saft

Ni-Cd Block battery range

The sustainable approach to performance and reliability for industrial applications

TotalEnergies

Meeting industry's power back-up challenges

Make Saft your long term partner to help you reduce your CO2 emissions

Saft has been a trusted battery partner for the world's leading industrial players for over 100 years, with a range of well-proven solutions that deliver with a reduced CO2 emissions secure energy for stationary applications. Saft's products are designed to meet the environment, reliability, safety and security challenges of today's industrial landscape where they provide power back-up, starting power and bulk energy storage. Saft's commitment to research and development and innovative engineering ensures that our nickel-cadmium (Ni-Cd) batteries offer the very latest in design, quality and industrial process technology to minimize their material consumption. They also come with comprehensive through-life global service support, from initial consultancy to volume delivery, including training, maintenance and expert technical back-up.

Saft Block batteries: flexible solutions for a wide range of industrial applications

Sustainable, reliable, and robust batteries for back-up power

Stationary batteries are used in refineries, power plants, onshore & offshore oil & gas industries, substations, airports & building infrastructure – locations where it is absolutely critical to have batteries that will work when they should, even under extreme operating conditions. Saft nickel cadmium batteries capable of operating at higher temperature with very limited performances changes will allow the end users to reduce their energy consumption by limiting the need to cool down the batterie room. Power is absolutely vital to Uninterruptible Power Supply (UPS) systems, switching and transmission functions, emergency and security systems, industrial fire monitors and alarms, process control installations, substation switchgear, signaling systems and more.

If the primary power source for these applications is suddenly unavailable, a back-up system provides a temporary source of power until primary power re-engages or while systems operators perform a controlled shutdown. But back-up power is only as good as the stationary battery that enables it!

Instant starting power

Cranking up an emergency generator or switching on heaters, pumps or other equipment requires batteries that are very reliable, offer high discharge capabilities and function properly in extreme temperatures. Saft batteries recover their voltage instantaneously, making them the ideal choice for starting applications.

PLATINUM Top 1% 2023 ecovadis Sustainability Rating

In 2023, the sustainability performance of Saft was evaluated by Ecovadis, a leading Environment and Social Responsibility rating Agency. This evaluation focuses on the following matters: environment, labor an human rights, ethics as well as sustainable procurement.

Saft is ranked within the top 1% of companies involved in the manufacture of batteries and accumulators.

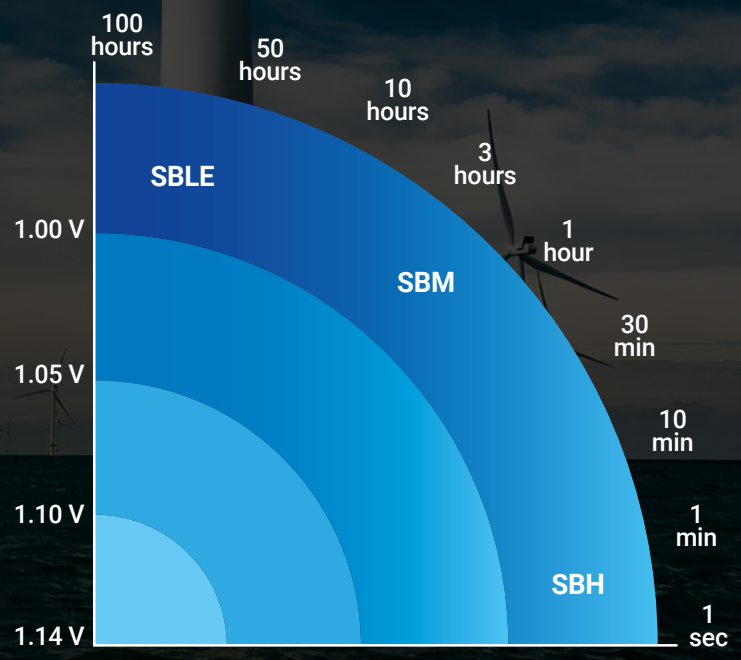
Saft LE/M/H Block battery range: a wide choice of capacity and performance to select to optimized product limiting the usage of raw material

Saft has developed the SBLE, SBM and SBH ranges of block batteries to offer the optimum, flexible solution for all stationary applications. The choice of low rate discharge, medium and high performance types makes it easy to select the ideal battery, based on the required discharge time and end of discharge voltage. Thanks to the robust and reliable Saft Nife® pocket pocket plate technology they resist electrical abuse, shock and vibrations. Furthermore, a generous reserve of electrolyte means that the block batteries need only basic maintenance, while operating across a wide range of fluctuating temperatures. This ensures an optimized solution as regard to environment and economics that can last 20 years or more.

	LE Type	M Type	H Type
Capacity steps	58	68	51
Capacity	7.5 – 1690 Ah	11 - 1445 Ah	8.3 – 920 Ah
Performance	For low rate discharge over long periods between 1 and 100 hours	For varied loads with low and high discharge rates between 30 minutes and 3 hours	For high rate discharge over short periods less than 30 minutes
Applications	Power back-up applications		Power back-up and starting applications

From seconds to hours - every discharge need is covered

Saft has a Block battery range to suit every discharge profile from 1 second to 100 hours



Saft Ni-Cd technology - the proven advantages of a sustainable, safe and robust design

Specify the ideal battery for every application

• Performance optimized for each application according to plate thickness.

LE type

- Thicker plates
- High energy
- Low cost per Amp at low rates

M type

- Thinner plates
- Medium power
- Optimised between H and L design for mixed loads

H type

-Thinnest plate
- High power
- Low cost per Amp at high rates

• Optimized design boosts electrical performance by up to 10%depending on discharge time.

• Twice the number of capacity steps compared with previous designs enables accurate matching with calculated amp-hour requirements.

Improved performance and more capacity steps allow you to select the best, cost-effective battery for your application.

Ni-Cd battery benefits

▶ Sustainable

• Saft manufacturing process and recycling capability ensure lowest CO2 footprint
• Saft Ni-Cd wide operating temperature range makes AC and heating redundant, hence saving energy

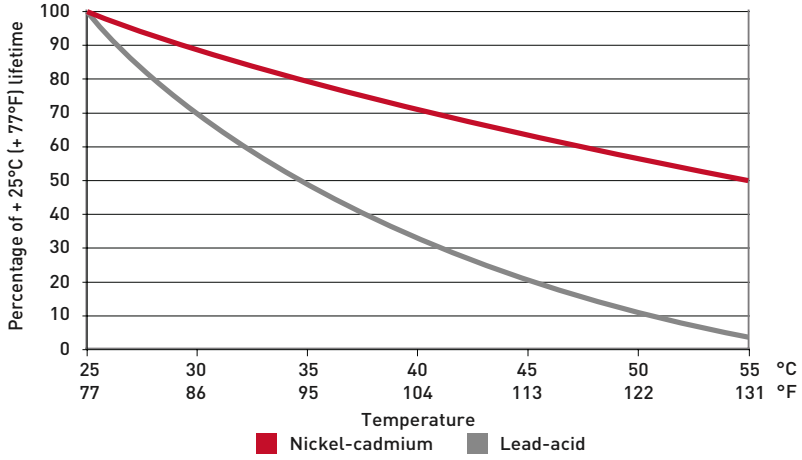
▶ Reliable

• Long operational life of over 20 years, at least 3 times longer than lead-acid batteries
• No risk of sudden death failure

▶ Economical

• Lowest total cost of ownership

Effect of temperature on lifetime



Block battery construction –

• The steel pocket plate structure does not suffer from « sudden death » or internal corrosion since there is no interaction between the active material and the electrolyte.

• Tough polypropylene casing ensures structural integrity throughout a long life.

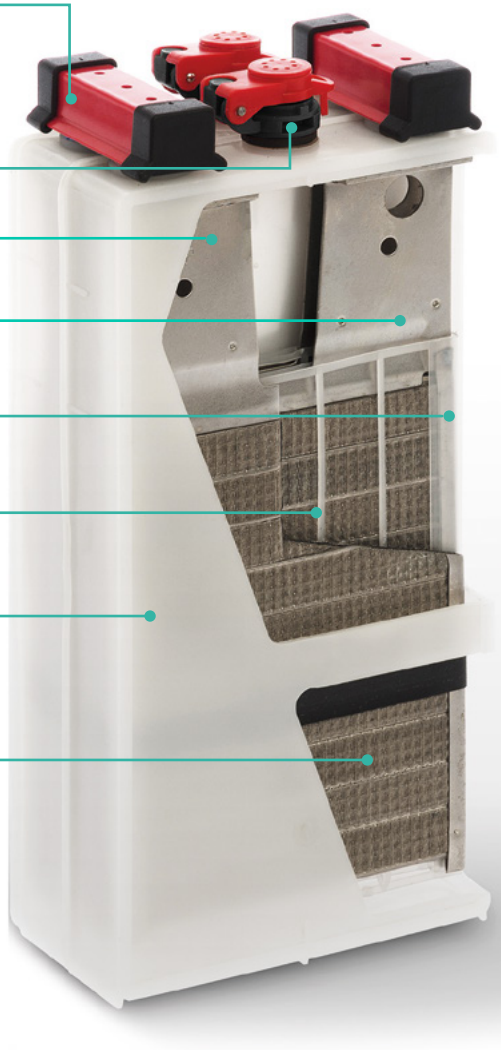
• An engineered electrolyte solution delivers optimum performance without causing degradation of plate materials.

• Plenty of space is allowed for a good reserve of electrolyte.

• A special electrolyte is available for extremely low temperature applications.

• A specially designed flame arresting flip top vent ensures the battery does not produce corrosive emissions.

• The Block battery offers a long shelf life when stored under Saft's recommended conditions and is easy to install.



Note: *The cells are welded together to form rugged blocks of 1-6 cells depending on the cell size and type. Saft cells fully comply with the requirements of the IEC 60623 standard.*

Setting the benchmark for industrial batteries

Low maintenance means lower CO2 needed during the operational life of the product.

• Topping-up intervals are now up to two times longer under standard conditions at + 20°C (+ 68°F) and at float voltage.

• A simple annual maintenance exercise is recommended to check correct functioning of the charging system, battery and the auxiliary electronics.

• Easy maintenance thanks to:

- Visible electrolyte level

- Simple bolted connector for fast installation and allowing

Higher chargeability minimises down time

• Faster recharge time enables at least 80% recovery of capacity from fully discharged conditions in 15 hours at float voltage level. to be quickly commissioned

Recommended charging voltage:

→ For two level charge:

- Float level:

1.42 ± 0.01 V/cell for SBLE

1.40 ± 0.01 V/cell for SBM and SBH

- High level:

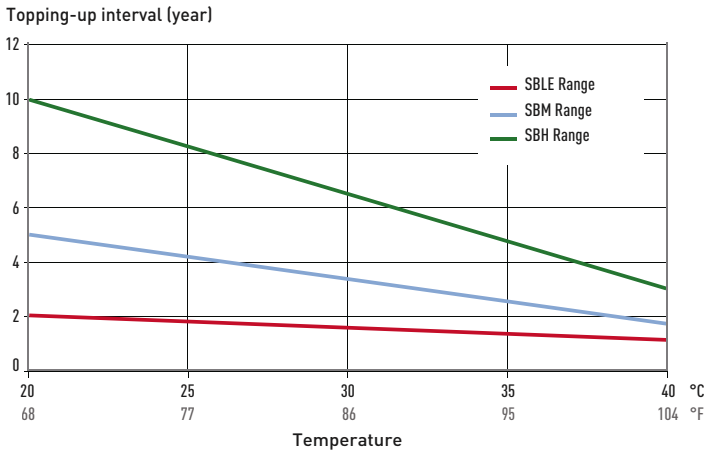
1.47 - 1.70 V/cell for SBLE

1.45 - 1.70 V/cell for SBM and SBH

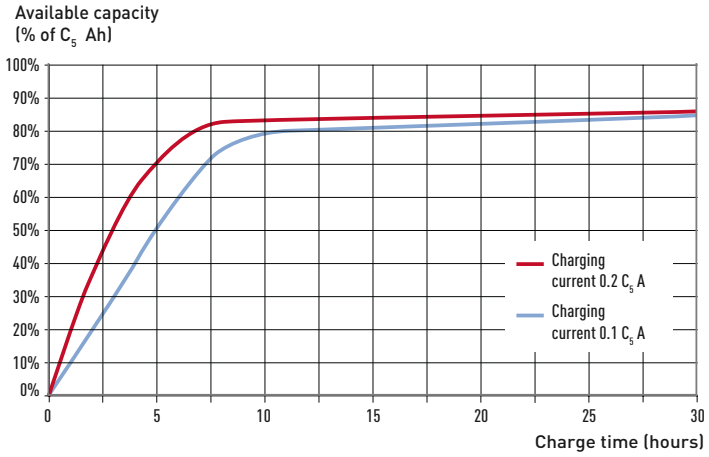
A high voltage will increase the speed and efficiency of the recharging.

→ For single level charge:
1.43 - 1.50 V/cell.

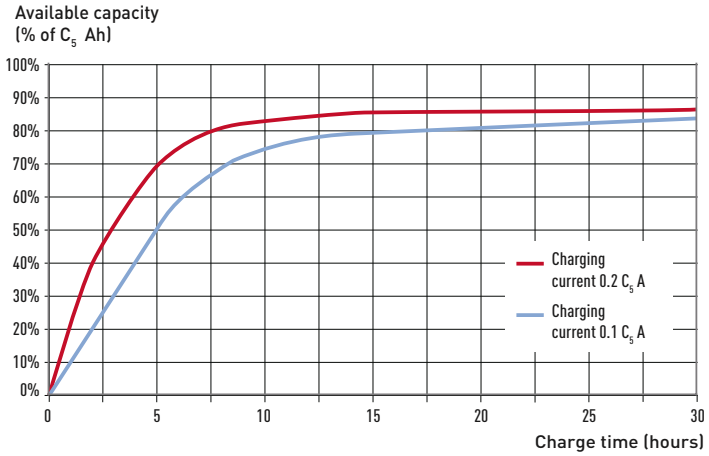
Typical topping up intervals at recommended charge voltage



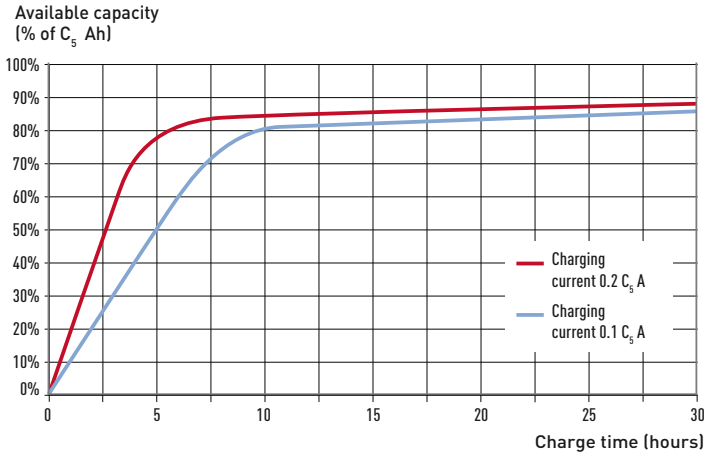
SBLE Range – Available capacity after constant voltage charge at 1,42 V at + 20°C (+ 68°F)



SBM Range – Available capacity after constant voltage charge at 1,40 V at + 20°C (+ 68°F))



SBH Range – Available capacity after constant voltage charge at 1,40 V at + 20°C (+ 68°F)



Quality built, quality tested for sustainability, durability and performance

Saft Excellence System

Saft Block batteries are designed in full compliance with the highest quality, safety and environmental standards

Electrical characteristics

- Certified IEC 60623 - Secondary cells and batteries containing alkaline or other non-acid electrolytes - Vented nickel-cadmium prismatic rechargeable single cells.

