

Material Safety Data Sheet

Product name

Butane Gas Cartridge

1. Product and company identification

- a) Product name Butane Gas Cartridge
- b) Recommended use of product and limitations
- Recommended Use of product For use only in portable gas appliances
 - Limitations Extremely flammable
- c) Manufacturer / Supplier Information
- Company ADA Import & Großvertriebs GmbH
 - Address Bergiusstr. 53-59
12057 Berlin, Germany
 - Emergency phone number +49-30-767647-0

2. Hazards identification

- a) Hazard-Risk Classification
- Flammable gases : 1
Gases under pressure : liquefied gas or Refrigerated liquefied gas
Specific target organ toxicity (single exposure) : 3 (narcosis)

- b) Label elements including precautionary
- Symbol



- Signal word Danger
- Hazard-risk statement
H220 Extremely flammable gas
H280 Contains gas under pressure may explode if heated
H281 Contains refrigerated gas; may cause cryogenic burns or injury.
H336 May cause drowsiness or dizziness
- Precautionary statement
Prevention
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking
P261 Avoid breathing dust/fumes/gas/mist/vapours/spray.
P271 Use only outdoors or in a well-ventilated area.
P282 Wear cold insulating gloves/face shield/eye protection.
Response
P304+P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing
P312 Call a medical center(doctor) if you feel unwell.
P315 Get immediate medical advice/attention.
P336 Thaw frosted parts with lukewarm water. Do not rub affected areas.
P362+P364 Take off contaminated clothing and wash it before reuse.
P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely
P381 Eliminate all ignition sources if safe to do so
Storage
P403 Store in a well-ventilated place
P403+P233 Store in a well ventilated place. Keep container tightly closed.
P405 Store locked up.
P410+P403 Protect from sunlight. Store in a well-ventilated place.
Disposal
P501 Dispose of contents or container in accordance with

local/regional/national international regulations.

- d) Ingestion Seek medical attention immediately.
- e) Notes for physician Keep a doctor to recognize chemical substance and take care of patients.

5. Fire-fighting measures

- a) Suitable (and unsuitable) extinguishing media. CO₂, dry chemical, water spray or fog for surrounding area
Use dry sand or earth for the smothering extinguishment
- b) Specific hazards arising from the chemical
Extreme flammable gas
A leakage of material may present a fire / explosion risk.
There is a risk of steam explosion in indoor, outdoor and sewer.
It will ignite easily by heat, spark and flame.
Vapors may ignite and explode.
Shut off source of propane, if possible, dilute leakage of water.
Easily ignited by heat, sparks and flames.
Steam can move back to the ignition source and flash back Vapor may cause dizziness or asphyxiant without awareness
Some constituents may be irritating when inhaled at high concentrations.
Cylinders exposed to fire may release flammable gas.
Note that some part can leave flammable residue after evaporation
- c) Special protective equipment and precautions for fire-fighters
Keep away from contact with clothing and other combustible materials to avoid
Avoid friction or rough handling because of fire hazard.
Allow gas to burn if flow cannot be shut off.
Eliminate sources of ignition.
Evacuate area and fight fire from a safe distance.
Leaking gas fire : do not stop extinguish unless leak can be stopped safely.
Move container from fire area if it is not dangerous.
Be careful that broken cylinders may fly over.
Isolate the hazard area and deny entry to unnecessary and unprotected personnel. Do not touch the exposure source or safety device directly, as it may freeze in the In case of a tank fire, use fire extinguisher at enough distance or use unmanned After fire has extinguished, flush with plenty of water for a long time to cool In case of a tank fire, immediately leave the fire area if there is treble sound or discoloration of the tank.
In case of a tank fire, get out of the area If the tank is in flames
Evacuate in accordance of accident situation. (Evacuation radius : 0.8 km, The spread range varies depending on the location of the accident and the fire fighting way to be taken.) Rapidly excess heating or fire will be caused burst or rupture of a container. (In case at elevated temperatures(over 54 °C/130°F) CRV of containers will be operated.

6. Accidental release measures

- a) Personal precautions, protective equipment and emergency procedures
Use non-sparking equipment when cleaning up flammable spill.
In closed spaces, wear a self-contained breathing apparatus and ventilate.
Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Avoid inhalation and skin contact, contaminated clothing should be changed.
Contain spilled liquid with sand or earth. do NOT use combustible materials.
Dust can be a fire or explosion hazard.
Immediately wipe the spill, follow precautions for protective equipment.
- a) Personal precautions, protective equipment and emergency procedures
(Continued)
If possible, turn the leak valve of container to be released as gas rather than Ventilate the contaminated area.
Do not touch the leak source directly.
Using water spray to reduce the vapor or vapor clouds of gas and do not allow Always ground all equipment when handling material.

