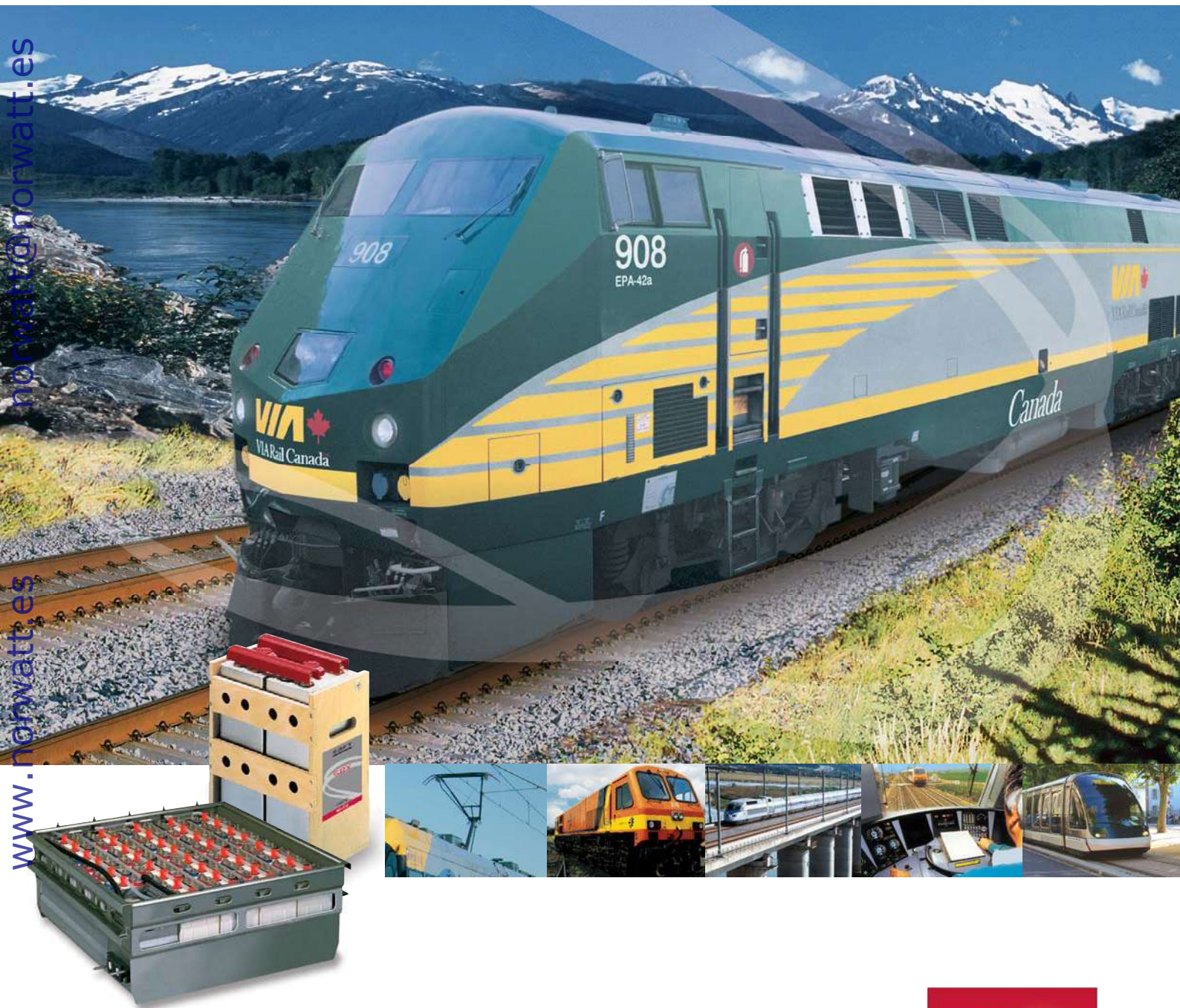


SRX Ni-Cd battery

High power back-up for railways



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SRX Ni-Cd battery

Starting and braking power for railways

Diesel locomotives, DMU (Diesel Multiple Units) and electric rolling stock equipment operate in some of the world's most punishing conditions.