Safety

- Complies with EN 50272-2/ IEC 62485-2 - Safety requirements for secondary batteries and battery installations - Part 2: Stationary batteries - The protective covers for terminals and connectors, the insulated cables are compliant with IP2 level protection against electrical shocks according to safety standard.
- Complies with UL 1989 - Section 7: Flame arrester vent cap tests - UL standard for safety for standby batteries.

Quality

- ISO 9001 and ISO 14001
- Saft world class continuous programme

Environment & Recycling of Ni-cd

- Fully recyclable
- RoHS – Although batteries and accumulators are not within the scope of the RoHS directive, Saft has taken voluntary measures to make sure that the substances forbidden by RoHS are not present in the battery, with the exception of the electro-chemical core.
- REACH - The Saft Group has adopted internal procedures to ensure conformity with the European REACH (Registration, Evaluation, Authorisation and Restriction of Chemical Substances) Regulation.Substances) Regulation
- Saft operates the only plant in the world that produces nickel-cadmium batteries incorporating metals that have been reclaimed on site from spent batteries, reducing their eco-footprint. The recycling of Ni-Cd batteries is a complex process that involves separating the nickel, cobalt and cadmium from the electrodes, a process perfected by Saft's plant in Oskarshamn, Sweden. This plant in Sweden is the only one in the world which combines the recycling of used batteries and the manufacturing of new ones, hence facilitating the incorporation of recycled materials into new products.
- Saft operates a network of over 30 bring back points worldwide that receive spent Ni-Cd batteries manufactured by Saft. The bring back points located in northern Europe bring these used batteries back to Oskarshamn, minimizing transportation. Other bring back points work with other fully permitted recycling partners selected by Saft. This take back and recycling service ensures that the recycling efficiency mandated by the EU battery directive is met and that we have closed the loop on responsible production of Ni-Cd batteries.

Providing a wide scope of support and services

Saft offers total end to end application support

Saft's stationary battery experts offer a comprehensive range of skills and expertise to help our global customers specify the ideal battery solution for their particular application.

This end to end support starts at the design stage, such as advice on battery sizing, and carries customers through installation and commissioning.

Saft's after-sales service covers support, maintenance and diagnostics as well as end of life recycling.

Saft organizes battery training seminars for consultants, engineering teams and maintenance departments.

To ensure that customers receive the optimum service, wherever they are in the world, we are continuing to expand and enhance our network of approved service stations in the Middle East, Asia, Europe and North America.

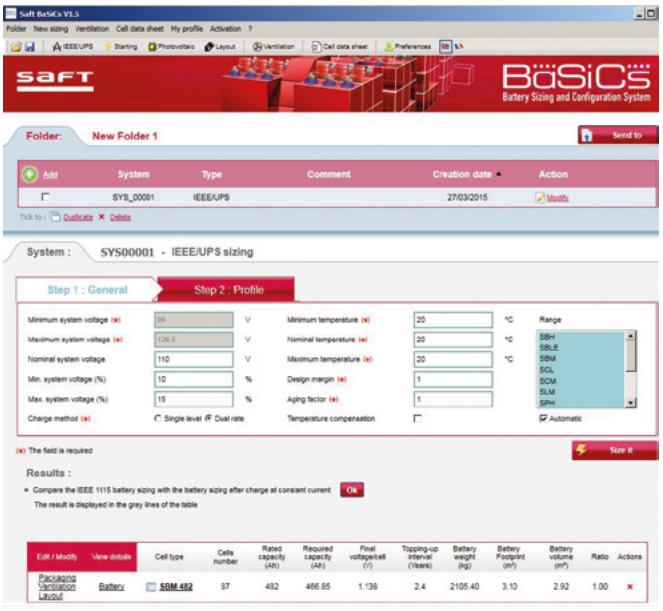
Perform your own sizing

Saft's Battery Sizing and Configuration System, known as BaSiCs, helps our customers to quickly and easily find the right battery for their back-up or starting applications. BaSiCs helps users create the layout for one or more stands as well as the battery layout itself.

This tool allows you to evaluate your environmental footprint against lead acid and see the Saft Nickel cadmium benefits

To download the BaSICs application, search for "BaSiCs" on our web site:

www.saftbatteries.com



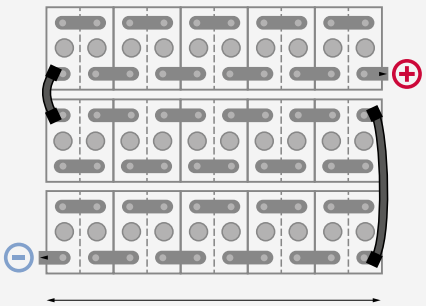
Connecting your batteries for optimum efficiency

Standard layouts

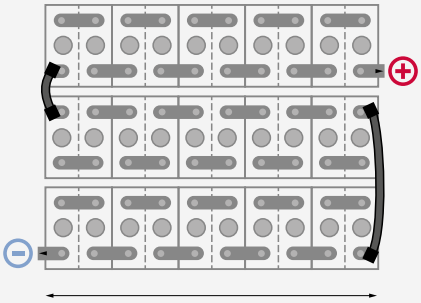
Saft has developed a series of standard layouts for ordering a battery. Whether the battery is being installed on a rack, in a cabinet or is simply freestanding, the same configuration principals can be applied.

Two ways to configure the battery

	Normal connection	Crosswise connection
SBLE	7.5 → 510	550 → 1690
SBM	11 → 392	415 → 1445
SBH	8.3 → 157	177 → 920



Length-to-length connection



Width-to-Width connection

The cell is turned through 90° and then connected width-to-width. This is referred to as «crosswise» mounted and its purpose is to minimize the installation's over-all length. The cell's width is used to calculate the row length.

Dimensions

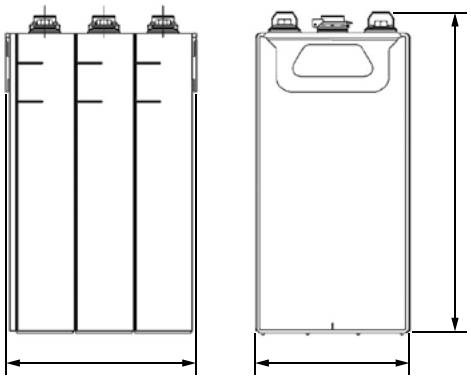
The dimensions of all available cell types are listed in the tables. The block length is determined by the cell length and the number of cells in the block.

Notes:

•All the tabulated dimensions are maximum values.

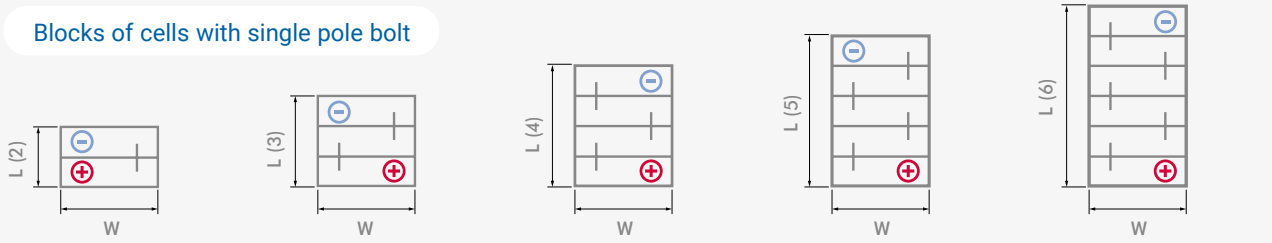
• All block types with a cell weight exceeding 8.4 kg (18.5 block length includes 6 mm for handles for these types.

• All the cell heights given in the tables include the height of the IP2X terminal cover.



Position of terminals

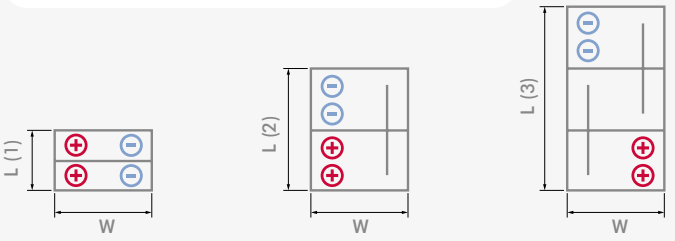
Blocks of cells with single pole bolt



SBLE 7.5 → 62

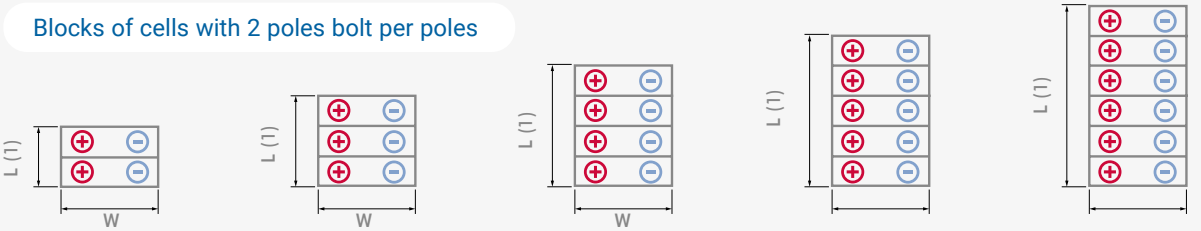
SBLE 75 → 275
SBM 11 → 241
SBH 8.3 → 118

Blocks of cells with 2 poles bolt per poles



SBLE 300 → 510
SBM 250 → 392
SBH 137 → 157

Blocks of cells with 2 poles bolt per poles



SBLE 550
SBM 415 → 482
SBH 177 → 256
SBH 270 → 281
SBH 307

SBLE 600 → 830
SBM 505 → 723
SBH 265 / 294
SBH 323 → 383
SBH 400 → 460

SBLE 890 → 1100
SBM 740 → 940
SBH 393 / 471
SBH 510 → 560
SBH 600 → 615

SBLE 1150 → 1400
SBM 1009 → 1181
SBH 471 / 590
SBH 640 → 765

SBLE 1450 → 1690
SBM 965
SBM 1220 → 1445
SBH 800 → 920

SBLE

Capacities and dimensions

Cell Type	Capa-city	Height		Width		Lenght per block												Approx. Weight per cell		Approx. Electrolyte vol. between level marks	Approx. electrolyte per cell		Internal Resistance	Cell connection bolt per pole
						1 cells		2 cells		3 cells		4 cells		5 cells		6 cells								
	C_5 Ah	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	kg	lb	cm^3	L	kg	mOhm	
SBLE 7.5	7.5	190	7.5	123	4.8							101	4.0	125	4.9	149	5.9	0.8	1.8	87	0.08	0.24	14.00	M6
SBLE 15	15	270	10.6	123	4.8							101	4.0	125	4.9	149	5.9	1.1	2.4	87	0.12	0.35	8.33	M6
SBLE 22	22	270	10.6	123	4.8							143	5.6	178	7.0	212	8.3	1.7	3.7	129	0.17	0.53	5.45	M6
SBLE 30	30	270	10.6	123	4.8							143	5.6	178	7.0	212	8.3	1.8	4.0	129	0.15	0.46	4.17	M6
SBLE 34	34	270	10.6	123	4.8							191	7.5	238	9.4	284	11.2	2.3	5.1	177	0.23	0.70	3.53	M6
SBLE 40	40	270	10.6	123	4.8							239	9.4	298	11.7	356	14.0	3.0	6.6	224	0.29	0.90	3.00	M6
SBLE 47	47	270	10.6	123	4.8							191	7.5	238	9.4	284	11.2	2.3	5.1	177	0.20	0.59	2.66	M6
SBLE 62	62	270	10.6	123	4.8							239	9.4	298	11.7	356	14.0	3.2	7.1	224	0.25	0.70	2.02	M6
SBLE 70	70	350	13.8	195	7.7			79	3.1	115	4.5							4.1	9.0	299	0.33	1.00	2.29	M8
SBLE 75	75	350	13.8	195	7.7			79	3.1	115	4.5							4.1	9.0	299	0.38	1.00	2.13	M8
SBLE 85	85	411	16.2	195	7.7			79	3.1	115	4.5							4.9	10.8	299	0.45	1.40	1.94	M8
SBLE 95	95	411	16.2	195	7.7			79	3.1	115	4.5							4.7	10.4	299	0.45	1.20	1.74	M8
SBLE 100	100	350	13.8	195	7.7			103	4.1	151	5.9							5.4	11.9	404	0.49	1.50	1.60	M10
SBLE 110	110	350	13.8	195	7.7			103	4.1	151	5.9							5.6	12.3	404	0.49	1.20	1.45	M10
SBLE 125	125	411	16.2	195	7.7			103	4.1	151	5.9							6.7	14.8	404	0.58	1.70	1.32	M10
SBLE 140	140	411	16.2	195	7.7			103	4.1	151	5.9							6.5	14.3	404	0.58	1.80	1.18	M10
SBLE 149	149	350	13.8	195	7.7			127	5.0	187	7.4							6.6	14.6	510	0.59	1.80	1.07	M10
SBLE 165	165	411	16.2	195	7.7			127	5.0	187	7.4							8.4	18.5	510	0.71	2.20	1.00	M10
SBLE 176	176	350	13.8	195	7.7			153	6.0	226	8.9							7.9	17.4	624	0.72	2.20	0.91	M10
SBLE 185	185	411	16.2	195	7.7			127	5.0	187	7.4							8.4	18.5	510	0.71	2.00	0.89	M10
SBLE 200	200	411	16.2	195	7.7			159	6.3	232	9.1							10.2	22.5	624	0.86	2.60	0.83	M10
SBLE 215	215	411	16.2	195	7.7			159	6.3	232	9.1							10.2	22.5	624	0.86	2.60	0.77	M10
SBLE 220	220	350	13.8	195	7.7			183	7.2	268	10.6							9.1	20.1	729	0.81	2.50	0.73	M10
SBLE 230	230	411	16.2	195	7.7			159	6.3	232	9.1							9.9	21.8	624	0.86	2.30	0.72	M10
SBLE 255	255	411	16.2	195	7.7			183	7.2	268	10.6							11.9	26.2	729	1.00	3.00	0.65	M10
SBLE 275	275	411	16.2	195	7.7			183	7.2	268	10.6							11.5	25.4	729	1.00	2.90	0.60	M10
SBLE 285	285	411	16.2	195	7.7			183	7.2	268	10.6							11.9	26.2	729	0.98	3.00	0.58	M10
SBLE 300	300	411	16.2	195	7.7			229	9.0	337	13.3							14.8	32.6	914	1.29	3.90	0.55	2xM10
SBLE 325	325	411	16.2	195	7.7			229	9.0	337	13.3							14.5	32.0	914	1.29	3.50	0.51	2xM10
SBLE 334	334	411	16.2	195	7.7			253	10.0	373	14.7							14.8	32.6	1019	1.27	3.90	0.49	2xM10
SBLE 344	344	411	16.2	195	7.7			253	10.0	373	14.7							16.5	36.4	1019	1.40	4.30	0.48	2xM10
SBLE 355	355	411	16.2	195	7.7			253	10.0	373	14.7							16.5	36.4	1019	1.42	4.30	0.46	2xM10
SBLE 365	365	411	16.2	195	7.7			253	10.0	373	14.7							16.5	36.4	1019	1.42	4.30	0.45	2xM10
SBLE 375	375	411	16.2	195	7.7			253	10.0	373	14.7							16.8	37.0	1019	1.42	4.00	0.44	2xM10
SBLE 395	395	411	16.2	195	7.7	146	5.7	279	11.0									18.0	39.7	1133	1.57	4.70	0.42	2xM10
SBLE 415	415	411	16.2	195	7.7	146	5.7	279	11.0									18.3	40.3	1133	1.57	4.30	0.40	2xM10
SBLE 425	425	411	16.2	195	7.7	146	5.7	279	11.0									18.3	40.3	1133	1.53	4.70	0.39	2xM10
SBLE 435	435	411	16.2	195	7.7	159	6.3	305	12.0									19.8	43.7	1247	1.73	5.20	0.38	2xM10
SBLE 460	460	411	16.2	195	7.7	159	6.3	305	12.0									19.8	43.7	1247	1.73	4.60	0.36	2xM10
SBLE 470	470	411	16.2	195	7.7	159	6.3	305	12.0									20.0	44.1	1247	1.69	5.20	0.35	2xM10

