

Safety Data Sheet
acc. to ISO and GHS

Page 4 of 8

Printing date: 03.04.2014

Reviewed on: 03.04.2014

Trade name: ENVIROTEMP™ FR3™ Fluid

Eye protection:



Safety glasses

Body protection:

Protective work clothing may be required for spills.
Not required under normal conditions of use.

Limitation and supervision of exposure into the environment: No special requirements.

9 Physical and chemical properties

Information on basic physical and chemical properties

General Information

Appearance

Form:	Liquid
Color:	Light green
Odor:	Slight
Odor threshold:	Not determined.

pH-value: Not applicable.

Change in condition

Melting point/Melting range:	Not determined.
Boiling point/Boiling range:	>360 °C / >680 °F /

Flash point: >240 °C / >464 °F / (Closed Cup)

Flammability (solid, gaseous): Not applicable.

Ignition temperature: Not applicable.

Decomposition temperature: Not determined.

Autoignition: 401 - 404°C (ASTM E659)

Danger of explosion: Product does not present an explosion hazard.

Explosion limits

Lower:	Not determined.
Upper:	Not determined.

Oxidizing properties: Non-oxidizing.

Safety Data Sheet
acc. to ISO and GHS

Page 5 of 8

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Vapor pressure at 20 °C (68 °F):	< 1.3 Pa (< 0.01 mm Hg)
Density at 20 °C (68 °F):	0.92 g/cm³ (7.677 lbs/gal)
Relative density at 20 °C (68 °F):	Not applicable
Vapor density:	Not determined.
Evaporation rate:	Nil.
Solubility in / Miscibility with Water:	Insoluble.
Partition coefficient (n-octanol/water):	Not determined.
Viscosity	
Dynamic:	Not determined.
Kinematic at 40 °C (104 °F):	33 - 35 mm²/s
Other information:	No additional information.

10 Stability and reactivity

Reactivity

Chemical stability

Thermal decomposition / conditions to be avoided:

To avoid thermal decomposition, avoid temperatures > 250C.

Possibility of hazardous reactions:

Reacts with strong oxidizing agents.

Reacts with strong alkali.

Conditions to avoid: Store away from oxidizing agents.

Incompatible materials: No additional information.

Hazardous decomposition products: None.

11 Toxicological information

Information on toxicological effects

Acute toxicity: Not acutely toxic (OECD 420)

Primary irritant effect

On the skin: No irritant effect.

On the eye: No irritating effect.

Sensitization: No sensitizing effects known.

Additional toxicological information:

When used and handled according to specifications, the product does not have any harmful effects according to our experience and the information provided to us.

The substance is not subject to classification.

Safety Data Sheet
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Page 6 of 8

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Carcinogenic categories

NTP (National Toxicology Program):

None of the ingredients are listed.

Repeated Dose Toxicity: None.

12 Ecological information

Toxicity

Aquatic toxicity: No Observable Adverse Effect > 10 000 mg/L (ASTM D608, OECD 203).

Oral toxicity: No Observable Adverse Effect > 2 000 mg/kg (OECD 420).

Persistence and degradability: Readily biodegradable.

Bioaccumulative potential: No potential for bioaccumulation.

Mobility in soil: Product has low mobility in soil.

Additional ecological information

Results of PBT and vPvB assessment

PBT: Not applicable.

vPvB: Not applicable.

Other adverse effects: No additional information.

13 Disposal considerations

Waste treatment methods

Recommendation:

Product and packaging must be disposed of in accordance with relevant national and local regulations.
May be incinerated. Unopened product may be returned for reclamation.

Uncleaned packagings:

Recommendation: Disposal must be made according to the applicable regulations.

Recommended cleansing agent: Water. Use cleansing agents, if necessary.

14 Transport information

UN-Number

DOT, ADR, ADN, IMDG, IATA: Not Regulated

UN proper shipping name

DOT, ADR, ADN, IMDG, IATA: Not Regulated

Safety Data Sheet
acc. to ISO and GHS

Page 7 of 8

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Trade name: ENVIROTEMP™ FR3™ Fluid

Transport hazard class(es)

DOT, ADR, ADN, IMDG, IATA
Class:

Not applicable

Packing group

DOT, ADR, IMDG, IATA:

Not applicable

Environmental hazards:

Marine pollutant:

No

Special precautions for user:

Not applicable.

Transport in bulk according to Annex II of
MARPOL73/78 and the IBC Code:

Not applicable.

