

SRM Ni-Cd BATTERY EMERGENCY POWER FOR RAIL APPLICATIONS



S A F T

Ni-Cd TECHNOLOGY FOR PASSENGER SECURITY AND COMFORT

As demand increases worldwide for rail transport, operators and passengers need the security of failsafe on-board power protection. In emergencies, guaranteed autonomous battery power for computing, door control, radio communications systems, air conditioning, lighting and ventilation is available.

Reliability and long life

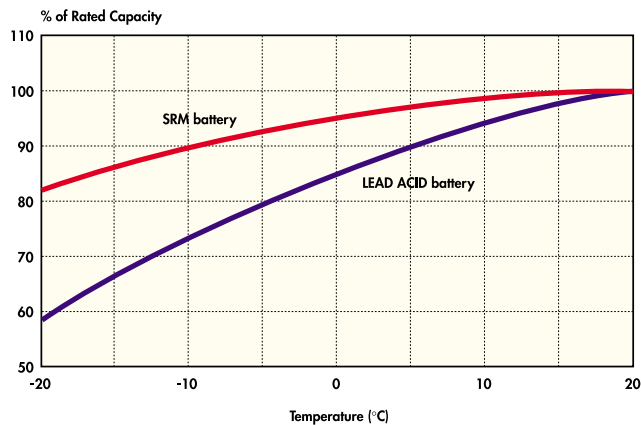
For rail operators, minimizing the effects of high temperatures and punishing conditions leads to increased operational efficiency and longer maintenance intervals.

Proven sintered/pbe technology assures totally reliable back-up energy without any risk of sudden death.

Ni-Cd battery technology is especially well suited for railways and ensures reliability throughout its long life, exceeding by more than 6 times minimum lifetime requirements of the UIC 854 R railway specification.

The battery solution for extreme temperatures

SRM will supply emergency discharges within a wide temperature range, and provides a long battery life even at extremes of up to 70°C. The battery tolerates deep, often uncontrolled (overnight) cycling, and resists arid conditions and heavy vibration over long periods without affecting operational capability.



Ni-Cd TECHNOLOGY WITH A PROVEN TRACK RECORD

Low life cycle cost

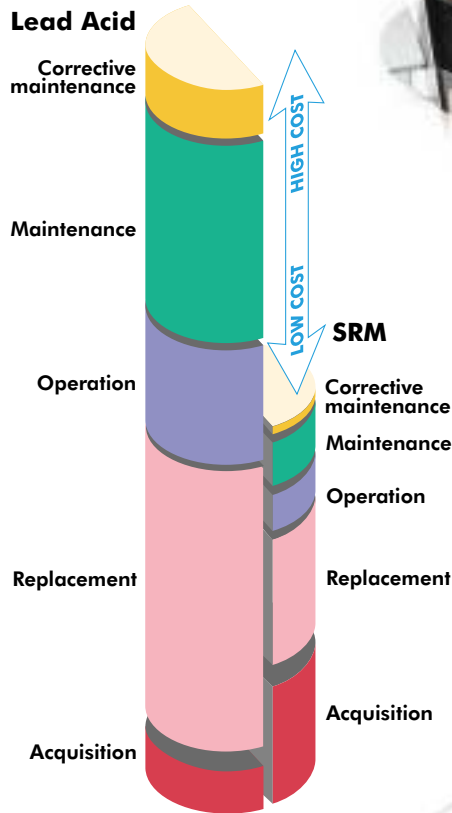
Saft SRM nickel-cadmium batteries represent the most effective low life cycle cost solution. After 5 years Ni-Cd shows a clear saving over lead acid. During 30 years' operation of the rail network SRM will have provided total reliability for around half the cost of a lead acid battery.

Two years between maintenance checks

SRM requires water topping-up only every 2 years when charged at 1.45 V/cell at 20°C. The battery's excellent chargeability at low voltage permits this, resulting in a reduction of overcharge current. Additionally, it is unnecessary to change the electrolyte during the battery's lifetime.