** Height including the IP2X terminal cover*

SBLE

Capacities and dimensions

Cell Type	Capa-city	Height		Width		Lenght per block				Approx. Weight per cell		Approx. Electrolyte vol. between level marks	Approx. electrolyte per cell		Internal Resistance	Cell connection bolt per pole
						1 cells		2 cells								
	C_5 Ah	mm	in	mm	in	mm	in	mm	in	kg	lb	cm^3	L	kg	mOhm	
SBLE 480	480	411	16.2	195	7.7	171	6.7	329	13.0	21.8	48.1	1353	1.86	5.60	0.34	2xM10
SBLE 500	500	411	16.2	195	7.7	171	6.7	329	13.0	21.8	48.1	1353	1.86	5.60	0.33	2xM10
SBLE 510	510	411	16.2	195	7.7	171	6.7	329	13.0	21.4	47.2	1353	1.86	5.20	0.32	2xM10
SBLE 550	550	411	16.2	195	7.7	183	7.2			23.0	50.7	1458	1.99	5.80	0.30	2xM10
SBLE 570	570	411	16.2	195	7.7	183	7.2			23.5	51.8	1458	1.95	6.00	0.29	2xM10
SBLE 600	600	411	16.2	195	7.7	206	8.1			26.7	58.9	1643	2.28	6.30	0.28	3xM10
SBLE 620	620	411	16.2	195	7.7	206	8.1			26.1	57.5	1643	2.21	6.80	0.27	3xM10
SBLE 650	650	411	16.2	195	7.7	219	8.6			28.0	61.7	1757	2.44	6.60	0.25	3xM10
SBLE 700	700	411	16.2	195	7.7	232	9.1			30.0	66.1	1871	2.59	6.90	0.24	3xM10
SBLE 750	750	411	16.2	195	7.7	244	9.6			31.3	69.0	1977	2.72	7.50	0.22	3xM10
SBLE 762	762	411	16.2	195	7.7	244	9.6			31.4	69.2	1977	2.72	8.10	0.22	3xM10
SBLE 790	790	411	16.2	195	7.7	256	10.1			33.4	73.6	2082	2.85	8.50	0.21	3xM10
SBLE 830	830	411	16.2	195	7.7	268	10.6			34.5	76.1	2187	2.99	8.70	0.20	3xM10
SBLE 855	855	411	16.2	195	7.7	268	10.6			35.0	77.2	2187	2.89	8.90	0.19	3xM10
SBLE 890	890	411	16.2	195	7.7	292	11.5			37.2	82.0	2381	3.30	9.80	0.19	4xM10
SBLE 905	905	411	16.2	195	7.7	292	11.5			37.8	83.3	2381	3.18	9.80	0.18	4xM10
SBLE 925	925	411	16.2	195	7.7	305	12.0			39.6	87.3	2495	3.45	9.20	0.18	4xM10
SBLE 980	980	411	16.2	195	7.7	317	12.5			41.0	90.4	2600	3.58	10.70	0.17	4xM10
SBLE 1000	1000	411	16.2	195	7.7	329	13.0			43.0	94.8	2706	3.72	11.10	0.17	4xM10
SBLE 1020	1020	411	16.2	195	7.7	329	13.0			42.8	94.4	2706	3.72	10.40	0.16	4xM10
SBLE 1070	1070	411	16.2	195	7.7	341	13.4			45.0	99.2	2811	3.85	11.50	0.15	4xM10
SBLE 1100	1100	411	16.2	195	7.7	353	13.9			46.0	101.4	2917	3.98	11.60	0.15	4xM10
SBLE 1125	1125	411	16.2	195	7.7	353	13.9			46.6	102.7	2917	3.87	11.90	0.15	4xM10
SBLE 1150	1150	411	16.2	195	7.7	378	14.9			48.6	107.1	3119	4.31	12.90	0.14	5xM10
SBLE 1200	1200	411	16.2	195	7.7	390	15.4			51.1	112.7	3224	4.45	12.10	0.14	5xM10
SBLE 1250	1250	411	16.2	195	7.7	402	15.8			52.6	116.0	3330	4.58	13.60	0.13	5xM10
SBLE 1300	1300	411	16.2	195	7.7	413	16.3			54.3	119.7	3426	4.69	13.60	0.13	5xM10
SBLE 1350	1350	411	16.2	195	7.7	426	16.8			56.6	124.8	3540	4.84	14.40	0.12	5xM10
SBLE 1400	1400	411	16.2	195	7.7	438	17.2			57.5	126.8	3646	4.98	14.50	0.12	5xM10
SBLE 1450	1450	411	16.2	195	7.7	463	18.2			60.2	132.7	3848	5.31	15.80	0.11	6xM10
SBLE 1500	1500	411	16.2	195	7.7	487	19.2			64.2	141.5	4059	5.58	15.60	0.11	6xM10
SBLE 1560	1560	411	16.2	195	7.7	499	19.6			66.2	145.9	4164	5.71	17.00	0.11	6xM10
SBLE 1600	1600	411	16.2	195	7.7	511	20.1			67.4	148.6	4270	5.84	16.80	0.10	6xM10
SBLE 1660	1660	411	16.2	195	7.7	523	20.6			69.0	152.1	4375	5.97	17.40	0.10	6xM10
SBLE 1690	1690	411	16.2	195	7.7	523	20.6			69.8	153.9	4375	5.97	17.80	0.10	6xM10
SBLE 1710	1710	411	16.2	195	7.7	523	20.6			69.8	153.9	4375	5.78	17.80	0.10	6xM10

** Height including the IP2X terminal cover*

SBM

Capacities and dimensions

Cell Type	Capa-city	Height		Width		Lenght per block				Approx. Weight per cell		Approx. Electrolyte vol. between level marks	Approx. electrolyte per cell		Internal	Cell connection bolt per pole
						2 cells		3 cells								
	C, Ah	mm	in	mm	in	mm	in	mm	in	kg	lb	cm³	L	kg	mOhm	
SBM 11	11	190	7.5	123	4.8	64	2.5	94	3.7	0.9	2.0	109	0.09	0.30	5.00	M6
SBM 15	15	190	7.5	123	4.8	74	2.9	109	4.3	1.2	2.6	129	0.10	0.33	3.67	M6
SBM 22	22	270	10.6	123	4.8	64	2.5	94	3.7	1.5	3.3	109	0.13	0.46	2.82	M6
SBM 30	30	270	10.6	123	4.8	74	2.9	109	4.3	1.8	4.0	129	0.15	0.46	2.07	M6
SBM 39	39	270	10.6	123	4.8	98	3.9	145	5.7	2.4	5.3	177	0.28	0.70	1.59	M6
SBM 43	43	350	13.8	195	7.7	69	2.7	100	3.9	3.4	7.5	255	0.32	0.95	1.81	M6
SBM 46	46	270	10.6	123	4.8	122	4.8	181	7.1	2.8	6.2	224	0.29	0.90	1.35	M6
SBM 50	50	350	13.8	195	7.7	69	2.7	100	3.9	3.6	7.9	255	0.32	1.00	1.56	M6
SBM 55	55	270	10.6	123	4.8	122	4.8	181	7.1	3.4	7.5	224	0.36	1.10	1.13	M6
SBM 56	56	411	16.2	195	7.7	69	2.7	100	3.9	4.0	8.8	255	0.38	1.10	1.54	M6
SBM 65	65	350	13.8	195	7.7	79	3.1	115	4.5	4.1	9.0	299	0.37	1.00	1.20	M8
SBM 72	72	350	13.8	195	7.7	79	3.1	115	4.5	4.4	9.7	299	0.36	1.10	1.08	M8
SBM 77	77	270	10.6	123	4.8	191	7.5	284	11.2	4.8	10.6	353	0.46	1.40	0.81	2xM6
SBM 84	84	411	16.2	195	7.7	79	3.1	115	4.5	4.9	10.8	299	0.43	1.20	1.02	M8
SBM 86	86	350	13.8	195	7.7	94	3.7	138	5.4	5.2	11.5	365	0.44	1.30	0.91	M8
SBM 90	90	350	13.8	195	7.7	94	3.7	138	5.4	5.7	12.6	365	0.42	1.30	0.87	M8
SBM 93	93	411	16.2	195	7.7	79	3.1	115	4.5	5.1	11.2	299	0.43	1.30	0.92	M8
SBM 100	100	411	16.2	195	7.7	94	3.7	138	5.4	6.4	14.1	365	0.52	1.60	0.86	M8
SBM 107	107	350	13.8	195	7.7	127	5.0	187	7.4	7.0	15.4	510	0.62	1.90	0.73	M10
SBM 112	112	411	16.2	195	7.7	94	3.7	138	5.4	6.3	13.9	365	0.52	1.40	0.77	M8
SBM 118	118	411	16.2	195	7.7	94	3.7	138	5.4	6.3	13.9	365	0.52	1.60	0.73	M8
SBM 125	125	350	13.8	195	7.7	127	5.0	187	7.4	7.4	16.3	510	0.59	1.80	0.62	M10
SBM 130	130	350	13.8	195	7.7	127	5.0	187	7.4	7.5	16.5	510	0.61	1.80	0.60	M10
SBM 138	138	411	16.2	195	7.7	115	4.5	169	6.7	7.6	16.8	457	0.66	1.70	0.62	M10
SBM 150	150	350	13.8	195	7.7	159	6.3	232	9.1	8.9	19.6	624	0.77	2.30	0.52	M10
SBM 161	161	411	16.2	195	7.7	127	5.0	187	7.4	8.4	18.5	510	0.71	2.10	0.53	M10
SBM 168	168	350	13.8	195	7.7	183	7.2	268	10.6	10.1	22.3	729	0.92	2.70	0.46	M10
SBM 169	169	411	16.2	195	7.7	127	5.0	187	7.4	8.9	19.6	510	0.68	2.10	0.51	M10
SBM 184	184	411	16.2	195	7.7	159	6.3	232	9.1	9.9	21.8	624	0.91	2.40	0.47	M10
SBM 192	192	411	16.2	195	7.7	159	6.3	232	9.1	10.5	23.1	624	0.91	2.70	0.45	M10
SBM 200	200	411	16.2	195	7.7	183	7.2	268	10.6	12.0	26.5	729	1.08	3.20	0.43	M10
SBM 208	208	411	16.2	195	7.7	183	7.2	268	10.6	11.5	25.4	729	1.08	2.90	0.41	M10
SBM 216	216	411	16.2	195	7.7	183	7.2	268	10.6	12.0	26.5	729	1.08	3.20	0.40	M10
SBM 225	225	411	16.2	195	7.7	187	7.4	274	10.8	12.8	28.2	729	1.04	3.20	0.38	2xM8
SBM 231	231	411	16.2	195	7.7	183	7.2	268	10.6	12.0	26.5	729	1.01	2.90	0.37	M10
SBM 241	241	411	16.2	195	7.7	183	7.2	268	10.6	12.5	27.6	729	1.01	3.00	0.36	M10
SBM 250	250	411	16.2	195	7.7	229	9.0	337	13.3	15.5	34.2	914	1.32	3.90	0.34	2xM10
SBM 260	260	411	16.2	195	7.7	229	9.0	337	13.3	15.5	34.2	914	1.32	3.90	0.33	2xM10
SBM 270	270	350	13.8	195	7.7	279	11.0	412	16.2	16.5	36.4	1133	1.33	4.10	0.29	2xM10
SBM 277	277	411	16.2	195	7.7	229	9.0	337	13.3	14.5	32.0	914	1.32	3.50	0.31	2xM10

** Height including the IP2X terminal cover*

SBM

Capacities and dimensions

Cell Type	Capa-city	Height		Width		Lenght per block						Approx. Weight per cell		Approx. Electrolyte vol. between level marks	Approx. electrolyte per cell		Internal	Cell connection bolt per pole
						1 cells		2 cells		3 cells								
	C_5 Ah	mm	in	mm	in	mm	in	mm	in	mm	in	kg	lb	cm^3	L	kg	mOhm	
SBM 286	286	411	16.2	195	7.7			229	9.0	337	13.3	15.6	34.4	914	1.27	3.90	0.30	2xM10
SBM 287	287	350	13.8	195	7.7			305	12.0	451	17.8	16.0	35.3	1247	1.54	4.20	0.27	2xM10
SBM 300	300	411	16.2	195	7.7			241	9.5	355	14.0	15.5	34.2	966	1.37	3.70	0.29	2xM10
SBM 323	323	411	16.2	195	7.7			253	10.0	373	14.7	17.3	38.1	1019	1.43	3.90	0.27	2xM10
SBM 335	335	411	16.2	195	7.7			253	10.0	373	14.7	17.6	38.8	1019	1.36	4.20	0.26	2xM10
SBM 346	346	411	16.2	195	7.7	146	5.7	279	11.0			19.5	43.0	1133	1.62	4.80	0.25	2xM10
SBM 359	359	350	13.8	195	7.7	183	7.2	353	13.9			20.0	44.1	1458	1.73	5.00	0.22	2xM10
SBM 369	369	411	16.2	195	7.7	159	6.3	305	12.0			20.5	45.2	1247	1.81	4.80	0.23	2xM10
SBM 382	382	411	16.2	195	7.7	159	6.3	305	12.0			20.5	45.2	1247	1.72	5.30	0.23	2xM10
SBM 392	392	411	16.2	195	7.7	171	6.7	329	13.0			22.1	48.7	1353	1.99	5.30	0.22	2xM10
SBM 404	404	411	16.2	195	7.7	171	6.7	329	13.0			22.3	49.2	1353	1.92	5.90	0.21	2xM10
SBM 415	415	411	16.2	195	7.7	183	7.2					23.7	52.2	1458	2.16	5.80	0.21	2xM10
SBM 431	431	350	13.8	195	7.7	232	9.1					25.5	56.2	1871	2.31	6.40	0.18	3xM10
SBM 438	438	411	16.2	195	7.7	183	7.2					23.5	51.8	1458	2.09	5.80	0.20	2xM10
SBM 450	450	411	16.2	195	7.7	183	7.2					24.3	53.6	1458	1.98	6.10	0.19	2xM10
SBM 461	461	411	16.2	195	7.7	183	7.2					24.0	52.9	1458	2.03	5.70	0.19	2xM10
SBM 482	482	411	16.2	195	7.7	183	7.2					24.7	54.5	1458	2.03	5.90	0.18	2xM10
SBM 505	505	411	16.2	195	7.7	213	8.4					27.5	60.6	1704	2.47	6.50	0.17	3xM10
SBM 526	526	411	16.2	195	7.7	213	8.4					27.6	60.8	1704	2.47	7.30	0.16	3xM10
SBM 540	540	350	13.8	195	7.7	268	10.6					31.5	69.4	2187	2.59	7.50	0.14	3xM10
SBM 555	555	411	16.2	195	7.7	232	9.1					30.0	66.1	1871	2.72	7.20	0.15	3xM10
SBM 575	575	411	16.2	195	7.7	305	12.0					34.0	75.0	2495	2.72	8.60	0.14	4xM10
SBM 576	576	411	16.2	195	7.7	232	9.1					30.3	66.8	1871	2.72	8.00	0.15	3xM10
SBM 600	600	411	16.2	195	7.7	244	9.6					32.1	70.8	1977	2.89	8.50	0.14	3xM10
SBM 625	625	411	16.2	195	7.7	268	10.6					35.5	78.3	2187	3.24	8.70	0.14	3xM10
SBM 649	649	411	16.2	195	7.7	268	10.6					35.4	78.0	2187	3.24	9.50	0.13	3xM10
SBM 674	674	411	16.2	195	7.7	268	10.6					35.9	79.1	2187	3.18	9.30	0.13	3xM10
SBM 690	690	411	16.2	195	7.7	268	10.6					37.0	81.6	2187	3.04	8.60	0.12	3xM10
SBM 703	703	411	16.2	195	7.7	268	10.6					36.5	80.5	2187	2.96	9.10	0.12	3xM10
SBM 720	720	411	16.2	195	7.7	353	13.9					40.5	89.3	2917	3.04	10.00	0.11	4xM10
SBM 723	723	411	16.2	195	7.7	268	10.6					37.0	81.6	2187	3.04	8.90	0.12	3xM10
SBM 740	740	411	16.2	195	7.7	305	12.0					40.0	88.2	2495	3.63	9.60	0.12	4xM10
SBM 768	768	411	16.2	195	7.7	305	12.0					40.2	88.6	2495	3.63	10.60	0.11	4xM10
SBM 792	792	411	16.2	195	7.7	317	12.5					42.0	92.6	2600	3.80	11.20	0.11	4xM10
SBM 808	808	411	16.2	195	7.7	329	13.0					44.5	98.1	2706	3.80	11.70	0.11	4xM10
SBM 830	830	411	16.2	195	7.7	353	13.9					47.0	103.6	2917	4.32	11.70	0.10	4xM10
SBM 849	849	411	16.2	195	7.7	341	13.4					46.0	101.4	2811	4.03	12.40	0.10	4xM10
SBM 866	866	411	16.2	195	7.7	353	13.9					47.6	104.9	2917	4.32	12.70	0.10	4xM10
SBM 890	890	411	16.2	195	7.7	353	13.9					47.6	104.9	2917	4.26	12.50	0.10	4xM10
SBM 900	900	411	16.2	195	7.7	438	17.2					50.5	111.3	3646	4.06	12.50	0.09	5xM10

