



Doosan Fuel Cell America, Inc.

Fuel Cell Fire Prevention and Emergency Response
Guide

SCEF 5 Stratford
540 Long Brook Ave.
Stratford, CT 06614



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DISCLAIMER

Doosan Fuel Cell America reserves the right to change or modify, without notice, the design or equipment specifications of the PureCell® system Model 400 without obligation with respect to equipment either previously sold or to be sold. This guide is provided by Doosan Fuel Cell America, and no liability will accrue to Doosan Fuel Cell America based on the information or specifications included herein. No warranties or representations are made by this guide and no warranties or representations shall apply to the equipment except as stated in Doosan Fuel Cell America's standard terms and conditions of sale applicable at the time of purchase, a copy of which will be provided upon request. The Model 400 is designed to provide safe and reliable service when operated within design specifications, according to all applicable instructions, and with the appropriate operating materials. When operating this equipment, use good judgment and follow safety precautions to avoid damage to equipment and property or injury to personnel. Be sure to understand and follow the procedures and safety precautions contained in all applicable instructions, [Owner's Manual](#), operating materials, and those listed in this guide. All information in this document is as of ~~August 21, 2018~~ [February 28, 2019](#).

Policy

The following plan has been developed to minimize the severity of damage to human health, the environment, and property in the event of an unexpected failure.

Scope

This Emergency Response Guide shall be integrated into the site [Fire Prevention and Emergency Response Plan](#). Information contained in this document shall be customized to meet local requirements and shall be shared with local responders as necessary. This guide is only a template and in no way assumes or transfers liability or ownership. Doosan Fuel Cell America should be contacted if clarification is needed.

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Emergency Contacts and Numbers

Local Emergency Number	911
Doosan Fuel Cell America Control Center	(860) 727-2847
Clean Harbors Emergency Cleanup Response	(800) 645-8265
Fire Department – Non-emergency number	Stratford Fire Department (203) 385-4070 {Phone n
Hospital – Non-emergency number	Bridgeport Hospital Milford Campus 300 Seaside Avenue Milford, CT 06460 203-876-4000 Hartford Healthcare Medical Group 1 Buckland Road, Suite 7 South Windsor CT 860-698-4301
Electric Utility Name: United Illuminating Company Eversource Energy	203-929-1730 888-783-6617
Gas Utility Name: Connecticut Natural Gas/Southern Connecticut Gas Eversource	888-688-7267 *Gas Leaks Only: 877-944-5323 203-499-3417 *Gas Leaks Only: 800-513-8898
Local Oil & Chemical Spill Response Division	800-645-8265 800-645-8265
Connecticut Oil & Chemical Spill Response Division	860-424-3338
EPA - Environmental Protection Agency {LOCAL REGION}	(800) 424-8802 Environmental Emergency

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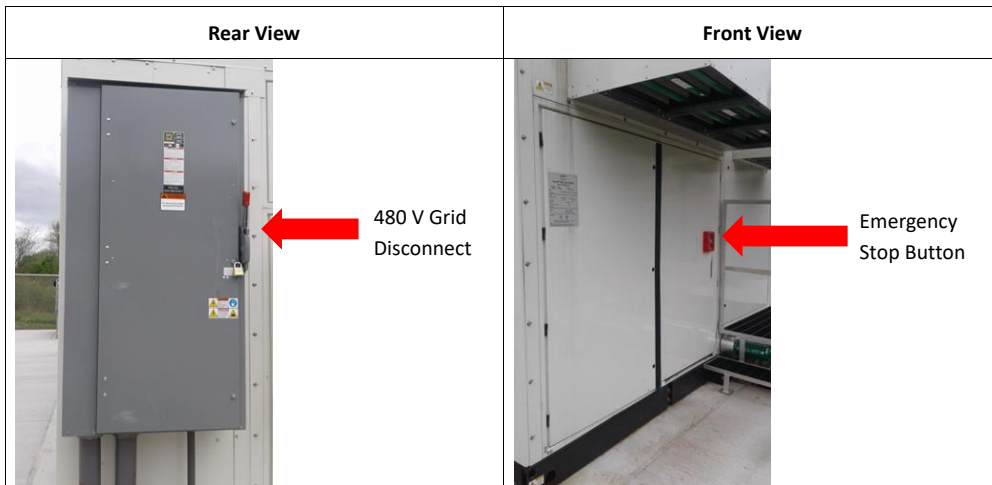
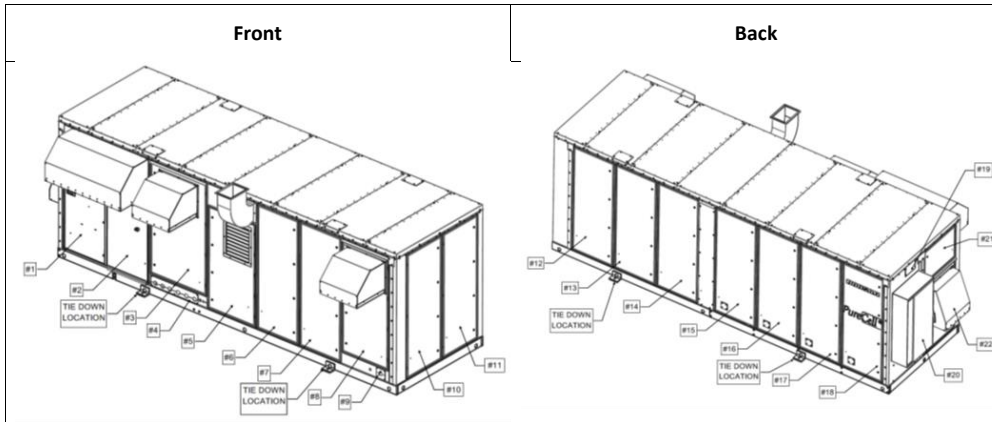
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OSHA - Occupational Safety and Health Admin. Emergency Number	(800) 321-6742 National Emergency Number
Poison Control Center	(800) 222-1222 National Emergency Number



Fuel Cell Hazard Overview





Rear View Panel	Primary Hazard	Front View Panel	Primary Hazard
1 (Computer Terminal)	Electrical = 120 VAC	12 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam
		13 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam
2 (Swing Door)	Electrical = 480 VAC	14 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam
3 (Mechanical Entry)	Electrical = 480 VAC Chemical = Propylene Glycol Thermal = 350°F Steam Pressure = 150 psi Steam	15 (DC Cell Stack)	Electrical = 300 VDC Chemical = Solid phosphoric acid / combustibles
4 (Mechanical Entry)	Chemical = Propylene Glycol Thermal = 350°F Steam Pressure = 150 psi Steam	16 (DC Cell Stack)	Electrical = 300 VDC Chemical = Solid phosphoric acid / combustibles
5 (TMS)	Electrical = 480 VAC Chemical = Propylene Glycol / Deionized Water / Resin Thermal = 350°F Steam Pressure = 150 psi Steam	17 (DC Cell Stack)	Electrical = 300 VDC Chemical = Solid phosphoric acid / combustibles
6 (ILS)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	18 (DC Cell Stack)	Electrical = 300 VDC Chemical = Solid phosphoric acid / combustibles
7 (Fuel Processing Area)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	19	Not accessible
8 (Fuel Processing Area)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	20 (Grid Connect Disconnect)	Electrical = 480 VAC
9 (Gas/Nitrogen Inlet)	Chemical = combustibles	21 (Blower 110)	Electrical = 300 VDC Mechanical = Blower
10 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	22	Electrical = 1400 VDC / 480 VAC
11 (Reformer)	Electrical = 480 VAC Chemical = Air sensitive catalyst / combustibles Thermal = 600°F Reformer Pressure = 150 psi steam	ALL Roof Panels	Multiple Hazards DO NOT WALK ON ROOF!