The SRM comprehensive offer

- High reliability: predictable performance without risk of sudden death.
- Wide operating temperature range: from -50°C to 70°C.
- Very competitive cost: less than half the cost of lead acid over a 30 year operation of the rail network.
- Minimum maintenance: two years without topping-up.
- Emergency discharges of autonomous power: assuring passenger safety in all situations.
- Advanced sintered/pbe technology: proven reliability with minimized water consumption.



Life cycle cost comparison over 30 years' rolling stock operation



THE COMPACT BATTERY SOLUTION

Lower weight, reduced volume

Lightweight and compact batteries are ideal for mass transit as minimized bulk with maximum reliability saves time, cost and worry. SRM achieves 20% weight and volume reductions for equivalent capacity by combining thin negative plates of active material bonded onto perforated steel strips, with sintered nickel positive electrodes, separated by microporous separators. Electrolyte circulates freely.

Designed and built to your specification

Soft designers work with you through all stages from initial specification, sizing and testing, manufacture and installation, to life cycle costing models and on-going international support.

Outstanding chargeability

SRM has excellent charging capability featuring a voltage window equivalent to that reached in other electrochemical couples.

SRM achieves:

- Faster recharge, reaching over 90% capacity after 5 hours.
- Lower installed capacity, by using a smaller derating factor for the charge, and by using a low charging voltage, therefore reducing the need to oversize the battery.
- Lower water consumption due to less overcharging.



Bayonet flame
arrestor vent cap

Large electrolyte
reserve

Sintered
positive electrode

Separator

Plastic bonded
negative electrode

Container

**Sintered/pbe
technology combines
physical strength with
excellent performance
for emergency power**



YOU AND SAFT SRM – A PARTNERSHIP FOR EXCELLENCE

Choice of containers

SRM batteries will be supplied in the container that best suits your application.

- SRM – stainless steel containers in flame retardant plywood crates.
- SRM P – plastic containers in compact stainless steel crates.
- SRM FR – polyamide flame retardant plastic containers (classified V0 to meet the UL 94 standard and I3F2 under the NFF 16 101 norm, and also meeting ASTM E 162 and ASTM E 662 standards) in compact stainless steel crates.

Trays for particular applications

Each battery option can be integrated into a tailored tray, individually designed to meet requirements for each application. Saft designers work with you through all stages from initial specification, sizing and testing, manufacture and installation, to life cycle costing models and on-going international support.

Saft – part of your team

SRM batteries are manufactured under strict ISO 9001 procedures at Bordeaux, France, and comply with most of the major mechanical and electrical standards, including IEC 60 623, IEC 60 077, NFF 64018, NFF 16 101, DIN 40 771 and BS 6260.

Saft's long experience in the rail industry means we will continue to provide effective battery solutions for future generations.



MECHANICAL FEATURES OF SRM

Steel range

Cell type	Capacity (C, Ah)	Electrolyte reserve (cm ³)	Cell weight (kg)	Weight including crate* (kg)										H	W	Dimensions* (mm)									
				2 cells	3 cells	4 cells	5 cells	6 cells	7 cells	8 cells	9 cells	10 cells	2 cells			3 cells	4 cells	5 cells	6 cells	7 cells	8 cells	9 cells	10 cells		
SRM 46	46	220	2.9	6.6	9.6	13	16	19	22	25	28	31	318	105	165	229	293	357	439	503	567	649	713		
SRM 62	62	340	3.8	8.1	13	17	21	25	29	33			318	105	217	307	397	505	595	703	793				
SRM 80	80	335	4.1	8.6	13	18	22	26	31	35			318	105	217	307	397	505	595	703	793				
SRM 105	105	730	6.5	15	22	29	35	43					427	190	166	232	298	364	445						
SRM 125	125	880	7.3	17	24	32	39	48					427	190	186	262	338	414	505						
SRM 140	135	905	7.6	17	25	33	41	50					427	190	190	268	346	424	517						
SRM 155	155	990	8.1	18	27	35	44	53					427	190	202	286	370	469	553						
SRM 170	170	1140	8.9	20	29	39	48	58					427	190	222	316	410	519	613						
SRM 200	200	1280	9.9	22	33	43	54	64					427	190	242	346	450	569	673						
SRM 220	220	1375	10.5	23	34	46	57	68					427	190	254	364	489	599	709						
SRM 250	250	1610	11.8	26	39	52	64						427	190	286	412	553	679							
SRM 300	300	1830	14.5	32	48	63							427	190	322	481	625								
SRM 375	375	2300	17.3	38	56								427	190	400	591									
SRM 440	440	2800	20.3	44									427	190	468										