** Height including the IP2X terminal cover*

SBM

Capacities and dimensions

Cell Type	Capa-city	Height		Width		Lenght per block		Approx. Weight per cell		Approx. Electrolyte vol. between level marks	Approx. electrolyte per cell		Internal	Cell connection bolt per pole
						1 cells								
	C_5 Ah	mm	in	mm	in	mm	in	kg	lb	cm^3	L	kg	mOhm	
SBM 920	920	411	16.2	195	7.7	353	13.9	49.5	109.1	2917	4.06	11.80	0.09	4xM10
SBM 940	940	411	16.2	195	7.7	353	13.9	48.7	107.4	2917	4.12	12.00	0.09	4xM10
SBM 965	965	411	16.2	195	7.7	373	14.7	50.5	111.3	3057	4.28	11.40	0.09	6xM10
SBM 1009	1009	411	16.2	195	7.7	402	15.8	53.7	118.4	3330	4.88	14.30	0.09	5xM10
SBM 1040	1040	411	16.2	195	7.7	438	17.2	57.5	126.8	3646	5.40	14.60	0.08	5xM10
SBM 1082	1082	411	16.2	195	7.7	438	17.2	58.8	129.6	3646	5.40	16.70	0.08	5xM10
SBM 1107	1107	411	16.2	195	7.7	438	17.2	59.3	130.7	3646	5.34	15.60	0.08	5xM10
SBM 1150	1150	411	16.2	195	7.7	438	17.2	60.0	132.3	3646	5.07	15.70	0.07	5xM10
SBM 1181	1181	411	16.2	195	7.7	438	17.2	60.9	134.3	3646	5.14	15.00	0.07	5xM10
SBM 1220	1220	411	16.2	195	7.7	511	20.1	67.5	148.8	4270	6.31	16.90	0.07	6xM10
SBM 1250	1250	411	16.2	195	7.7	499	19.6	68.5	151.0	4164	5.85	18.00	0.07	6xM10
SBM 1274	1274	411	16.2	195	7.7	511	20.1	69.0	152.1	4270	6.31	18.50	0.07	6xM10
SBM 1324	1324	411	16.2	195	7.7	523	20.6	71.0	156.5	4375	6.42	18.80	0.06	6xM10
SBM 1390	1390	411	16.2	195	7.7	523	20.6	72.0	158.7	4375	6.09	17.40	0.06	6xM10
SBM 1445	1445	411	16.2	195	7.7	523	20.6	73.7	162.5	4375	6.09	17.70	0.06	6xM10
SBM 1465	1465	411	16.2	195	7.7	523	20.6	73.7	162.5	4375	6.09	17.70	0.06	6xM10

** Height including the IP2X terminal cover*

SBH

Capacities and dimensions

Cell Type	Capa-city	Height		Width		Lenght per block						Approx. Weight per cell		Approx. Electrolyte vol. between level marks	Approx. electrolyte per cell		Internal	Cell connection bolt per pole
						1 cells		2 cells		3 cells								
	C_5 Ah	mm	in	mm	in	mm	in	mm	in	mm	in	kg	lb	cm^3	L	kg	mOhm	
SBH 8.3	8.3	270	10.6	123	4.8			53	2.1	77	3.0	1.1	2.4	87	0.11	0.36	3.61	M6
SBH 12	12	270	10.6	123	4.8			64	2.5	94	3.7	1.5	3.3	109	0.13	0.44	2.50	M6
SBH 16	16	270	10.6	123	4.8			74	2.9	109	4.3	1.8	4.0	129	0.15	0.48	1.88	M6
SBH 19	19	350	13.8	195	7.7			57	2.2	82	3.2	2.8	6.2	202	0.28	0.77	2.05	M6
SBH 25	25	411	16.2	195	7.7			57	2.2	82	3.2	3.2	7.1	202	0.36	0.92	1.68	M6
SBH 29	29	350	13.8	195	7.7			69	2.7	100	3.9	3.7	8.2	255	0.34	0.95	1.34	M6
SBH 34	34	270	10.6	123	4.8			122	4.8	181	7.1	3.6	7.9	224	0.36	1.10	0.88	M6
SBH 38	38	411	16.2	195	7.7			69	2.7	100	3.9	4.0	8.8	255	0.40	1.20	1.11	M6
SBH 39	39	350	13.8	195	7.7			79	3.1	115	4.5	4.5	9.9	299	0.38	1.10	1.00	M8
SBH 49	49	350	13.8	195	7.7			94	3.7	138	5.4	5.4	11.9	365	0.47	1.30	0.80	M8
SBH 51	51	411	16.2	195	7.7			79	3.1	115	4.5	4.9	10.8	299	0.45	1.30	0.82	M8
SBH 59	59	350	13.8	195	7.7			103	4.1	151	5.9	6.2	13.7	404	0.55	1.50	0.66	M10
SBH 64	64	411	16.2	195	7.7			94	3.7	138	5.4	6.3	13.9	365	0.55	1.60	0.66	M8
SBH 69	69	350	13.8	195	7.7			127	5.0	187	7.4	7.3	16.1	510	0.66	1.80	0.57	M10
SBH 77	77	411	16.2	195	7.7			103	4.1	151	5.9	6.7	14.8	404	0.55	1.60	0.55	M10
SBH 79	79	350	13.8	195	7.7			127	5.0	187	7.4	7.7	17.0	510	0.62	1.80	0.49	M10
SBH 88	88	350	13.8	195	7.7			159	6.3	232	9.1	9.1	20.1	624	0.80	2.20	0.44	M10
SBH 89	89	411	16.2	195	7.7			115	4.5	169	6.7	7.6	16.8	457	0.67	1.90	0.47	M10
SBH 98	98	350	13.8	195	7.7			159	6.3	232	9.1	9.4	20.7	624	0.76	2.20	0.40	M10
SBH 102	102	411	16.2	195	7.7			127	5.0	187	7.4	8.4	18.5	510	0.74	2.10	0.41	M10
SBH 110	110	350	13.8	195	7.7			183	7.2	268	10.6	10.6	23.4	729	0.92	2.90	0.35	M10
SBH 115	115	411	16.2	195	7.7			159	6.3	232	9.1	9.9	21.8	624	0.95	2.80	0.37	M10
SBH 118	118	350	13.8	195	7.7			183	7.2	268	10.6	11.0	24.3	729	0.88	2.70	0.33	M10
SBH 128	128	411	16.2	195	7.7			159	6.3	232	9.1	10.5	23.1	624	0.90	2.60	0.33	M10
SBH 137	137	350	13.8	195	7.7			253	10.0	373	14.7	14.5	32.0	1019	1.32	3.70	0.28	2xM10
SBH 141	141	411	16.2	195	7.7			183	7.2	268	10.6	11.5	25.4	729	1.09	3.30	0.30	M10
SBH 149	149	350	13.8	195	7.7			253	10.0	373	14.7	14.9	32.8	1019	1.33	4.10	0.26	2xM10
SBH 153	153	411	16.2	195	7.7			183	7.2	268	10.6	12.0	26.5	729	1.04	3.20	0.27	M10
SBH 157	157	350	13.8	195	7.7			253	10.0	373	14.7	15.3	33.7	1019	1.24	3.70	0.25	2xM10
SBH 170	170	350	13.8	195	7.7			279	11.0	412	16.2	16.8	37.0	1133	1.49	4.60	0.23	2xM10
SBH 177	177	350	13.8	195	7.7			305	12.0	451	17.8	17.6	38.8	1247	1.60	4.50	0.22	2xM10
SBH 179	179	411	16.2	195	7.7			229	9.0	337	13.3	14.5	32.0	914	1.33	3.80	0.23	2xM10
SBH 190	190	411	16.2	195	7.7			241	9.5	355	14.0	16.5	36.4	966	1.53	4.70	0.22	2xM10
SBH 196	196	350	13.8	195	7.7	159	6.3					18.3	40.3	1247	1.52	4.40	0.20	2xM10
SBH 204	204	411	16.2	195	7.7	133	5.2					18.0	39.7	1019	1.47	4.60	0.21	2xM10
SBH 218	218	411	16.2	195	7.7	146	5.7					19.2	42.3	1133	1.75	5.40	0.19	2xM10
SBH 230	230	411	16.2	195	7.7	159	6.3					20.0	44.1	1247	1.89	5.60	0.18	2xM10
SBH 236	236	350	13.8	195	7.7	183	7.2					21.4	47.2	1458	1.76	5.70	0.17	2xM10
SBH 244	244	411	16.2	195	7.7	159	6.3					20.5	45.2	1247	1.88	5.80	0.17	2xM10
SBH 256	256	411	16.2	195	7.7	159	6.3					21.7	47.8	1247	1.79	5.20	0.16	2xM10
SBH 265	265	350	13.8	195	7.7	232	9.1					26.1	57.5	1871	2.40	6.80	0.15	3xM10

** Height including the IP2X terminal cover*

SBH

Capacities and dimensions

Cell Type	Capa-city	Height		Width		Lenght per block 1 cells		Approx. Weight per cell		Approx. Electrolyte vol. between level marks	Approx. electrolyte per cell		Internal	Cell connection bolt per pole
	C, Ah	mm	in	mm	in	mm	in	kg	lb	cm^3	L	kg	mOhm	
SBH 270	270	411	16.2	195	7.7	171	6.7	23.4	51.6	1353	1.98	6.10	0.16	2xM10
SBH 281	281	411	16.2	195	7.7	183	7.2	24.8	54.7	1458	2.17	6.60	0.15	2xM10
SBH 293	293	411	16.2	195	7.7	183	7.2	25.2	55.6	1458	2.14	6.60	0.14	2xM10
SBH 294	294	350	13.8	195	7.7	232	9.1	27.2	60.0	1871	2.28	6.50	0.13	3xM10
SBH 307	307	411	16.2	195	7.7	183	7.2	25.6	56.4	1458	2.07	6.50	0.14	2xM10
SBH 323	323	411	16.2	195	7.7	206	8.1	28.1	61.9	1643	2.42	7.50	0.13	3xM10
SBH 334	334	411	16.2	195	7.7	219	8.6	29.4	64.8	1757	2.66	8.20	0.13	3xM10
SBH 345	345	411	16.2	195	7.7	232	9.1	31.3	69.0	1871	2.84	8.40	0.12	3xM10
SBH 353	353	350	13.8	195	7.7	268	10.6	31.8	70.1	2187	2.63	8.60	0.11	3xM10
SBH 363	363	411	16.2	195	7.7	232	9.1	31.5	69.4	1871	2.79	8.60	0.12	3xM10
SBH 375	375	411	16.2	195	7.7	232	9.1	31.9	70.3	1871	2.76	8.50	0.11	3xM10
SBH 383	383	411	16.2	195	7.7	232	9.1	32.2	71.0	1871	2.69	7.80	0.11	3xM10
SBH 393	393	350	13.8	195	7.7	305	12.0	36.1	79.6	2495	3.03	8.70	0.10	4xM10
SBH 400	400	411	16.2	195	7.7	244	9.6	33.9	74.7	1977	2.88	8.90	0.11	3xM10
SBH 410	410	411	16.2	195	7.7	256	10.1	35.1	77.4	2082	3.09	9.50	0.10	3xM10
SBH 422	422	411	16.2	195	7.7	268	10.6	37.0	81.6	2187	3.26	9.80	0.10	3xM10
SBH 440	440	411	16.2	195	7.7	268	10.6	37.4	82.5	2187	3.21	9.90	0.10	3xM10
SBH 450	450	411	16.2	195	7.7	268	10.6	37.9	83.6	2187	3.18	9.80	0.09	3xM10
SBH 460	460	411	16.2	195	7.7	268	10.6	38.3	84.4	2187	3.11	9.70	0.09	3xM10
SBH 471	471	350	13.8	195	7.7	353	13.9	42.2	93.0	2917	3.51	11.40	0.08	4xM10
SBH 473	473	411	16.2	195	7.7	305	12.0	40.6	89.5	2495	3.83	11.80	0.09	4xM10
SBH 484	484	411	16.2	195	7.7	305	12.0	41.4	91.3	2495	3.77	11.60	0.09	4xM10
SBH 491	491	350	13.8	195	7.7	378	14.9	45.1	99.4	3119	3.79	10.90	0.08	5xM10
SBH 510	510	411	16.2	195	7.7	305	12.0	42.7	94.1	2495	3.58	10.40	0.08	4xM10
SBH 523	523	411	16.2	195	7.7	305	12.0	42.7	94.1	2495	3.58	10.40	0.08	4xM10
SBH 537	537	411	16.2	195	7.7	329	13.0	44.4	97.9	2706	4.00	12.30	0.08	4xM10
SBH 560	560	411	16.2	195	7.7	353	13.9	49.2	108.5	2917	4.34	13.10	0.08	4xM10
SBH 575	575	411	16.2	195	7.7	353	13.9	49.7	109.6	2917	4.32	13.30	0.07	4xM10
SBH 589	589	411	16.2	195	7.7	353	13.9	50.2	110.7	2917	4.29	13.20	0.07	4xM10
SBH 590	590	350	13.8	195	7.7	438	17.2	52.6	116.0	3646	4.39	14.30	0.07	5xM10
SBH 600	600	411	16.2	195	7.7	353	13.9	50.6	111.6	2917	4.19	12.90	0.07	4xM10
SBH 615	615	411	16.2	195	7.7	353	13.9	51.0	112.4	2917	4.15	13.00	0.07	4xM10
SBH 630	630	411	16.2	195	7.7	378	14.9	52.5	115.7	3119	4.55	14.00	0.07	5xM10
SBH 640	640	411	16.2	195	7.7	378	14.9	52.5	115.7	3119	4.48	13.00	0.07	5xM10
SBH 655	655	411	16.2	195	7.7	390	15.4	55.0	121.3	3224	4.67	14.40	0.06	5xM10
SBH 670	670	411	16.2	195	7.7	402	15.8	56.7	125.0	3330	4.86	15.00	0.06	5xM10
SBH 680	680	411	16.2	195	7.7	414	16.3	56.7	125.0	3435	5.07	15.60	0.06	5xM10
SBH 690	690	411	16.2	195	7.7	426	16.8	57.6	127.0	3540	5.30	16.30	0.06	5xM10
SBH 705	705	411	16.2	195	7.7	438	17.2	60.5	133.4	3646	5.43	16.40	0.06	5xM10
SBH 725	725	411	16.2	195	7.7	438	17.2	62.5	137.8	3646	5.36	16.50	0.06	5xM10

