R 600a - Profi

1. Identification of the substance / preparation and of the company

Substance / preparation:

Trade name:	R 600a - Profi
Other means of identification:	Isobutane
Use of the substance / preparation:	Refrigerant

Company identification:

GHC Gerling, Holz & Co. Handels GmbH	Telephone: +49 (0) 40 - 853 123 - 0
Ruhrstraße 113	Telefax: +49 (0) 40 - 853 123 - 66
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Emergency Phone:

GHC Gerling, Holz & Co. Handels GmbH	Telephone: +49 (0) 40 - 853 123 - 0

2. Composition / Information on ingredients

Product name:	R 600a (liquefied gas)	Concentration:	≥ 95 %
Hazardous symbols:	F+	CAS-No.:	75-28-5
R-phrases:	R 12	EC-No. (EINECS):	200-857-2
(Full text of R-phrases: see section 15.)		UN-No.:	2037

Ingredients:

Ingredient	Chem. formula	% w/w	CAS-No.	EC-No. (EINECS)	Hazardous symbols	R-Phrases
Isobutane	$(CH_3)_3$-CH	> 95	75-28-5	200-857-2	F+	R 12
n-Butane	H_3C-$(CH_2)_2$-CH_3	< 5	106-97-8	203-448-7	F+	R 12
Propane	H_3C-CH_2-CH_3	< 3	74-98-6	200-827-9	F+	R 12

Hazard(ous) impurity(ies): < 0,01 % 1,3 Butadiene; < 0,01 % Ethane

3. Hazards identification

Classification:

Extremely flammable (R 12).

Additional human health effect(s) and environmental effect(s):

Acute toxicity: Liquefied gas: Contact with the product may cause cold burns / frostbite.
Central nervous system disorders upon exposure to high concentrations.
Chronical toxicity: Repeated overexposure may lead to central nervous system disorders.

Dangerous substances are released in case of incomplete combustion.
Risk of formation of explosive gas air mixtures.
The vapour of the product is heavier than air and may accumulate below ground level, in pits, channels and basements in higher concentration.

4. First-aid measures

General information:

Take off immediately all contaminated clothing not adhering to the body. Seek medical advice. Note precautions for self-protection of first-aider.

On inhalation:

Move affected person into fresh air, keep warm and allow to rest. If there is difficulty in breathing, give oxygen. In case of respiratory arrest, ventilation with Ambu bag or ventilator or perform mouth to nose or mouth to mouth respiration. Medical treatment necessary.

On contact with skin:

Do not tear away clothing frozen to the skin. Defrost with plenty of lukewarm water. Do not rub! Cover with sterile bandage, prevention of further heat loss. Take affected person for medical treatment (emergency physician).

On contact with the eyes:

On contact with the eyes, rinse immediately with plenty of water for 15 minutes without spread of the eyelids. No application of heat. Protect uninjured eye. Seek ophthalmic treatment.

If swallowed:

Swallowing is not considered a potential route of exposure (gas).

Information for the doctor:

Pay attention to symptoms of respiratory insufficiency on inhalation of high concentrations. Blood circulation control is absolutely necessary.

5. Fire- fighting measures

Suitable extinguishing media:

Dry powder, carbon dioxide. Use a fire extinguisher with gas nozzle. In case of valve fire, use fire-fighting powder; direct the jet towards the flame front.

Extinguishing media which must not be used for safety reasons:

No data available.

Special exposure hazards arising from the substance, combustion products or resulting gases:

Risk of formation of explosive gas air mixtures.
Substances potentially set free in case of fire (incomplete combustion): carbon monoxide

Special protective equipment for firefighting:

Use breathing apparatus with independent air supply (isolated).