Conditional Assessment

Normal Condition	Potential Abnormal Condition	Response
Fuel Cell White steam exiting power plant at exhaust chimney, above panel #6 (It can be a large amount of white steam depending on ambient conditions)	Dark colored smoke exiting chimney or any other part of enclosure	1. Establish safe perimeter 2. Contact Doosan Fuel Cell America Control Center (860) 727-2847
	Observable fire or heavy smoke at any point on fuel cell	1. Press Fuel Cell 'Stop Button' – Only if safely accessible! 2. Dial 911 or Local Emergency Response Number 3. Establish safe perimeter 4. Contact Doosan Fuel Cell America Control Center (860) 727-2847
Fuel Cell Moderate humming, clicking and fan sounds	Grinding or loud intermittent noises	1. Contact Doosan Fuel Cell America Control Center (860) 727-2847
	Observable fire or heavy smoke at any point on fuel cell	1. Press Fuel Cell 'Stop Button' – Only if safely accessible! 2. Dial 911 or Local Emergency Response Number 3. Establish safe perimeter 4. Contact Doosan Fuel Cell America Control Center (860) 727-2847
Cooling Module Fan humming	Smoke or fire coming from module	1. Press Fuel Cell 'Stop Button' – Only if safely accessible! 2. Dial 911 or Local Emergency Response Number 3. Establish safe perimeter 4. Contact Doosan Fuel Cell America Control Center (860) 727-2847



	Grinding or loud noise coming from fans	1. Contact Doosan Fuel Cell America Control Center (860) 727-2847
Cooling Module	Small leak dripping from joint, valve or connection	1. Contact Doosan Fuel Cell America Control Center (860) 727-2847
No leaking from cooling loop piping or coils	Medium to large leak	1. Follow local spill response protocol or contact Clean Harbors Emergency Cleanup Response (800) 645-8265 2. Contact Doosan Fuel Cell America Control Center (860) 727-2847
Mechanical Hi/Lo Grade Piping	Small leak dripping from joint, valve or connection	1. Contact Doosan Fuel Cell America Control Center (860) 727-2847
Small amounts of condensate dripping from piping	Medium to large leak	1. Follow local spill response protocol or contact Clean Harbors Emergency Cleanup Response (800)-645-8265 2. Contact Doosan Fuel Cell America Control Center (860) 727-2847
Disconnects/Other Equipment	Smoke or fire coming from equipment	1. Dial 911 or Local Emergency Response Number 2. Establish safe perimeter 3. Contact Doosan Fuel Cell America Control Center (860) 727-2847
No leaks or smoke		
Compressed Gas Manifold (N2/H2)	Leaks – may be able to hear hissing sound.	1. If Indoors – Evacuate Immediately! Dial 911 or Local Emergency Response Number 2. Establish safe perimeter 3. Contact Doosan Fuel Cell America Control Center (860) 727-2847
No leaks, May hear intermittent gas flow during purges		



Fuel Cell Related Safety Data Sheets (SDS)

1	Propylene Glycol – DowFrost®
2	Phosphoric Acid – Solid
3	Reformer/ILS Catalysts
4	Anion/Cation Resin
5	Nitrogen / Hydrogen Compressed Gas Mixture (non-flammable)

Inspections

Inspection Type	Equipment Requirements	Frequency Required
General Maintenance	Laptop, Service Vehicle	Monthly
General Housekeeping	N/A	Daily
Waste and Chemical Storage*	N/A	Weekly
Internal Combustible Gas Monitor	AT-160 Calibration Kit	Annual
Fire Prevention	N/A	Monthly

*When applicable

[General Housekeeping: Combustible materials should not be stored near power plant. Keep combustible materials at least five feet away from power plant.](#)

Fuel Cell operation is monitored and controlled remotely 24 hours a day 7 days a week by the Doosan Fuel Cell America Control Center. Upset or abnormal occurrences outside of normal operating parameters are immediately identified and service technicians are dispatched within 24 hours to respond when required.

Emergency Procedures

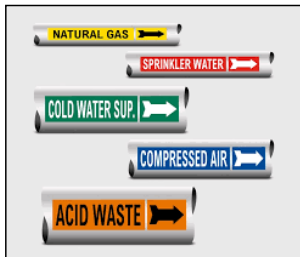
Alarms	There are no audible or visual alarms on Fuel Cell. Alarm conditions are relayed immediately to the Doosan Fuel Cell America Control Center. The Doosan Fuel Cell America Control Center will then contact the appropriate site personnel on the site’s emergency contact list.
Emergency Shut Down Onsite	Actuate Fuel Cell Stop Button
Emergency Area Egress - Gas Odor	Evacuate 330 Feet in all directions
Emergency Area Egress - Fire	Evacuate <u>employees and visitors no directly involved in fire-fighting activities</u> 330 Feet in all directions – <u>CV000 automatic natural gas supply shut off</u> <u>Notify fire response personnel.</u> <u>Coordinate with security forces or other designated personnel to admit pulic fire department and control traffic and personnel.</u> <u>There are no restrictions for type of fire suppression</u>

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	<p><u>equipment.</u> <u>CV000 automatic natural gas supply shut off will engage through tripping of power plant thermal fuses or by depressing the Fast Stop button. No further power plant interaction is required.</u> <u>If necessary, a Fire Report should be filed, investigation conducted and corrective actions identified.</u></p>
Emergency Egress - General	<p>Fuel cell is unmanned remotely monitored and controlled. No Doosan Fuel Cell America employees attending unit unless service or maintenance is required.</p>

Signage and labeling



General:

Safety Hazard Analysis

The PureCell® Model 400 fuel cell system has been designed to meet strict ANSI/CSA safety standards to protect against risks from electrical, mechanical, chemical, and combustion safety hazards. The following items are a few of the safety measures incorporated into the design.

Fire Detection and Protection:



The power plant design incorporates a combustible gas sensor as well as thermal fuses located throughout the power module cabinet to detect fire. The detection of a potential flammable gas mixture, a fire, or the failure of this detection circuit will result in a power plant shutdown and a subsequent inert gas (nitrogen) purge of the fuel cell stack and fuel processing system. This event will also result in an alarm callout notification to Doosan Fuel Cell America service personnel. The power plant is designed with an integral emergency-stop button on the outside of the enclosure to enable immediate shutdown in the event of an emergency. There is also a gas shut-off valve and electrical disconnect switch easily accessible to emergency personnel. There are no restrictions for type of fire suppression equipment.