Terminals SRM 46 to SRM 80: 2 M 10 x 1.25; SRM 105 to SRM 250: 2 M 14 x 2; SRM 300 to SRM 440: 4 M 14 x 2

Plastic range in standard polypropylene (for FR type of plastic, increase the physical characteristics by approximately 1.5%)

Cell type	Capacity (C, Ah)	Electrolyte reserve (cm ³)	Cell weight (kg)	Crate configuration	Weight including crate* (kg)										H	W	Dimensions* (mm)									
					2	3	4	5	6	7	8	9	10	2			3	4	5	6	7	8	9	10		
SRM 25 P	25	175	1.6	1 row			7	9	11	12	14	16	18	277	90			196	242	288	334	380	426	472		
				2 rows			14	18	21	24	28	31	35	277	177			196	242	288	334	380	426	472		
SRM 37 P	37	355	2.6	1 row			12	15	17	20	23		277	90			354	439	526	611	697					
				2 rows			23	28	34	40	45		277	177			354	439	526	611	697					
SRM 43 P	43	355	2.7	1 row			12	15	18	21	24		277	90			354	439	526	611	697					
				2 rows			24	29	35	41	47		277	177			354	439	526	611	697					
SRM 56 P	56	350	2.8	1 row			13	16	19	22	25		277	90			354	439	526	611	697					
				2 rows			25	31	38	44	50		277	177			354	439	526	611	697					
SRM 66 P	66	345	3.0	1 row			14	17	20	24	27		277	90			354	439	526	611	697					
				2 rows			27	33	40	46	53		277	177			354	439	526	611	697					
SRM 80 P	80	315	3.4	1 row			15	19	22	26	29		307	90			354	439	526	611	697					
				2 rows			29	36	44	51	58		307	177			354	439	526	611	697					
SRM 105 P	105	345	4.4	1 row		15	19	24	29				307	91		323	426	530	634							
				2 rows		28	37	46	56				307	178		323	426	530	634							
SRM 125 P	125	575	5.5	1 row	12	18	24	30	36	42	48		343	170	163	241	319	397	475	553	631					
SRM 140 P	140	575	5.7	1 row	13	19	25	31	37	43	49		343	170	163	241	319	397	475	553	631					
SRM 155 P	155	655	6.1	1 row	14	20	27	34	40	47	53		343	170	181	268	355	442	530	616	703					
SRM 185 P	185	785	7.3	1 row	16	24	32	40	48				343	170	213	316	419	523	626							
SRM 220 P	220	905	8.9	1 row	20	29	38	48	57				343	170	241	358	475	593	709							
SRM 250 P	250	1100	10.4	1 row	24	34	45	56					343	170	285	423	562	701								
SRM 270 P	270	1085	10.9	1 row	24	35	46	58					343	170	285	423	562	701								

Terminals: SRM 25 P to SRM 80 P: 2 M10 x 1.25; SRM 105 P: 4 M10 x 1.25; SRM 125 P to SRM 185 P: 2 M14 x 2; SRM 220 P to SRM 270 P: 4 M14 x 2

For battery assembly, an inter-crate space of 10 mm is required (for SRM 25 P to SRM 105 P).

