

Sunica.plus Ni-Cd batteries

Extended capability for challenging photovoltaic conditions



Performance beyond conventional limits

Situated in the most punishing environments, photovoltaic applications experience conditions for energy storage that only the toughest battery can survive.

For the particular needs of photovoltaic applications...



The correct choice of battery energy storage is crucial to enable photovoltaic system efficiency. To optimise performance, and to guarantee uninterrupted service, batteries must withstand –

- cycling at variable state of charge (SOC) and depth of discharge (DOD)
- operation with erratic charging conditions
- wide temperature fluctuations
- absolute reliability with minimal maintenance
- unpredictable demands in isolated locations
- physical and mechanical abuses
- complex patterns of shallow and deep discharges

...the specialised solution is Sunica.plus Ni-Cd batteries...

Soft nickel-cadmium batteries are proven in the field of photovoltaics and are specified for their very broad capability and total reliability in uncertain conditions.

- corrosion-free steel internal construction, unaffected by alkaline electrolyte
- low life cycle cost
- electrochemically stable during charge and discharge (no plate degradation)

...for performance beyond the lead acid limit

- resistant to over- and under-charging, and complete discharge
- no premature capacity loss – sulphation – when cycled at low state of charge
- operates at temperatures lower than -20°C (-4°F) with no risk of freezing electrolyte



Reliability

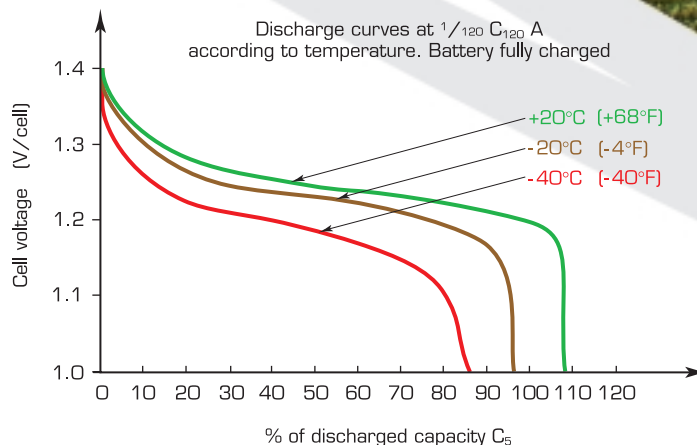
– energy storage redefined

Operates in extremes of temperature

Sunica.plus generally operates between temperatures of -20°C to $+50^{\circ}\text{C}$ (-4°F to $+122^{\circ}\text{F}$) but can tolerate extremes of -50°C to $+70^{\circ}\text{C}$ (-58°F to $+158^{\circ}\text{F}$). For operation in temperatures below -20°C (-4°F), a special electrolyte with higher density is used.

Nickel-cadmium active materials remain stable when cycling during high states of charge and do not shed active mass during deep cycles. Sunica.plus operates with –

- no risk of sudden death
- no plate degradation or sulphation
- more than 80% of capacity for a typical 120 hour discharge at -40°C (-40°F)
- only 20% decrease in life at $+30^{\circ}\text{C}$ ($+86^{\circ}\text{F}$), vs. 50% reduction for lead acid



...performs at any state of charge...

The stable alkaline electrolyte in Sunica.plus does not change during charge and discharge. It continues to operate irrespective of the charge level and is unaffected by accidental overcharge, deep discharges or inversion. During the critical winter months the charge efficiency is close to 100%.

...achieves 8000 cycles at 15% depth of discharge

At $+20^{\circ}\text{C}$ ($+68^{\circ}\text{F}$), Sunica.plus nickel-cadmium batteries can achieve –

- up to 8000 cycles at 15% depth of discharge during its 20 years life
- good cycling ability in unstable photovoltaic conditions, even at partial state of charge

Sunica.plus is new

With a heritage of long life, reliable, low maintenance and low life cycle cost solutions, Saft Sunica.plus is an innovation in battery technology for photovoltaics.