Gas Leak:

Augmenting the internal combustible gas sensor, the power plant also monitors the flow rate of natural gas. If the gas flow rate exceeds the equivalent power production of the power plant then a shutdown will result. The largest possible accumulation from a leak prior to shutdown is below combustible limits. Fuel valves inside the power plant are "fail safe" and will return to their normally closed position upon loss of power. The power plant is designed to have a physical barrier that separates the equipment handling combustible gases (fuel compartment) from electrical or potential spark-creating equipment (motor compartment). The fuel compartment is kept at a negative pressure to contain and remove any potential gas leaks, whereas the motor compartment is pressurized by a fan source to prevent combustible gases from entering.

Hydrogen:

Hydrogen is lighter than air and thus does not pool like other fuels and will readily dissipate with proper ventilation making it less likely to ignite. Although hydrogen has low self-ignition characteristics, the fuel in the power plant is not pure hydrogen. Also, the power plant is not producing or storing hydrogen, it consumes hydrogen-rich gas equal to what it requires to produce power. The fuel cell stack is wrapped in a fire retardant blanket. There are no materials inside the unit that would sustain a flame. There is no large volume of gas or any ignition that occurs within the cell stack.

Phosphoric Acid:

Phosphoric acid is integral part of the fuel cell system, acting as the electrolyte within the fuel cell stack. Phosphoric acid is a surprisingly common substance that is contained in common cola drinks. A leak of phosphoric acid is not possible because phosphoric acid is not in liquid form once applied in the equipment. There is no reservoir of liquid. Phosphoric acid is contained in the porous structure of the fuel cell stack material by capillary action, similar to how ink is absorbed into a blotter.

Fluid Leaks:

All pressurized water vessels are designed to ASME boiler codes and inspected annually. All piping, welds, etc. meet pressurized piping standards. There are three fluid sources inside the fuel cell power module:

- 1) Water produced through the electrochemical process is "pure" water and is reclaimed and reused by the process.
- 2) Fluid used in the external cooling module, which is water mixed with a polypropylene glycol and a rust inhibitor to prevent rust and freezing in colder climates.
- 3) Fluid used in the heat recovery loops, this is the same glycol solution used in the external cooling module.



If a leak is observed around the fuel cell power module or absorption use a gray or blue absorbent mat, pad, or boom to contain the leak and prevent it from entering any drains. Contact Doosan Fuel Cell America, Inc Control Center for further assistance in identifying the leak source.

Transformers:

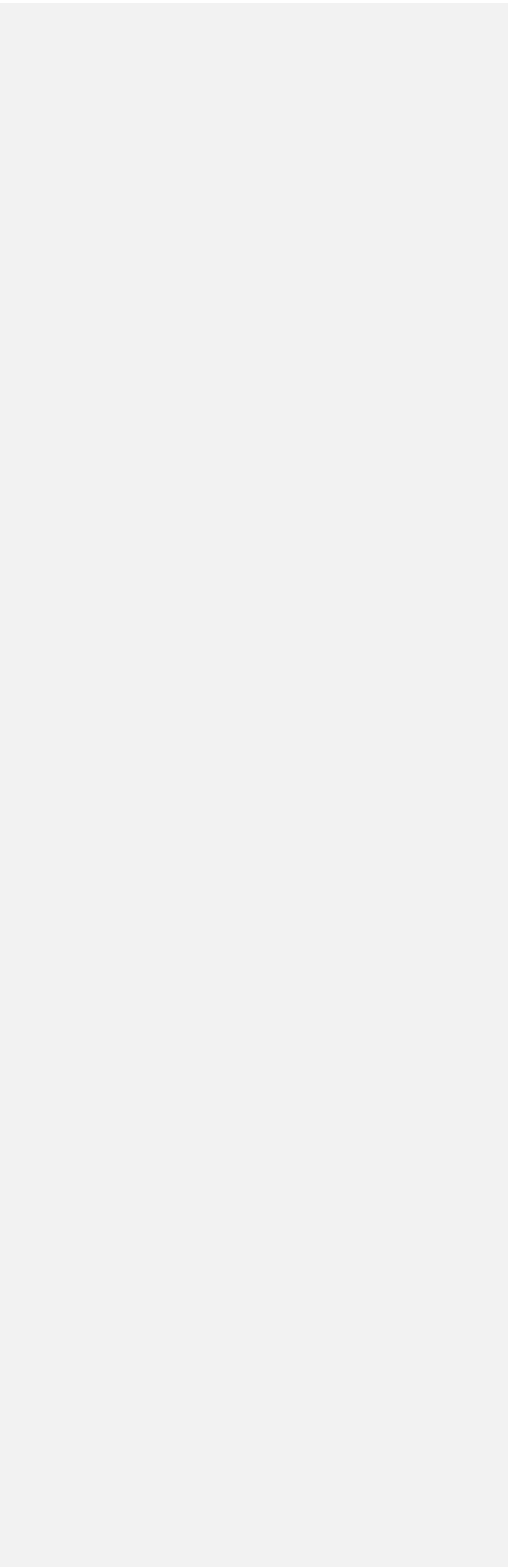
NEMA 3R, OIL FILLED, LESS FLAMMABLE OIL, 13.8 KV DELTA PRIMARY, 480-277V GROUNDED WYE SECONDARY, UL LISTED total oil capacity 950 gallons.

Methods and material for containment and clean up.

1. Large spills: Dike area to contain spill. Knock down and dilute vapors with water fog or spray. Collect with vacuum equipment or inert materials. Approach release upwind.
2. Small spills: Absorb with non-combustible liquid-binding material (sand, diatomaceous earth (clay), acid binders, universal binders). Remove with shovel. Collect in suitable and properly labeled containers. Wash surfaces with aqueous cleaner and hot water. Used rags or other cleaning materials should be soaked with water and placed in a sealed container to prevent spontaneous combustion. Dispose of contents/container in accordance with local regulations.

Hazardous Waste:

The fuel cell does not produce any hazardous waste. Standard Material Safety Data Sheets (MSDS) are available upon request.



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APPENDIX A — FUEL CELL AND ANCILLARY EQUIPMENT DAILY CHECKLIST



This checklist has been developed as a guide. It is not intended to provide a comprehensive list of all possible hazards or risks. At no time are you authorized to open or manipulate any equipment, including but not limited to the fuel cell, cooling module, or liquid chiller.

If you observe an **EMERGENCY**, use your local emergency notification protocol and then notify Doosan Control Center at (860) 727-2847.

