SAFETY DATA SHEET

Creation Date Oct 2013 **Revision Date** Oct 2018 **Revision Number** 2

SECTION 1: IDENTIFICATION OF THE SUBSTANCE/MIXTURE AND OF THE COMPANY/UNDERTAKING

1.1. Product identification

Product Description:	**1-Butanol**
Product Grade:	SQ, ER, HPLC
Cat No. :	Q12045, Q12047, Q21905, Q21907, Q2190C, Q2190H, Q43106
Synonyms	n-Butanol; n-Butyl alcohol, Butan-1-ol
CAS-No	71-36-3
EC-No.	200-751-6
Molecular Formula	C4 H10 O
Reach Registration Number	01-2119484630-38

1.2. Relevant identified uses of the substance or mixture and uses advised against

Recommended Use	Laboratory chemicals.
Uses advised against	No Information available

1.3. Details of the supplier of the safety data sheet

Company	Thermo Fisher Scientific India Pvt. Ltd 403-404, B-wing, Delphi, Hiranandani Business Park, Powai, Mumbai 400076, INDIA.
E-mail address	laboratorysolutions@thermofisher.com

1.4. Emergency telephone number

India Toll Free: 18 00 22 22 30
Chemtrec US: (800) 424-9300
Chemtrec EU: 001 (202) 483-7616

SECTION 2: HAZARDS IDENTIFICATION

2.1. Classification of the substance or mixture

CLP Classification - Regulation (EC) No 1272/2008

Physical hazards

Flammable liquids	Category 3 (H226)

Health hazards

Acute oral toxicity	Category 4 (H302)
Skin Corrosion/irritation	Category 2 (H315)
Serious Eye Damage/Eye Irritation	Category 1 (H318)
Specific target organ toxicity - (single exposure)	Category 3 (H335) (H336)

Environmental hazards
Based on available data, the classification criteria are not met

2.2. Label elements

Signal Word **Danger**

Hazard Statements

H226 - Flammable liquid and vapor
H302 - Harmful if swallowed
H315 - Causes skin irritation
H318 - Causes serious eye damage H335 - May cause respiratory irritation H336 - May cause drowsiness or dizziness

Precautionary Statements

P210 - Keep away from heat/sparks/open flames/hot surfaces. - No smoking
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
P304 + P340 - IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing
P305 + P351 + P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P310 - Immediately call a POISON CENTER or doctor/ physician

2.3. Other hazards

Substance is not considered persistent, bioaccumulative and toxic (PBT) / very persistent and very bioaccumulative (vPvB)

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.1. Substances

Component	CAS-No	EC-No.	Weight %	CLP Classification - Regulation (EC) No 1272/2008
n-Butyl alcohol	71-36-3	EEC No. 200-751-6	99	Flam. Liq. 3 (H226) Acute Tox. 4 (H302) Skin Irrit. 2 (H315) Eye Dam. 1 (H318) STOT SE 3 (H335) STOT SE 3 (H336)

Reach Registration Number	01-2119484630-38

Full text of Hazard Statements: see section 16

SECTION 4: FIRST AID MEASURES

4.1. Description of first aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.

Skin Contact Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists,

call a physician.

Ingestion Clean mouth with water and drink afterwards plenty of water.

Inhalation Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Protection of First-aiders Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and prevent spread of contamination.

4.2. Most important symptoms and effects, both acute and delayed

Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

4.3. Indication of any immediate medical attention and special treatment needed

Notes to Physician Treat symptomatically. Symptoms may be delayed.

SECTION 5: FIREFIGHTING MEASURES

5.1. Extinguishing media

Suitable Extinguishing Media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Extinguishing media which must not be used for safety reasons
Do not use a solid water stream as it may scatter and spread fire.

5.2. Special hazards arising from the substance or mixture

Flammable. Risk of ignition. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Containers may explode when heated. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Carbon monoxide (CO), Carbon dioxide (CO_2).

5.3. Advice for firefighters

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Ensure adequate ventilation.

6.2. Environmental precautions

Should not be released into the environment.

6.3. Methods and material for containment and cleaning up

Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

6.4. Reference to other sections

Refer to protective measures listed in Sections 8 and 13.

SECTION 7: HANDLING AND STORAGE

7.1. Precautions for safe handling

Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation.

Hygiene Measures
Handle in accordance with good industrial hygiene and safety practice. Keep away from food, drink and animal feeding stuffs. Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing before re-use. Wash hands before breaks and at the end of workday.