Extremes of temperature directly affect efficiency, but passengers and freight services still expect reliable service at a predictable cost.

Guaranteed power for engine starting – even in freezing temperatures – emergency braking, tilting, and for raising pantographs is provided by today's advanced rail battery technology: SRX nickel-cadmium batteries.

Low temperature reliability

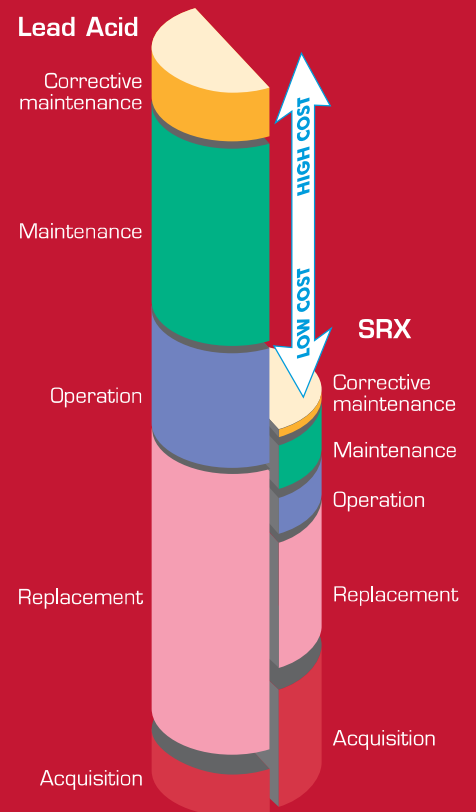
Where total reliability is essential in harsh conditions, sintered/PBE technology tolerates extreme temperatures from +70°C (+158°F) to as low as -50°C (-58°F), levels that destroy lead acid batteries. Saft builds SRX nickel-cadmium batteries specifically for demanding rail applications in all climates.

At -20°C (-4°F) SRX retains more than 70% capacity, avoiding the need to oversize the battery and ensuring the availability of power even at low temperatures.

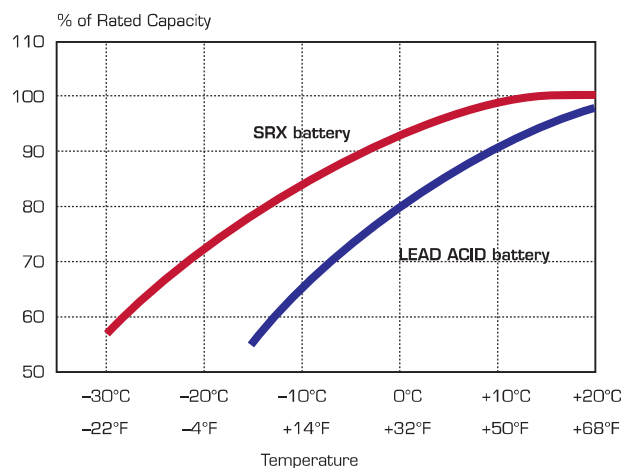
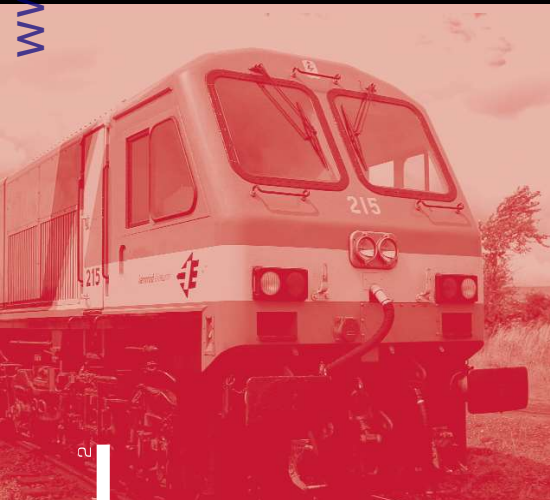
Minimizing life cycle cost

SRX features keep down overall cost and provide up to 15 years' service through solid construction, large electrolyte reserves and advanced plate design. The optional Saft battery water filling system operates quickly and accurately to minimize maintenance costs.