<i>Month:</i> _____	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31		
General Housekeeping																																	
1. Safe access is provided to/from fuel cell location (snow and ice removed - 48" parameter around fuel cell and 48" wide cleared access, lighted access, etc.)																																	
2. No construction or other hazards/risks exist																																	
3. Access gate is locked/secured (site specific)																																	
4. No combustible material within 60" of PPLT																																	
Fuel Cell																																	
1. Doors are closed and appear secured																																	
2. Fuel cell appears to be operating as normal																																	
a. No leaks																																	
b. No smoke or burning smell (if the fuel cell is running, steam will come out of chimney - this is normal)																																	
4. No strong natural gas (mercaptan) smell is observed																																	
5. No leaks or discharges are coming from mechanical piping to/from fuel cell																																	



APPENDIX 1 – SAFETY DATA SHEETS

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Version: 1.0
Revision date: 04-07-2014

SAFETY DATA SHEET

1. Identification

Product identifier: PHOSPHORIC ACID

Other means of identification

Synonyms: Ortho-Phosphoric Acid, White Phosphoric Acid
Product No.: 0240, 6908, 2798, 2797, 5854, 2796, 5804, 2788, 0259, 5372, 0274, 0269, 0268, 0265, 0264, 0262, 0260, 0255, 0251

Recommended use and restriction on use

Recommended use: Not available.
Restrictions on use: Not known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company Name: Avantor Performance Materials, Inc.
Address: 3477 Corporate Parkway, Suite 200
Center Valley, PA 18034
Telephone: Customer Service: 855-282-6867
Fax:
Contact Person: Environmental Health & Safety
e-mail: info@avantormaterials.com

Emergency telephone number:
24 Hour Emergency: 908-859-2151

Chemtec: 800-424-9300

2. Hazard(s) identification

Hazard classification

Physical hazards

Corrosive to metals Category 1

Health hazards

Acute toxicity (Oral) Category 4
Skin corrosion/irritation Category 1
Serious eye damage/eye irritation Category 1
Specific target organ toxicity - single exposure Category 3

Unknown toxicity

Acute toxicity, oral 0 %
Acute toxicity, dermal 0 %
Acute toxicity, inhalation, vapor 100 %
Acute toxicity, inhalation, dust or mist 100 %

Unknown toxicity

Acute hazards to the aquatic environment 84 %
Chronic hazards to the aquatic environment 84 %

Label elements

SDS_US - SDSMIX000331

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OR
VY
CELL

COP
AN
SOUR



Version: 1.0
Revision date: 04-07-2014

Hazard symbol:



Signal word: Danger

Hazard statement: May be corrosive to metals.
Harmful if swallowed.
Causes severe skin burns and eye damage.
May cause respiratory irritation.

Precautionary statement

Prevention: Keep only in original container. Do not breathe dust/fume/mist/vapors. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection. Wash thoroughly after handling.

Response: Absorb spillage to prevent material damage. IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Remove/take off immediately all contaminated clothing. Rinse skin with water/shower. Wash contaminated clothing before reuse. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Immediately call a POISON CENTER or doctor/physician.

Storage: Store locked up. Store in a well-ventilated place. Keep container tightly closed. Store in corrosive resistant container with a resistant inner liner.

Disposal: Dispose of contents/container to an appropriate treatment and disposal facility in accordance with applicable laws and regulations, and product characteristics at time of disposal.

Other hazards which do not result in GHS classification: None.

3. Composition/information on ingredients

Mixtures

Chemical identity	Common name and synonyms	CAS number	Content in percent (%) [*]
PHOSPHORIC ACID		7664-38-2	80 - 90%

^{*} All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

4. First-aid measures

General information: Get medical advice/attention if you feel unwell. Show this safety data sheet to the doctor in attendance.



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Ingestion:	Do NOT induce vomiting. Call a physician or poison control center immediately. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs.
Inhalation:	Move to fresh air. Call a physician or poison control center immediately. Apply artificial respiration if victim is not breathing. If breathing is difficult, give oxygen.
Skin contact:	Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.
Eye contact:	Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately. In case of irritation from airborne exposure, move to fresh air. Get medical attention immediately.

Most important symptoms/effects, acute and delayed

Symptoms: Causes severe skin and eye burns. Causes digestive tract burns.

Indication of immediate medical attention and special treatment needed

Treatment: Treat symptomatically. Symptoms may be delayed.

5. Fire-fighting measures

General fire hazards: No data available.

Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media: None known.

Specific hazards arising from the chemical: Not combustible, but if involved in a fire decomposes to produce toxic gases.

Special protective equipment and precautions for firefighters

Special fire fighting procedures: Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters: Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA. Product is highly acidic. Wear protective gear if spilled during fire fighting.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures: See Section 8 of the MSDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away. Keep upwind. Ventilate closed spaces before entering them.



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Methods and material for containment and cleaning up: Neutralize with lime or soda ash. Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Clean surface thoroughly to remove residual contamination. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Inform authorities if large amounts are involved.

Environmental precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

7. Handling and storage

Precautions for safe handling: Do not get in eyes, on skin, on clothing. Do not taste or swallow. Wash thoroughly after handling. Do not eat, drink or smoke when using the product. Use caution when adding this material to water. Add material slowly when mixing with water. Do not add water to the material; instead, add the material to the water.

Conditions for safe storage, including any incompatibilities: Do not store in metal containers. Keep container tightly closed. Store in a well-ventilated place.

8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Chemical identity	Type	Exposure Limit values	Source
PHOSPHORIC ACID	TWA	1 mg/m ³	US. ACGIH Threshold Limit Values (2011)
	STEL	3 mg/m ³	US. ACGIH Threshold Limit Values (2011)
	REL	1 mg/m ³	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
	STEL	3 mg/m ³	US. NIOSH: Pocket Guide to Chemical Hazards (2010)
PEL		1 mg/m ³	US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2008)
	TWA	1 mg/m ³	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1999)
	STEL	3 mg/m ³	US. OSHA Table Z-1-A (29 CFR 1910.1000) (1999)
	TWA	1 mg/m ³	US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A (08 2008)
	STEL	3 mg/m ³	US. Tennessee. OELs. Occupational Exposure Limits, Table Z1A (08 2008)
	ST ESL	10 µg/m ³	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010)
	AN ESL	1 µg/m ³	US. Texas. Effects Screening Levels (Texas Commission on Environmental Quality) (12 2010)
	TWA PEL	1 mg/m ³	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (08 2010)
	STEL	3 mg/m ³	US. California Code of Regulations, Title 8, Section 5155. Airborne Contaminants (08 2010)

Appropriate engineering controls No data available.



Version: 1.0
Revision date: 04-07-2014

Individual protection measures, such as personal protective equipment

General information:	Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.
Eye/face protection:	Wear safety glasses with side shields (or goggles) and a face shield.
Skin protection	
Hand protection:	Chemical resistant gloves
Other:	Wear suitable protective clothing and gloves.
Respiratory protection:	In case of inadequate ventilation use suitable respirator. Respirator type: Chemical respirator with acid gas cartridge.
Hygiene measures:	Provide eyewash station and safety shower. Observe good industrial hygiene practices. Wash hands before breaks and immediately after handling the product. Wash contaminated clothing before reuse. Avoid contact with eyes. Avoid contact with skin.