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| b) Environmental precautions and protective procedures | <p>Keep out of drains, sewers, ditches and waterways.</p> <p>Use appropriate container to avoid environmental contamination.</p> <p>Cover with absorbent or contain, Collect and dispose.</p> |
| d) Methods and materials for containment | <p>If possible, release in vapor by turning over leaking container.</p> <p>Clean the contaminated zone using cleanser and water.</p> <p>Use water spray/fog for prevent spread.</p> |

7. Handling and storage

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| a) Precautions for safe handling | <p>To avoid sudden release of pressure, loosen closure cautiously before opening.</p> <p>Avoid inhalation, skin and eyes.</p> <p>Use only clean, dry utensils in handling.</p> <p>Minimize dust generation and accumulation.</p> <p>Do not smoke or use matches or lighters during use and until vapors are gone.</p> <p>To dissipate static electricity during transfer, ground drum and connect to receiving container with bonding strap.</p> <p>Avoid prolonged or repeated skin contact.</p> <p>Wash thoroughly after handling.</p> <p>Avoid breathing gas or vapor.</p> |
| b) Conditions for safe storage
(including any incompatibilities) | <p>Keep away from heat, spark and flame – No Smoking.</p> <p>Avoid direct sunlight and store in a well-ventilated place.</p> <p>The empty cylinder should be completely drained, properly blocked and immediately returned to the cylinder regulator. Place it properly.</p> <p>Stored containers should be periodically checked for general conditions and leakage.</p> <p>Keep container tightly closed.</p> <p>Store in a cool, well-ventilated area.</p> |

8. Exposure controls and personal protection

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|---|---------------------------------------|
| a) Control parameter and Biological Exposure Indices | |
| Domestic regulation | |
| Propane | TWA - 1,000ppm 1,800mg/m ³ |
| n-Butane | TWA - 800ppm 1,900mg/m ³ |
| iso-Butane | TWA - 800ppm 1,900mg/m ³ |
| n-Pentane | No Data Available |
| iso-Pentane | No Data Available |
| ACGIH TLV-TWA (Threshold Limit Value - Time Weighted Average) | |
| Propane | TWA 1,000 ppm 8hours (3/2012) |
| n-Butane | TWA 1,000 ppm 8hours (3/2012) |
| iso-Butane | TWA 1,000 ppm 8hours (3/2012) |
| n-Pentane | TWA 600 ppm 8hours (3/2012) |
| iso-Pentane | TWA 600 ppm 8hours (3/2012) |
| Biological Exposure Indices (BEI) | |
| Propane | No Data Available |
| n-Butane | No Data Available |
| iso-Butane | No Data Available |
| n-Pentane | No Data Available |
| iso-Pentane | No Data Available |

b) Appropriate engineering controls	Adequate ventilation should be provided so that exposure limits are not exceeded. In case of risk explosion, use explosion-proof ventilation equipment.
c) Personal protective equipment	
- Respiratory protection	Use NIOSH approved positive-pressure, supplied air respirator with escape bottle.
- Eye protection	Where there is a possibility of liquid contact, wear splash-proof safety goggles and face-shield.
- Hands protection	Use cold-impervious, insulating gloves where contact with liquid may occur.
- Body protection	Where contact with liquid may occur, wear apron and face-shield.

9. Physical and chemical properties

a) Appearance	
- Color	Colorless
- Physical state	Gas, liquid at low temperature, high pressure
b) Odor	Odorless (before injecting an odorizer), Characteristic odor (after injecting an odorizer)
c) Odor threshold	The odor of gas shall be detected when the gas/air compound ratio reaches 1/1000. (after injecting an odorizer)
d) pH	Not applicable
e) Melting /freezing point	About -155 ~ -138 °C
- Propane	-187.68 °C
- n-Butane	-138.29 °C
- iso-Butane	-159.61 °C
- n-Pentane	-129.8 °C
- iso-Pentane	-159.9 °C
f) Initial boiling point and boiling range	About -10 ~ 0 °C
- Propane	-42.11 °C
- n-Butane	-0.49 °C
- iso-Butane	-11.75 °C
- n-Pentane	36.1 °C
- iso-Pentane	27.85 °C
g) Flash point	About -75 ~ -60 °C
- Propane	-104 °C
- n-Butane	-60 °C
- iso-Butane	-83 °C
- n-Pentane	-49 °C
- iso-Pentane	-51 °C
h) Evaporation rate	No Data Available
i) Flammability (liquid, gas)	Flammable gas
j) Upper / lower flammability	About 8.4 % / 1.6 %
- Propane	9.5% / 2.1%
- n-Butane	8.4% / 1.6%
- iso-Butane	9.6% / 1.8%
- n-Pentane	7.8 % / 1.4 %
- iso-Pentane	9.2 % / 1.3 %