Additional information:

Escaping gas can be blown off by using a directed spray. Extinguish only if gas flow can be interrupted. Explosion hazard due to gas agglomeration and backfire. Cool neighbouring containers with water spray. Move containers out of danger zone (where possible). Risk of pressure increase, bursting and explosion hazard upon heating. Use only explosion proof and non-sparking equipment and devices. Remove sources of ignition. Vapours spread along floors. Increased hazard associated with escape of liquid phase! Explosion hazard when released into sewerage.

6. Accidental release measures

Personal precautions: see section 8. Evacuate area.

Environmental precautions:

Contain spillage.
Do not allow to enter into soil / subsoil. Do not allow to enter drains / surface waters / groundwater.
In case of entry into waterways, soil or drains, inform the responsible authorities - Risk of explosion.
Keep away sources of ignition. Increased hazard associated with escape of liquid phase! Explosion hazard when released into sewerage.

Methods for cleaning up:

Transfer leaking cylinders to salvage packaging (pressure receptacle) or supply for disposal by an appropriate method (see section 13). Ventilate area. Keep area evacuated and free from ignition sources until any spilled liquid has evaporated (ground free from frost).

7. Handling and Storage

Handling:

- Hints for safe handling: It is essential to design all working procedures principally to avoid the following: Inhalation of substance, skin contact, eye contact. Open and handle container with care.
  Vapours / aerosols should be exhausted directly at place of formation.
  Keep vapours away from hot surfaces (risk of decomposition). Avoid decomposition of vapours by electric arc (welding).
- Technical measures: When filling, transferring, measuring out or sampling have to be used: closed arrangements, which is properly specified and suitable for the product, its supply pressures and temperatures. Dangerous pressure levels can result from the effect of heat. Therefore suitable safety arrangements must be used.

- Hints for protection against fire and explosion: Product is combustible. Have fire-extinguishers in readiness. Observe national regulations and guidelines on explosion protection. Take precautionary measures against electrostatic loading. Vapours may form an explosive mixture with air. Explosion area. Keep away from sources of ignition – refrain from smoking. Keep away from hot surfaces.
- Other hints: Ensure good aeration and ventilation of the workplace. Since vapours / gases are heavier than air, corresponding ventilation must be provided in the basement area.

Storage:

- Requirements for storage rooms and vessels:
  Keep container tightly closed and store in a cool, well ventilated place. Protect from heat.
- Packaging materials: All standard materials. Unsuitable: polyisobutylene, ethylcellulose, silicone rubber.
- Hints on storage assembly: Do not store with pharmaceuticals, foods, and animal feeds including additives; infectious, radioactive and explosive materials; spontaneously flammable gases in contact with water; organic peroxides; oxidizing agents of group 1 - 3 of TRGS 515; extremely flammable, highly flammable and flammable substances; high toxic and toxic substances. This product should not be stored with substances, which dangerous chemical reactions are possible (see section 10).
- Further information on storage conditions: max. storage temperature: 50 °C.
- Germany: The provisions of TRGS 280 should be observed.
  Storage class: 2A (Compressed, liquefied or dissolved gases.)

Specific use(s): Not applicable.

8. Exposure limitation and personal protective equipment

Exposure limits:

OSHA PEL:	800 ppm	(n-Butane)
ACGIH TLV-TWA:	1000 ppm	(aliphatic hydrocarbon gases (2004)
MAK (TRGS 900):	2400 mg/m³ = 1000 ppm	Threshold limit factor: 4

Occupational exposure controls:

- Respiratory protection: Escapes with adequate ventilation. In an emergency (e.g. unintentional release of substance) respiratory protection must be worn. Observe the wear time limits.
  Filter apparatus against gases and vapours: Gas filter AX, identification colour: brown.
  Respiratory protection: insulating device. Use for concentrations above the usage limits for filter device, for oxygen concentration below 17 % volume, or in circumstances which are unclear.
  Use only respiratory protection equipment that complies with national / international standards.
- Hand protection: Leather gloves as protection against frostbite as well as chemical resistant protective gloves. Suitable materials: PVC, nitrile rubber.
- Eye protection: Eye glasses with side protection. Basket eye glasses.
- Protective clothing: Safety footwear and flame resistant and antistatic protective clothing.
- General health and safety measures: Do not eat, drink, smoke or take snuff while working. Keep away of foods drinks and feeding stuffs. Wash hands before breaks and on finishing work.
  Avoid contact with eyes, skin and clothing. Do not breathe gas/fume/vapour.