7.2. Conditions for safe storage, including any incompatibilities

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

7.3. Specific end use(s)

Use in laboratories

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1. Control parameters

Exposure limits
List source(s): **UK** - EH40/2005 Containing the workplace exposure limits (WELs) for use with the Control of Substances Hazardous to Health Regulations (COSHH) 2002 (as amended). Updated by September 2006 official press release and October 2007 Supplement. **IRE -** 2010 Code of Practice for the Safety, Health and Welfare at Work (Chemical Agents) Regulations 2001. Published by the Health and Safety Authority.

Component	European Union	The United Kingdom	France	Belgium	Spain
n-Butyl alcohol		50ppm STEL; 154mg/m³ STEL	STEL / VLCT: 50 ppm. STEL / VLCT: 150 mg/m³.	50ppm VLE; 154mg/m³ VLE	STEL / VLA-EC: 50 ppm (15 minutos). STEL / VLA-EC: 154 mg/m³ (15 minutos). TWA / VLA-ED: 20 ppm (8 horas) TWA / VLA-ED: 61 mg/m³ (8 horas)

Component	Italy	Germany	Portugal	The Netherlands	Finland
n-Butyl alcohol		100ppm TWA; 310mg/m³ TWA	TWA: 20 ppm 8 horas	15ppm STEL; 45mg/m³ STEL	TWA: 50 ppm 8 tunteina TWA: 150 mg/m³ 8 tunteina STEL: 75 ppm 15 minuutteina STEL: 230 mg/m³ 15 minuutteina lho

Component	Austria	Denmark	Switzerland	Poland	Norway
n-Butyl alcohol	MAK-KZW: 200 ppm 15 Minuten MAK-KZW: 600 mg/m³ 15 Minuten MAK-TMW: 50 ppm 8 Stunden MAK-TMW: 150 mg/m³ 8 Stunden	Ceiling: 50 ppm Ceiling: 150 mg/m³ Hud	STEL: 50 ppm 15 Minuten STEL: 150 mg/m³ 15 Minuten TWA: 50 ppm 8 Stunden TWA: 150 mg/m³ 8 Stunden	STEL: 150 mg/m³ 15 minutach TWA: 50 mg/m³ 8 godzinach	Hud Ceiling: 25 ppm Ceiling: 75 mg/m³

Component	Bulgaria	Croatia	Ireland	Cyprus	Czech Republic
n-Butyl alcohol	TWA: 100 mg/m³ STEL : 150 mg/m³	kože STEL-KGVI: 50 ppm 15	TWA: 20 ppm 8 hr. STEL: 60 ppm 15 min		TWA: 300 mg/m³ 8 hodinách.

		minutama. STEL-KGVI: 154 mg/m³ 15 minutama.	Skin		Potential for cutaneous absorption Ceiling: 600 mg/m³

Component	Estonia	Gibraltar	Greece	Hungary	Iceland
n-Butyl alcohol	Nahk TWA: 15 ppm 8 tundides. TWA: 45 mg/m³ 8 tundides. Ceiling: 30 ppm Ceiling: 90 mg/m³		skin - potential for cutaneous absorption STEL: 100 ppm STEL: 300 mg/m³ TWA: 100 ppm TWA: 300 mg/m³	STEL: 90 mg/m³ 15 percekben. CK TWA: 45 mg/m³ 8 órában. AK lehetséges borön keresztüli felszívódás	STEL: 50 ppm STEL: 150 mg/m³ TWA: 25 ppm 8 klukkustundum. TWA: 80 mg/m³ 8 klukkustundum. Skin notation Ceiling: 50 ppm Ceiling: 160 mg/m³

Component	Latvia	Lithuania	Luxembourg	Malta	Romania
n-Butyl alcohol	TWA: 10 mg/m³	Ceiling: 30 ppm Ceiling: 90 mg/m³ TWA: 15 ppm IPRD TWA: 45 mg/m³ IPRD Oda			TWA: 33 ppm 8 ore TWA: 100 mg/m³ 8 ore STEL: 66 ppm 15 minute STEL: 200 mg/m³ 15 minute

Component	Russia	Slovak Republic	Slovenia	Sweden	Turkey
n-Butyl alcohol	TWA: 10 mg/m³ 0400 STEL: 30 mg/m³ 0400	Ceiling: 310 mg/m³ TWA: 100 ppm TWA: 310 mg/m³	TWA: 100 ppm 8 urah TWA: 310 mg/m³ 8 urah STEL: 100 ppm 15 minutah STEL: 310 mg/m³ 15 minutah	Binding STLV: 30 ppm 15 minuter Binding STLV: 90 mg/m³ 15 minuter LLV: 15 ppm 8 timmar. LLV: 45 mg/m³ 8 timmar. Hud	

