
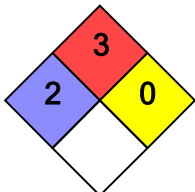


Identification			
Name	n-Butyl alcohol	Reference numbers	
IUPAC name	butan-1-ol	UN number	1120
Proper shipping name	BUTANOLS	CAS number	71-36-3
Product name	n-butyl alcohol	EINECS	200-751-6
		Index number	603-004-00-6
<b>Other names</b> (more on page 11)	1-hüdoksübutaan Butüülalkohol n-Butanol 1-Butanol (9CI) Butyl alcohol (8CI)		

Reference: 2, 10, 42, 44

Substance Properties	
Flammable colourless liquid and vapours with pungent odour. Dissolver. May form explosive mixtures.	
<b>Class</b>	Flammable liquids
<b>Main uses</b>	Solvents, disinfectants, adhesives.
<b>Appearance</b>	Colourless, clear liquid
<b>Odour</b>	Pungent, acrid
<b>Behaviour (EBCS)</b>	D - dissolver



Reference: 2, 10, 178

Fire Codes			
Legend	no risk  severe risk		
Health	Blue (Left)	0 to 4	
Flammability	Red (Top)	0 to 4	
Reactivity	Yellow (Right)	0 to 4	
Special Hazards	White (Bottom)	OX means "oxidizer" W means "use no water"	

Reference: 10

**Warning: Danger of ignition at ambient temperatures.**

Reference: 10

Maritime transport codes					
IMDG			IBC		
UN number		1120	Marine pollution category 	Z	Chapt. 18 - IBC does not apply
Hazard class	3	Flammable liquids			
Subsidiary risks	-		Hazards		
Packing group	II	Moderate hazard	Ship type		
Emergency schedule EmS	F-E	Non-water-reactive flammable liquids	Tank type		
	S-D	Flammable liquids			
Placard / label			Tank vents		
			Gauging		
			Tank environmental control		
			Vapour detection		
			Fire protection		
Stowage and segregation	Cat.B	Cargo or passenger ships with < 25 passengers or 1 passenger/3 m length - stowage on or under deck; other passenger ships with more passengers - stowage on deck only	Emergency equipment		
Marine pollutant	No				

Reference: 2, 44, 229

GESAMP profile		1	2	3	4	5	6
<b>Bioaccumulation &amp; biodegradation</b>	A1 Bioaccumulation	0					
	A2 Biodegradation	R: Readily biodegradable					
<b>Aquatic toxicity</b>	B1 Acute aquatic toxicity	0					
	B2 Chronic aquatic toxicity	NI: No information					
<b>Acute mammalian toxicity</b>	C1 Mammalian acute oral toxicity	0					
	C2 Mammalian acute dermal toxicity	0					
	C3 Mammalian acute inhalation toxicity	0					
<b>Irritation, corrosion and long term health effects</b>	D1 Skin irritation and corrosion	2: Irritating					
	D2 Eye irritation and corrosion	3: Severely irritating					
	D3 Long-term health effects						
<b>Interference with other uses of the sea</b>	E1 Tainting	NT: Not tainting (tested)					
	E2 Physical effects on wildlife & benthic habitats	D: Dissolves					
	E3 Interference with coastal amenities	3					
<b>Legend</b>		<div> <div></div> maximum value </div> <div> <div></div> maximum value reached </div> <div> <div></div> ( ) indicative or provisional classification </div>					

Reference: 1

## Overview

Narcotic effect. Serious irritation of eyes, irritation of respiratory tract. Severe inflammation of eyes, irritation of skin.

Reference: 10

## CLP/GHS classification and hazard communication

### GHS pictogram



### Signal word

**danger / warning**

### Hazard statements

Flam. Liq. 3	H226	Flammable liquid and vapour.
Acute Tox. 4	H302	Harmful if swallowed.
Skin Irr. 2	H315	Causes skin irritation.
Eye Dam. 1	H318	Causes serious eye damage.
STOT SE 3	H335	May cause respiratory irritation.
STOT SE 3	H336	May cause drowsiness or dizziness.