* As function of number of cells. For FR type of plastic, consult Saft for specific requests.

ELECTRICAL PERFORMANCE OF SRM

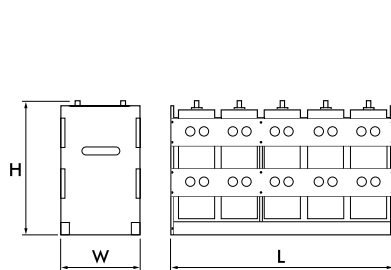
Available amperes at +20°C

Steel range

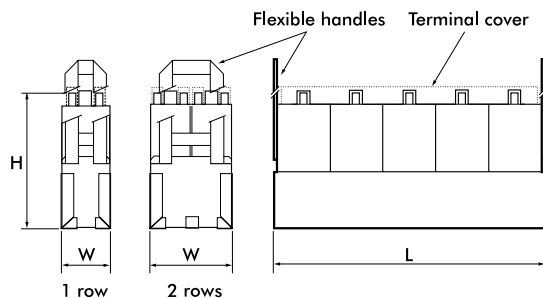
Cell type	Capacity (C ₅ Ah)	End voltage 1.1 V/cell								End voltage 1.05 V/cell								End voltage 1.00 V/cell							
		Hours					Minutes			Hours					Minutes			Hours					Minutes		
		5	3	2	1½	1	45	30	5	3	2	1½	1	45	30	5	3	2	1½	1	45	30			
SRM 46	46	8.8	14.2	20.6	25.8	33.7	40.0	49.0	9.1	14.8	21.7	27.9	39.9	49.5	60.7	9.2	15.1	22.2	28.9	42.1	53.6	71.6			
SRM 62	62	11.9	19.2	27.7	34.7	45.9	54.5	66.7	12.2	20.0	29.2	37.6	54.3	67.4	82.7	12.4	20.3	29.9	38.9	57.4	72.8	93.7			
SRM 80	80	15.3	24.7	35.8	44.7	58.0	68.2	82.8	15.8	25.7	37.6	48.6	68.1	83.6	102	16.0	26.3	38.6	50.3	71.9	90.4	120			
SRM 105	105	20.1	32.3	46.4	57.6	73.5	85.6	102	20.7	33.8	49.3	63.2	88.8	110	132	21.0	34.5	50.6	65.7	95.4	120	153			
SRM 125	125	23.9	38.5	55.2	68.6	87.6	102	122	24.7	40.2	58.7	75.2	106	131	157	25.0	41.0	60.3	78.3	113	142	183			
SRM 135	135	25.8	41.6	59.7	74.1	94.0	108	127	26.6	43.5	63.4	81.2	113	137	163	27.0	44.0	65.1	84.5	121	148	190			
SRM 155	155	29.7	47.7	68.5	85.0	108	124	146	30.6	49.9	72.8	93.2	129	157	187	31.0	50.9	74.7	97.0	138	171	218			
SRM 170	170	32.5	52.3	75.1	93.3	118	136	160	33.5	54.7	79.9	102	141	173	205	34.0	55.8	82.0	106	151	188	239			
SRM 200	200	38.3	61.5	88.4	110	139	160	188	39.5	64.4	94.0	120	166	203	241	40.0	65.6	96.5	125	178	221	281			
SRM 220	220	41.6	66.7	95.1	118	148	170	198	43.2	70.3	103	130	177	216	257	44.0	72.0	106	137	194	239	297			
SRM 250	250	47.3	75.7	108	134	168	193	225	49.0	79.9	117	148	201	245	292	50.0	81.8	120	156	220	271	338			
SRM 300	300	56.8	91.0	130	161	202	231	271	58.9	95.9	140	178	241	294	350	60.0	98.1	144	187	264	325	405			
SRM 375	375	71.0	114	162	201	253	289	338	73.6	120	175	222	302	368	437	75.0	123	180	233	331	407	506			
SRM 440	440	83.3	133	190	236	296	339	397	86.4	141	205	261	354	431	513	88.0	144	211	274	388	477	594			