SRX's extended lifetime is achieved through sintered/PBE technology and exceeds by more than 6 times the minimum lifetime required by UIC 854 R railway specification.



Life cycle cost comparison over 30 years' rolling stock operation



Reliable power proven in action worldwide

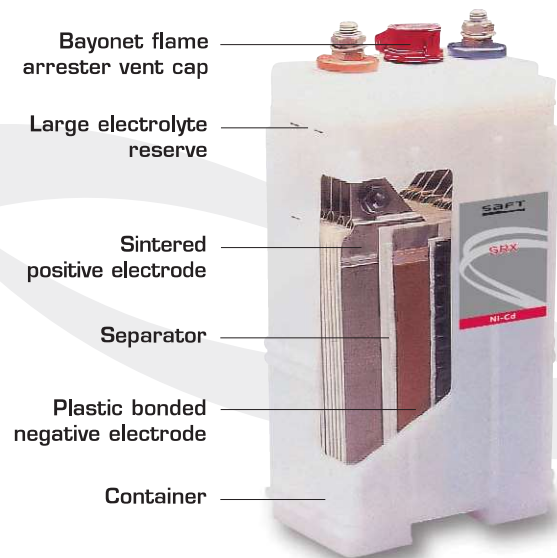
High power performance

SRX can deliver short duration high current discharges of up to 1 minute and up to 5 times its capacity for instantaneous diesel engine starting. Discharges of up to three times capacity for up to three minutes provide power for high speed train emergency braking.

Lighter and smaller

Battery weight and volume savings lead directly to lower operational costs with increased efficiency. SRX is lighter than conventionally sized batteries and provides equivalent performance in containers and battery compartments at least 60% smaller.

Its flexible design makes SRX ideal in replacement and retrofit markets, suiting existing battery compartments without alteration.



Sintered/pbe technology combines physical strength with excellent performance for high power rail applications

The SRX comprehensive offer

- **Very competitive cost**
less than half the cost of lead acid over a 30 year operation of the rail network.
- **Minimum maintenance**
two years or more without topping-up.
- **High reliability**
predictable performance without risk of sudden death.
- **Long duration life**
SRX batteries can function for more than 15 years.
- **Wide operating temperature range**
from -20°C to $+50^{\circ}\text{C}$ (-4°F to $+122^{\circ}\text{F}$) with extreme temperatures from -50°C to $+70^{\circ}\text{C}$ (-58°F to $+158^{\circ}\text{F}$).
- **Advanced sintered/PBE technology**
excellent chargeability with minimized water consumption.



A sound economical choice

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Built for reliability and long life

Sintered/PBE construction brings together very strong sintered nickel positive electrodes and negative plastic bonded electrodes, insulated by microporous separators that allow electrolyte to freely circulate.

Ni-Cd will not suffer sudden death, unlike lead acid batteries.

Designed-in low maintenance

Saft's water filling system can be integrated as an option to cut the cost and time of maintenance and increase battery life through measured and controlled topping-up. Gases are safely exhausted through the channel system.

Meeting recognised standards

SRX batteries are built to ISO 9001 criteria and comply with most of the major mechanical and electrical standards, including IEC 60623, IEC 60077, DIN 40 771, BS 6260, UIC 854 R, NF F 64 018.



Containers for all conditions

Batteries are supplied in a wide variety of containers to suit varied conditions.

- SRX steel containers in flame retardant plywood crates.
- SRX P plastic containers in compact stainless steel crates.
- SRX FR polyamide flame retardant plastic containers (classified VO 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 ongoing international support.