### Precautionary statements

P210	Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/ bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ .../ equipment.
P242	Use only non-sparking tools.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ take off immediately all contaminated clothing. Rinse skin with water/ shower.
P370 + P378	In case of fire: Use ... for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to ...

Reference: 178

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Health hazards	
<b>If swallowed</b>	Harmful
<b>If inhaled</b>	Irritation
<b>Skin/eye contact</b>	Serious irritation and severe inflammation of eyes, irritation of skin.
<b>Odour threshold concentration</b>	unbekannt
<b>Toxicity</b>	<p>Workers:</p> <p>Long-term exposure - local effects</p> <p>Inhalation DNEL (Derived No Effect Level) 310 mg/m<sup>3</sup>,</p> <p>General population:</p> <p>Long-term exposure - systemic effects</p> <p>Oral DNEL (Derived No Effect Level) 3.125 mg/kg bw/day,</p> <p>Long-term exposure - local effects</p> <p>Inhalation DNEL (Derived No Effect Level) 55 mg/m<sup>3</sup>.</p>

Reference: 10, 178

Substance intrinsic hazards					
<b>Fire explosion</b>	Flammable liquid and vapours, may form explosive mixtures.				
<b>Fume hazards</b>	Vapours may form explosive mixture with air.				
<b>Reaction with other substances</b>					
Acids	No	Shock	No	Oxidising agents	Yes
Air	No	Fresh/sea water	No	Alkalis	No
With reducing agents	No				
With other substances					
Combustion by-products	Vapours may form explosive mixture with air. In case of fire/thermal decomposition: formation of toxic narcotic vapours.				

Reference: 10

Environmental hazards	
<b>Behaviour</b>	Dissolves slowly. Possibility of explosive mixtures in warm conditions.
<b>Viscosity</b>	Water-like
<b>Eco toxicity</b>	<p>PNEC aqua (freshwater) 0.082 mg/L,</p> <p>PNEC aqua (marine water) 0.0082 mg/L,</p> <p>PNEC aqua (intermittent releases) 2.25 mg/L,</p> <p>PNEC STP 2476 mg/L,</p> <p>PNEC sediment (freshwater) 0.178 mg/kg sediment dw,</p> <p>PNEC sediment (marine water) 0.0178 mg/kg sediment dw,</p> <p>PNEC soil 0.015 mg/kg soil dw.</p>

Reference: 10, 178

## Emergency health measures

### Always consult a doctor!

<b>Symptoms</b>	Narcotic effect. Irritation of eyes, respiratory tract. Severe inflammation of eyes, irritation of skin.
<b>First aid response</b>	
Inhalation	If difficulties occur after vapour/aerosol has been inhaled, remove to fresh air and seek medical attention.
Ingestion	Rinse mouth immediately and then drink plenty of water, seek medical attention.
Skin contact	Wash thoroughly with soap and water.
Eye contact	Immediately wash affected eyes for at least 15 minutes under running water with eyelids held open, consult an eye specialist.

Reference: 10, 178

## Emergency response measures on board of vessels

<b>Response actions</b>	KEEP UNAUTHORISED PERSONNEL AWAY. STAY UPWIND. KEEP OUT OF LOW AREAS/CONFINED SPACES. VENTILATE CLOSED SPACES BEFORE ENTERING. ALOHA danger zone: Initial safety zone (100 m <sup>3</sup> release, wind speed 1 m/s): Downwind >10 km, 90 degrees 10 km. For large amounts: Pump off product. For residues: Pick up with suitable absorbent material (e.g. sand, sawdust, general-purpose binder).
<b>In case of leakage</b>	
In open area	If possible, close leak. Chemical binder. Cover residual quantities, place ready in closed containers. Seal off low-lying rooms. Remove ignition sources.
In confined space	If possible, close leak. Chemical binder. Cover residual quantities, place ready in closed containers. Seal off low-lying rooms. Remove ignition sources.
To water	