UN "Model Regulation":

-

15 Regulatory information

Safety, health and environmental regulations/legislation specific for the substance or mixture.
SARA

Section 355 (extremely hazardous substances):
None of the ingredient is listed.

Section 313 (Specific toxic chemical listings):
None of the ingredient is listed.

TSCA (Toxic Substances Control Act):
All ingredients are listed.

Proposition 65 (California)

Chemicals known to cause cancer:
None of the ingredient is listed.

Chemicals known to cause reproductive toxicity for females:
None of the ingredient is listed.

Chemicals known to cause reproductive toxicity for males:
None of the ingredient is listed.

Chemicals known to cause developmental toxicity:
None of the ingredient is listed.

Carcinogenic categories

EPA (Environmental Protection Agency):
None of the ingredient is listed.

IARC (International Agency for Research on Cancer):
None of the ingredient is listed.

TLV (Threshold Limit Value established by ACGIH):
None of the ingredient is listed.

Safety Data Sheet
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Page 8 of 8

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MAK (German Maximum Workplace Concentration):
None of the ingredient is listed.

NIOSH-Ca (National Institute for Occupational Safety and Health):
None of the ingredient is listed.

OSHA-Ca (Occupational Safety & Health Administration):
None of the ingredient is listed.

State Right to Know Listings:
None of the ingredient is listed.

Canadian substance listings:

Canadian Domestic Substances List (DSL):
All ingredients are listed.

Canadian Ingredient Disclosure list (limit 0.1%):
None of the ingredient is listed.

Canadian Ingredient Disclosure list (limit 1%):
None of the ingredient is listed.

16 Other information

Date of preparation / last revision: 03/04/2014

Abbreviations and Acronyms:

ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road).
IMDG: International Maritime Code for Dangerous Goods.
DOT: US Department of Transportation.
IATA: International Air Transport Association.
GHS: Globally Harmonized System of Classification and Labelling of Chemicals.
ACGIH: American Conference of Governmental Industrial Hygienists.
EINECS: European Inventory of Existing Commercial Chemical Substances.
ELINCS: European List of Notified Chemical Substances.
CAS: Chemical Abstracts Service (division of the American Chemical Society).
DNEL: Derived No-Effect Level (REACH).
PNEC: Predicted No-Effect Concentration (REACH).

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Exhibit F
Mililani II Solar Project Transformer Container Design



