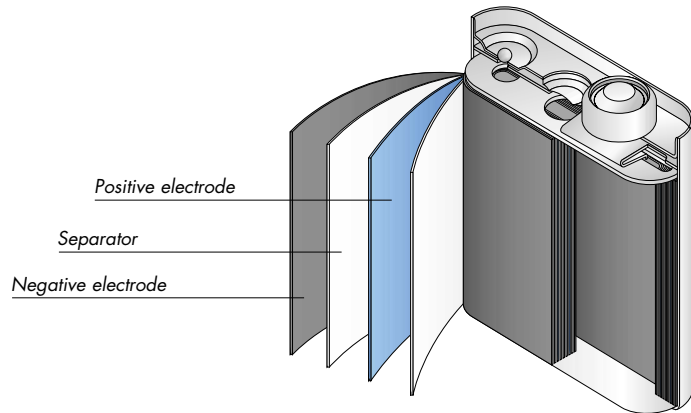
Charging can be completed in 3 hours or less using a constant voltage (4.1V) limited current ( $\leq C$  rate) charging method. However, using a pulse charge, Saft MP single cell can be charged more quickly in as little as one hour.

Though continuous charging can be carried out with adequate precautions (consult us), a simple end of charge feature: timer or low current detection device (see specification on the overleaf for details) will enhance the safety of the charging process.

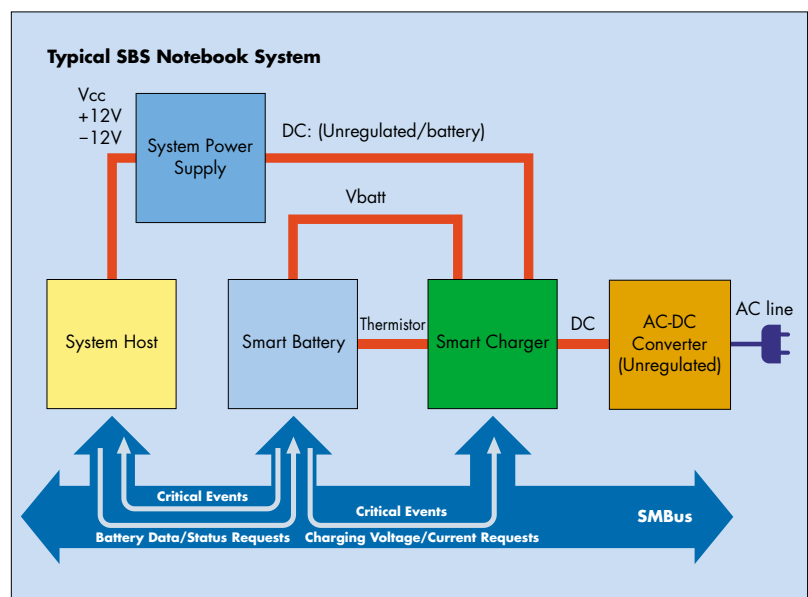
### Effective protection circuit

Every MP pack is equipped with appropriate electronics protection circuits, from 1 to 4 cells or more in series and from 1 to 4 branches in parallel. (Above standard configuration, cell particular application will be studied very fast by our design offices).

These help provide reliable protection against overcharge (4.1 V/cell), overdischarge (2,5 V/cell), and overcurrent (charge, discharge and short circuit). In addition, Saft can incorporate state-of-charge circuits in your MP batteries. These can range from simple gas gauge measuring to more complete data reporting via smart battery technology such as SMBus.