Mechanical features

Steel range

Cell type	Capacity (C ₅ Ah)	Electrolyte reserve (cm ³)	Approx. weight per cell (kg)	Weight including crate* (kg)					H	W	Dimensions* (mm)				
				2 cells	3 cells	4 cells	5 cells	6 cells			2 cells	3 cells	L		
SRX 720	73	485	5.3	13	18	23	30	35	362	190		227	291	355	436
SRX 800	81	475	5.4	14	19	24	31	36	362	190		227	291	355	436
SRX 900	90	580	6.1	15	21	27	35	42	362	190	183	257	327	405	496
SRX 1000	103	565	6.3	15	21	28	35	42	362	190	183	257	327	405	496
SRX 1200	115	640	6.9	16	24	31	38	46	362	190	199	281	363	462	544
SRX 1300	130	735	7.7	17	26	34	42	51	362	190	219	311	403	512	604
SRX 1500	145	830	8.5	20	29	37	48	57	362	190	239	341	443	562	664
SRX 1700	170	860	9.6	23	33	43	54	65	362	190	251	359	484	592	700
SRX 1900	195	1010	11.0	25	37	49	60		362	190	283	407	540	672	
SRX 2200	220	1180	12.3	28	41	55			362	190	319	478	620		
SRX 2500	250	1250	13.3	30	44				362	190	337	505			
SRX 3000	300	1455	15.3	34					362	190	399				
SRX 3700	375	1755	18.6	42					362	190	467				

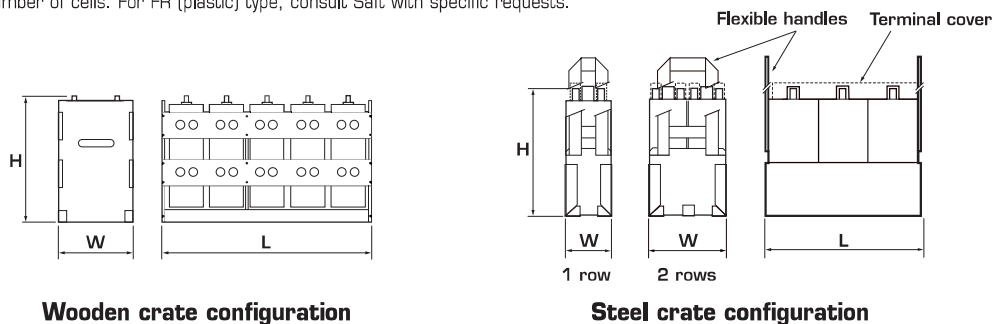
Terminals SRX 720 to SRX 1500: 2 M12 x 1.5 / SRX 1700 to SRX 3000: 4 M12 x 1.5 / SRX 3700: 6 M12 x 1.5.

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

Cell type	Capacity (C ₅ Ah)	Electrolyte reserve (cm ³)	Approx. weight per cell (kg)	Crate configuration	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		
SRX 22 P	22	160	1.6	1 row 2 rows		7	9	11	12	14	16	18	277	90			196	242	288	334	380	426	472			
SRX 25 P	25	160	1.7	1 row 2 rows		8	10	11	13	15	17	19	277	90			196	242	288	334	380	426	472			
SRX 31 P	31	215	2.1	1 row 2 rows		9	12	14	16	18	21	23	277	90			254	314	375	435	496	557	618			
SRX 37 P	37	325	2.7	1 row 2 rows		12	15	18	21	24			277	90			354	439	526	611	697					
SRX 46 P	46	315	2.9	1 row 2 rows		13	16	19	22	25			277	90			354	439	526	611	697					
SRX 52 P	52	315	2.9	1 row 2 rows		13	16	19	22	25			277	90			354	439	526	611	697					
SRX 60 P	60	315	3.3	1 row 2 rows		14	18	22	25	29			307	90			354	439	526	611	697					
SRX 70 P	70	315	3.5	1 row 2 rows		15	19	23	26	30			307	90			354	439	526	611	697					
SRX 80 P	80	380	4.3	1 row 2 rows		14	19	23	28				307	91		323	426	530	634							
SRX 900 P	90	690	5.8	1 row	12	18	24	30	36	42	48		343	170	163	241	319	397	475	553	631					
SRX 1000 P	103	670	6.0	1 row	13	19	25	31	37	44	50		343	170	163	241	319	397	475	553	631					
SRX 1200 P	115	660	6.2	1 row	13	19	26	32	39	45	51		343	170	163	241	319	397	475	553	631					
SRX 1300 P	130	740	6.9	1 row	14	22	29	36	43	50	57		343	170	181	268	355	442	530	616	703					
SRX 1500 P	155	910	8.1	1 row	17	25	33	42	50				343	170	213	316	419	523	626							
SRX 1700 P	170	1050	9.7	1 row	20	30	40	50					343	170	241	358	475	593								
SRX 1900 P	190	1030	9.9	1 row	20	31	41	51					343	170	241	358	475	593								
SRX 2200 P	220	1235	11.6	1 row	24	35	47	59					343	170	285	423	562	701								

