



**Product Guide for LudgerTag™ 2-AB  
(2-aminobenzamide) Glycan Labeling Kit**

**(Ludger Product Code: LT-KAB-A2)**

**Ludger Document # LT-KAB-A2-Guide-v3.1**

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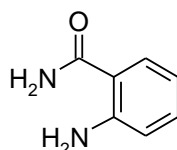
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## Specifications for LT-KAB-A2

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<b>Application</b>	For labeling of free glycans with 2-aminobenzamide acid (2-AB).
<b>Description</b>	The kit contains reagents for the conjugation of dye to the free reducing end of the glycan by a reductive amination reaction.
<b>Dye Properties</b>	Mass = 136.15 Fluorescence, $\lambda_{\text{ex}} = 320 \text{ nm}$ , $\lambda_{\text{em}} = 420 \text{ nm}$ .



<b>Number of Samples</b>	Typically, up to 15 separate analytical samples per set of labeling reagents.
<b>Amount of Sample</b>	From 25 pmol up to 25 nmol glycans per sample.
<b>Suitable Samples</b>	Any purified glycans with free reducing termini can be labeled.
<b>Structural Integrity</b>	No detectable (< 2 mole per cent) loss of sialic acid, fucose, sulfate, or phosphate.
<b>Labeling efficiency</b>	Typically > 85 % (dependent on sample).
<b>Labeling Selectivity</b>	Essentially stoichiometric labeling.
<b>Storage:</b>	Store at room temperature in the dark. Protect from sources of heat, light, and moisture. The reagents are stable for at least two years as supplied.
<b>Shipping:</b>	The product can be shipped at ambient temperature.
<b>Handling:</b>	Ensure that any glass, plasticware or solvents used are free of glycosidases and environmental carbohydrates. Use powder-free gloves for all sample handling procedures and avoid contamination with environmental carbohydrate. All steps involving labeling reagents must be performed in a dry environment with dry glassware and plasticware. Once individual vials of reagents are opened, their contents should be used immediately and excess then discarded according to local safety rules.
<b>Safety:</b>	<b>For research use only. Not for human or drug use</b> Please read the Material Safety Data Sheets (MSDS's) for all chemicals used. All processes involving labeling reagents should be performed using appropriate personal safety protection - eyeglasses, chemically resistant gloves (e.g. nitrile), etc. - and where appropriate in a laboratory fume cupboard.

## Kit Contents

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Each labeling reaction set consists of one vial of each of the following:

Cat. #	Item	Quantity
LT-2AB-01	2-AB Dye (2-Aminobenzamide)	5 mg
LT-DMSO-01	DMSO	350 µL
LT-ACETIC-01	Acetic acid	200 µL
LT-CYANOB-01	Sodium cyanoborohydride (Reductant)	6 mg

## Additional Reagents and Equipment Required

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- Heating block, oven, or similar dry heater (a water bath cannot be used) set at 65°C
- Centrifugal evaporator (e.g. Savant, Heto, or similar)
- Reaction vials (e.g. polypropylene microcentrifuge vials)
- Note: Further reagents are required if doing the optional post-labeling sample cleanup (see Section on Sample Cleanup)

## Time Line for Labeling

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The LudgerTag™ labeling procedure including the optional post-labeling sample cleanup typically takes 4 - 5 hours:

Procedure	Time	Elapsed Time (hours)
Transfer samples to reaction tube and dry	30 min	0.5
Make up and add labeling reagent	15 min	0.75
Incubate samples with reagent	3 hours	3.75
Post-labeling cleanup	1 hour	4.75

# The Reductive Amination Reaction

The labeling reaction involves a two step process (see Figure 1):

## 1. Schiff's base formation.

This requires a glycan with a free reducing terminus which is equilibrium between the ring closed (cyclic) and ring open (acyclic) forms. The primary amino group of the dye performs a nucleophilic attack on the carbonyl carbon of the acyclic reducing terminal residue to form a partially stable Schiff's base.

## 2. Reduction of the Schiff's base.

The Schiff's base imine group is chemically reduced to give a stable labeled glycan.