Designed specifically for this application

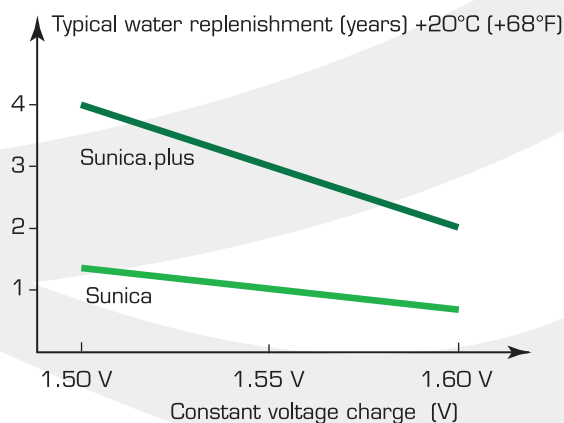
Sunica.plus has been developed in line with the safety requirements of EN 50272-2, and components used (such as insulated cable connectors and end lug covers) are defined to ensure high protection against electric shocks (IP2 level).

Sunica.plus features Saft's highly efficient internal gas recombination pocket plate technology – meets IEC 62259 – and electrode design, optimised for photovoltaic applications. These features, plus inherently safe Ni-Cd, provide the low maintenance service vital in isolated locations.

- more than 4 years maintenance-free intervals without topping-up, depending upon application requirements
- compatible with all current photovoltaic charge regulators
- improved cycling ability

Optimised for practical reliability

- robust construction withstands heavy treatment
- unaffected by fluctuating climatic conditions
- resistant to electrical abuses
- integrated handles mean easy handling
- easy to install, simple block construction



Where customers rely on Sunica

Around the coast of Scotland and the Isle of Man, 95 solar-powered land-based lighthouses have been equipped with Sunica batteries. Solar panels combined with a suitably sized and highly efficient 24 V battery can accumulate sufficient energy to ensure reliable signalling, even in the less sunny winter months.

An installation for Spencer Gulf Telecasters in Australia comprised a 3 kW solar array supported by two 18 cell parallel strings of SUN 84-1 Sunica cells, each with a nominal capacity of 860 Ah. In 2001 a further 3kW solar array was installed together with another string of 18 SUN 84-1 Sunica cells.

Robustness guaranteed by design

Protective cover

- to prevent external short-circuits
- in line with EN 50272-2 (safety) with IP2 level

Flame arresting vent plug

with transport seal protection

Handles

Block concept

up to 10 cells

Cell container

made of tough polypropylene

Automated integral water filling system

Saft's automated integral water filling system is available as an option for Sunica.plus cell types 185 Ah to 1110 Ah.

The main benefits of the system are:

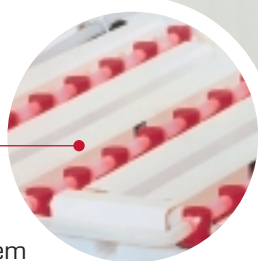
- centrally monitors levels
- tops up accurately and efficiently when necessary
- enables gases generated to be evacuated outside the battery room

20 years low life cycle cost product

A combination of factors add up to give a predictably low life cycle cost.

- low maintenance
- fail-safe technology
- long life time
- easy to install
- 12 months storage filled and charged, ready for immediate commissioning

Over 20 years operation, typically cycling at an average 15% DOD, Saft Sunica.plus will rapidly repay initial battery investment and overall photovoltaic system costs through autonomous operation and total reliability.



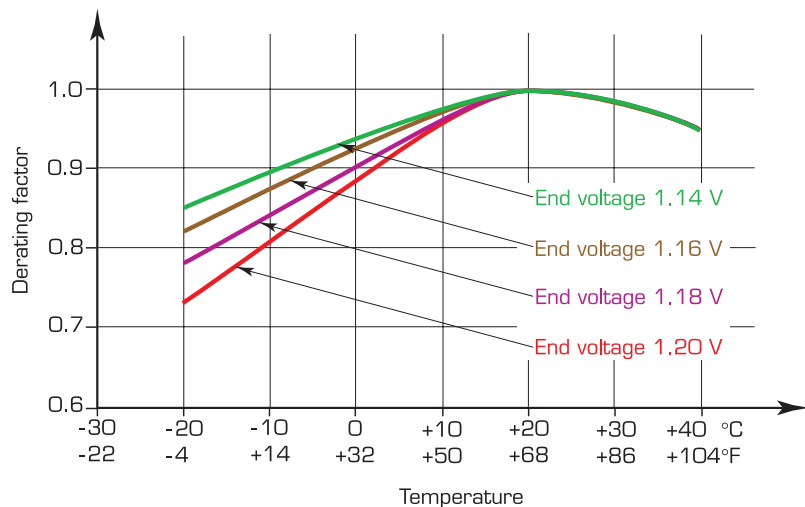
A full range of solutions for a world of photovoltaic needs