Terminals SRX 22 P to SRX 70 P: 2 M10 X 1.25 / SRX 80 P: 4 M10 x 1.25 / SRX 900 P to SRX 1500 P: 2 M12 x 1.5 / SRX 1700 P to SRX 2200 P: 4 M12 x 1.5
An inter-crate space of 10 mm is required for SRX 22 P to SRX 80 P battery assemblies.

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



Wooden crate configuration

Steel crate configuration

Electrical performance

Performance for fully charged cells by a constant current charge according to IEC 60623 standard

Steel range

Available amperes at +20°C ± 5°C (+68°F ± 9°F)

Type	SRX 720	SRX 800	SRX 900	SRX 1000	SRX 1200	SRX 1300	SRX 1500	SRX 1700	SRX 1900	SRX 2200	SRX 2500	SRX 3000	SRX 3700
Capacity (C ₅ Ah)	73	81	90	103	115	130	145	170	195	220	250	300	375
End voltage = 1.10 V / cell													
Duration													
1 min	370	410	460	511	582	642	715	874	962	1086	1202	1381	1717
3 min	266	296	332	368	420	463	517	630	695	784	868	1009	1247
5 min	222	247	277	307	350	386	430	525	579	653	727	849	1050
15 min	148	165	183	206	234	265	296	349	397	447	499	595	740
30 min	116	128	142	163	182	206	223	269	309	348	396	465	58
60 min	66.7	74.0	82.2	94.0	105	119	132	155	178	201	228	274	342
90 min	45.8	50.8	56.4	64.6	72.1	81.5	90.9	107	122	138	157	188	235
5 h	14.3	15.8	17.6	20.2	22.5	25.4	28.4	33.3	38.2	43.0	48.9	58.7	73.4
End voltage = 1.05 V / cell													
1 min	457	508	569	632	720	793	886	1080	1190	1343	1487	1709	2125
3 min	341	378	425	471	537	592	660	805	888	1001	1109	1288	1593
5 min	285	316	355	394	449	495	552	674	742	837	932	1089	1347
15 min	180	200	222	250	283	320	357	423	481	543	604	721	896
30 min	128	142	157	180	201	227	246	297	341	385	437	514	642
60 min	69.2	76.8	85.3	97.6	109	123	137	161	185	209	237	284	355
90 min	47.1	52.3	58.1	66.5	74.2	83.9	93.6	110	126	142	161	194	242
5 h	14.5	16.1	17.8	20.4	22.8	25.8	28.7	33.7	38.7	43.6	49.6	59.5	74.3
End voltage = 1.00 V / cell													
1 min	544	602	677	751	855	943	1052	1284	1414	1596	1768	2032	2525
3 min	410	454	510	566	647	712	794	969	1067	1204	1333	1550	1924
5 min	338	375	421	467	532	586	654	798	880	992	1104	1291	1596
15 min	203	226	251	283	320	362	404	479	544	613	682	814	1013
30 min	133	147	164	187	209	236	256	309	354	400	454	534	668
60 min	70.5	78.2	86.9	99.4	111	125	140	164	188	212	241	290	362
90 min	47.6	52.8	58.7	67.2	75.0	84.8	94.6	111	127	143	163	196	245
5 h	14.6	16.2	18.0	20.6	23.0	26.0	29.0	34.0	39.0	44.0	50.0	60.0	75.0
End voltage = 0.85 V / cell													
30 s	816	905	1016	1128	1285	1416	1580	1928	2125	2398	2654	3050	3793
1 min	751	833	935	1038	1183	1304	1454	1775	1956	2207	2443	2839	3511
3 min	581	643	723	802	914	1008	1124	1372	1511	1705	1888	2193	2712
5 min	488	542	608	675	769	848	945	1154	1271	1434	1597	1866	2307
10 min	323	359	403	449	509	570	636	760	855	964	1073	1262	1561