** Height including the IP2X terminal cover*

SBH

Capacities and dimensions

Cell Type	Capa-city	Height		Width		Lenght per block 1 cells		Approx. Weight per cell		Approx. Electrolyte vol. between level marks	Approx. electrolyte per cell		Internal	Cell connection bolt per pole
	C_5 Ah	mm	in	mm	in	mm	in	kg	lb	cm^3	L	kg	mOhm	
SBH 753	753	411	16.2	195	7.7	438	17.2	63.5	140.0	3646	5.33	16.40	0.06	5xM10
SBH 765	765	411	16.2	195	7.7	438	17.2	60.0	132.3	3646	5.18	16.20	0.05	5xM10
SBH 785	785	411	16.2	195	7.7	463	18.2	64.9	143.1	3848	5.59	17.20	0.05	6xM10
SBH 800	800	411	16.2	195	7.7	463	18.2	65.9	145.3	3848	5.52	17.00	0.05	6xM10
SBH 825	825	411	16.2	195	7.7	499	19.6	68.5	151.0	4164	6.08	18.70	0.05	6xM10
SBH 840	840	411	16.2	195	7.7	511	20.1	69.5	153.2	4270	6.27	19.30	0.05	6xM10
SBH 865	865	411	16.2	195	7.7	498	19.6	72.6	160.1	4155	5.92	18.10	0.05	6xM10
SBH 890	890	411	16.2	195	7.7	523	20.6	74.7	164.7	4375	6.34	19.50	0.05	6xM10
SBH 910	910	411	16.2	195	7.7	523	20.6	75.8	167.1	4375	6.27	19.30	0.05	6xM10
SBH 920	920	411	16.2	195	7.7	523	20.6	76.5	168.7	4375	6.22	19.20	0.05	6xM10

** Height including the IP2X terminal cover*

Saft has launched a sustainability initiative, Program Net Zero, consisting of 5 pillars:

1. Reducing the environmental footprint of our activities and that of our battery solutions.
2. Assisting Saft's customers in lowering their environmental footprint.
3. Using natural resources sustainably and implementing circular economy principles throughout our operations.
4. Prioritizing suppliers with strong environmental, social, and human rights records.
5. Working to always ensure compliance with environmental regulations and best practices in all locations.

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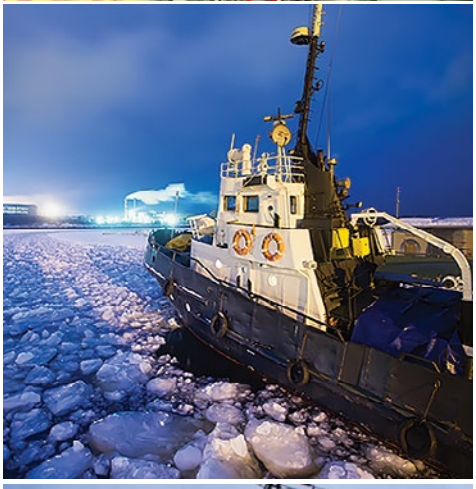
TotalEnergies

Saft racks for Ni-Cd batteries

A complete range of racks for backup power applications



saft

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Saft rack range

A wide range of rugged and modular battery racks meeting stringent specifications

Saft offers a full and modular range of battery racks

- Standard racks
- Seismic racks (EQ)
- Compact racks

Battery racks are used for arranging cells in a safe and organized setup to achieve the best performance out of the battery system. When selecting the best racking solution for your system you need to consider room dimensions, maintenance requirements and specific conditions.

Our modular racking system can be used for all our cells, from standard to maintenance-free nickel technology batteries. You can build the ideal rack and battery system with Saft BaSics software. Our experts can also give you guidance on the appropriate rack and battery sizing for end-user requirement.

All racks are built up in the same way, with supports (gables) and stringers (which hold the cells) in a large variation of dimensions to fit many needs. All dimensions are sizable in length, width and height depending on cell dimensions and the number of cells in a battery system. These define how many rows there will be in the rack and the length of each row.

Saft racks are carefully designed to meet stringent specifications

- All racks are fully insulated:
  - The dielectric strength is verified in accordance with standard IEC 62485-2 (EN 50272-2).
- Coatings are resistant against the chemicals used in the batteries:
  - Chemical resistance in accordance with standard EN ISO 2812, 05-2007.
  - Adhesion of the epoxy coating in accordance with standard EN ISO 2409, 06-2013.
  - Polyethylene (PE) coating in accordance with standard EN ISO 16276, 08-2007.
- Operating temperature: -50°C to +70°C.
- Racks are compliant to RoHS European Directives.
- Design life of more than 25 years at room temperature (20 - 25 °C).

Saft rack range
Standard racks: robust & easy-to-use



A rugged rack range

Saft racks are particularly rugged: our stringers are made of a folded steel plate and coated with black polyethylene (PE) material giving electrolyte protection. Furthermore, the PE's insulating properties ensure protection against electric shock.

Its modular design meets any type of installation requirements, making it the most functional equipment on the market with a limited number of components included.

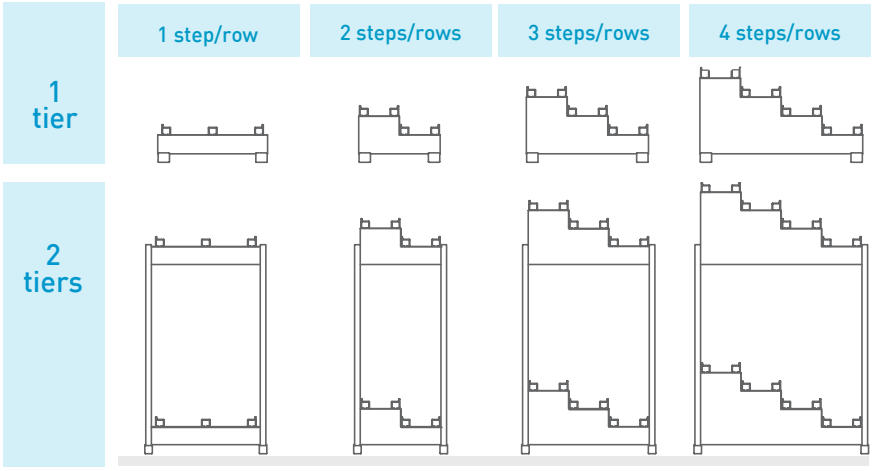
Our stringers are available in many sizes with length from 600 to 1500 mm and in steps of 150 mm. There are two types of stringers, made of cold shaped steel sections depending on the rack usage.

Standard battery racks

Saft standard racks are compatible with all our stationary battery cells. These easy-to-use racks are robust, have a modular design, and are chemical-resistant. Their light, small compact structure makes them easy to store, transport and install.

Our nickel technology racks offer a complete range with options of 1 to 2 tiers and from 1 to 4 rows in steps. Furthermore, the length of the racks can be adapted between 600 to 9000 mm.

Standard & crosswise installation configuration



Saft rack range
Specific racks: seismic range



Seismic racks

Seismic racks are designed for regions experiencing earthquakes, seismic movements, or for specific applications such as ships, offshore oil & gas and wind platforms.

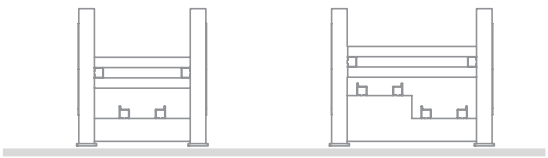
When the rack is located in a seismic area, it requires the correct anchoring, always fixed to the floor. Our seismic solutions constrain the cells and restrict movements in case of an event.

Saft seismic rack range is certified for acceleration forces from 0,1g to 1,0g (1g is equivalent to 9 on the Richter scale) and IBC type 1 to IBC type 4.

These stronger racks are available in 1 or 2 tiers and 1 or 2 rows with length between 600 and 6000 mm.

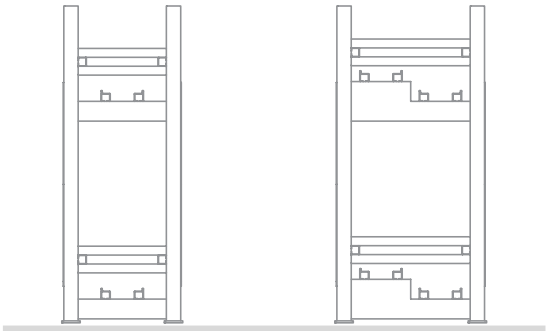
1 tier

1 step/row	2 steps/rows

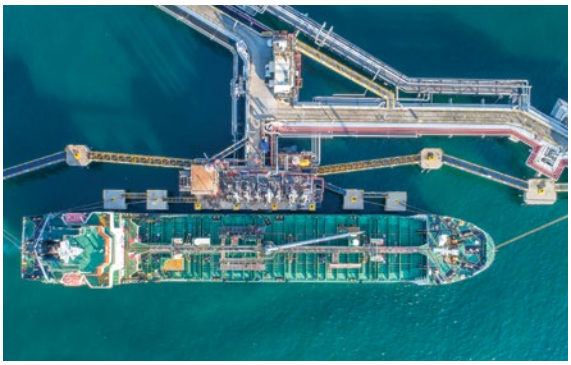


2 tiers

1 step/row	2 steps/rows



Saft rack range
Specific racks: compact range



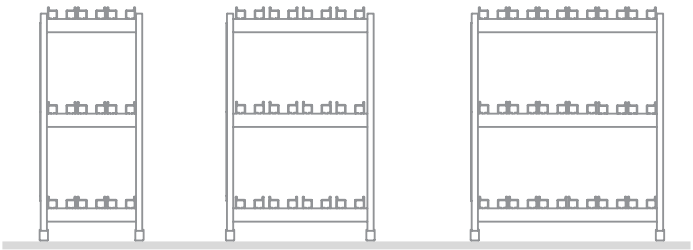
Compact racks

In applications where space is expensive or restricted (Oil & Gas, Offshore platforms), the compact rack increases the installed capacity in the same space, saving money.

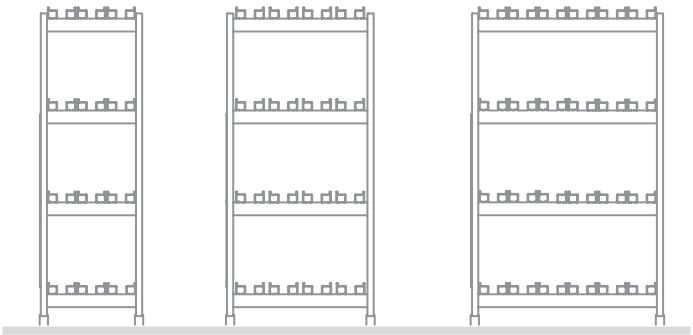
Saft compact racks have been designed for Uptimax maintenance free cells. When choosing our compact rack, you save up to 50% of footprint compared to standard rack by reducing the height between the tiers.

There are many different configurations to answer specific requirements, depending on cell capacity and numbers. With our compact racks we offer various lengths between 600 to 9000 mm.

3 tiers		
3 rows	4 rows	6 rows



4 tiers		
3 rows	4 rows	6 rows



Saft rack range
Optional accessories for battery racks



FIX foot

Saft FIX foot is ideal in applications (like Oil & Gas, Utilities) where there is a need to fix the rack to the floor, but without seismic requirements.

The FIX foot is available for standard and compact battery racks and will replace the original foot that is supplied with the rack.

Ground clearance

In some applications extra ground clearance is required, usually to give operators better access to the batteries.

Our ground clearance solution can be added to the standard rack when there is a requirement for more space between ground and the stringers of the first tier: Saft ground clearance is 300 mm.

Cladded racks

Saft cladded rack solution is designed for battery rooms where access is non-restricted or areas where higher personal protection against electricity is required.

The cladded rack system is based on our standard rack model with additional modular cladded panels of thermoplastic compound. This is a more flexible solution compared to a cabinet, since it is based on the configuration of a standard rack.

Specifications of the cladding:

- Shock resistance according to IK 10 EN 50102
- Dielectric strength 6 kV according to EN 60950 and EN 50272-2
- Fire protection UL 94V0/ISO 1210
- Ageing (extreme conditions) according to XP C 20-540
- Chemically resistant against potassium hydroxide (KOH)
- Color: RAL 7035, Light Grey

Saft rack range
Additional accessories for all Saft racks to meet all your needs

Drip Trays

Drip Trays are used with vented type batteries according to IEC 62485-2, when the floor is not fulfilling impermeability and chemical resistance to the electrolyte.

Our Drip Trays are manufactured in Polyethylene (PE) and are available in various dimensions to fit your battery installation perfectly.

Accessories

Saft offers a wide range of accessories to use when installing a battery system and rack. Some of the parts can improve your battery installation.

• **Wall brackets** to fasten the rack to the wall, creating better horizontal stability.

• **U-profile** to disperse floor spot loading for installations when the floor is not strong enough to manage high point loads.

• **BCU** (sized to fit your rack) to fix the junction box or bus bar to the rack.

Customization

Saft offers a wide range of racks. Nevertheless, for specific requirements, our experts can provide the right solution to meet your needs. Besides standard, seismic and compact rack systems, we supply specific constructions for applications such as container, offshore, power stations or utility sites.

We support you to create customized solutions, like cabinets and racks with non-standard dimensions to fulfill specific standards or specifications. We provide solutions fulfilling specific requirements such as IP65, ATEX, change colors (RAL), connection boxes, wall mount etc. For every customized construction we guarantee robustness with a static calculation.

Please contact Saft if you have any specific requirements.

BaSics sizing software

The rack design can be easily created after sizing the battery for a complete solution.

Our battery sizing calculation software can be downloaded on our website here: *https://www.saftbatteries.com/products-solutions/services*

Saft is committed to the highest standards of environmental stewardship

Saft is committed to protecting and preserving the environment. We are engaged in a sustained effort to use resources responsibly and to act in a way that clearly demonstrates our great respect for the planet.