k) Vapor pressure	About 2.5 Bar (at 21 °C)
- Propane	8.587 Bar (at 21 °C)
- n-Butane	2.148 Bar (at 21 °C)
- iso-Butane	3.126 Bar (at 21 °C)
- n-Pentane	0.5790 Bar (at 20 °C)
- iso-Pentane	0.795 Bar (at 21 °C)
l) Solubility	About 60mg/L (at 25 °C)
- Propane	62.5mg/L (at 25 °C)
- n-Butane	61mg/100mL (at 20 °C)
- iso-Butane	48.9mg/L (at 25 °C)
- n-Pentane	40.2mg/L (at 20 °C)
- iso-Pentane	48 mg/L (at 25 °C)
m) Vapor density	About 2 (air=1)
- Propane	1.55
- n-Butane	2.07
- iso-Butane	2.01
- n-Pentane	2.48
- iso-Pentane	2.5
n) Specific gravity	About 0.58 (at 15 °C)
- Propane	0.58088 kg/L (at boiling point, 1.013bar)
- n-Butane	0.60126 kg/L (at boiling point, 1.013bar)
- iso-Butane	0.59382 kg/L (at boiling point, 1.013bar)
- n-Pentane	0.626 kg/L
- iso-Pentane	0.616 kg/L (at boiling point, 1.013bar)
o) Partition coefficient (n-octanol / water)	About 2.85 (log Kow)
- Propane	2.36
- n-Butane	2.89
- iso-Butane	2.76
- n-Pentane	3.39
- iso-Pentane	2.3
p) Autoignition temperature	About 260 °C (The Lowest temperature of all substance)
- Propane	470 °C
- n-Butane	430 °C
- iso-Butane	460 °C
- n-Pentane	260 °C
- iso-Pentane	420 °C
q) Decomposition temperature	No Data Available
r) Viscosity	No Data Available
s) Molecular weight	About 58.4
- Propane	44.0965
- n-Butane	58.1234
- iso-Butane	58.1234
- n-Pentane	72.1503
- iso-Pentane	72.1503

10. Stability and reactivity

a) Chemical stability and possibility of hazardous reactions	Extreme Flammable gas. A leakage of material may present a fire / explosion risk. There is a risk of steam explosion in indoor, outdoor and sewer. It will ignite easily by heat, spark and flame. Vapors may ignite and explode. Vapor can move to the ignition source and flash back. Vapors may cause dizziness or asphyxiant without awareness Cylinders exposed to fire may release flammable gas.
b) Conditions to avoid	Keep away from strong oxidizers, ignition sources and heat – no smoking.
c) Incompatible materials	No Data Available
d) Hazardous decomposition products	Carbon monoxide, carbon dioxide and non-combusted hydrocarbons(smoke).

11. Toxicological information

a) Information on the likely routes of exposure	
- Propane	nausea, vomiting, irregular heart rate, headaches, drowsiness, dizziness, disorientation, emotional lability, inebriation, adjustment (feature) loss, asphyxiant, convulsion, loss of consciousness, lethargy, shortness of breath, central nervous system (CNS) depression. Ingestion of a hazardous amount is unlikely to occur. may cause freeze burns and frostbite.
- n-Butane	It can cause stimulus, nausea, vomiting, shortness of breath, irregular heart rate, headaches, drowsiness, fatigue, dizziness, disorientation, emotional lability, inebriation, adjustment (feature) loss, asphyxiant, convulsion, loss of consciousness, lethargy.
- iso-Butane	It can cause stimulus, nausea, vomiting, headaches, drowsiness, fatigue, dizziness, emotional lability, adjustment (feature) loss, asphyxiant, convulsion, loss of consciousness, lethargy. may cause freeze burns and frostbite
- n-Pentane	It can cause stimulus, nausea, vomiting, stomach ache, shortness of breath, headaches, drowsiness, dizziness, adjustment (feature) loss, asphyxiant. Ingestion of a hazardous amount is unlikely to occur.
- iso-Pentane	It can cause stimulus, nausea, vomiting, stomach ache, shortness of breath, headaches, drowsiness, dizziness, adjustment (feature) loss, asphyxiant. Ingestion of a hazardous amount is unlikely to occur.
b) Health hazards information	
- Acute toxic	No Data Available
Oral	
Dermal	No Data Available
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	LC50 > 2,000 mg/kg Rat
iso-Pentane	
Inhalation	
Propane	LD50 570,000 ppm 15 min Rat
n-Butane	LC50 277,374 ppm 4 hr Rat
iso-Butane	LC50 658,000mg/ m ³ 4 hr Rat
n-Pentane	LC50 364,000mg/ m ³ 4 hr Rat
iso-Pentane	LC50 280,000mg/ m ³ 4 hr Rat