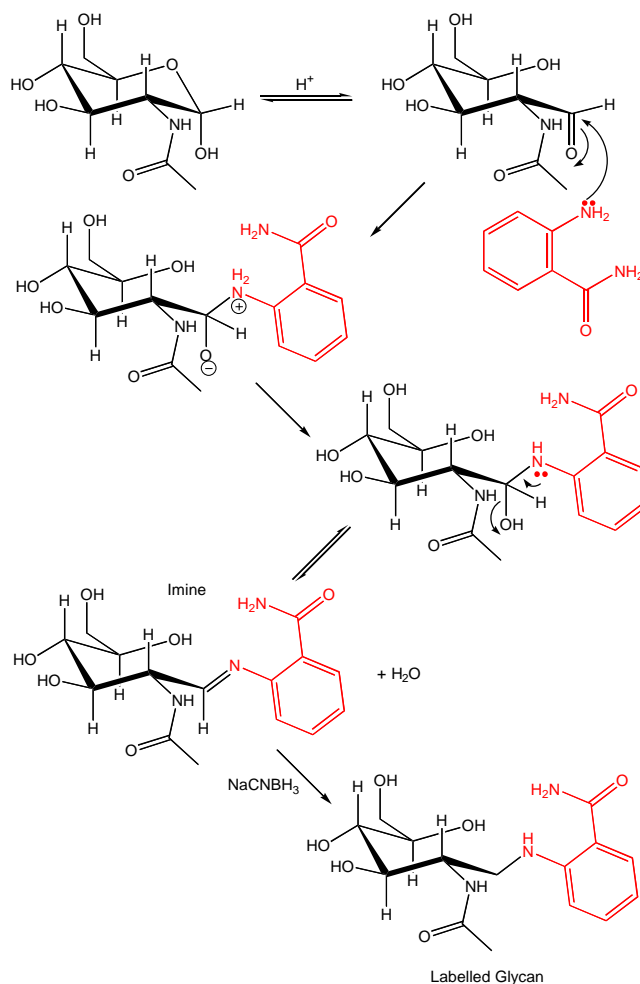


Figure 1: Labeling of a glycan with 2-aminobenzamide acid (2-AB) by reductive amination.

# Outline of Labeling Protocol

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LudgerTag™ glycan labeling kits are designed for the fluorophore or chromophore labeling of glycans with a free reducing terminus. Labeled glycans may be followed by either high-sensitivity fluorescence detection or monitoring of UV-absorbance during various chromatographic and structure sequence analyses. These include chromatography on LudgerSep™ HPLC columns and sequencing using exoglycosidases (See refs 1-5, 7).

The outline of the labeling procedure is as follows:

## 1 Prepare the glycans.

Prepare the glycan samples by removing contaminants such as salts and detergents that could interfere with the labeling procedure.

## 2 Dry the glycans

Place the samples in reaction vials and dry down.

## 3 Prepare labeling reagent

Prepare fresh dye labeling solution by mixing reagents in the kit.

## 4 Add labeling reagent to glycans

Add a small amount of labeling solution to each sample.

## 5 Incubate

Incubate the samples to allow the labeling reaction to progress.

## 6 Post-labeling cleanup

After incubation, if required (depending on the subsequent analysis procedures), remove the excess labeling reagents using a straightforward cleanup procedure.

## 7 Store or analyse the labeled glycans

The labeled glycans are now ready for analysis.

# Sample Preparation

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The glycan sample to be labeled, whether a purified glycan or a glycan mixture, must contain a free reducing terminus, be particle and salt-free, and be presented in a volatile solvent system (preferably pure water).

The following may interfere with the labeling reaction and must be removed from the glycan samples prior to LudgerTag™ labeling:

- Non-volatile solvents
- Non-volatile salts, in particular transition metal ions
- Detergents
- Dyes and stains such as Coomassie Blue

A range of LudgerClean™ kits for cleaning glycan samples prior to LudgerTag™ labeling is available from Ludger. These are detailed in the LudgerClean Glycan Cleanup Guide [ref 6].

The standard sample preparation protocol is as follows:

## 1 Purify the glycans

If necessary, remove non-carbohydrate contaminants from the samples using one of the strategies outlined in the Glycan Cleanup Guide [ref 6].