Sunica.plus type	Capacity		Height		Width		Length per block														Approx. weight per cell					
	C ₁₂₀ 120 h 1.0 V Ah	C ₅ 5 h 1.0 V Ah	mm	in	mm	in	1 cell		2 cells		3 cells		4 cells		5 cells		6 cells		8 cells		9 cells		10 cells		kg	lb
							mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in	mm	in		
SUN® 45	45	43	405	15.95	195	7.68					88	3.46	113	4.49	137	5.39	162	6.38	212	8.35	237	9.33	261	10.28	3.2	7.1
SUN® 90	90	85	405	15.95	195	7.68					121	4.76	157	6.18	192	7.56	228	8.98	300	11.81	336	13.23	371	14.61	4.9	10.8
SUN® 105	105	100	405	15.95	195	7.68					157	6.18	205	8.07	252	9.92	300	11.81	396	15.59	444	17.48			6.2	13.7
SUN® 140	140	128	405	15.95	195	7.68					157	6.18	205	8.07	252	9.92	300	11.81	396	15.59					6.7	14.8
SUN® 185	185	171	405	15.95	195	7.68					193	7.60	253	9.96	312	12.28	372	14.65							8.4	18.5
SUN® 230	230	213	405	15.95	195	7.68			159	6.26	232	9.13	305	12.01	377	14.84									9.9	21.8
SUN® 275	275	256	405	15.95	195	7.68			183	7.21	268	10.55	353	13.90	437	17.21									11.5	25.4
SUN® 320	320	300	405	15.95	195	7.68			228	8.98	336	13.23													15.1	33.3
SUN® 370	370	341	405	15.95	195	7.68			252	9.92	372	14.65													16.8	37.0
SUN® 415	415	384	405	15.95	195	7.68	146	5.75	278	10.95															18.3	40.4
SUN® 460	460	427	405	15.95	195	7.68	159	6.26	304	11.97															19.8	43.7
SUN® 505	505	469	405	15.95	195	7.68	171	6.73	328	12.91															21.4	47.2
SUN® 555	555	512	405	15.95	195	7.68	183	7.21	353	13.90															23.0	50.7
SUN® 645	645	597	405	15.95	195	7.68	219	8.62																	28.2	62.2
SUN® 735	735	682	405	15.95	195	7.68	244	9.61																	31.3	69.0
SUN® 830	830	768	405	15.95	195	7.68	268	10.55																	34.5	76.1
SUN® 920	920	853	405	15.95	195	7.68	304	11.97																	39.6	87.3
SUN® 1110	1110	1024	405	15.95	195	7.68	352	13.86																	46.0	101

Sunica.plus complies with IEC 62259 standard.

Derating factor according to temperature and end voltage

For typical solar application with 3 days or more backup time



Cell performance in amperes at +20°C ± 5°C (+68°F ± 9°F)

for fully charged cells after a constant current charge according to IEC 62259 standard.