- Skin corrosive / irritant	
Propane	No Data Available (EU Directive 67/548) rabbit /irritating (IUCLID)
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	Non-stimulated (rabbit)
- Serious eye damage / eye irritation	
Propane	No Data Available (EU Directive 67/548/EEC) Rabbit/ not irritating (IUCLID)
n-Butane	Non-stimulated (rabbit)
iso-Butane	Non-stimulated (rabbit)
n-Pentane	No Data Available
iso-Pentane	High-concentrated vapor can stimulate eye.
- Respiratory sensitization	No Data Available
- Skin sensitization	
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	Negative (from the result of Maximization test using a guinea pig)
- Carcinogenicity	Not applicable
The occupational safety and health act (domestic)	No Data Available
Labor Ministry Notice	Not Listed
propane	Not Listed
n-Butane	Not Listed
iso-Butane	Not Listed
n-Pentane	Not Listed
iso-Pentane	Not Listed
IARC	Not Listed
OSHA	Not Listed
ACGIH	No Data Available
NTP	Not Listed
- EU CLP	
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	No Data Available
- Germ cell mutagenicity	
Propane	No Data Available
n-Butane	Back mutation test using microorganism – negative
iso-Butane	Back mutation test using microorganism – negative
n-Pentane	No Data Available
iso-Pentane	Mammal bone marrow micronucleus test – negative

- Reproductive toxicity	0
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	First generation reproductive toxicity test result : No reproductive toxicity was
- Specific target organ toxicity (single exposure)	Not applicable (EU Directive 67/548/EEC)
Propane	No Data Available
n-Butane	In high concentration, causing narcosis and depressing-central nervous system.
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	Narcotization was reported for inhalation exposure : Rat
- Specific target organ toxicity (repeated exposure)	
Propane	No Data Available
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	No Data Available
- Aspiration hazard	No Data Available

12. Ecological information

a) Aquatic and terrestrial ecotoxicity

- fish	
Propane	LC50 > 100 mg/L 96 hr ((Species : Fish TLm))
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	No Data Available
- Crustacean	
Propane	LC50 52.157 mg /L 48 hr
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	EC50 2.3 mg/L 48 hr
- Algae	
Propane	LC50 32.252 mg /l 96 hr
n-Butane	No Data Available
iso-Butane	No Data Available
n-Pentane	No Data Available
iso-Pentane	No Data Available

b) Persistence and degradability

- Persistence	
Propane	log Kow 2.36
n-Butane	log Kow 2.89
iso-Butane	log Kow 2.76
n-Pentane	No Data Available
iso-Pentane	log Kow 2.30
- Degradability	No Data Available

c) Bioaccumulative potential	
- Accumulative	
Propane	BCF 13
n-Butane	No Data Available
iso-Butane	BCF 1.57~1.97
n-Pentane	No Data Available
iso-Pentane	No Data Available
- Biodegradability	
Propane	65.7% 35day
n-Butane	65.7% 35day (aerobic, microbes, well-decomposed)
iso-Butane	65.7% 36day (aerobic, microbes, well-decomposed)
n-Pentane	No Data Available
iso-Pentane	No Data Available
d) Mobility in soil	No Data Available
e) Other adverse effects	No Data Available (the components ratio of pentanes is less than 2.5 %)

13. Disposal considerations

a) Disposal method	All disposal practices must be in compliance with all laws and regulations with elimination of the risk of explosion.
b) Disposal precaution	Beware of fire and explosion hazards due to residual gas in the container like cylinder or tank. Disposal should be in accordance with applicable regional, national and local laws and regulations.