9. Physical and chemical properties

Appearance

Physical state:	Liquid
Form:	Liquid
Color:	Colorless
Odor:	Odorless
Odor threshold:	No data available.
pH:	1.5 0.1 N Aqueous solution
Melting point/freezing point:	21.1 °C
Initial boiling point and boiling range:	158 °C
Flash Point:	Not applicable
Evaporation rate:	No data available.
Flammability (solid, gas):	No data available.
Upper/lower limit on flammability or explosive limits	
Flammability limit - upper (%):	No data available.
Flammability limit - lower (%):	No data available.
Explosive limit - upper (%):	No data available.
Explosive limit - lower (%):	No data available.
Vapor pressure:	0.3 kPa
Vapor density:	No data available.
Relative density:	1.69 (20 °C)
Solubility(ies)	
Solubility in water:	Miscible with water.
Solubility (other):	No data available.
Partition coefficient (n-octanol/water):	No data available.
Auto-ignition temperature:	No data available.
Decomposition temperature:	No data available.
Viscosity:	No data available.

SDS_US - SDSMIX000331

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SD DOCUMENT OR
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Revision date: 04-07-2014

10. Stability and reactivity

Reactivity:	No dangerous reaction known under conditions of normal use.
Chemical stability:	Material is stable under normal conditions.
Possibility of hazardous reactions:	Hazardous polymerization does not occur.
Conditions to avoid:	Avoid contact with oxidizing agents. Avoid contact with strong reducing agents. Contact with alkalis.
Incompatible materials:	Strong reducing agents. Alkalies. Strong oxidizing agents. Metals.
Hazardous decomposition products:	oxides of phosphorus

11. Toxicological information

Information on likely routes of exposure

Ingestion:	Harmful if swallowed.
Inhalation:	Severely irritating to respiratory system.
Skin contact:	Causes severe skin burns.
Eye contact:	Causes serious eye damage.

Information on toxicological effects

Acute toxicity (list all possible routes of exposure)

Oral	
Product:	ATEmix (Rat): 1,700 mg/kg
Dermal	
Product:	ATEmix (): 3,044.44 mg/kg

Inhalation	
Product:	No data available.

Repeated dose toxicity	
Product:	No data available.

Skin corrosion/irritation	
Product:	Causes severe skin burns.

Serious eye damage/eye irritation	
Product:	Causes serious eye damage.

Respiratory or skin sensitization	
Product:	Not a skin sensitizer.

Carcinogenicity	
Product:	This substance has no evidence of carcinogenic properties.

IARC Monographs on the Evaluation of Carcinogenic Risks to Humans:
No carcinogenic components identified

US. National Toxicology Program (NTP) Report on Carcinogens:
No carcinogenic components identified



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US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050):
No carcinogenic components identified

Germ cell mutagenicity

In vitro
Product: No mutagenic components identified

In vivo
Product: No mutagenic components identified

Reproductive toxicity

Product: No components toxic to reproduction

Specific target organ toxicity - single exposure

Product: None known.

Specific target organ toxicity - repeated exposure

Product: None known.

Aspiration hazard

Product: Not classified

Other effects: Not known.

12. Ecological information

Ecotoxicity:

Acute hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic invertebrates
Product: No data available.

Chronic hazards to the aquatic environment:

Fish
Product: No data available.

Aquatic invertebrates
Product: No data available.

Toxicity to Aquatic Plants
Product: No data available.

Persistence and degradability

Biodegradation
Product: Expected to be readily biodegradable.

BOD/COD ratio
Product: No data available.

Bioaccumulative potential

Bioconcentration factor (BCF)
Product: No data available on bioaccumulation.

Partition coefficient n-octanol / water (log Kow)
Product: No data available.



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Mobility in soil: The product is water soluble and may spread in water systems.

Other adverse effects: The product may affect the acidity (pH-factor) in water with risk of harmful effects to aquatic organisms.

13. Disposal considerations

Disposal instructions: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Contaminated packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number:	UN 1805
UN proper shipping name:	Phosphoric acid solution
Transport hazard class(es):	
Class(es):	8
Label(s):	8
Packing group:	III
Marine Pollutant:	No

IMDG

UN number:	UN 1805
UN proper shipping name:	PHOSPHORIC ACID SOLUTION
Transport hazard class(es):	
Class(es):	8
Label(s):	8
EmS No.:	F-A, S-B
Packing group:	III
Marine Pollutant:	No

IATA

UN number:	UN 1805
Proper Shipping Name:	Phosphoric acid, solution
Transport hazard class(es):	
Class(es):	8
Label(s):	8
Marine Pollutant:	No
Packing group:	III

15. Regulatory information

US federal regulations

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)
None present or none present in regulated quantities.

CERCLA Hazardous Substance List (40 CFR 302.4):

PHOSPHORIC ACID Reportable quantity: 5000 lbs.



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Superfund amendments and reauthorization act of 1986 (SARA)

Hazard categories

Acute (Immediate) Chronic (Delayed) Fire Reactive Pressure Generating

SARA 302 Extremely hazardous substance

None present or none present in regulated quantities.

SARA 304 Emergency release notification

Chemical identity	RQ
PHOSPHORIC ACID	5000 lbs.

SARA 311/312 Hazardous chemical

Chemical identity	Threshold Planning Quantity
PHOSPHORIC ACID	500 lbs

SARA 313 (TRI reporting)

None present or none present in regulated quantities.

Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3)

PHOSPHORIC ACID Reportable quantity: 5000 lbs.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):

None present or none present in regulated quantities.

US state regulations

U.S. California Proposition 65

No ingredient regulated by CA Prop 65 present.

U.S. New Jersey Worker and Community Right-to-Know Act

PHOSPHORIC ACID Listed

U.S. Massachusetts RTK - Substance List

PHOSPHORIC ACID Listed

U.S. Pennsylvania RTK - Hazardous Substances

PHOSPHORIC ACID Listed

U.S. Rhode Island RTK

PHOSPHORIC ACID Listed

Inventory Status:

Australia AICS:	On or in compliance with the inventory
Canada DSL Inventory List:	On or in compliance with the inventory
EINECS, ELINCS or NLP:	On or in compliance with the inventory
Japan (ENCS) List:	On or in compliance with the inventory
China Inv. Existing Chemical Substances:	Not in compliance with the inventory.
Korea Existing Chemicals Inv. (KECI):	On or in compliance with the inventory
Canada NDSL Inventory:	Not in compliance with the inventory.
Philippines PICCS:	On or in compliance with the inventory
US TSCA Inventory:	On or in compliance with the inventory
New Zealand Inventory of Chemicals:	On or in compliance with the inventory
Japan ISHL Listing:	Not in compliance with the inventory.
Japan Pharmacopoeia Listing:	Not in compliance with the inventory.

16. Other information, including date of preparation or last revision

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Revision date: 04-07-2014

NFPA Hazard ID



- Flammability
- Health
- Reactivity
- Special hazard.

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe

Issue date: 04-07-2014
Revision date: No data available.
Version #: 1.0
Further information: No data available.