As part of its environmental commitment, Saft gives priority to recycled raw materials over virgin raw materials, reduces its plants'air and water releases year after year, minimizes water usage, reduces fossil energy consumption and associated CO_2 emissions, and ensures that its customers have recycling solutions for their spent batteries.

Regarding industrial batteries, Saft has set up a network of Bring Back Points (BBPs) which receive end-of-life nickel-based batteries from end users free of charge. These batteries are then shipped by these BBPs to our recycling facility in Sweden or to fully permitted recycling companies, in compliance with the laws governing trans-boundary waste shipments.

The recycling efficiency of these recyclers exceeds 75% of the nickel-based battery weight (a level which exceeds the mandated recycling efficiency of 65% applicable to lead-acid batteries), and recycled materials are reused as secondary raw material for industry.

This network of Bring Back Points comprises over 30 entities and provides services in all of our major markets in Europe, North America, Asia and Africa. The list of BBPs and their contact details are available on the Saft website.

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Saft rail batteries

Innovative solutions for a fast-changing world

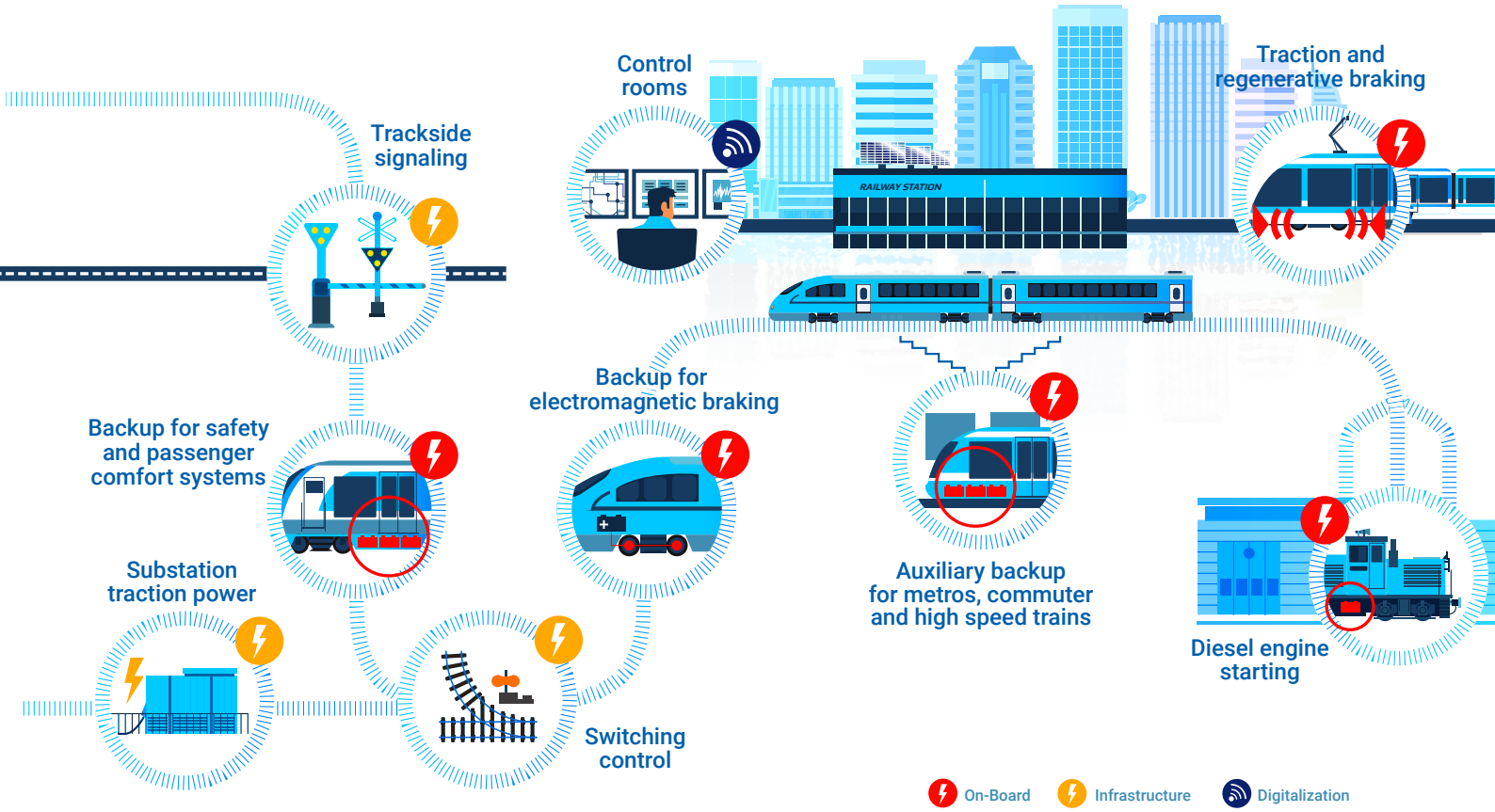
TotalEnergies

Saft, a trusted partner and battery solutions expert in mobility -- yesterday, today and tomorrow

At Saft, we developed our first batteries for Paris train stations in 1919. Since then, we have provided rail companies worldwide with unrivalled expertise in design, manufacture and supply of onboard and trackside battery solutions. Our full service ranges from providing individual batteries to serving as a global supplier of fully integrated, turnkey battery systems. Our scope covers both new-build and replacement projects using nickel-based and lithium-ion (Li-ion) battery technologies.

Saft has extensive knowledge of energy storage, combined with a commitment to sustainability. This ensures that manufacturers of rolling stock for passenger and cargo systems can have total confidence in the safety and performance of their battery systems.

Innovative energy storage powers smarter railways



Cost-effective battery solutions for every purpose

Batteries are essential to rail networks and rolling stock – all associated costs such as initial purchase, maintenance, operation and replacement should always be optimized. The true value of Saft's battery solutions are best illustrated by their Total Cost of Ownership (TCO).

Predictable service life: up to 20 years lifetime without risk of sudden death*, i.e. only one battery replacement over a typical rolling stock life of 30 to 40 years

Low maintenance: minimum preventive maintenance required at extended intervals of 5 to 10 years

Total reliability: near zero corrective maintenance costs

Wide temperature range: a broad portfolio of battery solutions for reliable operation at moderate and extreme temperatures

**Saft nickel-based batteries feature a robust construction that ensures a fully predictable and reliable performance over a long service life. For critical installations, this predictability eliminates the risk of 'sudden death' that can affect lead-acid batteries, which deteriorate rapidly in high temperatures or in demanding operating conditions.*

A proven approach to safety and outstanding performance

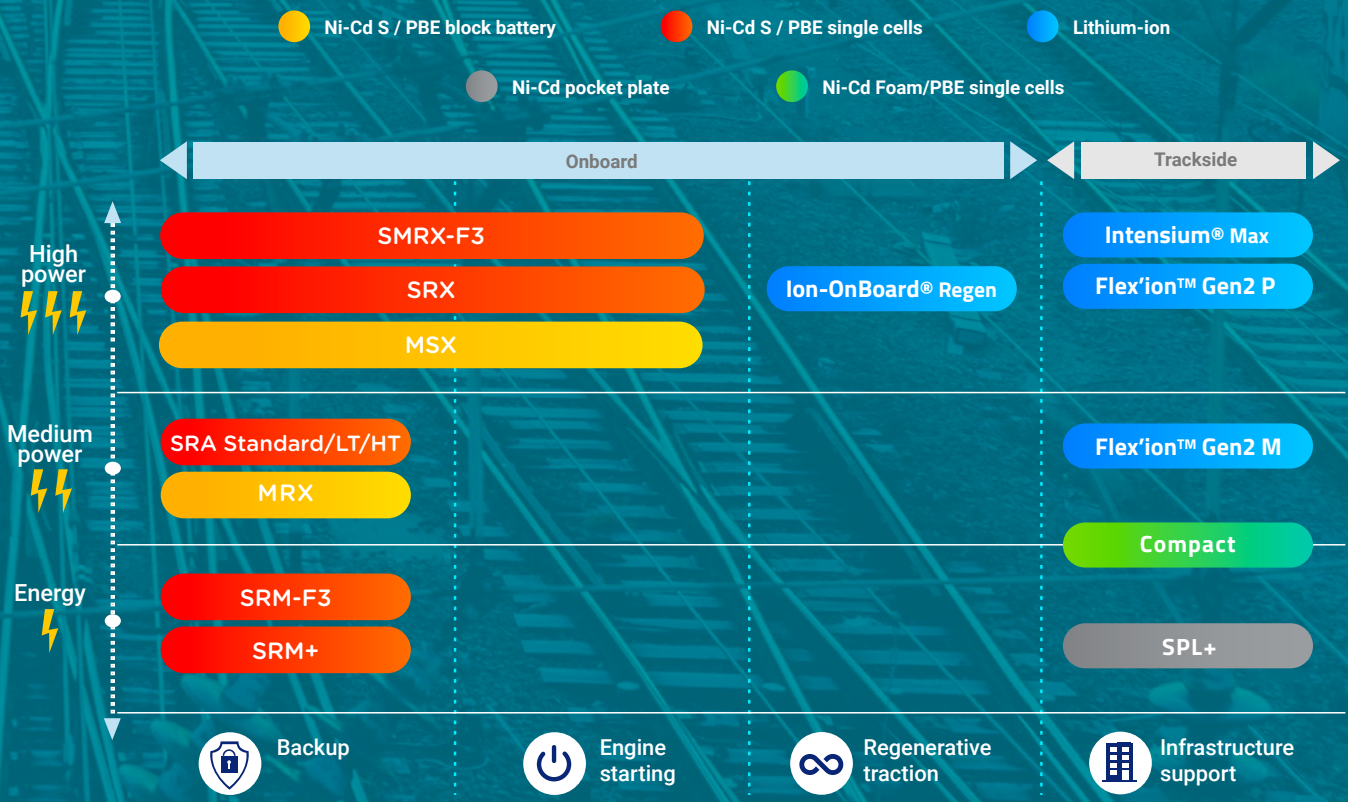
Saft continually strives to develop innovative products to help rail manufacturers and operators meet the latest standards and requirements in the rail industry based on:

- High cycle life and long storage life
- Rapid recharging capability
- Mature technology
- Full recyclability

While many rail operators rely on batteries from our extensive nickel-cadmium (Ni-Cd) battery portfolio, we also offer Li-ion-based battery solutions with specific benefits for demanding applications.

An impressive track record in rail

Onboard batteries are critical to rolling stock. They provide power for auxiliary backup and emergency traction with the confidence of safe daily operation and low maintenance throughout a long service life. Renowned for robustness, reliability and longevity, our nickel-based batteries operate over a wide temperature range without risk of sudden death.



Comprehensive backup solutions

Saft's energy and medium power products deliver backup power for vital onboard services such as lighting, data and communications systems, ventilation and door opening, as well as safety-critical electromagnetic braking applications.

Energy range
(Continuous current = 1C / Peak current = 2C)

	Main characteristics	Operating temperature range	Capacity range
SRM+	Compact cost-effective solution for onboard comfort and safety	-30°C to +50°C	40 to 360Ah
SRM-F3	Ultralight onboard backup battery housed in a transparent and flame retardant polysulfide container	-25°C to +50°C	80 to 250Ah

Medium power range
(Continuous current = 2C / Peak current = 5C)

	Main characteristics	Operating temperature range	Capacity range
MRX	Lightweight battery providing high energy and power performance for everyday use	-30°C to +50°C	70 to 520Ah
SRA	Outstanding reliability for auxiliary backup with high energy density	-30°C to +50°C	75 to 375Ah
SRA LT (Low Temperature)	Compact battery offering exceptional capacity at low temperatures	-50°C to +40°C	75 to 375Ah
SRA HT (High Temperature)	Optimized battery solution with superior charge efficiency at high temperatures	-20°C to +65°C	70 to 350Ah

Robust support for demanding applications

Saft's high power range of battery solutions is designed to accommodate the different requirements of rolling stock. The batteries offer extra support for demanding critical backup applications, from engine starting to emergency braking.

Our high power batteries are able to meet the peak power requirements of braking and tilting systems on high speed trains, as well as enabling safety functions for emergency and depot traction. They also deliver the exceptionally high cranking currents essential for frequent engine starting on locomotives and Diesel Multiple Units (DMUs) to help train operators save fuel and reduce noise and gas emissions, including CO_2 footprint.

High power range
(Continuous current = 5C / Peak current = 20C)

	Main characteristics	Operating temperature range	Capacity range
MSX	Optimum capability and cycling performance for electromagnetic braking and diesel engine starting	-30°C to +50°C	70 to 260Ah
SRX	Excellent rail starting battery for diesel locomotives and DMUs	-25°C to +50°C	22 to 220Ah (Plastic) 73 to 375Ah (Steel)
SMRX	High power backup battery for starting and supporting the continuity of onboard auxiliary systems (Low Temperature and High Temperature versions are also available)	-30°C to +55°C	70 to 260Ah
SMRX-F3	Compact high-power battery for instant diesel engine starting, housed in a transparent and flame retardant polysulfone container	-30°C to +50°C	80 to 360Ah

Total reliability for trackside communications

In addition to onboard batteries, Saft also offers uninterrupted power solutions for trackside communications and infrastructure to support smooth and safe running of services. To ensure total reliability, our nickel-based batteries are available in high and low current versions to cater for the requirements of trackside equipment and substations. This includes signalling, level crossing and point operation, positive train control, security surveillance and telecommunications equipment.

Energy, medium and high power ranges

	Main characteristics	Operating temperature range	Capacity range
SPL+	Combines reliable backup power with fast, flexible charging	-30°C to +50°C	80 to 510Ah
Compact (CPL, CPM)	Optimized for tight spaces, compatible with VRLA changing systems	-20°C to +50°C	80 to 180Ah

- High power
- Excellent cycling capability
- Long cycle life and calendar life
- High temperature performance
- Recyclable

Li-ion batteries for advanced functions

As a leader in battery technology, Saft has pioneered the development and application of Li-ion batteries for improved safety, reliability, service life and fast charging. Over the last 25 years, we have successfully deployed Li-ion batteries across our portfolio, from aviation to space, and from electric grid energy storage to mobility.

Rail manufacturers and operators around the world are focused on improving vehicle performance while keeping rail transport affordable and sustainable. Saft's Li-ion batteries offer significant reductions in both operating costs and emissions by facilitating advanced functions such as regenerative traction, automatic traction systems, trackside protection and safety as well as energy storage.

Ion-OnBoard LTO

Latest addition to Saft's rail battery family

As the rail industry develops rolling stock designed for the journey towards zero emission operations, requirements for onboard batteries are changing. New-generation hybrid and battery-powered trains need batteries to provide more than merely auxiliary or backup power. They must contribute to the reduction of energy consumption, infrastructure costs and environmental impact. The batteries will also enable trains to utilize regenerative traction power for catenary-free operation over a long distance.

Saft's Ion-OnBoard LTO is a prismatic cell based on our Lithium Titanate Oxide (LTO) technology with improved energy density for rolling stock operation. It is ideally suited for applications requiring high power throughput, fast charging and a long cycle life over a wide range of temperatures (from -25°C to +60°C).

Ion-OnBoard LTO	Main characteristics	Operating temperature range
	• Provides regenerative traction power for energy efficiency • Exceptionally long cycle and calendar life • Reduces energy consumption, infrastructure costs and maintenance requirements	-25°C to +45°C (Incl. BTMS)

Flex'ion™ Gen2

Flex'ion™ Gen2 regenerative traction sets a new standard for uninterruptible power supply (UPS)

Fully manufactured by Saft in Europe, Flex'ion™ Gen2 new lithium-ion battery solution provides up to 220 kW per cabinet, boosting power performance by 40% compared with the first generation Flex'ion. It complies to the highest safety standards such as UL 9540A, UL 1973 and IEC 62619.