Environmental exposure controls

See section 7. No additional measures necessary.

9. Physical and chemical Properties

General information:

Physical state:	Liquified under pressure
Colour:	Colourless, clear
Odor:	slightly sweetish

Important health, safety and environmental information:

pH-value:		Not applicable
Melting-point / Melting range:		- 159.6 °C
Boiling point / Boiling range:		- 11.7 °C
Flash point:		- 83 °C
Explosion limits:	lower:	1.3 %
	upper:	9.8 %
Ignition temperature:		460 °C

Critical temperature:	135 °C	
Critical pressure:	36500 hPa	
Vapour pressure:	3010 hPa	(at 20 °C)
Vapour pressure:	4100 hPa	(at 30 °C)
Vapour pressure:	6900 hPa	(at 50 °C)
Density:	0.594 g/cm³	(at 20 °C)
Vapour density:	2.65 g/l	(at 0 °C)
Relative vapour density (air = 1):	2.11	
Water solubility:	49 mg/l	(at 20 °C)
Fat solubility:	No data available.	
Solubility in org. menstruum:	Easily soluble	
Partition coefficient:	2.76	n-Octanol / water (log p O/W)
Viscosity (dynamic):	No data available	

10. Stability and Reactivity

Conditions to avoid:

Warmth, warmth sources, sources of ignition, electrostatic loading, explosive gas air mixtures.

Materials to avoid:

Ignition or explosion upon contact with strong oxidising agents. Spontaneous reaction or explosive reaction upon thermal or catalytic ignition of mixtures with strong oxidising gases such as oxygen, chlorine, dinitrogen oxide, nitrogen tetraoxide and acetylene.

Hazardous decomposition products: Incomplete combustion may produce carbon monoxide.

Further informations: No decomposition if used as prescribed.

11. Toxicological information

Toxicity tests:

- Acute toxicity:
  LC_{50} inhalative, rat: 520 000 ppm (2 h exposure)
  LD_{50} inhalative, mouse: 570 000 ppm (15 min. exposure)
- Specific symptoms in animal studies: Rabbit eye: 4 s exposure to 0.1 ml 22% aerosol and subsequent rinsing with water: After one hour were shown only light, reversible changes (short term) (conjunctivitis, iritis) without provable affection of the cornea. The extent of the effects on the heart and circulatory system (increase of myocardial sensitivity induced from adrenaline) was judged differently. Studies in dogs have demonstrated that a corresponding potential cannot be neglected at least. No data available referring to inhalative challenge test responses from animal testing with repeated exposure to pure isobutene.
- Irritant-/corrosive effects: Even at high concentrations, gaseous isobutane has no irritating effect to eyes and skin. Skin contact with liquefied gas may cause frostbite (cold burn) (erythema, oedema, deep necrosis) due to the elevated negative heat of evaporation. Toxic effects from resorption induced by exclusive skin contact are improbable.
  Inhalation: no subjective or clinical symptoms induced by 250 to 1000 ppm (8 hrs exposure), nor provable effects on the heart, lung, central nervous system (CNS), blood and renal function. Higher concentrations (exceeding 100000 ppm) lead to narcotic effects that include a feeling of weakness, headaches, nausea and vomiting, dizziness and lethargy. Superior concentrations lead to anaesthetic effects and may cause death by asphyxia. Anaesthesia becomes evident within 10 minutes upon exposure to concentrations of 450000 ppm. Clinical symptoms induced by lethal concentrations (550000 ppm) are central nervous system depression, rapid shallow respiration and apnoea.
- Sensitization: No study results available. Present experiences of handling this liquefied gas haven't shown any sensitising effect.
- Subacute to chronical toxicity: Upon exposure to 500 ppm (8 h/d, 5 d/w, 2 weeks), test subjects have shown neither clinical symptoms of intoxication nor effects (various physical malfunctions). At the end of two weeks has been noted a reduction of visually evoked potentials that may have been induced by a CNS depression.
- Carcinogenic, mutagenic and reproductive toxic effects:

  Carcinogenicity: No data available. Presence of a carcinogenic risk is only associated to the presence of 1,3-butadiene impurities in concentrations ≥ 0,1 % .

  Genotoxicity: Isobutane hasn' t shown any genotoxic effect during the Ames Test (with and without metablic activation).

Reproductive toxicity and fetotoxicity: No data from animal testing available. A teratogenic effect is to be expected only under extreme conditions. In this case it may be induced by oxygen deficiency (maternal anoxia).

Experiences made in practice:

- Observations relevant for classification / Other observations: No data available.

12. Ecological information

Ecotoxicity:

Fish toxicity: No data available.
Daphnia toxicity: No data available.
Algae toxicity: No data available.
Harmful effects of this product on the environment are not known**.**

Mobility: No data available.

Information about elimination (persistence and degradation): No data available.

Taking up and accumulation in organisms (bioaccumulation potential):

Partition coefficient -Octanol / water (log p O/W) = 2.76. Evaluation: moderate bioaccumulation potential.

Other adverse effects: No data available.

Further ecological information:

- Chemical oxygen deman (COD): / Biochemical oxygen demand (BOD): no data available.

13. Disposal considerations

Disposal / Waste (product): Ask the supplier / manufacturer.
Disposal in accordance with national / local legislation / regulations.

List of proposed waste codes / waste designations in accordance with EWC:

16 05 04 - gases in pressure containers (including halons) containing dangerous substances
Hazardous waste pursuant to Directive 91/689/EEC.

Uncleaned Packages: Return packaging to the supplier / manufacturer.

14. Transport information

Land transport (ADR/GGVS, RID/GGVE):

Label: 2.1 Hazard No.: Flamm. gas *Class / classification code: 2 / 5 F*
UN-No.: 2037 Name of substance: RECEPTACLES, SMALL, CONTAINING GAS (GAS CARTRIDGES) without a release device, non-refillable

Marine transport (IMDG):

Class: 2 packing groupe: - EmS: F-D, S-U marine pollutant: no
UN-No.: 2037 Name of substance: RECEPTACLES, SMALL, CONTAINING GAS (GAS CARTRIDGES) without a release device, non-refillable

Air transport ICAO/IATA:

Class: 2.1 packing instruction: Y203
UN/ID-No.: 2037 Name of substance: GAS CARTRIDGES (flammable) without a release device, non-refillable

Other informations: None.

15. Regulatory information

Labelling:

- Hazardous symbols:	F+	Extremely flammable.
- R-phrase:	R 12	Extremely flammable.
- S-phrase:	S 9	Keep container in a well-ventilated place.
	S 16	Keep away from sources of ignition - No smoking.
	S 33	Take precautionary measures against static discharges.

National regulations:

Observe the national legislative regulations.
EU

- Directive 96/82/EC :	Control of major-accident hazards involving dangous substances Annex 1 Part 2 Categorie 8
- Directive 1999/13/EC:	This chemical is a VOC according to Directive 1999/13/EC.
- Water hazard class (Germany):	nwg (not water hazardous) (Classification according VwVwS, Annex 1)

Other regulations: None.

16. Other informations

The information given corresponds to the current state of our knowledge and experience of the product, and is not exhaustive. This applies to product which conforms to the specification, unless otherwise stated. In the case of combinations and mixtures one must make sure that no new dangers can arise. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and protection of human welfare and the environment.