Available amperes at -20°C ± 5°C (-4°F ± 9°F)

Type	SRX 720	SRX 800	SRX 900	SRX 1000	SRX 1200	SRX 1300	SRX 1500	SRX 1700	SRX 1900	SRX 2200	SRX 2500	SRX 3000	SRX 3700
Capacity (C ₅ Ah)	73	81	90	103	115	130	145	170	195	220	250	300	375
End voltage = 1.00 V / cell													
Duration													
3 min	290	323	362	402	457	505	563	686	757	854	946	1099	1358
15 min	176	196	218	245	278	315	351	415	472	532	592	707	879
30 min	109	121	134	154	171	194	210	253	291	328	373	438	548
60 min	57.8	64.1	71.2	81.5	91.0	103	115	135	154	174	198	237	297
90 min	39.0	43.3	48.1	55.1	61.5	69.5	77.5	90.9	104	118	134	160	201
5 h	13.1	14.6	16.2	18.5	20.7	23.4	26.1	30.6	35.1	39.6	45.0	54.0	67.5

Electrical performance

Performance for fully charged cells by a constant current charge according to IEC 60623 standard

Plastic range

Available amperes at +20°C ± 5°C (+68°F ± 9°F)

Type	SRX 22 P	SRX 25 P	SRX 31 P	SRX 37 P	SRX 46 P	SRX 52 P	SRX 60 P	SRX 70 P	SRX 80 P	SRX 90 P	SRX 100 P	SRX 120 P	SRX 130 P	SRX 150 P	SRX 170 P	SRX 190 P	SRX 220 P
Capacity (C ₅ Ah)	22	25	31	37	46	52	60	70	80	90	103	115	130	155	170	190	220
End voltage = 1.10 V / cell																	
Duration																	
1 min	119	134	167	196	244	275	272	318	364	460	511	582	642	742	874	937	1086
3 min	92.6	105	131	153	190	214	213	249	284	332	368	420	463	536	630	676	784
5 min	79.8	90.7	112	132	164	185	184	214	245	277	307	350	386	446	525	564	653
15 min	55.0	62.5	77.5	91.8	114	129	141	165	188	183	206	234	265	304	349	387	447
30 min	39.1	44.5	55.1	65.5	81.4	92.0	104	121	139	142	163	182	206	238	269	301	348
60 min	20.7	23.6	29.2	34.9	43.3	49.0	56.0	65.3	74.6	82.2	94.0	105	119	142	155	173	201
90 min	14.0	15.9	19.7	23.5	29.2	33.0	38.1	44.4	50.8	56.4	64.6	72.1	81.5	97.2	107	119	138
5 h	4.3	4.9	6.0	7.2	8.9	10.1	11.7	13.6	15.5	17.6	20.2	22.5	25.4	30.3	33.3	37.2	43.0
End voltage = 1.05 V / cell																	
1 min	148	168	209	245	304	343	341	397	454	569	632	720	793	917	1080	1160	1343
3 min	119	135	168	197	244	276	274	320	365	425	471	537	592	684	805	865	1001
5 min	102	116	144	169	210	237	235	274	314	355	394	449	495	572	674	723	837
15 min	63.8	72.5	90.0	106	132	149	164	191	219	222	250	284	320	369	423	438	543
30 min	40.2	45.7	56.6	67.2	83.6	94.5	107	125	142	157	180	201	227	263	297	332	385
60 min	21.1	24.0	29.7	35.5	44.1	49.9	57.0	66.5	76.0	85.3	97.6	109	123	147	161	180	209
90 min	14.3	16.2	20.1	24.0	29.8	33.7	38.9	45.4	51.8	58.1	66.5	74.2	83.9	100	110	123	142
5 h	4.4	5.0	6.1	7.3	9.1	10.3	11.9	13.9	15.8	17.8	20.4	22.8	25.8	30.7	33.7	37.7	43.6
End voltage = 1.00 V / cell																	
1 min	178	202	250	292	364	410	407	475	542	677	751	856	943	1090	1284	1379	1596
3 min	143	163	202	236	294	332	330	385	440	510	566	646	712	823	969	1041	1204
5 min	121	137	170	199	248	280	278	324	370	421	467	532	586	678	798	857	992
15 min	67.7	77.0	95.4	113	140	158	174	203	231	251	283	320	362	417	479	529	613
30 min	41.5	47.1	58.4	69.4	86.3	97.5	110	129	147	164	187	209	236	273	309	345	400
60 min	21.4	24.3	30.2	36.0	44.8	50.6	57.8	67.4	77.1	86.9	99.4	111	125	150	164	183	212
90 min	14.4	16.4	20.3	24.3	30.2	34.1	39.3	45.9	52.5	58.7	67.2	75.0	84.8	101	111	124	143
5 h	4.4	5.0	6.2	7.4	9.2	10.4	12.0	14.0	16.0	18.0	20.6	23.0	26.0	31.0	34.0	38.0	44.0
End voltage = 0.85 V / cell																	
30 s	268	304	377	440	547	619	614	716	820	1016	1128	1285	1416	1637	1928	2070	2398
1 min	252	287	355	416	517	584	580	677	773	935	1038	1183	1304	1507	1775	1906	2207
3 min	202	230	285	333	415	469	465	542	620	723	802	914	1007	1164	1372	1473	1705
5 min	163	185	230	269	334	378	375	438	500	608	675	769	848	979	1154	1239	1434
10 min	106	121	150	177	220	249	261	305	349	403	449	509	570	655	760	833	964

