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

+49-30-767647-0 - Emergency phone number

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 (narcosism)

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. Page 1/12

c) Other Hazard Risk (NFPA)

- Propane

1 (slightly hazardous) Health

4 (flash points below 22.7 °C) Flammability

0

1

4

0

Reactivity 0 (stable)

- n-Butane

Health 1 4 Flammability 0 Reactivity

- iso-Butane

Health 1 4 Flammability 0 Reactivity - n-Pentane Health 1 4 Flammability

Reactivity

- iso-Pentane

Health Flammability Reactivity

3. composition / information in ingredients			
Chemical name	Other name	CAS 번호	Content (wt%)
Propane	f ¹ ropane	74-98-6	0 <= x%< 5
Butanes	Butane	68513-65-5	-
- n-Butane	n-Butane	106-97-8	50 <= x%< 70
- iso-Butane	iso-Butane	75-28-5	25 <= x%< 35
1,3-Butadiene	1,3-Butadiene	106-99-0	< 0.1%
Total			100 %

4. First aid measure

a) Eye contact

Seek medical attention immediately.

b) Skin contact

If frostbite has occurred, seek medical attention immediately; Do NOT rub the

affected areas.

In order to prevent further tissue damage, do NOT attempt to remove frozen clothing and cool the frostbite part as long as possible with cold water.

Before to remove frozen clothing, thaw it

If frostbite has NOT occurred, immediately wash contaminated skin with soap and

water.

If skin trouble occurred, get medical attention and advice.

c) Inhalation

Seek medical attention immediately.

Keep the affected person warm and at rest.

If a person breathes large amounts of this chemical, move the exposed person to

fresh air place

If breathing is difficult, give oxygen.

If breathing has stopped, perform mouth-to-mouth resuscitation.

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 $54\,^{\circ}\text{C}/130\,^{\circ}\text{F}$) 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.

b) Environmental precautions and

protective procedures

Keep out of drains, sewers, ditches and waterways.

Use appropriate container to avoid environmental contamination.

Cover with absorbent or contain, Collect and dispose.

d) Methods and materials for containment If possible, release in vapor by turning over leaking container.

Clean the contaminated zone using cleanser and water.

Use water spray/fog for prevent spread.

7. Handling and storage

a) Precautions for safe handling

To avoid sudden release of pressure, loosen closure cautiously before opening.

Avoid inhalation, skin and eyes.

Use only clean, dry utensils in handling.

Minimize dust generation and accumulation.

Do not smoke or use matches or lighters during use and until vapors are gone.

To dissipate static electricity during transfer, ground drum and connect to receiving

container with bonding strap.

Avoid prolonged or repeated skin contact.

Wash thoroughly after handling. Avoid breathing gas or vapor.

b) Conditions for safe storage

(including any incompatibilities)

Keep away from heat, spark and flame – No Smoking.

Avoid direct sunlight and store in a well-ventilated place.

The empty cylinder should be completely drained, properly blocked and $% \left(1\right) =\left(1\right) \left(1$

immediately returned to the cylinder regulator. Place it properly.

Stored containers should be periodically checked for general conditions and

leakage.

Keep container tightly closed. Store in a cool, well-ventilated area.

8. Exposure controls and personal protection

a) Control parameter and Biological Exposure Indices

Domestic regulation

 Propane
 TWA - 1,000ppm 1,800mg/m3

 n-Butane
 TWA - 800ppm 1,900mg/m3

 iso-Butane
 TWA - 800ppm 1,900mg/m3

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

- Eye protection Where there is a possibility of liquid contact, wear splash-proof safety goggles and face-

shield.

- 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)

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 \sim -138 $^{\circ}$ C

- Propane -187.68 ℃
- n-Butane -138.29 ℃
- iso-Butane -159.61 ℃
- n-Pentane -129.8 ℃
- iso-Pentane -159.9 ℃

f) Initial boiling point and boiling range About -10 $\sim 0^{\circ}$

- Propane -42.11℃
- n-Butane -0.49℃
- iso-Butane -11.75℃
- n-Pentane 36.1℃
- iso-Pentane 27.85℃

g) Flash point About -75 \sim -60 $^{\circ}$ C

- Propane $-104\,^{\circ}$ C
- n-Butane $-60\,^{\circ}$ C
- iso-Butane $-83\,^{\circ}$ C
- n-Pentane $-49\,^{\circ}$ C
- iso-Pentane $-51\,^{\circ}$ C

h) Evaporation rate
No Data Available
i) Flammability (liquid, 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) I) 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)