d = days / h = hours

Sunica.plus type	End voltage = 1.14 V									End voltage = 1.16 V								
	2 d 48 h	3 d 72 h	4 d 96 h	5 d 120 h	6 d 144 h	7 d 168 h	8 d 192 h	9 d 216 h	10 d 240 h	2 d 48 h	3 d 72 h	4 d 96 h	5 d 120 h	6 d 144 h	7 d 168 h	8 d 192 h	9 d 216 h	10 d 240 h
SUN® 45	0.94	0.64	0.48	0.39	0.33	0.28	0.25	0.22	0.20	0.92	0.63	0.47	0.39	0.33	0.28	0.25	0.22	0.20
SUN® 90	1.86	1.26	0.95	0.77	0.65	0.56	0.49	0.44	0.40	1.82	1.25	0.94	0.77	0.64	0.56	0.49	0.44	0.40
SUN® 105	2.19	1.49	1.11	0.90	0.76	0.66	0.58	0.52	0.47	2.15	1.47	1.10	0.90	0.76	0.65	0.58	0.52	0.47
SUN® 140	2.80	1.90	1.43	1.15	0.98	0.85	0.74	0.66	0.60	2.75	1.88	1.41	1.15	0.97	0.84	0.74	0.66	0.60
SUN® 185	3.74	2.54	1.91	1.54	1.31	1.13	0.99	0.89	0.80	3.67	2.52	1.89	1.54	1.29	1.12	0.99	0.89	0.80
SUN® 230	4.66	3.17	2.37	1.92	1.63	1.41	1.23	1.10	0.99	4.57	3.14	2.35	1.92	1.61	1.39	1.23	1.10	0.99
SUN® 275	5.60	3.80	2.85	2.30	1.96	1.69	1.48	1.33	1.19	5.49	3.77	2.83	2.30	1.94	1.68	1.48	1.33	1.19
SUN® 320	6.56	4.46	3.34	2.70	2.29	1.98	1.73	1.56	1.40	6.44	4.42	3.31	2.70	2.27	1.96	1.73	1.56	1.40
SUN® 370	7.46	5.07	3.80	3.07	2.60	2.25	1.97	1.77	1.59	7.32	5.02	3.77	3.07	2.58	2.23	1.97	1.77	1.59
SUN® 415	8.40	5.71	4.28	3.46	2.93	2.54	2.22	1.99	1.79	8.24	5.65	4.24	3.46	2.91	2.51	2.22	1.99	1.79
SUN® 460	9.34	6.35	4.76	3.84	3.26	2.82	2.47	2.21	1.99	9.16	6.29	4.71	3.84	3.23	2.80	2.47	2.21	1.99
SUN® 505	10.26	6.97	5.23	4.22	3.58	3.10	2.71	2.43	2.19	10.06	6.90	5.18	4.22	3.55	3.07	2.71	2.43	2.19
SUN® 555	11.20	7.61	5.71	4.61	3.91	3.38	2.96	2.65	2.39	10.99	7.54	5.65	4.61	3.88	3.35	2.96	2.65	2.39
SUN® 645	13.06	8.87	6.65	5.37	4.56	3.94	3.45	3.10	2.79	12.81	8.79	6.59	5.37	4.52	3.91	3.45	3.10	2.79
SUN® 735	14.92	10.14	7.60	6.14	5.21	4.51	3.94	3.54	3.18	14.63	10.04	7.53	6.14	5.16	4.47	3.94	3.54	3.18
SUN® 830	16.80	11.41	8.56	6.91	5.87	5.07	4.44	3.98	3.58	16.48	11.31	8.48	6.91	5.81	5.03	4.44	3.98	3.58
SUN® 920	18.66	12.68	9.51	7.68	6.52	5.64	4.93	4.42	3.98	18.30	12.56	9.42	7.68	6.46	5.59	4.93	4.42	3.98
SUN® 1110	22.40	15.52	11.41	9.22	7.82	6.77	5.92	5.31	4.78	21.97	15.08	11.31	9.22	7.75	6.70	5.92	5.31	4.78