Plastic range

Cell type	Capacity (C ₅ Ah)	End voltage 1.1 V/cell								End voltage 1.05 V/cell								End voltage 1.00 V/cell							
		Hours					Minutes			Hours					Minutes			Hours					Minutes		
		5	3	2	1½	1	45	30	5	3	2	1½	1	45	30	5	3	2	1½	1	45	30			
SRM 25 P	25	4.8	7.7	11.2	14.0	18.3	21.7	26.6	4.9	8.0	11.8	15.2	21.7	26.9	33.0	5.0	8.2	12.1	15.7	22.9	29.1	38.9			
SRM 37 P	37	7.1	11.4	16.6	20.8	27.1	32.2	39.4	7.3	11.9	17.5	22.4	32.1	39.8	48.8	7.4	12.1	17.9	23.2	33.9	43.1	57.6			
SRM 43 P	43	8.2	13.3	19.3	24.1	31.5	37.4	45.8	8.5	13.8	20.3	26.1	37.3	46.3	56.7	8.6	14.1	20.8	27.0	39.4	50.1	66.9			
SRM 56 P	56	10.7	17.3	25.0	31.3	41.5	49.2	60.2	11.0	18.1	26.4	34.0	49.0	60.9	74.7	11.2	18.3	27.0	35.1	51.8	65.8	84.6			
SRM 66 P	66	12.6	20.4	29.5	36.9	48.9	58.0	71.0	13.0	21.3	31.1	40.0	57.8	71.7	88.0	13.2	21.6	31.8	41.4	61.1	77.5	99.7			
SRM 80 P	80	15.3	24.7	35.8	44.7	58.0	68.2	82.8	15.8	25.7	37.6	48.6	68.1	83.6	102	16.0	26.3	38.6	50.3	71.9	90.4	120			
SRM 105 P	105	20.1	32.3	46.4	57.6	73.5	85.6	102	20.7	33.8	49.3	63.2	88.8	110	132	21.0	34.5	50.6	65.7	95.4	120	153			
SRM 125 P	125	23.9	38.5	55.2	68.6	87.6	102	122	24.7	40.2	58.7	75.2	106	131	157	25.0	41.0	60.3	78.3	113	142	183			
SRM 140 P	140	26.8	43.1	61.9	76.8	97.5	112	132	27.6	45.1	65.8	84.2	117	142	169	28.0	46.0	67.5	87.6	125	154	197			
SRM 155 P	155	29.7	47.7	68.5	85.0	108	124	146	30.6	49.9	72.8	93.2	129	157	187	31.0	50.9	74.7	97.0	138	171	218			
SRM 185 P	185	35.4	56.9	81.8	102	129	148	174	36.5	59.6	87.0	111	154	188	223	37.0	60.7	89.3	116	165	204	260			
SRM 220 P	220	41.6	66.7	95.1	118	148	170	198	43.2	70.3	103	130	177	216	257	44.0	72.0	106	137	194	239	297			
SRM 250 P	250	47.3	75.7	108	134	168	193	225	49.1	79.9	117	148	201	245	292	50.0	81.8	120	156	220	271	338			
SRM 270 P	270	51.1	81.8	117	145	181	208	243	53.0	86.3	126	160	217	265	315	54.0	88.3	130	168	238	293	365			



Wooden crate configuration



Steel crate configuration



Committed to a clean environment.

Saft takes seriously its responsibility to safeguard the environment. At several sites worldwide, more than 99% of metals contained in the battery are recycled. This process safeguards valuable natural resources and is a service to customers that Saft will continue to offer for future generations.

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