Designed for demanding industrial requirements and other mission critical UPS applications such as data centers, industrial processes, railway trackside protection and safety, Flex'ion™ Gen2 is compact, lightweight and capable of operating continuously at high temperatures.

Major European railway operators have selected Flex'ion to back-up vital trackside equipment, enhancing their ETCS (European Train control System) to ensure optimum traffic flow and a safe journey for passengers.

Intensium® Max High Energy

Trackside energy storage

Saft's Intensium containerized Li-ion products have established a remarkable track record in utility-scale solutions for grids, renewables and industries. In rail, we deploy advanced Intensium® Max High Energy systems based on our Li-ion technology for hybrid energy storage in trackside applications. This enables the capture, storage and reuse of regenerative energy created by train braking during thousands of daily stops. In addition, through frequency support, this megawatt-scale energy storage system can maintain continuity of energy supply at substations. Furthermore, train operators may also sell excess recovered energy to the local grid to generate additional revenue.

	Main characteristics	Operating temperature range
 Flex'ion™ Gen2	• Compact, lightweight and capable of operating continuously at high temperatures • Ability to discharge even when charging is interrupted • Remote access to battery information and troubleshooting ability	-20°C to +35°C
Intensium® Max High Energy 	• Flexible building blocks for optimizing high-density energy storage systems up to 100's of MW • Remote supervision capability • Integrates advanced thermal and safety management with smoke detection, fire suppression and alarms	-20°C/+45°C (option +50°C)

On track for complete battery management

Saft is more than just a high-performance battery provider. With our extensive knowledge and experience in the rail industry, we simplify integration of batteries into onboard systems. We also help manufacturers and operators to monitor the performance of their batteries.

Battery System

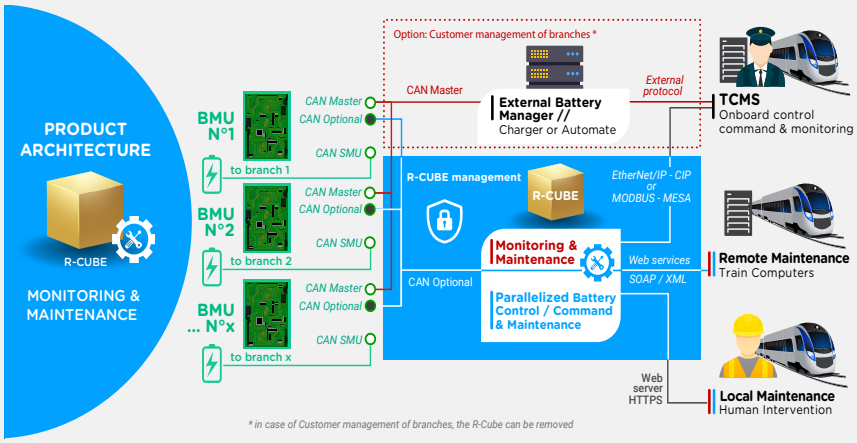
With more than 20,000 rail battery systems installed globally, Saft has consolidated this experience into the development of nine standard pre-designed systems. They include batteries, rafts, trays, access mechanisms, water filling systems, isolators, fuses, connectors, and battery management control (BMC). Furthermore, we design and manufacture custom-made rafts to cater for the needs of different vehicle manufacturers. Our service to supply and fit battery systems reduces the weight and volume of the total assembly, improves energy efficiency and offers more passenger space.

Battery Thermal Management System (BTMS)

For better energy efficiency, many vehicle makers are adopting Li-ion and even introducing battery- or hybrid-powered trains. A Battery Thermal Management System (BTMS) enables operators to monitor the temperature and thermal behavior of battery cells during operation. Through control of heating and cooling, the BTMS optimizes the battery temperature to maximize power output while reducing the potential for temperature-induced safety hazards.

Battery Management System (BMS): R-CUBE

System architecture for maintenance & monitoring



To take rail battery monitoring and maintenance to a new level, Saft has introduced the R-CUBE, a real-time battery control, supervision and big-data platform specially designed for the rail industry.

Operators can now oversee and inspect the train control system and onboard maintenance server remotely. R-CUBE's powerful functions include external communication, battery container parallelization, remote monitoring and supervision and data management with a high cybersecurity level for enhanced analytics and services. Hence, it helps operators to save operation and maintenance costs.

Saft's batteries in global rail networks

1. Backup for electro-magnetic braking

2a. Traction & regenerative braking

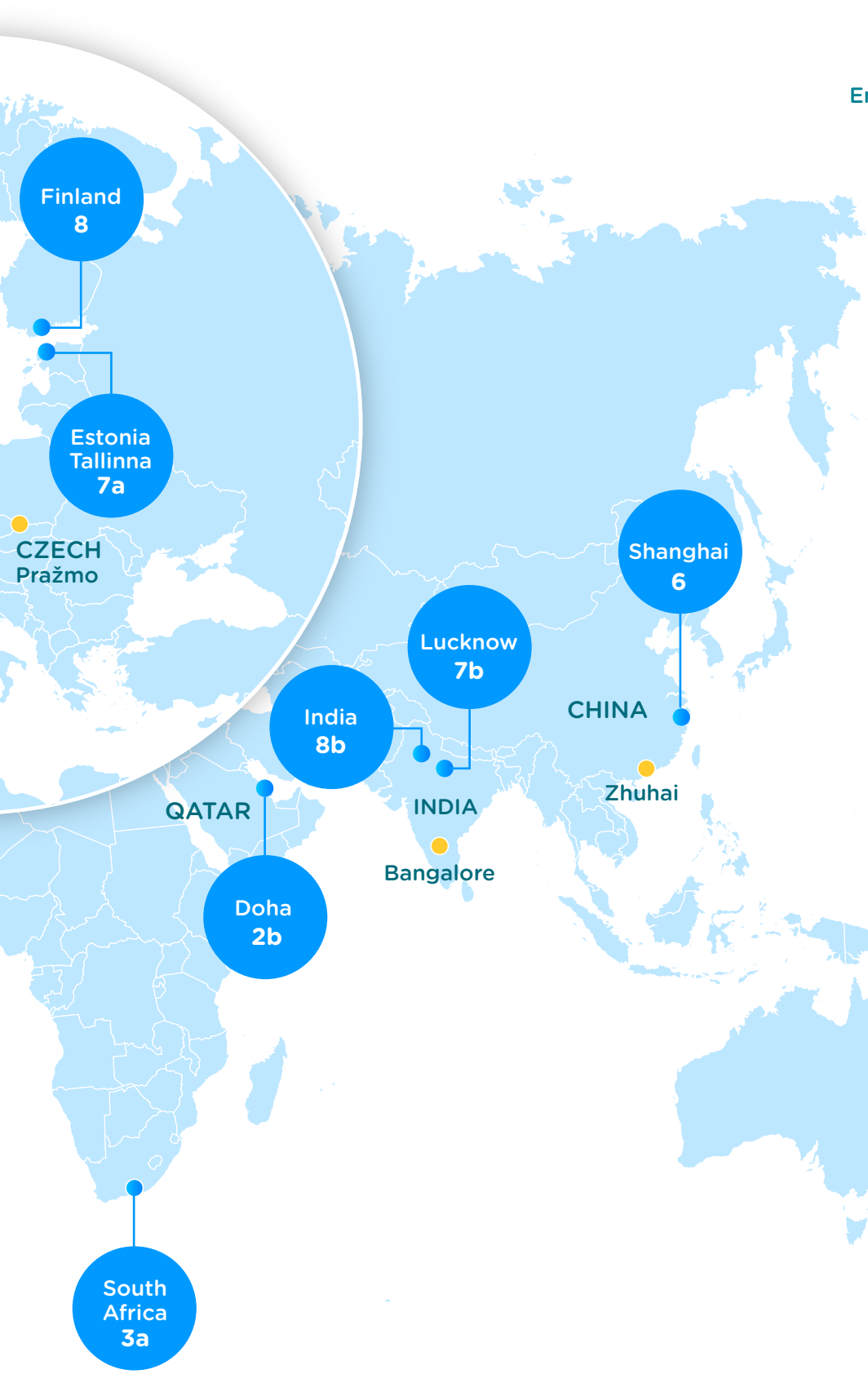
2b. Traction & regenerative braking

3a. Auxiliary backup for metros, commuter and high-speed trains

3b. Auxiliary backup for metros, commuter and high-speed trains

4. Diesel engine starting

5. Backup for safety and passenger comfort systems



6. Backup and Emergency Traction

7a. Resilient to extreme temperatures

7b. Resilient to extreme temperatures

8a. TCO/Low Maintenance

8b. TCO/Low Maintenance

9. Replacement

10. Digital trackside backup

Case studies

1. Backup for electro-magnetic braking

PROJECT: Germany | Karlsruhe Tramway Network
PRODUCT: MSX **YEAR COMMISSIONED:** 2012
TRAIN MANUFACTURER: Bombardier (now part of Alstom group)

Bombardier selected Saft's MSX batteries for the transition from lead-acid to nickel-based batteries on the dual-system tram-train fleet in Karlsruhe, Germany. The objective was a substantial reduction in battery size and weight, as well as reliable high power performance.

The batteries provide emergency backup power for critical systems (such as lighting, communications and door operation). They are sized to operate the electro-magnetic braking system for up to 12 seconds, even in the coldest winter conditions and after the designated backup period.

2a. Traction & regenerative braking

PROJECT: UK | Birmingham Network | West Midlands
PRODUCT: Modul'ion **YEAR COMMISSIONED:** 2019
TRAIN MANUFACTURER: CAF

CAF introduced the UK's first commercial tram line operating without catenary for the city of Birmingham. In addition to aesthetic harmony, catenary-free operation also eliminated the need for expensive overhead electrification equipment. This is feasible thanks to

Saft's onboard Li-ion battery, which charges on parts of the network where catenaries are available and provides traction power on catenary-free sections. Saft's Li-ion battery solutions are designed for a service life of at least 7 years to optimize the fleet's maintenance and operational schedule.

2b. Traction & regenerative braking

PROJECT: Qatar | Doha's Education City Tram
PRODUCT: Ion-Onboard **YEAR COMMISSIONED:** 2015
TRAIN MANUFACTURER: Siemens

Saft's Ion-OnBoard Regen Li-ion battery system is deployed on Avenio trams in Doha's Education City. By utilizing efficient regenerative braking and rapid charging at each stop, the tram system operates autonomously without the need for catenaries. The trams are enabling a shift from

road to rail transportation, showing the potential for sustainable urban development and CO_2 reduction, while maintaining architectural aesthetics in Doha's higher education hub. Saft's solution includes an advanced Battery Monitoring System (BMS) and Battery Thermal Management System (BTMS).

3a. Auxiliary backup for metros, commuter and high-speed trains

PROJECT: South Africa | Gautrain
PRODUCT: MRX **YEAR COMMISSIONED:** 2010
TRAIN MANUFACTURER: Bombardier (now part of Alstom group)

South Africa's Gautrain is a safe and rapid transport link for Johannesburg, Pretoria and O.R. Tambo Airport. Bombardier equipped the trains with Saft's MRX battery systems for reliable onboard backup power to support emergency lighting, air conditioning and door operation. The turnkey package is ideal for rapid transit applications thanks to high performance and reliability, long service life and low Total Cost of Ownership (TCO).

3b. Auxiliary backup for metros, commuter and high-speed trains

PROJECT: UK | Hitachi Class 800 and 801 trainsets
PRODUCT: MSX **YEAR COMMISSIONED:** 2014
TRAIN MANUFACTURER: Hitachi

Hitachi selected Saft to supply turnkey, fully integrated battery systems for vital backup power on their Class 800 trains for the UK's Great Western Main Line and East Coast Main Line. For safety, each of the 122 electric and bi-mode trains is equipped with at least two lightweight MSX systems to ensure up to three hours of backup power to support passenger safety and comfort functions, such as lighting, ventilation, door opening and communications.

4. Diesel engine starting

PROJECT: Brazil | MRS Logistica | Southeastern Federal Railroad Network
PRODUCT: SRX **YEAR COMMISSIONED:** 2019
TRAIN MANUFACTURER: General Electric

Brazil is transitioning its freight transportation from road to rail for greater efficiency and reduced CO_2 emissions. During the upgrade of their General Electric diesel-electric locomotive fleet, MRS Logistica selected Saft's SRX battery system for its long life, low maintenance, and reliable onboard starting and backup power. The battery systems deliver the cranking power to start the massive diesel engine up to 14 times a day.

Case studies

5. Backup for safety and passenger comfort systems

PROJECT: USA | Chicago Transit | Authority Series 7000
PRODUCT: SMRX-F3 **YEAR COMMISSIONED:** 2018
TRAIN MANUFACTURER: CRRC Sifang America

CRRC Sifang America's new Series 7000 trains are enhancing the passenger experience and boosting Chicago's economy. Saft has provided a comprehensive battery solution based on its SMRX-F3 batteries. It met the technical specifications, as well as US National Fire Protection Association's NFPA 130 standards. The battery systems supply backup power to essential onboard passenger comfort and safety functions, including heating, lighting, door control, security cameras and communication systems.

6. Backup and Emergency Traction

PROJECT: China | Shanghai Metro | Lines 3 & 4
PRODUCT: MSX **YEAR COMMISSIONED:** 2018
TRAIN MANUFACTURER: CRRC Puzhen

Shanghai has the second largest metro system in the world. MSX was selected by the metro operator to support emergency traction after successful deployment of the batteries on Line 11. Eventually, MSX was adopted in multiple metro lines in Shanghai. Apart from onboard backup power, MSX can deliver sufficient traction power for stranded trains to travel up to two kilometers without an external electricity supply so that passengers can evacuate safely.

7a. Resilient to extreme temperatures

PROJECT: Estonia | Tallinna Linnatranspordi Aktsiaseltsm
PRODUCT: SRA LT (Low Temperature) **YEAR COMMISSIONED:** 2015
TRAIN MANUFACTURER: CAF

Tallinn has extremely cold winters, where the temperature can fall as low as -50°C. Hence, vehicle builder CAF selected Saft's SRA LT batteries for fully reliable backup power for its new tram system. The batteries deliver a greater capacity than standard batteries at low temperatures owing to optimized electrical performance and very high energy density. The robust and reliable construction also ensures a long and predictable service life regardless of the challenging weather conditions.

7b. Resilient to extreme temperatures

PROJECT: India | Lucknow Metro
PRODUCT: SRM+
TRAIN MANUFACTURER: Alstom

YEAR COMMISSIONED: 2016

Alstom selected Saft's SRM+ to provide up to 90 minutes of onboard back-up power for critical control and passenger safety functions on their Lucknow Metro trains. The city's summer temperatures can reach 45°C, hence high temperature resistance was a key requirement. Furthermore, SRM+ offers a service life of more than 15 years.