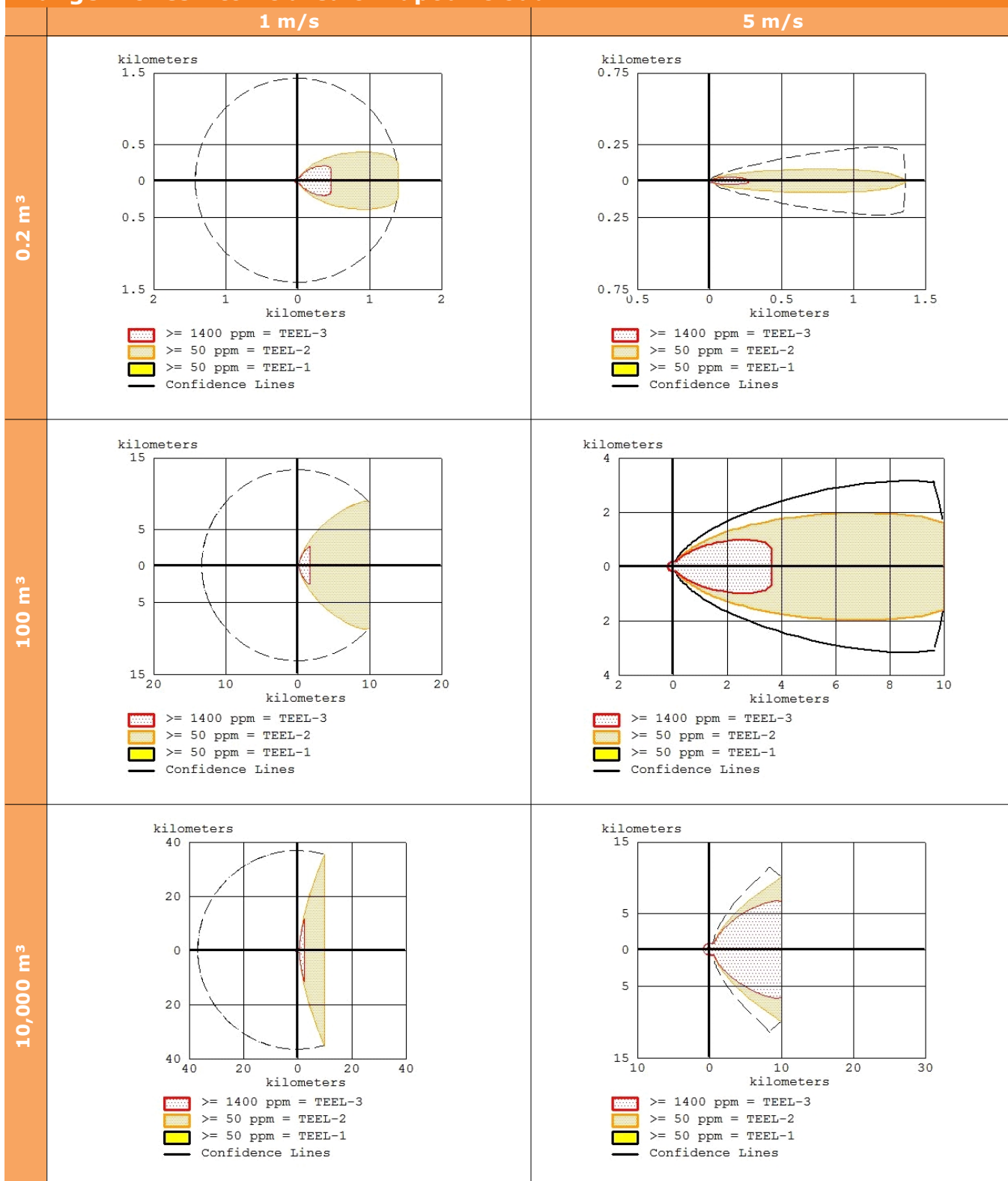
<b>Fire fighting</b>			
Extinguishing media	Large: Alcohol-resistant foam, water spray. Small: Carbon dioxide, powder, water.		
Fire fighting methods	Adapt measures to surrounding fire (substance is not burning). Keep containers cool by spraying with water if exposed to fire. Foam should be applied in large quantities as it is broken down to some extent by the product.		
<b>Personal protective equipment</b>	Wear self-contained breathing apparatus and chemical-protective clothing. Gas filter for gases/vapours of organic compounds (boiling point >65 °C, e. g. EN 14387 Type A). Hand protection: Chemical resistant protective gloves (EN 374) Suitable materials also with prolonged, direct contact (recommended: Protective index 6, corresponding > 480 minutes of permeation time according to EN 374): Butyl rubber (butyl) - 0.7 mm coating thickness; nitrile rubber (NBR) - 0.4 mm coating thickness. Eye protection: Tightly fitting safety goggles (splash goggles) (e. g. EN 166) Body protection: Body protection must be chosen depending on activity and possible exposure, e. g. apron, protecting boots, chemical-protection suit (according to EN 14605 in case of splashes or EN ISO 13982 in case of dust). Suitable materials: HDPE, LDPE, PA, PETG, PMP, POM, PP, PS, ECTFE/ETFE, FEP, PTFE, PVDF, NBR.		
<b>Decontamination of personnel on-site</b>	Drench contaminated suit and breathing apparatus with water before removing facemask and suit. Use chemical protection suit and self contained breathing apparatus while undressing contaminated co-workers or handling contaminated equipment. Contain decontamination runoff.		
<b>Exposure safety limit</b>	PAC 1	PAC 2	PAC 3
	20 ppm	50 ppm	8000 ppm
<b>Monitoring/detection</b>	Sample tubes: Dräger - alcohol 100/a; Auer - alcohol ALC or equivalent.		
<b>Emergency contacts</b>	<b>MAR-ICE</b> <b>Phone:</b> +33 2 98 33 10 10 +33 8 00 62 77 65 <b>Fax:</b> +33 2 98 44 91 38 <b>E-Mail:</b> MAR-ICE@cedre.fr		