Biological limit values
List source(s):

Component	European Union	United Kingdom	France	Spain	Germany
n-Butyl alcohol					1-Butanol: 10 mg/g urine (end of shift after hydrolysis;measured as mg/g Creatinine) 1-Butanol: 2 mg/g urine (before beginning of next shift after hydrolysis;measured as mg/g Creatinine)

Component	Gibraltar	Latvia	Slovak Republic	Luxembourg	Turkey
n-Butyl alcohol			n-Butyl alcohol: 2 mg/g creatinine urine after all work shifts for long-term exposure n-Butyl alcohol: 10 mg/g creatinine urine end of exposure or work shift		

Monitoring methods
BS EN 14042:2003 Title Identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.
MDHS70 General methods for sampling airborne gases and vapours
MDHS 88 Volatile organic compounds in air. Laboratory method using diffusive samplers, solvent desorption and gas chromatography
MDHS 96 Volatile organic compounds in air - Laboratory method using pumped solid sorbent tubes, solvent desorption and gas chromatography

Derived No Effect Level (DNEL) See table for values

Route of exposure	Acute effects (local)	Acute effects (systemic)	Chronic effects (local)	Chronic effects (systemic)
Oral				
Dermal				
Inhalation				310 mg/m^3 100 ppm

Predicted No Effect Concentration (PNEC) See values below.

Fresh water	0.082 mg/l
Fresh water sediment	0.178 mg/kg
Marine water	0.0082 mg/l
Marine water sediment	0.0178 mg/kg
Soil (Agriculture)	0.015 mg/kg

8.2. Exposure controls

Engineering Measures
Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure that eyewash stations and safety showers are close to the workstation location.

Glove material	Breakthrough time	Glove thickness	EU standard	Glove comments
Butyl rubber	> 480 minutes	0.35 mm	EN 374	As tested under EN374-3 Determination of
Nitrile rubber	> 480 minutes	0.38 mm	Level 6	Resistance to Permeation by Chemicals
Neoprene	> 480 minutes	0.45 mm		
Viton (R)	> 480 minutes	0.7 mm		

Skin and body protection Long sleeved clothing

Inspect gloves before use.
Please observe the instructions regarding permeability and breakthrough time which are provided by the supplier of the gloves. (Refer to manufacturer/supplier for information)
Ensure gloves are suitable for the task: Chemical compatability, Dexterity, Operational conditions, User susceptibility, e.g. sensitisation effects, also take into consideration the specific local conditions under which the product is used, such as the danger of cuts, abrasion.
Remove gloves with care avoiding skin contamination.

Respiratory Protection When workers are facing concentrations above the exposure limit they must use appropriate certified respirators.
To protect the wearer, respiratory protective equipment must be the correct fit and be used

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

9.1. Information on basic physical and chemical properties

Appearance	Colorless	
Physical State	Liquid	
Odor	Alcohol-like	
Odor Threshold	No data available	
pH	No information available	
Melting Point/Range	-89 °C / -128.2 °F	
Softening Point	No data available	
Boiling Point/Range	117.6 °C / 243.7 °F	
Flash Point	35 °C / 95 °F	**Method -** Closed cup
Evaporation Rate	0.46	(Butyl Acetate = 1.0)
Flammability (solid,gas)	Not applicable	Liquid
Explosion Limits	**Lower** 1.4 Vol%	
	Upper 11.2 Vol%	
Vapor Pressure	6.7 mbar @ 20 °C	
Vapor Density	2.6	(Air = 1.0)
Specific Gravity / Density	0.810	
Bulk Density	Not applicable	Liquid
Water Solubility	80 g/L (20°C)	
Solubility in other solvents	No information available	
Partition Coefficient (n-octanol/water)		
Component	**log Pow**	
n-Butyl alcohol	0.785	
Autoignition Temperature	340 °C / 644 °F	
Decomposition Temperature	No data available	
Viscosity	2.95 mPa.s (20 °C)	
Explosive Properties	No information available	explosive air/vapour mixtures possible
Oxidizing Properties	No information available	

9.2. Other information

Molecular Formula	C4 H10 O
Molecular Weight	74.12
Refractive index	1.390 - 1.400

SECTION 10: STABILITY AND REACTIVITY

10.1. Reactivity

None known, based on information available

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

10.4. Conditions to avoid

Keep away from open flames, hot surfaces and sources of ignition. Incompatible products.