Available amperes at -20°C ± 5°C (-4°F ± 9°F)

Type	SRX 22 P	SRX 25 P	SRX 31 P	SRX 37 P	SRX 46 P	SRX 52 P	SRX 60 P	SRX 70 P	SRX 80 P	SRX 90 P	SRX 100 P	SRX 120 P	SRX 130 P	SRX 150 P	SRX 170 P	SRX 190 P	SRX 220 P
Capacity (C ₅ Ah)	22	25	31	37	46	52	60	70	80	90	103	115	130	155	170	190	220
End voltage = 1.00 V / cell																	
Duration																	
3 min	102	116	143	168	209	235	234	272	312	362	402	458	505	583	686	738	854
15 min	58.7	66.8	82.7	97.8	122	137	151	176	201	218	245	278	315	362	415	460	532
30 min	34.0	38.6	47.9	56.9	70.7	80.0	90.4	106	121	134	154	171	194	224	253	283	328
60 min	17.6	19.9	24.7	29.5	36.7	41.5	47.4	55.3	63.2	71.2	81.5	91.0	103	123	135	150	174
90 min	11.8	13.4	16.7	19.9	24.7	28.0	32.3	37.6	43.0	48.1	55.1	61.5	69.5	82.9	90.9	102	118
5 h	4.0	4.5	5.6	6.7	8.3	9.4	10.8	12.6	14.4	16.2	18.5	20.7	23.4	27.9	30.6	34.2	39.6



Saft is committed to the highest standards of environmental stewardship.

Implementing this commitment to minimise the impact of its products and operations on the environment means that Saft gives priority to recycled over unrecycled raw materials, reduces its plant releases into the environment year after year, minimizes water usage, and ensures that its customers have recycling solutions for their batteries at the end of their lives.

Regarding industrial Ni-Cd batteries, Saft has had partnerships for many years with collection companies in most EU countries as well as in North America. This collection network receives and dispatches our customers' batteries at the end of their lives to fully approved recycling facilities, in compliance with the Laws governing transboundary waste shipments. Saft offers these services free of charge to its customers.

Please find a list of our collection points on our web site.

In other countries, Saft assists its customers in finding environmentally sound recycling solutions. Please contact your sales representative for further information.

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