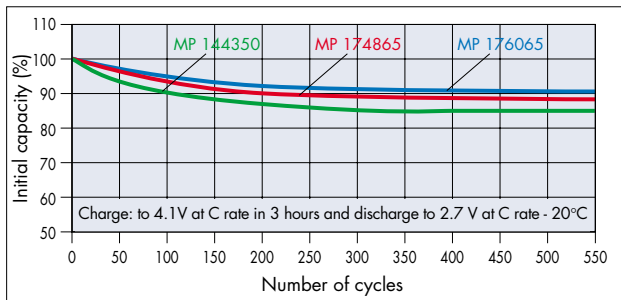
**Saft products are at the high capacity end of what the market offers**



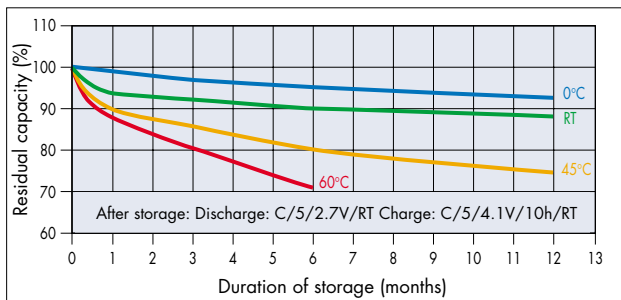
**A typical SMBus (Smart Battery System) application**

## High performance solutions in a single cell

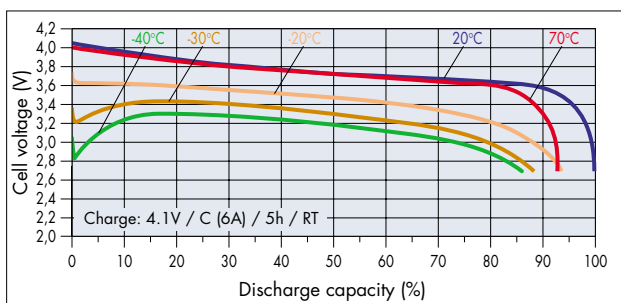
The graphs shown below illustrate the typical high performance curves of Saft MP lithium-ion batteries.



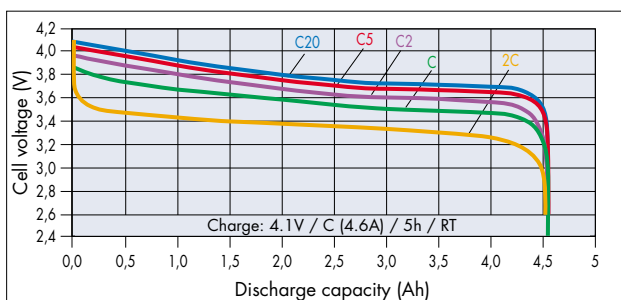
**Cycling performances**



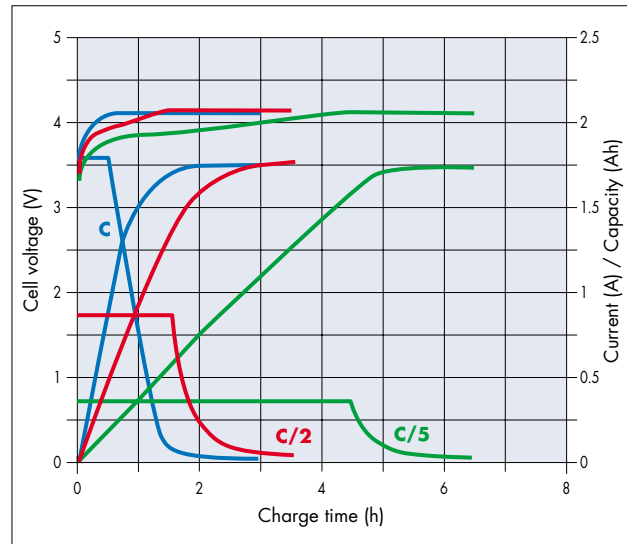
**MP 144350 - Storage characteristics state of charge= 100%**



**MP 176065 - Discharge characteristic at 1.2A (C/5)**



**MP 174865 - Discharge vs current**



**Charge characteristics to 4.1V at 20°C at C, C/2 and C/5 rate**

### Precautions

For the safe performance of all Saft MP Li-ion batteries, observe the following precautions.