10.5. Incompatible materials

Strong oxidizing agents. Reducing agents. Acid chlorides. copper. Copper alloys. Acid anhydrides.

10.6. Hazardous decomposition products

SECTION 11: TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Product Information

(a) acute toxicity;

Oral	Category 4
Dermal	Based on available data, the classification criteria are not met
Inhalation	Based on available data, the classification criteria are not met

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
n-Butyl alcohol	LD50 = 700 mg/kg (Rat) LD50 = 790 mg/kg (Rat)	LD50 = 3402 mg/kg (Rabbit) LD50 = 3400 mg/kg (Rabbit)	LC50 > 8000 ppm (Rat) 4 h

(b) skin corrosion/irritation; Category 2

(c) serious eye damage/irritation; Category 1

(d) respiratory or skin sensitization;

Respiratory	Based on available data, the classification criteria are not met
Skin	Based on available data, the classification criteria are not met

(e) germ cell mutagenicity; Based on available data, the classification criteria are not met

(f) carcinogenicity; Based on available data, the classification criteria are not met

There are no known carcinogenic chemicals in this product

(g) reproductive toxicity; Based on available data, the classification criteria are not met

(h) STOT-single exposure; Category 3

Results / Target organs Respiratory system, Central nervous system (CNS).

(i) STOT-repeated exposure; Based on available data, the classification criteria are not met

Target Organs No information available.

(j) aspiration hazard; Based on available data, the classification criteria are not met

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

SECTION 12: ECOLOGICAL INFORMATION

12.1. Toxicity

Ecotoxicity effects Do not flush into surface water or sanitary sewer system.

Component	Freshwater Fish	Water Flea	Freshwater Algae	Microtox
n-Butyl alcohol	LC50: = 1910000 µg/L, 96h static (Pimephales promelas) LC50: 100000 - 500000 µg/L, 96h static (Lepomis macrochirus) LC50: = 1740 mg/L, 96h flow-through (Pimephales promelas) LC50: 1730 - 1910 mg/L, 96h static (Pimephales promelas)	EC50: 1897 - 2072 mg/L, 48h Static (Daphnia magna) EC50: = 1983 mg/L, 48h (Daphnia magna)	EC50: > 500 mg/L, 72h (Desmodesmus subspicatus) EC50: > 500 mg/L, 96h (Desmodesmus subspicatus)	EC50 = 2041.4 mg/L 5 min EC50 = 2186 mg/L 30 min EC50 = 3980 mg/L 24 h EC50 = 4400 mg/L 17 h

12.2. Persistence and degradability

Persistence Soluble in water, Persistence is unlikely, based on information available.

Component	Degradability
n-Butyl alcohol 71-36-3 (99)	70 %

12.3. Bioaccumulative potential Does not bioaccumulate

Component	log Pow	Bioconcentration factor (BCF)
n-Butyl alcohol	0.785	0.64

12.4. Mobility in soil The product is water soluble, and may spread in water systems . Will likely be mobile in the environment due to its water solubility. Highly mobile in soils

12.5. Results of PBT and vPvB assessment Substance is not considered persistent, bioaccumulative and toxic (PBT) / very persistent and very bioaccumulative (vPvB).

12.6. Other adverse effects

Endocrine Disruptor Information This product does not contain any known or suspected endocrine disruptors

Persistent Organic Pollutant This product does not contain any known or suspected substance

Ozone Depletion Potential This product does not contain any known or suspected substance

SECTION 13: DISPOSAL CONSIDERATIONS

13.1. Waste treatment methods

Waste from Residues / Unused Products Waste is classified as hazardous. Dispose of in accordance with the European Directives on waste and hazardous waste. Dispose of in accordance with local regulations.

Contaminated Packaging Dispose of this container to hazardous or special waste collection point. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep product and empty container away from heat and sources of ignition.

European Waste Catalogue (EWC) According to the European Waste Catalogue, Waste Codes are not product specific, but application specific.

Other Information Waste codes should be assigned by the user based on the application for which the product was used. Do not dispose of waste into sewer. Can be incinerated, when in compliance with local regulations. Do not empty into drains.