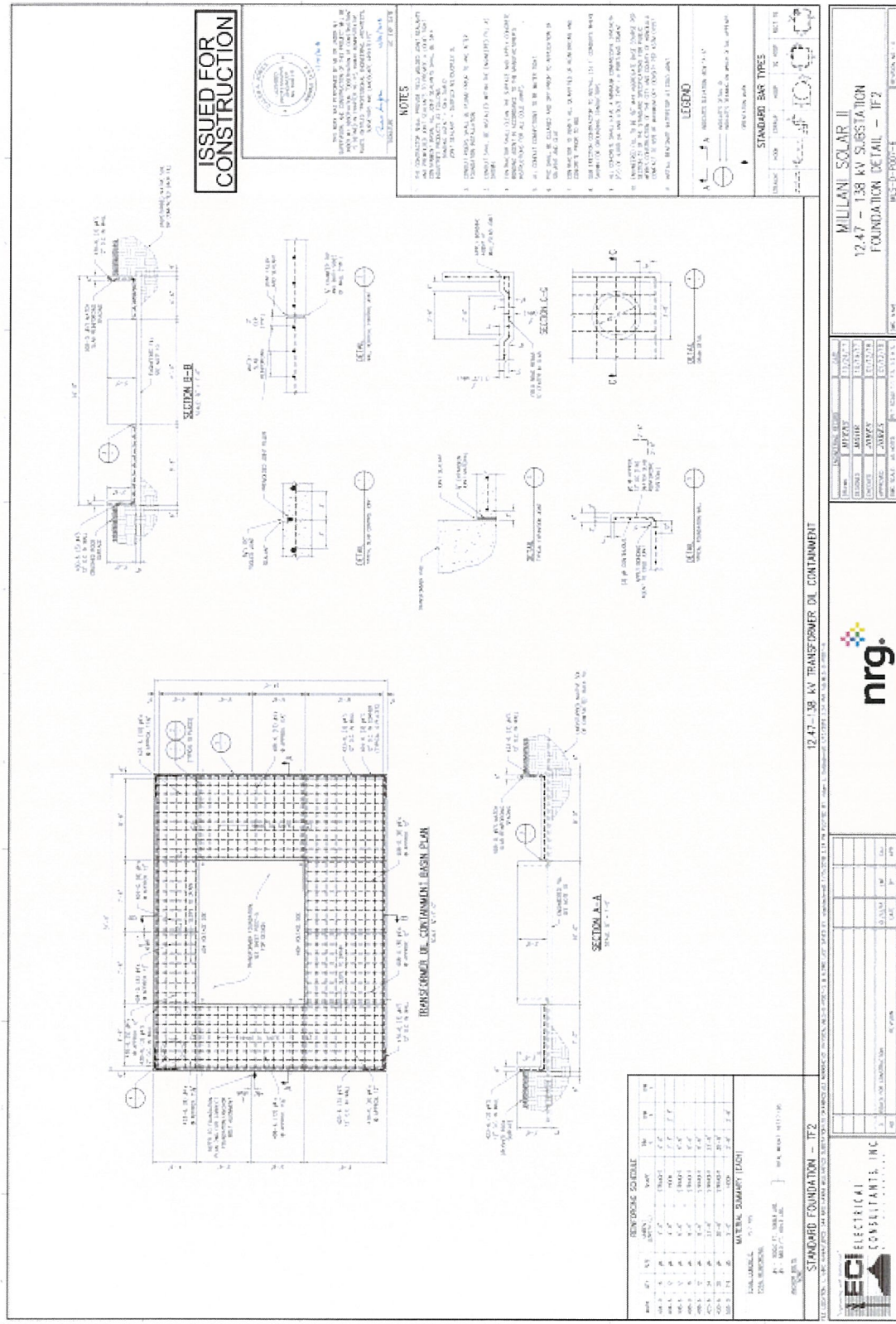


Exhibit G
Technical Information – Battery Chemistry

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TECHNICAL DOCUMENT

No. of Document	SSES-M24-TD-XXXXX
Revision	A
Theme/Topic	Cell SDS
Product Description	BATTERY ENERGY STORAGE SYSTEM



SAMSUNG SDI
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Cell SDS

1. Product and Company Identification USA, EU

Important Note: As a solid, manufactured article, exposure to hazardous ingredients is not expected with normal use. This battery is an article pursuant to 29 CFR 1910.1200 and, as such, is not subject to the OSHA Hazard Communication Standard requirement. The information contained in this Material Safety Data Sheet contains valuable information critical to the safe handling and proper use of the product. This SDS should be retained and available for employees and other users of this product.

Commercial product name

MODEL CM0940R0003A (94Ah capacity)

Use of the substance/preparation

Lithium-Ion battery

Company/undertaking identification

Manufacturer

SAMSUNG SDI Co. LTD

428-5 Gongse-dong, Giheung-gu, Yongin-si,
Gyeonggi-do, 446-577 Korea

Telephone:

++82 31 210 8535

Telefax:

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SAMSUNG SDI

Contact person:

Euiryong Bang

Telephone:

Responsible Department:

Development Team

Responsible for the safety data sheet: er.bang@samsung.com

Further Information

Battery-System: Lithium-Ion (Li-ion)

Voltage: 3.68V

Anode (negative electrode): based on intercalation graphite

Cathode (positive electrode): based on lithiated metal oxide (Cobalt, Nickel, Manganese)

Remark:

The information and recommendations set forth are made in good faith and believed to be accurate as of the date of preparation. SAMSUNG SDI Co., Ltd. makes no warranty, expressed or implied, with respect to this information and disclaims all liabilities from reliance on it.

2. Hazards Identification USA

Route(s) of Entry

There is no hazard when the measures for handling and storage are followed.

Signs and Symptoms of Exposure

In case of cell damage, possible release of dangerous substances and a flammable gas mixture.

OSHA Hazard Communication: This material is not considered hazardous by the OSHA Hazard Communication Standard 29CFR 1910.1200.

Carcinogenicity (NTP): Not listed

Carcinogenicity (IARC): Not listed

Carcinogenicity (OSHA): Not listed

Special hazards for human health and environment

There is no hazard when the measures for handling and storage are followed.

In case of cell damage, possible release of dangerous substances and a flammable gas mixture.

2. Hazards Identification USA, EU

Explication of special hazards for human health and environment

Not classified as dangerous according to directive 1999/45/EEC

There is no hazard when the measures for handling and storage are followed.