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MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Shift Max 230, Reduced Heterogeneous Catalyst, FC72372

SECTION 1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Doosan Fuel Cell America, Inc. TELEPHONE: 24 HOUR EMERGENCY: 1-800-424-9300 (CHEMTREC)
 195 Governors Hwy. PRODUCT INFORMATION: 860-727-2300
 South Windsor, CT 06074
 USA

MSDS NO: NN53 INITIAL RELEASE DATE: 4/29/2009 REVISION DATE:

GENERIC DESCRIPTION: Reduced catalyst
 PHYSICAL FORM: Cylindrical tablets
 COLOR: Dark brown
 ODOR: None

NFPA 704 CODES: HEALTH: 1 FLAMMABILITY: 4 REACTIVITY: 2

NOTE: NFPA = NATIONAL FIRE PROTECTION ASSOCIATION

SECTION 2. COMPOSITION / INFORMATION ON INGREDIENTS

CAS NUMBER	%WT/VOL	COMPONENTS	EXPOSURE LIMITS	
			OSHA	AGGIH
The following is the composition of the packed tablets:				
1344-28-1	9-12	Aluminum oxide	15 mg/m ³ 5 mg/m ³ (respirable)	1 mg/m ³ (respirable)
7440-50-8	55-62	Copper	1 mg/m ³	1 mg/m ³ (dust)
1314-13-2	28-33	Zinc oxide	15 mg/m ³ 5 mg/m ³ (respirable)	2 mg/m ³ (respirable)



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Shift Max 230, Reduced Heterogeneous Catalyst, FC72372

SECTION 3. EFFECTS OF OVEREXPOSURE

ACUTE EFFECTS:

EYE: May cause irritation

SKIN: Frequent or prolonged contact may irritate the skin and cause a skin rash (dermatitis).

INHALATION: Prolonged or repeated inhalation may cause lung damage. Prolonged or excessive inhalation may cause respiratory tract irritation.

ORAL: Moderately toxic and may be harmful if swallowed; may damage the liver, pancreas, kidney or nervous systems.

REPEATED EXPOSURE EFFECTS:

EYE: Signs and symptoms of overexposure may include scratch or abrasion, damage to cornea (necrosis).

SKIN: Overexposure may cause skin rash, dermatitis and or itching.

INHALATION: Overexposure may cause coughing, wheezing, shortness of breath, difficult breathing, chest pain.

ORAL: Ingestion may cause upset stomach and intestinal distress.

SECTION 3. EFFECTS OF OVEREXPOSURE

NOTE TO PHYSICIANS: N/D

THIS MATERIAL CONTAINS THE FOLLOWING COMPONENTS WITH THE SPECIAL HAZARDS LISTED BELOW.

CARCINOGENS	N/A
TERATOGENS	N/A
MUTAGENS	N/A
REPRODUCTIVE TOXINS	N/A
SENSITIZERS	N/A
COMMENTS:	None
NTP CLASSIFICATION:	N/A
IARC CLASSIFICATION:	N/A
OSHA CLASSIFICATION:	N/A



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Shift Max 230, Reduced Heterogeneous Catalyst, FC72372

SECTION 4. FIRST AID MEASURES

EYE: Immediately flush eyes with plenty of water for at least 30 minutes. Get immediate medical attention.

SKIN: Wash with plenty of soap and water. Get medical attention if irritation develops or persists.

INHALATION: Remove to fresh air. If breathing is difficult seek immediate medical attention.

ORAL: If swallowed, do NOT induce vomiting. Give victim large quantities of water. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person.

COMMENTS: Exposure to fumes of the metal oxides may cause metal fume fever including irritation of eyes and respiratory tract and flu-like symptoms.

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT (METHOD): N/A

AUTOIGNITION TEMPERATURE: N/A

FLAMMABILITY LIMITS IN AIR: N/A

EXTINGUISHING MEDIA: Protect exposures; cool with water fog. For small fires use Class D extinguishing media.

UNSUITABLE EXTINGUISHING MEDIA: N/D

FIRE FIGHTING PROCEDURES: Wear full protective clothing and SCBA's.

UNUSUAL FIRE HAZARDS: Packed material will spontaneously oxidize in air, producing significant heat. Keep away from combustible materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Toxic metal fumes may be emitted if thermally decomposed.

SECTION 6. ACCIDENTAL RELEASE MEASURES

CONTAINMENT / CLEAN UP:

Small spill With shovel or scoop, place material onto clean, dry non-flammable surface to allow catalyst to oxidize. Place oxidized catalyst into container and cover loosely. Remove containers from spill area. Protect against inhalation of dusts or fumes, Wear eye protection.

Large spill Wet methods of cleanup are preferred. Keep airborne particulates to a minimum. Protect against inhalation of dusts or fumes, Wear eye protection. Place in appropriate containers for disposal.



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Shift Max 230, Reduced Heterogeneous Catalyst, FC72372

SECTION 7. HANDLING AND STORAGE

HANDLING: No special precautions for intact containers.
STORAGE: Store in dry area. Prevent exposure to air by maintaining under an inert gas atmosphere such as nitrogen. Use additional precautions to prevent asphyxiant hazards due to inert gas usage.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS
LOCAL EXHAUST: If user operations generate dust or fume, use ventilation to keep exposure to airborne contaminants below the exposure limits.
GENERAL VENTILATION: N/A

PERSONAL PROTECTIVE EQUIPMENT FOR ROUTINE HANDLING
EYES: Wear safety glasses with side shields or goggles.
SKIN: Wear protective clothing, including long sleeves and gloves to prevent skin contact.
SUITABLE GLOVES: Impermeable, such as latex, Nitrile, etc.
INHALATION: Wear NIOSH approved respirator with particulate filter.

PERSONAL PROTECTIVE EQUIPMENT FOR SPILLS
EYES: Chemical goggles
SKIN: Chemical resistant gloves
INHALATION / SUITABLE RESPIRATOR: (Min) Use NIOSH-approved respirator with particulate filter
PRECAUTIONARY MEASURES: N/D



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Shift Max 230, Reduced Heterogeneous Catalyst, FC72372

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

TYPICAL PHYSICAL PROPERTIES ARE GIVEN BELOW.

APPEARANCE: Cylindrical tablets	POUR POINT C (F): N/A
COLOR: Dark brown	FREEZING POINT C (F): N/A
ODOR: None	VOLATILE ORGANIC COMPOUND:
ODOR THRESHOLD: N/A	SPECIFIC GRAVITY: (H ₂ O = 1) >8
pH: N/A	VAPOR PRESSURE - mmHg: N/A
BOILING POINT C (F): N/A	VAPOR DENSITY @ TEMP: ____: N/A
MELTING POINT C (F): N/A	EVAPORATION RATE RELATIVE TO ____: N/A
SOLUBILITY IN WATER: Insoluble	EXPLOSIVE PROPERTIES: Will not explode
VISCOSITY AT ____: N/A	OXIDIZING PROPERTIES: Not an oxidizer
VISCOSITY AT ____:	
RELATIVE DENSITY TO: 65-85 lb./CF (bulk)	

SECTION 10. STABILITY AND REACTIVITY

STABILITY (THERMAL, LIGHT, ETC.): Generally considered stable when contained under an inert atmosphere.

CONDITIONS TO AVOID: Exposure to air.

INCOMPATIBILITY (MATERIALS TO AVOID): Combustible materials.

HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition may produce metal oxide fumes.

HAZARDOUS POLYMERIZATION: Not expected to occur.



MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Shift Max 230, Reduced Heterogeneous Catalyst, FC72372

SECTION 11. TOXICOLOGICAL DATA
Exposure to metal oxide fume may produce "metal fume fever" which is characterized by flu-like symptoms including fever, chills and general aches.