SECTION 14: TRANSPORT INFORMATION

IMDG/IMO

14.1. UN number UN1120
14.2. UN proper shipping name BUTANOLS
14.3. Transport hazard class(es) 3
14.4. Packing group III

ADR

14.1. UN number UN1120
14.2. UN proper shipping name BUTANOLS
14.3. Transport hazard class(es) 3
14.4. Packing group III

IATA

14.1. UN number UN1120
14.2. UN proper shipping name BUTANOLS
14.3. Transport hazard class(es) 3
14.4. Packing group III

14.5. Environmental hazards No hazards identified

14.6. Special precautions for user No special precautions required

14.7. Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code Not applicable, packaged goods

SECTION 15: REGULATORY INFORMATION

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

International Inventories X = listed

Component	EINECS	ELINCS	NLP	TSCA	DSL	NDSL	PICCS	ENCS	IECSC	AICS	KECL
n-Butyl alcohol	200-751-6	-		X	X	-	X	X	X	X	X

National Regulations

Component	Germany - Water Classification (VwVwS)	Germany - TA-Luft Class
n-Butyl alcohol	WGK 1	

Component	France - INRS (Tables of occupational diseases)
n-Butyl alcohol	Tableaux des maladies professionnelles (TMP) - RG 84

Take note of Control of Substances Hazardous to Health Regulations (COSHH) 2002 and 2005 Amendment.
Take note of Dir 94/33/EC on the protection of young people at work
Take note of Directive 98/24/EC on the protection of the health and safety of workers from the risks related to chemical agents at work

15.2. Chemical safety assessment

A Chemical Safety Assessment/Report (CSA/CSR) has been conducted by the manufacturer/importer

SECTION 16: OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3
H226 - Flammable liquid and vapor
H302 - Harmful if swallowed
H315 - Causes skin irritation
H318 - Causes serious eye damage H335 - May cause respiratory irritation H336 - May cause drowsiness or dizziness

Legend

CAS - Chemical Abstracts Service

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory

EINECS/ELINCS - European Inventory of Existing Commercial Chemical Substances/EU List of Notified Chemical Substances

DSL/NDSL - Canadian Domestic Substances List/Non-Domestic Substances List

PICCS - Philippines Inventory of Chemicals and Chemical Substances

ENCS - Japanese Existing and New Chemical Substances

IECSC - Chinese Inventory of Existing Chemical Substances

AICS - Australian Inventory of Chemical Substances

KECL - Korean Existing and Evaluated Chemical Substances

NZIoC - New Zealand Inventory of Chemicals

WEL - Workplace Exposure Limit

TWA - Time Weighted Average

ACGIH - American Conference of Governmental Industrial Hygienists

IARC - International Agency for Research on Cancer

DNEL - Derived No Effect Level

PNEC - Predicted No Effect Concentration

RPE - Respiratory Protective Equipment

LD50 - Lethal Dose 50%

LC50 - Lethal Concentration 50%

EC50 - Effective Concentration 50%

NOEC - No Observed Effect Concentration

POW - Partition coefficient Octanol:Water

PBT - Persistent, Bioaccumulative, Toxic

vPvB - very Persistent, very Bioaccumulative

ADR - European Agreement Concerning the International Carriage of Dangerous Goods by Road

ICAO/IATA - International Civil Aviation Organization/International Air Transport Association

IMO/IMDG - International Maritime Organization/International Maritime

Dangerous Goods Code

MARPOL - International Convention for the Prevention of Pollution from Ships

OECD - Organisation for Economic Co-operation and Development

ATE - Acute Toxicity Estimate

BCF - Bioconcentration factor

VOC - Volatile Organic Compounds

Key literature references and sources for data

Suppliers safety data sheet, Chemadvisor - LOLI, Merck index, RTECS

Training Advice

Chemical hazard awareness training, incorporating labelling, Safety Data Sheets (SDS), Personal Protective Equipment (PPE) and hygiene.

Use of personal protective equipment, covering appropriate selection, compatibility, breakthrough thresholds, care, maintenance, fit and standards.

First aid for chemical exposure, including the use of eye wash and safety showers.

Fire prevention and fighting, identifying hazards and risks, static electricity, explosive atmospheres posed by vapours and dusts.

Chemical incident response training.

Creation Date	Oct-2013
Next Revision Date	Oct-2023
Revision Summary	SDS section 1 updated and update to Format.

This safety data sheet complies with the requirements of Regulation (EC) No. 1907/2006

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of Safety Data Sheet