## 2 Transfer sample to reaction vial

The amount of sample should be in the range 100 picomoles - 50 nanomoles for a glycan pool obtained from a typical glycoprotein. With a single pure glycan as little as 5 picomoles can be labeled and detected in subsequent HPLC analysis. Suitable reaction vials include small polypropylene microcentrifuge tubes and tubes for PCR work.

## 3 Dry the samples

Ideally, samples should be dried using a centrifugal evaporator. If this is not possible then freeze drying (lyophilization) can be used with caution (in particular, ensure that the sample dries to a small, compact mass at the very bottom of the vial).

Do not subject samples to high temperatures (> 28°C) or extremes of pH as these conditions will result in acid catalysed loss of sialic acids (high temperatures, low pH) or epimerization of the glycan reducing terminus (at high pH).

## Preparation of Labeling Reagent

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Prepare fresh labeling reagent as follows:

### 4 Prepare a DMSO-acetic acid mixture

Add 150  $\mu$ L glacial **acetic acid** to the vial of **DMSO** and mix by pipette action.

*The Catalog #s for the acetic acid and DMSO are LT-ACETIC-01 and LT-DMSO-01 respectively.*

*Open the ampoules by carefully tapping or flicking to dislodge any contents in the upper half, then carefully break open the ampoule.*

*If the DMSO is frozen then gently warm up the vial (before opening) in an oven or heating block to between 30°C and 65°C.*

### 5 Add the dye

Add 100  $\mu$ L of the DMSO-acetic acid mixture to a vial of LudgerTag™ **2-AB (2-Aminobenzamide Acid) Dye** and mix until the dye is dissolved.

*The Cat. # for the dye is LT-2AB-01.*

### 6 Add the reductant

Add the dissolved dye to a vial of LudgerTag™ **sodium cyanoborohydride** (reductant) and mix by pipette action until the reductant is completely dissolved to make the final **labeling reagent**.

*The Catalog. # for the sodium cyanoborohydride reductant is LT-CYANOB-01.*

*If the reductant is difficult to dissolve then gently warm the vial for up to four minutes in the 65°C incubation oven or stand on a heating block at this temperature then mix by pipette action. If undissolved reductant is still visible add 10  $\mu$ L pure water to the vial and mix.*

*Protect the labeling reagent from exposure to moisture and use within 60 minutes.*



## Labeling Reaction

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### 7 Add labeling reagent to samples

Add 5 µL of labeling reagent to each dried glycan sample, cap the microtube, mix thoroughly, and then gently tap to ensure the labeling solution is at the bottom of the vial.

### 8 Incubate

Place the reaction vials in a heating block, sand tray, or dry oven set at 65°C and incubate for 3 hours.

*The incubation must be performed in a dry environment. Use an oven or dry block - please do not use a water bath.*

*The samples must be completely dissolved in the labeling solution for efficient labeling. To encourage complete dissolution the samples can be vortexed 30 minutes after the start of the 65°C incubation then the incubation continued.*

*In most cases, the incubation time can be shortened to 2 hours or extended up to 4 hours without significantly changing the outcome of the labeling reaction.*

### 9 Centrifuge and cool

After the incubation period remove the samples, centrifuge the microtubes briefly, then allow them to cool completely to room temperature.

## LudgerClean™ S Post-Labeling Sample Cleanup

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Post-labeling sample cleanup (to remove excess dye and other labeling reagents) is necessary for certain applications - e.g. subsequent analysis by HPLC. Such cleanup can be achieved using LudgerClean™ S cartridges (Cat # LC-S-Ax, where x denotes the number of cartridges in the kit) using the standard protocol included with the kit.

Post-labeling sample cleanup is not necessary for applications where the excess labeling reagents do not interfere with subsequent sample analysis. These include carbohydrate electrophoresis where free dye runs away from the labeled glycans.

# Analysis of LudgerTag™ 2AB-Labeled Glycans

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LudgerTag™ 2-AB labeled glycans may be studied by a number of different analytical methods including HPLC, gel electrophoresis, and mass spectrometry. These are covered in detail in reference 8 and overviewed below.