Reference: 10, 51, 72, 112, 113, 178, 228

<b>Environmental protection measures</b>	
<b>Intermediate storage</b>	Keep container tightly closed and dry; store in a cool place. Suitable materials: CSM, PE, PP, PVDF, PTFE, teflon, fluorinated rubber, NBR, natural rubber, butyl rubber, EPDM, nickel 200, monel 400, hastelloy C276, tantalum, titanium, (premium) steel, stainless steel, CrNi steel, CrNiMo steel, Cu alloys, aluminium, glass.
<b>Substance disposal</b>	Special waste incineration plant.

Reference: 10, 178

## Danger zones - toxic area of vapour cloud



Source for the calculation is the ALOHA model developed by the US EPA and NOAA. Maximum predicted impacted area is 10 km. The calculations are based on:

Location: ATLANTIC, OCEAN

Building: unsheltered single storied

Time: using computer's clock

SOURCE STRENGTH:

Direct source: 0.2 or 100 or 10,000 m<sup>3</sup>

Source height: 10 meters with spontaneous release

ATMOSPHERIC DATA:

Wind: 1 or 5 meters/second from 180° true at 10 meters

Ground roughness: open water

Air temperature: 20 °C

Inversion height: No inversion height

Cloud: no cloud

Stability class: D

Relative humidity: 50 %

Reference: 51

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First case history	
<b>Cause of the incident</b>	Fire broke out during adverse weather in a freight container with sodium drums, which probably were inappropriately stowed.
<b>Type of cargo</b>	1,000 t of chemicals, including 1,430 barrels of sodium and 10 containers of flammable, toxic and/or corrosive chemicals loaded on deck. There were 300 barrels of butanol, orthocresol, cyclohexane, aniline, butacrylate, and phthalic anhydride bags in five cargo holds.
<b>Year</b>	1987
<b>Location</b>	Off the coast of Spanish Finistère
<b>Incident description</b>	On a voyage from Antwerp to Shanghai, the cargo of the Panamanian container ship Cason caught fire off the coast of Spanish Finistère, 1987 December 5. Cason first sent a distress message, and one hour later reported that the fire was out of control and that the ship was being abandoned. During the evacuation, 23 of her 31 crew died. Cason carried several different types of chemicals. But the fire probably started in one of the 11 containers of altogether 1430 drums of 126 tons of sodium.
<b>Response description</b>	A tug tried to salvage Cason, but adverse weather and the fire on board stopped the operation, and Cason went aground 100 m from the shore. It was only after grounding that the full diversity of the cargo became known. Part of the cargo on deck was being unloaded (orthocresol and formaldehyde) when a series of explosions occurred. A response team had started to unload orthocresol and formaldehyde drums. But bad weather stopped this work and caused more of the sodium drums to break and catch fire. Soon, the whole ship was on fire. Sodium drums that had fallen into the water were also burning. The fire could be seen far away at sea. 15,000 people within a 5-km-radius were evacuated in 300 buses overnight. Once the danger of explosion was ruled out, quality control of air, water and marine organisms was carried out in order to evaluate the possible threat to the public and the environment in the affected area. The results showed moderate levels of air and water contamination. Continuing bad weather conditions facilitated the dispersion and neutralization of the chemicals spilled. Seven days after the initial fire, it was possible to enter the stranded wreck again. The cargo could successively be recovered from Cason and from the shores. The operation was delayed several times because of the weather and technical difficulties. After three weeks the recovery of dangerous goods was regarded as completed. Analyses of marine organisms (mussels, barnacles and octopuses) showed no bioaccumulation of aniline and orthocresol. Comments on response: The cargo of sodium made the whole operation very complex and dangerous. The great hazard of sodium made it impossible to carry out efficient response work before all the sodium had disappeared through reaction with water. Adverse weather, however, prevented response work also afterwards. Recovery of dangerous goods stowed under deck was difficult and delayed the operation.
<b>Authority in charge for dealing with the incident</b>	Not reported

Reference: 6, 7

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Physical and chemical properties			
Structure	$\text{H}_3\text{C}-\text{CH}_2-\text{CH}_2-\text{CH}_2-\text{OH}$		
Formula	C <sub>4</sub> H <sub>10</sub> O		
Molar mass	74.1 g/mol	Vapour pressure (at 20 °C)	6.3 hPa
Melting point	-89.4 °C	Vapour density (air=1)	2.550
Boiling point	117.2 °C	Liquid surface tension (at 20 °C)	69.9 mN/m
Viscosity (at 20 °C)	2.96 mPa*s	COD	
Density (at 20 °C)	0.81 g/cm <sup>3</sup>	BOD	
Physical state (at 20 °C)	Liquid	Flammability limits in air	1.4 / 11.3 %
Auto flammability	340 °C	Flash point (ABEL closed vessel)	35 °C
Flash point (TAG closed vessel)		Decomposition temperature	
Partition coefficient log (octanol/water)	10 at 25 °C	Solubility in fresh water (at 20 °C)	79 g/L

Reference: 10, 42, 178, 212

Solubility in sea water	Temp. (°C)	5	10	20
	Salinity (g/kg)			
	0			
	5			
	20			
	34			
Note				

Reference:

Other names	
1-hüdroksübutaan	
Butüülalkohol	
n-Butanol	
1-Butanol (9CI)	
Butyl alcohol (8CI)	
Methylolpropane	
CCS 203	
Butyl hydroxide	
n-Butyl alcohol	
1-Butyl alcohol	
Hemostyp	
Propylcarbinol	
Butan-1-ol	
Butylalcohol	
1-Butanol	
n-butanol	
1-butyl alcohol	
1-hydroxybutane	
Nacol 4	
1-butanol	

Reference: 10, 178

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