- Propane
 - n-Butane
 - iso-Butane
 - n-Pentane
 - iso-Pentane
 2.5

- iso-Pentane

m) Vapor density

n) Specific gravity About 0.58 (at 15℃)

- Propane
- n-Butane
- iso-Butane
0.58088 kg/L (at boiling point, 1.013bar)
- iso-Butane
0.59382 kg/L (at boiling point, 1.013bar)
0.59382 kg/L (at boiling point, 1.013bar)

48 mg/L (at 25 °C)

About 2 (air=1)

- 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
 - n-Butane
 - iso-Butane
 - n-Pentane
 - iso-Pentane
 2.3

p) Autoignition temperature About 260 °C (The Lowest temperature of all substance)

- Propane $470\,^{\circ}$ - n-Butane $430\,^{\circ}$ - iso-Butane $460\,^{\circ}$ - n-Pentane $260\,^{\circ}$ - iso-Pentane $420\,^{\circ}$

q) Decomposition temperatureNo Data Availabler) ViscosityNo Data Available

s) Molecular weight
- Propane
- n-Butane
- iso-Butane
- n-Pentane
- iso-Pentane

10. Stability and reactivity

a) Chemical stability and possibility of Extreme Flammable gas.

hazardous reactions 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,

 $head a ches, \, drows in ess, \, dizziness, \, adjustment \, (feature) \, loss, \, as phyxiant.$

Ingestion of a hazardous amount is unlikely to occur.

- iso-Pentane It can cause stimulus, nausea, vomiting, stomach ache, shortness of breath,

 $headaches,\, drows in ess,\, dizziness,\, adjustment\,\, (feature)\,\, loss,\, as phyxiant.$

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

- Skin corrosive / irritant

No Data Available (EU Directive 67/548) rabbit /irritating (IUCLID) Propane

No Data Available n-Butane No Data Available iso-Butane No Data Available n-Pentane Non-stimulated (rabbit) iso-Pentane

- Serious eye damage / eye irritation

No Data Available (EU Directive 67/548/EEC) Rabbit/ not irritating (IUCLID) Propane

Non-stimulated (rabbit) n-Butane Non-stimulated (rabbit) iso-Butane No Data Available n-Pentane

High-concentrated vapor can stimulate eye. iso-Pentane

No Data Available - Respiratory sensitization

- Skin sensitization

No Data Available Propane No Data Available n-Butane No Data Available iso-Butane No Data Available n-Pentane

Negative (from the result of Maximization test using a guinea pig) iso-Pentane

Not applicable - Carcinogenicity No Data Available

The occupational safety and

health act (domestic)

Not Listed Labor Ministry Notice Not Listed propane Not Listed n-Butane Not Listed iso-Butane n-Pentane Not Listed iso-Pentane Not Listed Not Listed **IARC** Not Listed **OSHA**

ACGIH No Data Available NTP Not Listed

- EU CLP

No Data Available Propane n-Butane No Data Available No Data Available iso-Butane n-Pentane No Data Available No Data Available iso-Pentane

- 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

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 Not applicable (EU Directive 67/548/EEC)

(single exposure)

Propane No Data Available

n-Butane In high concentration, causing narcosism 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

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 harzad class(es) 2.

d) Packing group, if applicablee) Environmental harzardsNo Data Available

f) Special precaution for user

emergency procedures in a fireemergency procedures with the gasS-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 pollutans control act Not applicable

High-pressure gas safety control act

Safety control and business of

Flammable, Liquefied gas

Liquefied petroleum gas

liquefied petroleum gas act

- Foreign regulation

OSHA regulation Not regulated Not regulated CERCLA103 (40CFR302.4) SARA302 (40CFR355.30) Not regulated Not regulated SARA304 (40CFR355.40) SARA311/312 (40CFR370.21) Not regulated Not regulated SARA313 (40CFR372.65) EPCRA (section 302) Not regulated EPCRA (section 304) Not regulated Not regulated EPCRA (section 313) Not regulated Rotterdam Convention Not regulated Stockholm Convention 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
 \$2, \$9, \$16

 n-Butane
 \$2, \$9, \$16

 iso-Butane
 \$2, \$9, \$16

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

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- 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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