SECTION 12. ECOLOGICAL INFORMATION
No data available.

SECTION 13. DISPOSAL CONSIDERATIONS
Local regulations may vary; all waste must be disposed/recycled/reclaimed in accordance with federal, state and local environmental control regulations.

SECTION 14. TRANSPORT INFORMATION
PROPER SHIPPING NAME: Self-heating solid, inorganic, N.O.S.
HAZARD TECHNICAL NAME: Reduced copper catalysts.
HAZARD CLASS: 4.2
UN NUMBER: 3190
PACKING GROUP: II

SECTION 15. REGULATORY INFORMATION
TSCA STATUS: Component materials are in the TSCA inventory.
EPA SARA TITLE III CHEMICAL LISTINGS:
SECTION 302 HAZARDOUS SUBSTANCES: No
SECTION 355 EXTREMELY HAZARDOUS SUBSTANCES: No



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MATERIAL SAFETY DATA SHEET

PRODUCT NAME: Shift Max 230, Reduced Heterogeneous Catalyst, FC72372

SECTION 15. REGULATORY INFORMATION, CONTINUED

SECTION 312 HAZARD CLASS:

ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
PRESSURE: No
REACTIVE: No

SECTION 372 TOXIC CHEMICALS: Copper.

SECTION 16. OTHER INFORMATION

COMMENTS: N/D = Not Determined
N/A = Not Applicable

As a unit, the materials do not pose a hazard. However, should the container be compromised and the packed catalyst become available, measures must be taken to prevent exposure to air.

PREPARED BY: D. Black, J. Preston
Revision By:

DATE: 4/23/2009

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Safety Data Sheet

According to OSHA Hazard Communication Standard, 29 CFR 1910.1200

Initial preparation date: 12.14.2017

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Revision date: 05.21.2018

ENVIROTEMP™ FR3™ FLUID

SECTION 1: Identification

Product identifier

Product name: ENVIROTEMP™ FR3™ FLUID
Product code: 100088941; 100089128; 100089127; 100089129;
110013820; 110016511



Recommended use of the product and restriction on use

Relevant identified uses: Dielectric fluid
Uses advised against: Not determined or not applicable.
Reasons why uses advised against: Not determined or not applicable.

Manufacturer or supplier details

Manufacturer:
United States
Cargill, Incorporated
Cargill Industrial Specialties
13400 15th Avenue North
Plymouth, MN 55441
1-800-842-3631, 1-952-984-9122
CIS_CustomerService@Cargill.com

Emergency telephone number:

United States
ChemTel Inc
North America: 1-800-255-3924
International: 01-813-248-0585

SECTION 2: Hazard(s) identification

GHS classification: Not a hazardous substance or mixture

Label elements

Hazard pictograms: None

Signal word: None

Hazard statements: None

Precautionary statements: None

Hazards not otherwise classified: None

SECTION 3: Composition/information on ingredients

Identification	Name	Weight %
CAS number: 8001-22-7	Soybean Oil	>99

Additional information:

*This material is not considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200)



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ENVIROTEMP™ FR3™ FLUID

SECTION 4: First aid measures

Description of first aid measures

General notes:

No special measures required

After inhalation:

If inhaled, remove to fresh air

Get medical advice if you feel unwell

After skin contact:

Wash with plenty of water / soap and rinse thoroughly

Get medical advice if skin irritation occurs or you feel unwell

After eye contact:

Rinse cautiously with water for several minutes

Remove contact lenses, if present and easy to do. Continue rinsing

If symptoms persist, consult a doctor

After swallowing:

Rinse mouth and do not induce vomiting

Get medical advice if you feel unwell or concerned

Most important symptoms and effects, both acute and delayed

Acute symptoms and effects:

Any additional important symptoms and effects are described in Section 11: Toxicological Information

Delayed symptoms and effects:

Not determined or not applicable.

Immediate medical attention and special treatment

Specific treatment:

Not determined or not applicable.

Notes for the doctor:

Not determined or not applicable.

SECTION 5: Firefighting measures

Extinguishing media

Suitable extinguishing media:

Use Water (fog only), dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam

Unsuitable extinguishing media:

Do not use water as an extinguisher

Specific hazards during fire-fighting:

Thermal decomposition can lead to release of irritating gases and vapors

Special protective equipment for firefighters:

Use typical firefighting equipment, self-contained breathing apparatus, special tightly sealed suit

Special precautions:

Rags, steel wool, or waste contaminated with this product may spontaneously catch fire if improperly discarded

SECTION 6: Accidental release measures

Personal precautions, protective equipment and emergency procedures:





Safety Data Sheet

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ENVIROTEMP™ FR3™ FLUID

Spilled material may cause a slipping hazard. Use appropriate safety equipment

Environmental precautions:

Should not be released into the environment
Prevent from reaching drains, sewers, or waterways

Methods and material for containment and cleaning up:

Large spills: Dike area to contain spill. Knock down and dilute vapors with water fog or spray. Collect with vacuum equipment or inert materials. Approach release upwind
Small spills: Absorb with non-combustible liquid-binding material (sand, diatomaceous earth (clay), acid binders, universal binders). Remove with shovel. Collect in suitable and properly labeled containers
Wash surfaces with aqueous cleaner and hot water. Used rags or other cleaning materials should be soaked with water and placed in a sealed container to prevent spontaneous combustion
Dispose of contents / container in accordance with local regulations

Reference to other sections:

Not determined or not applicable.

SECTION 7: Handling and storage

Precautions for safe handling:

Use appropriate personal protective equipment (see Section 8).
Avoid breathing mist or vapor. Use with adequate ventilation. Avoid repeated and prolonged skin contact. Wash thoroughly after handling. Remove contaminated clothing and wash before reuse.
Surfaces of porous or fibrous materials saturated with this material can self-heat and auto ignite when exposed to air. Thin films of material on non-porous surfaces in contact with air will polymerize over time making it increasingly more difficult to clean.
Immediately after use, place rags, steel wool, or waste in a sealed water-filled metal container.

Conditions for safe storage, including any incompatibilities:

Protect material from extreme temperatures, humidity, and water prior to use. Store in labeled, tightly closed containers at 10-40° C (50-104° F) in dry, isolated and well-ventilated areas, away from sources of ignition and heat.

SECTION 8: Exposure controls/personal protection

Only those substances with limit values have been included below.

Occupational Exposure limit values:

Country (Legal Basis)	Substance	Identifier	Permissible concentration
United States (OSHA)	Vegetable oil mist	NA	OSHA PEL 15 mg/m ³ (Total); 5 mg/m ³ (Respirable fraction)
	Vegetable oil mists (except castor, cashew nut or similar irritant oils)	NA	California (OSHA) PEL 10 mg/m ³ (Total); 5 mg/m ³ (Respirable fraction)
NIOSH	Vegetable oil mist	NA	NIOSH REL 10-hr TWA 10 mg/m ³ (Total); 5 mg/m ³ (Respirable fraction)
ACGIH	Vegetable oil mists (except castor, cashew nut or similar irritant oils)	NA	ACGIH TLV TWA: 5 mg/m ³ (respirable fraction), 10 mg/m ³ (As "Oil mist, mineral")

Biological limit values:

No biological exposure limits noted for the ingredient(s).