14. Transport information

a) UN number	2037
Propane	1978
n-Butane	1969
iso-Butane	1011
b) UN proper shipping name	RECEPTACLES, SMALL, CONTAINING GAS (GAS CARTRIDGES) without a release device, non-refillable
c) Transport hazard class(es)	2.1
d) Packing group, if applicable	No Data Available
e) Environmental hazards	No Data Available
f) Special precaution for user	
- emergency procedures in a fire	F-D
- emergency procedures with the gas	S-U

15. Regulatory information

a) Regulations by the occupational safety and health agency	
Propane	Not applicable
n-Butane	Substance with exposure limits
iso-Butane	Not applicable
n-Pentane	Not applicable
iso-Pentane	Not applicable

b) Act on registration, evaluation, etc of chemicals (domestic)	
Propane	Not Listed
n-Butane	Not Listed
iso-Butane	Not Listed
n-Pentane	Not Listed
iso-Pentane	Not Listed
c) Chemicals control act (domestic)	
Propane	Not Listed
n-Butane	Not Listed
iso-Butane	Not Listed
n-Pentane	Not Listed
iso-Pentane	Not Listed
d) Regulation by the act on the safety control of hazardous substances (domestic)	
	Not applicable
e) Regulation by wastes control act (domestic)	
Propane	Designated waste material
n-Butane	Designated waste material
iso-Butane	Designated waste material
n-Pentane	No Data Available
iso-Pentane	No Data Available
f) The other regulation by domestic and foreign act	
- Domestic regulation	
Persistent organic pollutants control act	Not applicable
High-pressure gas safety control act	Flammable, Liquefied gas
Safety control and business of liquefied petroleum gas act	Liquefied petroleum gas
- Foreign regulation	
OSHA regulation	Not regulated
CERCLA103 (40CFR302.4)	Not regulated
SARA302 (40CFR355.30)	Not regulated
SARA304 (40CFR355.40)	Not regulated
SARA311/312 (40CFR370.21)	Not regulated
SARA313 (40CFR372.65)	Not regulated
EPCRA (section302)	Not regulated
EPCRA (section304)	Not regulated
EPCRA (section 313)	Not regulated
Rotterdam Convention	Not regulated
Stockholm Convention	Not regulated
Montreal protocol	Not regulated
EU REACH (classification result)	F+; R12
iso-Pentane	F+; R12 Xn; R65, R66, R67 N; R51/53
EU REACH (risk statement)	R12
Propane	R12
n-Butane	R12,R67
iso-Butane	R12
n-Pentane	R12, R51/53, R65, R66, R67

EU REACH(safety statement)	S2, S9, S16
Propane	S2, S9, S16
n-Butane	S2, S9, S16
iso-Butane	S2, S9, S16
n-Pentane	S2, S9, S16, S33, S61, S62
iso-Pentane	S2, S9, S16, S33, S61, S62

16. Other information

a) Information source and references

ECB-ESIS(European chemical Substances Information System)(<http://ecb.jrc.it/esis>)
 ECOTOX Database, EPA(<http://cfpub.epa.gov/ecotox>)
 IUCLID Chemical Data Sheet, EC-ECB
 International Chemical Safety Cards(ICSC)(<http://www.nihs.go.jp/ICSC>)
 TOXNET, U.S. National Library of Medicine(<http://toxnet.nlm.nih.gov>)
 The Chemical Database, The Department of Chemistry at the University of Akron(<http://ull.chemistry.uakron.edu/erd>)
 Transport of Dangerous Goods - UN
 Chemical Information System, National Environmental Science Institute(<http://ncis.nier.go.kr>)
 Korea Occupational Safety and Health Agency MSDS Database
 Corporate Solution From Thomson Micromedex(<http://csi.micromedex.com>)
 Industrial poisoning handbook, Shin Kwang Publishing Co.
 Dangerous Material Information Management System, National Emergency Management Agency
 (<http://hazmat.nema.go.kr>)
 UN RTDG
 ICSC
 PATTY(4th, 1994)
 ACGIH (7th, 2001)
 Air liquide (<http://encyclopedia.airliquide.com>)
 Airgas (<http://www.airgas.com>)
 Wikipedia (<http://en.wikipedia.org>) GHS
 (Rev.7) (2017) 7th Ed

b) First Date Created

c) Number of revisions and date of last revision

Number of revisions

Date of last revision

d) The other information

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