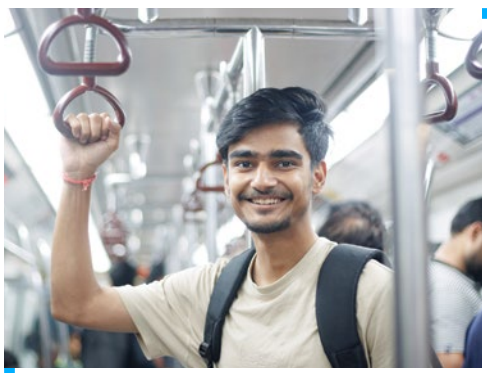
8a. TCO/Low Maintenance

PROJECT: Finland | VR Group
PRODUCT: SRM
TRAIN OPERATOR: VR Group

YEAR COMMISSIONED: Late 1990s

Saft's advanced nickel-based technology has successfully served on VR Group's electric double-decker passenger trains for over two decades. Operated close to the Arctic Circle, the Finnish rail operator relies on Saft's SRM batteries for comfort, convenience and safety The batteries provide backup power for three hours of autonomous operation, without the risk of 'sudden death' failure.

Twenty years after installation, tests showed the battery capacity was still perfect – a 33 percent gain in anticipated service life!



8b. TCO/Low Maintenance

PROJECT: Various metro lines including Delhi Metro, Bangalore Metro and Chennai Metro
PRODUCT: Ni-Cd batteries

YEAR COMMISSIONED: Since 2002

Saft's high performing Ni-Cd batteries are engineered to provide safe and reliable backup power with a long operation lifetime of up to 15 to 20 years, even under extreme climates. As an ideal choice for diverse landscapes, Saft has delivered over 2000 battery systems to different railway operators across India, including Delhi Metro, Bangalore Metro and Chennai Metro, from early 2000s.

The first SRM batteries were delivered to Delhi Metro in 2002. After 2 decades, they are still in operation today despites the city's hot temperatures.

Case studies

9. Replacement

PROJECTS: France | SNCF TER (Replacement)

PRODUCT: MRX **YEAR COMMISSIONED:** 2015

TRAIN OPERATOR: SNCF

France's national state-owned rail operator, SNCF, replaced the time-expired lead-acid batteries with Saft's MRX batteries on more than 200 new generation double-decker trains (TER 2N NG) on regional routes. The transition delivered improved battery performance and reliability over a long service life. MRX plays a critical role as backup power for control, safety and communications functions when the main power supply is interrupted.

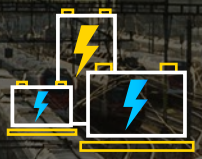
10. Digital trackside backup

PROJECTS: Digital signalling systems for improved safety and train management for several rail infrastructure operators in Europe

PRODUCT: Flex'ion™ Gen2 **YEAR COMMISSIONED:** 2023

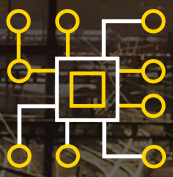
The digitalization of signalling and interlocking applications in European railways requires high-tech backup batteries with a successful track record in the industry. Saft's Flex'ion™ Gen2 System provides continuous and uninterrupted operation for the key digital trackside railway systems and integrated equipment, as well as optimizes rail traffic and passengers' safety.

A rail battery expert that truly understands your needs at every stage



One stop battery solutions partner

- Full range of battery solutions
- High performance cells, batteries and accessories with a proven track record
- Experienced across established and growing rail markets with our battery development and rail engineering centers in three continents: Europe (Bordeaux), Asia (Zhuhai and Bangalore) and North America (Jacksonville)



Expertise

- Capability to support OEM projects in different regions and expertise in managing cross-regional projects, from 31 sales offices worldwide (as of 2024)
- Battery system design and integration support via our rail battery manufacturing hubs, with over 20,000 rail battery systems installed around the world
- Broad knowledge in local and international rail standards and rolling stock requirements

Service

- Installation and commissioning
- Spare part supply
- Aging assessment
- Training programs
- Recycling

Ongoing assistance

- Dedicated support teams: project management for system development, application engineering, quality assurance and customer service
- International sales network
- Strong logistics support for local delivery

Innovation

- Expert and technology leader in some of the world's most advanced technologies
- Cross-platform applications to enhance battery performance
- On-going investment in new product development

Battery retrofit: promoting the circular economy

- Rejuvenation of spent batteries through remanufacture, reuse and recycling
- Thorough inspection and guidance on reconditioning of used batteries and battery systems

Since 2013, the sustainability performance of Saft has been reviewed by “Ecovadis”, a leading Environment and Social Responsibility rating agency. This evaluation focuses on the following matters: environment, labor and human rights, ethics as well as sustainable procurement.

Saft obtained the Platinum rating in 2023, and is ranked within the top 1% of companies involved in the manufacture of batteries and accumulators.

Program Net Zero

Goal

- Reduce our environmental impact
- Implement circular economy throughout our operations
- Help our customers decarbonize
- Procure sustainably
- Develop people and contribute to society

In 2023

- **6million Litre** recycled
- **- 3.6%** carbon intensity/ unit produced
- **60%** of waste recycled

Batteries facilitate the shift towards clean energy, but there is much work to do to achieve Net Zero. That’s why Saft is committed to reducing its impact.

Full conformity with quality, safety and environment standards

Company certifications / standards:

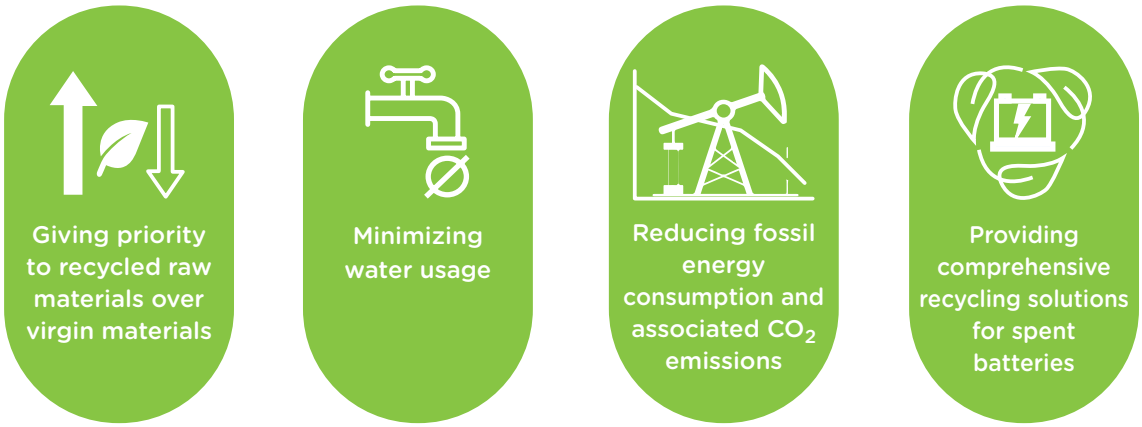
- **Quality ISO 9001, ISO / TS 22163 (IRIS),** Saft's world class continuous improvement program
- Environment fully recyclable, **ISO 14001, RoHS, REACH**

Product certifications / standards

- Saft's nickel-based batteries exceed the "M" and "H" type requirements of **IEC 60 623 and also significantly exceed UIC 854 requirements**
- Integration **EN 50547 and IEC 62973-2** railway auxiliary onboard battery, fire & smoke **NFF 16101-16102, NFPA 130 (ASTM E 162 & ASTM E 662), DIN 5510, UNI IEC 11170-3, UL 94-V0, shocks & vibrations IEC 61 373**
- **CE 548** Compliant batteries, aligned with the new European battery regulation **EU 2023/1542**

At Saft, we are committed to a more sustainable planet

Saft's philosophy has always been to offer battery solutions that make life easier. As batteries are becoming more sophisticated, they will play a crucial role in the evolution of future power ecosystems with the critical goal of reducing carbon emissions. That is why our scientists and engineers are motivated to work on the next breakthroughs in battery technology.



For industrial Ni-Cd batteries, Saft collaborates with collection companies across the world to receive and dispatch customers' batteries at the end of their lives to fully approved facilities, in compliance with the laws governing trans-boundary waste shipments.

Also, Saft assists users of its batteries in finding environmentally sound recycling solutions. Please contact your nearest Saft representative for further information.

Saft keeps the world moving towards a resilient future

With net-zero as our target, Saft is prioritizing developments that contribute to carbon neutrality. We are also focused on sustainability by using recycled raw materials over virgin raw materials in all manufacturing processes. At the same time, we prioritize reducing air and water emissions from our plants, minimizing water usage, reducing fossil energy consumption, and ensuring that all our customers have access to recycling solutions for their spent batteries.

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SRM+ Ni-Cd battery

The optimized high-energy railway backup battery

Saft's SRM+ nickel-based battery range assures continuity of onboard auxiliary backup applications and delivers outstanding performance, especially in arctic and desert temperature extremes.

Saft's SRM+ high performance Sintered/ PBE nickel-cadmium battery ensures reliable energy backup over a service life of more than 15 years and is fully recyclable.
The single cell design offers a high level of flexibility in battery system configuration and the package has the same installation footprint as an equivalent block battery solution.
SRM+ is purpose-designed to operate cost-efficiently and provides outstanding chargeability across a wide temperature range.

Applications

All types of trains

- Urban transport: metros, tramways, tram-trains, airport shuttles
- Regional transport: EMU, DMU (Electric and Diesel Multiple Units)
- Intercity transport: high-speed trains, electric locomotives, passenger coaches

All types of function

- Passenger safety: onboard signaling, security lighting, door control and communication networks
- Passenger comfort: ventilation, air-conditioning, lighting, Wi-Fi
- Fail-safe train start-up: pantograph lift-up, computing, electronics

Benefits

- Total reliability for high energy backup applications requiring "M" type performance, even in the toughest conditions
- Purpose designed for cost-effective solutions
- Optimized use of battery space
- Low LCC (Life Cycle Cost)
- Battery design offers complete flexibility
- Standardized or customized options available

Temperature	
Operating temperature	From -30°C to +50°C
Resistance to extreme temperatures	From -50°C to +70°C
Maintenance	
Low maintenance thanks to long time between topping-up operation	2 years or more depending upon operation characteristics
Optional water filling vents allow for quick and accurate topping-up to minimize maintenance costs	Less than 10 minutes for active topping-up operation
Light and compact design	
Gain in container and battery compartment size vs conventionally sized batteries	60% depending upon requested mission profile
Wide capacity range	
Capacity range to optimize sizing to specific performances request	From 40 to 360 Ah
Available crates for easy integration & handling	For 2 to 8 cells

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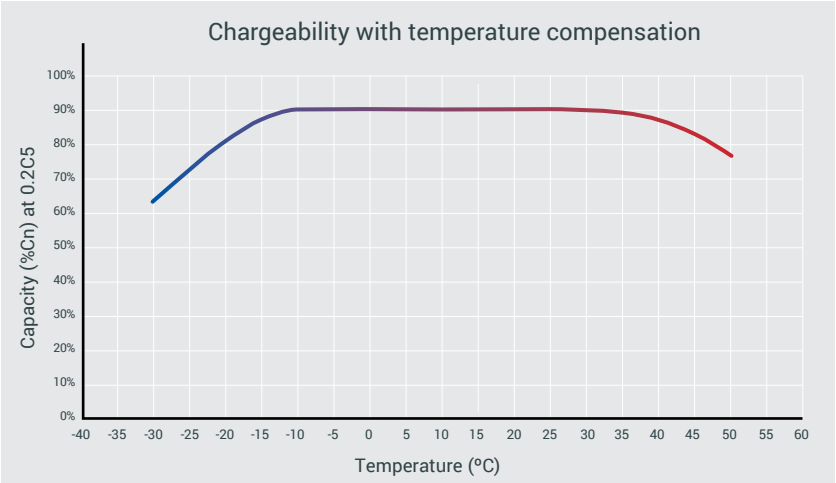
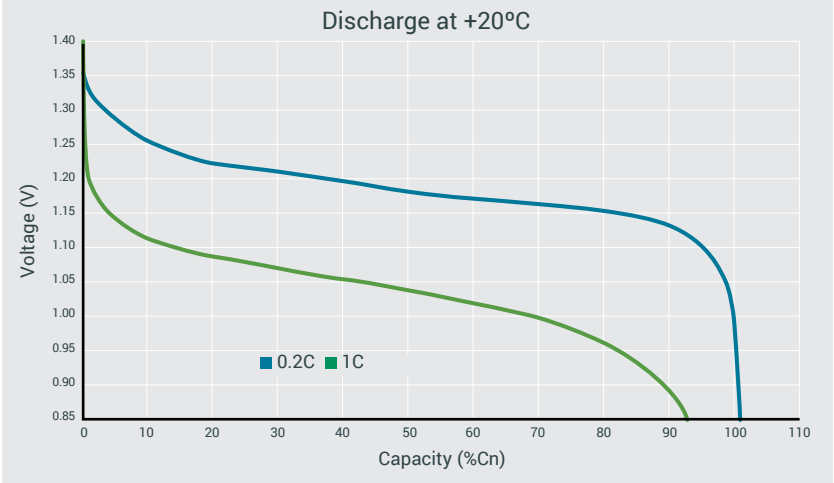
Features

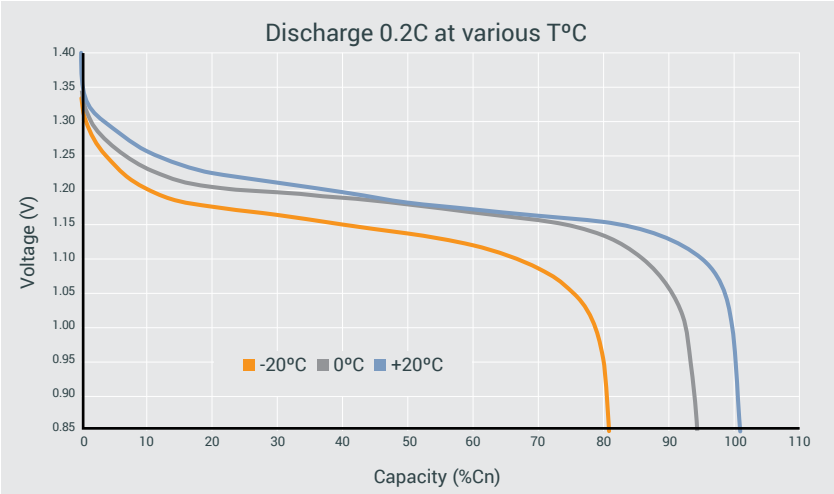
- Saft's Sintered/PBE Ni-Cd technology ensures reliable and predictable service life (over 15 years), without risk of sudden death
- Compact single cell design offers a 25% reduction in weight and installation footprint compared with SRM
- Advanced electrolyte ensures excellent charge/discharge performance
- Wide operating temperature range from -30°C to +50°C and resistance to extreme temperatures from -50°C to +70°C
- Proven resistance to shocks and vibrations
- Outstanding chargeability over an extended temperature range
- Fast recharge (90% capacity achieved in 5 hours) for rapid return to service
- Lower water consumption for optimized maintenance intervals
- Flexibility in capacity, container type and maintenance systems
  - 17 capacity steps ranging from 40 Ah to 360 Ah
  - Containers available in various plastics (FRpp, P, F2)
  - Optional centralized water filling system
- Compatible with Saft's range of standardized battery systems or can be integrated into a customized tray, individually designed, engineered and tested to meet specific application requirements

Full conformity with quality, safety and environmental standards

- Electrical: exceeds the medium "M" type requirements of IEC 60 623
- Integration: EN 50547 railway auxiliary onboard battery
- Fire & smoke: NFF 16101-16102, DIN 5510-2, UNI IEC 11170-3, UL 94-V0, NFPA 130 for ASTM E 162 and E 662
- Shocks & vibrations: IEC 61 373
- Quality: ISO 9001, ISO/TS 22163 (IRIS), Saft Excellence System
- Environment: fully recyclable, ISO 14001, RoHS, REACH







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