In case of cell damage, possible release of dangerous substances and a flammable gas mixture.

3. Composition/information on ingredients USA, EU

Hazardous components

EC-No.	CAS-No.	Chemical name	Quantity	EU-Classification
215-154-6	1307-96-6	Cobalt oxide	< 30 %	Xn, N R22435053
215-202-6	1313-13-9	Manganese dioxide	< 30 %	Xn R20/22
215-215-7	1313-99-1	Nickel oxide	< 30 %	Carc. Cat. 1, T R49-43-48/23--53
231-153-3	7440-44-0	Carbon	10 - 30 %	
		Electrolyte (*)	10 - 20 %	Carc. Cat. 3, C, R10-34-40-43
	24937-79-9	Polyvinylidene fluoride (PVdF)	< 10 %	
231-072-3	7429-90-5	Aluminium foil	2 - 10 %	
231-159-6	7440-50-8	Copper foil	2 - 10 %	
		Aluminium and inert materials	5 - 10 %	

Full text of each relevant R phrase can be found in heading 16.

Further Information

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http://www.samsungsdi.com



For information purposes:

(*) Main ingredients: Lithium hexafluorophosphate, organic carbonates

Because of the cell structure the dangerous ingredients will not be available if used properly.
During charge process a lithium graphite intercalation phase is formed.

Mercury content:	Hg < 0.1mg/kg
Cadmium content:	Cd < 1mg/kg
Lead content:	Pb: < 10mg/kg

4. First Aid Measures USA, EU

General information

The following first aid measures are required only in case of exposure to interior battery components after damage of the external battery casing.

Undamaged, closed cells do not represent a danger to the health.

After inhalation

Ensure of fresh air. Consult a physician.

After contact with skin

In case of contact with skin wash off immediately with plenty of water.

Consult a physician.

After contact with eyes

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.

Seek medical treatment by eye specialist.

After ingestion

Drink plenty of water.

Call a physician immediately.

5. Fire Fighting Measures USA, EU

Suitable extinguishing media

Cold water and dry powder in large amount are applicable.

Use metal fire extinction powder or dry sand if only few cells are involved.

Special hazards arising from the chemical

May form hydrofluoric acid if electrolyte comes into contact with water.

In case of fire, the formation of the following flue gases cannot be excluded:

Hydrogen fluoride (HF), Carbon monoxide and carbon dioxide.

Protective equipment and precautions for firefighters

Wear self-contained breathing apparatus and protective suit.

Additional information

If possible, remove cell(s) from fire fighting area. If heated above 125°C, cell(s) can explode/vent. Cell is not flammable but internal organic material will burn if the cell is incinerated.

6. Accidental Release Measures USA, EU

Personal precautions

Use personal protective clothing.

Avoid contact with skin, eyes and clothing.

Avoid breathing fume and gas.

Environmental precautions

Do not discharge into the drains/surface waters/groundwater.

Methods for cleaning up/taking up

Take up mechanically and send for disposal.

7. Handling and Storage USA, EU

Handling

Advice on safe handling

Avoid short circuiting the cell. Avoid mechanical damage of the cell. Do not open or disassemble.

Advice on protection against fire and explosion

Keep away from open flames, hot surfaces and sources of ignition.

Storage

Requirements for storage rooms and vessels

Storage at room temperature (approx. 20°C) at approx. 20-50% of the nominal capacity (OCV approx. 3.5-3.7 V).

Keep in closed original container.

8. Exposure Controls/Personal Protection Exposure limit values Exposure limits USA

8. Exposure controls/personal protection Exposure limit values Exposure limits (EH40) EU

CAS-No.	Chemical name	ml/m ³	mg/m ³	F/ml	Category	Origin
7440-44-0	Graphite, respirable	-	4	-	TWA (8 h) STEL (15 min)	WEL WEL

Additional advice on limit values

During normal charging and discharging there is no release of product.

Occupational exposure controls

No specific precautions necessary.

Protective and hygiene measures

When using do not eat, drink or smoke. Wash hands before breaks and after work.

Respiratory protection

No specific precautions necessary.

Hand protection

No specific precautions necessary.

Eye protection

No specific precautions necessary.

Skin protection

No specific precautions necessary.