## HPLC Analysis

LudgerTag™ 2-AB labeled glycan mixtures may be separated and analysed by a variety of HPLC (high pressure liquid chromatography) methods including LudgerSep™ HPLC:

Type of Analysis	Column	Cat. No.
Separation of charged and neutral glycans	LudgerSep™ C	LS-C-01
Profile analysis of neutral and charged glycans	LudgerSep™ N	LS-N-01
Separation of neutral glycans	LudgerSep™ R	LS-R-01

The uses of these columns for glycan analysis are overviewed in References 4 and 8.

The LudgerSep™ N column is an especially powerful tool for the purification and analysis of LudgerTag™ labeled oligosaccharides from complex glycan mixtures. Please contact us for advice regarding your particular application.

## Enzymatic Analysis

High purity, sequencing grade enzymes (e.g. exoglycosidases) suitable for structural analysis of both N- and O-linked LudgerTag™ labeled glycans are available from a number of companies.

When selecting glycosidases be especially careful to choose those with formulations that are compatible with your particular application. For example, some enzymes and enzyme buffers have components that interfere with certain types of analysis. Please call us for guidance in selecting enzymes and reaction conditions for your work.

## Mass Spectrometry and Electrophoresis

LudgerTag™ labeled glycans may also be analysed by mass spectrometry, electrophoresis, and various types of spectroscopy. Please call us for advice on the analysis conditions most suitable for your intended analyses.

## Warranties and Liabilities

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Ludger warrants that the above product conforms to the attached analytical documents. Should the product fail for reasons other than through misuse Ludger will, at its option, replace free of charge or refund the purchase price. This warranty is exclusive and Ludger makes no other warranties, expressed or implied, including any implied conditions or warranties of merchantability or fitness for any particular purpose. Ludger shall not be liable for any incidental, consequential or contingent damages.

This product is intended for *in vitro* research only.

## Document Revision Number

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Document # LT-KAB-A2-Guide-v3.1

## References

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- 1 Bigge, J.C.; Patel, T.P; Bruce, J.A.; Goulding, P.N.; Charles, S.M; Parekh, R.B. (1995)  
'Non-selective and efficient fluorescent labeling of glycans using 2-aminobenzamide and anthranilic acid'.  
*Analytical Biochemistry* **230**: 229-238
- 2 Guile, G.R.; Rudd, P.M.; Wing, D.R.; Prime, S.B.; Dwek, R.A. (1996)  
'A rapid and high-resolution high-performance liquid chromatographic method for separating glycan mixtures and analyzing oligosaccharide profiles'.  
*Analytical Biochemistry* **240**: 210-226
- 3 Townsend, R.R.; Lipniunas, P.H.; Bigge, C.; Ventom, A.; Parekh, R. (1996)  
'Multimode high-performance liquid chromatography of fluorescently labeled oligosaccharides from glycoproteins'.  
*Analytical Biochemistry* **239**: 200-207
- 4 LudgerSep™ High Resolution HPLC Carbohydrate Profiling Guide (Cat # LS-GUIDE-01)
- 5 Ludger Enzyme Selection Guide (Cat # EZ-GUIDE-01)
- 6 LudgerClean™ Glycan Cleanup Guide (Cat # LC-GUIDE-01)
- 7 Hardy, M.R. (1997)  
'Glycan labeling with the fluorophores 2-aminobenzamide and anthranilic acid'  
in 'Techniques in Glycobiology', edited by Townsend, R.R and Hotchkiss, A.T.. Marcel Dekker Inc, New York .
- 8 Ludger Technical Note # TN-AB-01: Analysis of 2-AB (2-aminobenzamide acid) labeled glycans

## Appendix 1: Troubleshooting Guide

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The LudgerTag™ labeling protocol is an efficient, robust method. If problems do arise they can normally be corrected without difficulty. The following is a guide to the most likely problems, possible causes, and solutions.

### Poor Incorporation of Dye / Low Labeling Yield

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**The labeling temperature was incorrect.**

Please ensure that the oven or heating block is equilibrated to the incubation temperature and that the reaction tube is subjected to this temperature for the entire labeling period.

**The sample was incompletely solubilised.**

The glycans must be completely dissolved in the labeling mixture for maximum labeling efficiency. Please ensure that the sample is thoroughly mixed with the labeling reagent prior to the incubation and, as a precaution, carefully mix the samples 15 minutes after the start of the incubation.