Information on monitoring procedures:

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According to OSHA Hazard Communication Standard, 29 CFR 1910.1200

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ENVIROTEMP™ FR3™ FLUID

Monitoring procedures should be chosen according to the indications set by national authorities or recognized standards.

Appropriate engineering controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor and mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling.

Personal protection equipment

Eye and face protection:

Safety glasses, goggles, or face shield recommended to protect eyes from mists or splashing.

Skin and body protection:

Wear protective clothing as necessary to minimize prolonged skin contact. Selection of specific items will depend on task.

Respiratory protection:

Respiratory protection should be worn when there is a potential to exceed the exposure limit requirements or guidelines. If there are no applicable exposure limit requirements or guidelines, wear respiratory protection when adverse effects, such as respiratory irritation or discomfort have been experienced, or where indicated by your risk assessment process. In misty atmospheres, use an approved particulate respirator.

General hygienic measures:

Handle in accordance with good industrial hygiene and safety practice. Avoid contact with skin, eyes and clothing. Wash hands before breaks and at the end of work. Wash contaminated clothing before reusing.

SECTION 9: Physical and chemical properties

Information on basic physical and chemical properties

Appearance	Light green liquid
Odor	Slight
Odor threshold	Not determined or not available.
pH	Not determined or not available.
Melting point/freezing point	Not determined or not available.
Initial boiling point/range	>360°C (>680°F)
Flash point (closed cup)	>265°C (Closed Cup)
Evaporation rate	Not determined or not available.
Flammability (solid, gas)	Not determined or not available.
Upper flammability/explosive limit	Not determined or not available.
Lower flammability/explosive limit	Not determined or not available.
Vapor pressure	< 1.3 Pa (<0.01 mmHg)
Vapor density	Not determined or not available.
Density	0.92 g/cm ³ (7.677 lbs./gal)
Relative density	Not determined or not available.
Solubilities	Insoluble.
Partition coefficient (n-octanol/water)	Not determined or not available.
Auto/Self-ignition temperature	401-404°C (ASTM E659)
Decomposition temperature	Not determined or not available.
Dynamic viscosity	Not determined or not available.

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ENVIROTEMP™ FR3™ FLUID

Kinematic viscosity	33-35 mm ² /s @ 40°C
Explosive properties	Not determined or not available.
Oxidizing properties	Not determined or not available.

Other information

SECTION 10: Stability and reactivity

Reactivity:

Does not react under normal conditions of use and storage.

Chemical stability:

Stable under normal conditions.

Possibility of hazardous reactions:

None under normal conditions of use and storage.

Conditions to avoid:

To avoid thermal decomposition, avoid temperatures > 250C

Incompatible materials:

Strong oxidizing agents.

Strong alkali.

Hazardous decomposition products:

Carbon monoxide, carbon dioxide.

SECTION 11: Toxicological information

Acute toxicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

Route	Result
Oral	LD50 > 5000 mg/kg bw (calculated)
Dermal	LD50 > 2000 mg/kg bw (calculated)
Inhalation	Acute inhalation toxicity data not available. At room temperature, exposure to vapor is minimal due to low volatility; single exposure is not likely to be hazardous

Substance data: No data available.

Skin corrosion/irritation

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to cause irritation base on component or similar materials.

Substance data: No data available.

Serious eye damage/irritation

Assessment: Based on available data, the classification criteria are not met.

Product data:

Minimal irritation or no effect expected base on component or similar materials.

Substance data: No data available.

Respiratory or skin sensitization

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to be a skin sensitizer based on animal data for similar substances.

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Substance data: No data available.

Carcinogenicity

Assessment: Based on available data, the classification criteria are not met.

Product data: No data available.

Substance data: No data available.

International Agency for Research on Cancer (IARC): None of the ingredients are listed.

National Toxicology Program (NTP): None of the ingredients are listed.

Germ cell mutagenicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to be a germ cell mutagen. In vitro and in vivo tests did not show mutagenic effects using similar materials.

Substance data: No data available.

Reproductive toxicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to be toxic to reproductive or developmental based on testing in rats for similar materials.

Substance data: No data available.

Specific target organ toxicity (single exposure)

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to cause organ damage from a single exposure.

Substance data: No data available.

Specific target organ toxicity (repeated exposure)

Assessment: Based on available data, the classification criteria are not met.

Product data:

Not expected to cause organ damage from prolonged or repeated exposure based on animal studies for similar materials.

Substance data: No data available.

Aspiration toxicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

No data available.

Substance data: No data available.

Information on likely routes of exposure:

No data available.

Symptoms related to the physical, chemical and toxicological characteristics:

No data available.

Other information:

No data available.

SECTION 12: Ecological information

Acute (short-term) toxicity

Assessment: Based on available data, the classification criteria are not met.

Product data:

Fish This product is not expected to be harmful to aquatic organisms.

Substance data: No data available.

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Chronic (long-term) toxicity

Product data: No data available.

Substance data: No data available.

Persistence and degradability

Product data:

Readily biodegradable

Substance data: No data available.

Bioaccumulative potential

Product data:

Not expected to bioaccumulate based on testing of similar substance in fish.

Substance data: No data available.

Mobility in soil

Product data:

Product has low mobility in soil.

Substance data: No data available.

Other adverse effects: No data available.

SECTION 13: Disposal considerations

Disposal methods:

It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory agencies. 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.

SECTION 14: Transport information

United States Transportation of dangerous goods (49 CFR DOT)

UN number	Not Regulated
UN proper shipping name	Not Regulated
UN transport hazard class(es)	None
Packing group	None
Environmental hazards	None
Special precautions for user	None

International Maritime Dangerous Goods (IMDG)

UN number	Not Regulated
UN proper shipping name	Not Regulated
UN transport hazard class(es)	None
Packing group	None
Environmental hazards	None
Special precautions for user	None

International Air Transport Association Dangerous Goods Regulations (IATA-DGR)

UN number	Not Regulated
UN proper shipping name	Not Regulated
UN transport hazard class(es)	None

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ENVIROTEMP™ FR3™ FLUID	
Packing group	None
Environmental hazards	None
Special precautions for user	None

SECTION 15: Regulatory Information

United States regulations

Inventory listing (TSCA): All ingredients are listed.
Significant New Use Rule (TSCA Section 5): Not applicable.
Export notification under TSCA Section 12(b): Not applicable.
SARA Section 302 extremely hazardous substances: Not listed.
SARA Section 313 toxic chemicals: Not listed.
CERCLA: Not listed.
RCRA: See Section 13.
Section 112(r) of the Clean Air Act (CAA): Not listed.
Massachusetts Right to Know: Not listed.
New Jersey Right to Know: Not listed.

New York Right to Know:

NA	Vegetable oil >5%	Listed
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Pennsylvania Right to Know:

8001-22-7	Soybean Oil	Listed
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California Proposition 65: Not listed.

SECTION 16: Other information

Abbreviations and Acronyms: None

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End of Safety Data Sheet