9. Physical and Chemical Properties USA, EU

Appearance

Form: Solid
Color: Various
Odor: Odorless

Important health, safety and environmental information

Test method

pHValue:	n.a.
Flash point:	n.a.
Lower explosion limits:	n.a.
Vapour pressure:	n.a.
Density:	n.a.
Water solubility:	Insoluble
Ignition temperature:	n.a.

10. Stability and Reactivity USA, EU

Stability

Stable

Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Do not puncture, crush or incinerate.

Materials to avoid

No materials to be especially mentioned.

Hazardous decomposition products

In case of open cells, there is the possibility of hydrofluoric acid and carbon monoxide release.

Possibility of Hazardous Reactions

Will not occur

Additional information

No decomposition if stored and applied as directed.

11. Toxicological Information USA, EU

Empirical data on effects on humans

If appropriately handled and if in accordance with the general hygienic rules, no damages to health have become known.

12. Ecological Information USA, EU

Further information

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Ecological injuries are not known or expected under normal use. Do not flush into surface water or sanitary sewer system.

13. Disposal Considerations USA, EU

Advice on disposal
For recycling consult manufacturer.

Contaminated packaging
Disposal in accordance with local regulations.

14. Transport Information USA, EU

US DOT 49 CFR 172.101

Proper shipping name	
Lithium-ion batteries	
ID Number:	UN3480
Hazard Class or Division:	9
Packing group:	II
Label:	9

Land transport (ADR/RID)

UN number:	3480
ADR/RID class:	9
Classification code:	M4
Warning plate	
Hazard label:	9



ADR/RID packing group:	II
Limited quantity:	LQ 0
Tunnel restriction code:	E
Description of the goods	Lithium-ion batteries

Other applicable information (land)
LQ 0: No exemption under the conditions of 3.4.2.
Transport category: 2

Marine transport

UN number:	3480
IMDG code:	9
Marine pollutant:	No
Hazard label:	9



IMDG packing group:	II
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SAMSUNG SDI

EmS: F-A, S-I
Limited quantity: None
Description of the goods: Lithium-ion batteries

Air transport

UN/ID number: 3480
ICAO/IATA-DGR: 9
Hazard label: 9



ICAO packing group: II
Limited quantity Passenger: -
IATA-packing instructions - Passenger: 965
IATA-max. quantity - Passenger: 5 kg G
IATA-packing instructions - Cargo: 965
IATA-max. quantity - Cargo: 35 kg G
Description of the goods: Lithium-ion batteries

Other applicable information

Lithium equivalent: 35.1g
Wh-rating per cell: 346 Wh

15. Regulatory Information USA

U.S. Regulations

National Inventory TSCA

SAMSUNG SDI certifies that all chemical components of the Model CM0940R0003A (94 Ah capacity) Lithium-Ion Battery are listed on the US EPA TSCA 8(b) Inventory or are exempt from listing.

SARA

To the best of our knowledge this product contains no toxic chemicals subject to the supplier notification requirements of Section 313 of the Superfund Amendments and Reauthorization Act (SARA/EPCRA) and the requirements of 40 CFR Part 372.

15. Regulatory information EU

Labeling

Hazardous components which must be listed on the label

As an article the product does not need to be labeled in accordance with EC directives or respective national laws.

EU regulatory information

1999/13/EC (VOC): 0 %

16. Other Information USA

Hazardous Materials Information Label (HMIS)

Health: 0
Flammability: 0
Physical Hazard: 0



NFPA Hazard Ratings

Health: 0
Flammability: 0
Reactivity: 0
Unique Hazard:

16. Other Information EU

Full text of R-phrases referred to under sections 2 and 3

R10	Flammable.
R20/22	Harmful by inhalation and if swallowed.
R22	Harmful if swallowed.
R34	Causes burns.
R40	Limited evidence of a carcinogenic effect.
R43	May cause sensitization by skin contact.
R48/23	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R49	May cause cancer by inhalation.
R50	Very toxic to aquatic organisms.
R53	May cause long-term adverse effects in the aquatic environment.

Further Information USA, EU

Data of sections 4 to 8, as well as 10 to 12, do not necessarily refer to the use and the regular handling of the product (in this sense consult package leaflet and expert information), but to release of major amounts in case of accidents and irregularities. The information describes exclusively the safety requirements for the product (s) and is based on the present level of our knowledge. This data does not constitute a guarantee for the characteristics of the product(s) as defined by the legal warranty regulations. "(n.a. = not applicable; n.d. = not determined)"

The data for the hazardous ingredients were taken respectively from the last version of the sub-contractor's safety data sheet.