Sunica.plus type	End voltage = 1.18 V									End voltage = 1.20 V								
	2 d 48 h	3 d 72 h	4 d 96 h	5 d 120 h	6 d 144 h	7 d 168 h	8 d 192 h	9 d 216 h	10 d 240 h	2 d 48 h	3 d 72 h	4 d 96 h	5 d 120 h	6 d 144 h	7 d 168 h	8 d 192 h	9 d 216 h	10 d 240 h
SUN® 45	0.89	0.62	0.47	0.38	0.32	0.28	0.24	0.22	0.20	0.82	0.57	0.43	0.36	0.31	0.27	0.24	0.21	0.19
SUN® 90	1.75	1.22	0.93	0.76	0.64	0.55	0.48	0.43	0.39	1.61	1.13	0.86	0.71	0.61	0.53	0.46	0.42	0.38
SUN® 105	2.06	1.43	1.09	0.89	0.75	0.65	0.57	0.51	0.46	1.90	1.33	1.01	0.83	0.72	0.62	0.55	0.49	0.44
SUN® 140	2.64	1.83	1.40	1.14	0.96	0.83	0.73	0.65	0.59	2.43	1.71	1.29	1.07	0.92	0.79	0.70	0.63	0.57
SUN® 185	3.53	2.45	1.87	1.52	1.28	1.11	0.97	0.87	0.78	3.24	2.28	1.73	1.43	1.22	1.06	0.94	0.84	0.76
SUN® 230	4.39	3.05	2.33	1.90	1.60	1.38	1.21	1.08	0.98	4.04	2.84	2.15	1.78	1.52	1.32	1.16	1.05	0.94
SUN® 275	5.28	3.66	2.80	2.28	1.92	1.66	1.45	1.30	1.17	4.85	3.41	2.59	2.13	1.83	1.58	1.40	1.26	1.13
SUN® 320	6.19	4.29	3.28	2.68	2.25	1.95	1.70	1.53	1.38	5.69	4.00	3.03	2.50	2.15	1.86	1.64	1.47	1.33
SUN® 370	7.03	4.88	3.73	3.04	2.56	2.21	1.94	1.74	1.56	6.46	4.55	3.45	2.84	2.44	2.11	1.86	1.67	1.51
SUN® 415	7.92	5.49	4.20	3.42	2.88	2.49	2.18	1.96	1.76	7.28	5.12	3.88	3.20	2.75	2.38	2.10	1.88	1.70
SUN® 460	8.81	6.11	4.67	3.81	3.20	2.77	2.42	2.17	1.96	8.10	5.69	4.31	3.56	3.05	2.64	2.34	2.10	1.89
SUN® 505	9.67	6.71	5.13	4.18	3.52	3.04	2.66	2.39	2.15	8.89	6.25	4.74	3.91	3.35	2.90	2.56	2.30	2.07
SUN® 555	10.56	7.32	5.60	4.57	3.84	3.32	2.91	2.61	2.35	9.71	6.83	5.17	4.27	3.66	3.17	2.80	2.51	2.26
SUN® 645	12.31	8.54	6.53	5.32	4.48	3.87	3.39	3.04	2.74	11.32	7.96	6.03	4.98	4.27	3.70	3.26	2.93	2.64
SUN® 735	14.07	9.76	7.46	6.08	5.12	4.42	3.87	3.47	3.13	12.93	9.09	6.89	5.68	4.88	4.22	3.73	3.35	3.01
SUN® 830	15.84	10.99	8.40	6.85	5.76	4.98	4.36	3.91	3.52	14.56	10.24	7.76	6.40	5.49	4.75	4.20	3.77	3.39
SUN® 920	17.59	12.20	9.33	7.61	6.40	5.53	4.84	4.34	3.91	16.17	11.37	8.62	7.11	6.10	5.28	4.66	4.19	3.77
SUN® 1110	21.12	14.65	11.20	9.13	7.68	6.64	5.81	5.21	4.69	19.41	13.65	10.35	8.53	7.32	6.34	5.60	5.03	4.52

Sizing

Soft find the optimum battery solution by calculating –

I load

1/temperature ^x derating factor

1/charge ^x derating factor*

requested design margin ^x

=
current value to select in the performance table

*The typical value is 90% when using the recommended charge voltage

Recommended charge voltage

Battery system	12 V	24 V	48 V
Number of cells	9	18	36
Daily Depth of Discharge (% of C ₁₂₀)	5 to 10%	13.5 V	27 V
	10 to 15%	13.95 V	27.9 V
	15 to 25%	14.4 V	28.8 V



Soft 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 Soft 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, Soft 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. Soft offers these services free of charge to its customers.