When handling Saft MP batteries:

- Do not expose to heat or flame.
- Do not disassemble or alter.
- Do not leave in vehicles or in direct sunlight for extended periods of time.
- Do not short circuit.
- Do not allow metal objects to come into contact with battery terminals.
- Do not immerse in water.
- Do not drop or subject batteries to shock.
- Do not solder directly to batteries.
- Do not remove the protection circuit.

When charging and discharging Saft MP batteries:

- Use only a Saft-approved charger.
- Do not reverse battery leads when charging.
- Do not overcharge.
- Do not use in equipment not designed for their use.
- Do not overdischarge.

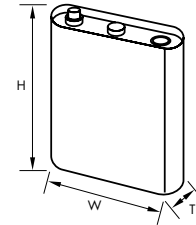
When storing Saft MP batteries:

- Store in a cool, dry place at a temperature below 25°C (80° F).
- If stored for an extended period of time, charge batteries to between 20% and 50% state of charge.

## Technology tailored to your needs

### Saft Medium batteries have the following characteristics:

Model	Dimensions*			Nominal Weight (g)	Nominal Voltage (V)	Nominal Capacity (mAh)	Typical Capacity (mAh)	Maximum Continuous Discharge Current
	Thickness mm	Width mm	Height mm					
MP 144350	13.8 max.	42.4 $\pm$ 0,2	49.5 $\pm$ 0,5	70	3.6	2100	2300	up to 2C
MP 174865	18.5 max.	47.6 $\pm$ 0,2	64.5 $\pm$ 0,5	121	3.6	4300	4600	up to 3C/4C
MP 176065	18.5 max.	59.6 $\pm$ 0,2	64.5 $\pm$ 0,5	150	3.6	5600	6000	up to 3C/4C

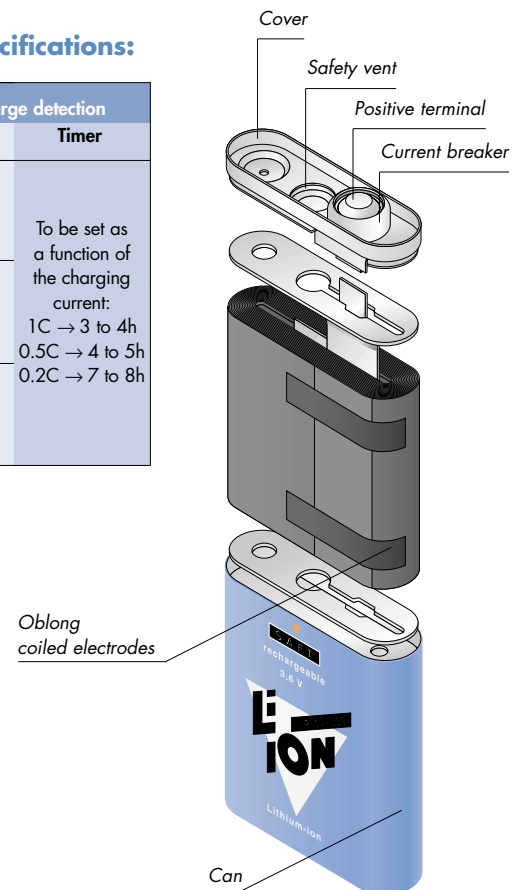


\* Dimensions are given for bare cells; for final battery dimensions, consult SAFT.

### Saft Medium Prismatic batteries have the following charge specifications:

Model	Charge Method	Charging Voltage	Charging Current	Operating Temperature	End of charge detection	
					Low current	Timer
MP 144350	Constant Current/ Constant Voltage (CCCV)	4.1V $\pm$ 0,04V per cell	1C max.  C/2 recommended	Charge 0°C to +50°C  Discharge -40°C to +60°C	30 mA	To be set as a function of the charging current: 1C → 3 to 4h 0.5C → 4 to 5h 0.2C → 7 to 8h
MP 174865					70 mA	
MP 176065					100 mA	

Please consult your local Saft representative for details.



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