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

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

Africa

Export sales dpt,
France
Tel: +33 1 49 93 19 18
Fax: +33 1 49 93 19 56

Argentina

Energia Alcalina,
Buenos Aires
Tel: +54 11 4334 9034/35
Fax: +54 11 4342 5024

Australia

Soft Australia Pty Ltd,
Seven Hills
Tel: +61 2 9674 0700
Fax: +61 2 9620 9990

Austria

Statron GmbH,
Wien
Tel: +43 1 617 40 60
Fax: +43 1 617 40 60/40

Belgium

AEG Belgium SA,
Brussels
Tel: +32 2 529 6543
Fax: +32 2 529 6449

Brazil

FSE (Fábrica de Sistemas de Energia) Ltda.,
Sao Paulo
Tel: +55 11 6100 6304
Fax: +55 11 6100 6338

Canada

Please contact USA office

Chile

Horacio Toro V. Representaciones,
Santiago
Tel: +56 2 220 2353
Fax: +56 2 229 4946

China

Soft (Zhuhai Free Trade Zone) Batteries Co Ltd,
Shanghai
Tel: +86 21 5866 6405
Fax: +86 21 5866 6403

Czech Republic

Soft Ferak a.s.,
Prague
Tel: +420 257 013 260
Fax: +420 257 013 261

Denmark

Scansupply A/S,
Birkerød
Tel: +45 45 82 50 90
Fax: +45 45 82 54 40

Finland

HansaBattery Oy,
Espoo
Tel: +358 9 260 65 292
Fax: +358 9 260 65 299

France

Division France,
Bagnolet
Tel: +33 1 49 93 19 18
Fax: +33 1 49 93 19 56

Germany

Soft Batterien GmbH,
Nürnberg
Tel: +49 911 94 174-0
Fax: +49 911 426 144

Hong Kong

Soft Ltd,
Kowloon
Tel: +852 2796 99 32
Fax: +852 2798 06 19

India sub continent

Export sales dpt,
Sweden
Tel: +46 491 680 00
Fax: +46 491 681 80

Italy

Soft Batterie Italia S.r.l.,
Segrate (Milano)
Tel: +39 02 89 28 07 47
Fax: +39 02 89 28 07 62

Japan

Sumitomo Corp.,
Tokyo
Tel: +81 3 5144 9082
Fax: +81 3 5144 9267

Korea

Energys Korea Co. Ltd,
Kyunggi-Do
Tel: +82 2501 0033
Fax: +82 2501 0034

Mexico

Troop y Compania, SA de CV,
Mexico
Tel: +52 55 50 82 10 30
Fax: +52 55 50 82 10 39

Middle East

Soft Nife ME Ltd,
Limassol, Cyprus
Tel: +357 25 820040
Fax: +357 25 748492

Netherlands

Soft Batteries B.V.,
Haarlem
Tel: +31 23 750 5720
Fax: +31 23 750 5725

Norway

Soft AS,
Osteraas
Tel: +47 6716 4160
Fax: +47 6716 4170

Russia

ZAO Alcatel,
Moscow
Tel: +7 095 937 0967
Fax: +7 095 937 0906

Singapore

Soft Batteries Pte Ltd,
Singapore
Tel: +65 6512 1500
Fax: +65 6749 7282

Spain

Soft Baterias S.L.,
San Sebastian de los Reyes
Tel: +34 916 593 480
Fax: +34 916 593 490

Sweden

Soft AB,
Oskarshamn
Tel: +46 491 680 00
Fax: +46 491 681 80

Switzerland

Statron AG,
Mägenwil
Tel: +41 62 887 4 887
Fax: +41 62 887 4 888

United Kingdom

Soft Ltd,
Harlow
Tel: +44 1279 772 550
Fax: +44 1279 420 909

USA

Soft America Inc.,
North Haven (CT)
Tel: +1 203 239 4718
Fax: +1 203 234 7598

Telecom applications

Valdosta (GA)
Tel: +1 229 245 2854
Fax: +1 229 247 8486

Venezuela

Corporación INTELEC C.A.,
Caracas
Tel: +58 212 9631122

Soft

Industrial Battery Group

12, rue Sadi Carnot
93170 Bagnolet – France
Tel: +33 1 49 93 19 18
Fax: +33 1 49 93 19 64

www.softbatteries.com

Doc N° 21521-2-0506

Edition: May 2006

Data in this document is subject to change without notice and becomes contractual only after written confirmation.

Photo credits: Cathy Archbould, © Corbis, PhotoDisc, Soft, Studioline.

Société anonyme au capital de 31 944 000 €
RCS Bobigny B 383 703 873

Prepared by Arthur Associates Limited.