**The sample contained contaminants that interfered with the labeling.**

Please ensure that the glycans are adequately purified before labeling (see protocol step 1 and the LudgerClean™ Glycan Cleanup Guide).

**The labeling solution was inactive.** Please make up the labeling solution immediately before use - the reagents will lose activity within a few hours of mixing.

**There was less starting glycan than was originally estimated.**

**The glycans did not contain a free reducing terminus.**

The 2-AB dye conjugates to the glycan via the aldehyde group of the free reducing terminus. Alditols and glycans already conjugated via their reducing terminus (e.g. glycopeptides, glycolipids, and previously labeled glycans) do not contain a free reducing terminus and so cannot conjugate to the dye.

**The glycans were lost during the post-labeling cleanup.**

Please ensure that the removal of excess labeling reagents is performed as specified in the cleanup protocol and that the wash reagents are correctly made.

## The Labeled Samples Contain Fluorescent Non-Carbohydrate Material

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### **The original glycans contained aldehyde-bearing contaminants.**

Please ensure that the glycans are adequately purified before labeling (see protocol step 1 and the LudgerClean Glycan Cleanup Guide).

### **The post-labeling cleanup step did not work correctly.**

Please ensure that the removal of excess labeling reagents is performed as specified in the post-labeling cleanup protocol and that the wash reagents are correctly made.

## Selective Loss of Smaller Glycans

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### **The cleanup cartridge was not primed correctly.**

Please ensure the cartridge is primed correctly and that the cartridge bed is still wet with acetonitrile when the sample is applied to the disc.

### **Incorrect wash reagents were used during the post-labeling cleanup.**

Please ensure that the wash reagents are correctly prepared.

## Selective Loss of Larger Glycans

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### **The sample was incompletely solubilised.**

The glycans must be completely dissolved in the labeling mixture for maximum labeling efficiency. Larger glycans tend to be less soluble in the labeling mixture than small sugars. Please ensure that the sample is thoroughly mixed with the labeling reagent prior to the incubation and, as a precaution, carefully mix the samples 15 minutes after the start of the incubation.

## Desialylation of the Glycans

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### **The sample was subjected to acidic conditions in aqueous solutions at elevated temperatures**

Avoid prolonged periods of exposure of sialylated glycan samples in aqueous solutions to conditions of low pH and elevated temperatures. Note that the reductive amination reaction is carried out in essentially anhydrous conditions under which loss of sialic acids is minimal.

In general, try to keep samples in solutions in the pH range 5 – 8.5 and avoid exposure to temperatures above 30 °C. Samples in pH buffered aqueous solutions (with pH between 5 and 8.5) tend to be resistant to acid catalyzed de-sialylation even at temperatures higher than 30°C. However, even then it is wise to err on the side of caution and keep the samples cool whenever possible.

**The samples were not cleaned up correctly after labeling**

Make sure that samples undergo the post-labeling cleanup immediately after the reductive amination reaction and that the post-labeling drying and cleanup procedure is conducted reasonably quickly.

Labeled samples that have **not** undergone drying and subsequent cleanup will be prone to acid catalyzed de-sialylation.

## Appendix 2: SDS



### SAFETY DATA SHEET

Version: 1.2

Date written: 19 October 2011

Date reviewed: 08 June 2022

#### SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	<b>acetic acid</b>
Product Catalogue Name	<b>LT-ACETIC-01</b>
CAS-No.	<b>64-19-7</b>
Company:	Ludger Ltd Culham Science Centre Abingdon Oxfordshire OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

#### SECTION 2. HAZARDS IDENTIFICATION

##### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP].**

Flammable liquids (Category 3)

Skin corrosion (Category 1A)

Serious eye damage (Category 1)

##### 2.2 Label elements



Signal Word: Danger

##### Hazard Statement(s)

H314

Causes severe burns and eye damage.

H226

Flammable liquid and vapour.

##### Precautionary Statement(s)

P210

Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.

P280

Wear protective gloves/protective clothing/ face protection.

P301 + P330 + P331

IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.

P305+P351+P338

IF IN EYES: Rinse cautiously with water for several minutes.

Remove

contact lenses, if present and easy to do so. Continue rinsing.

P310

Immediately call a POISON CENTRE or doctor/ physician.



## 2.3 Other hazard information:

Lachrymator

## SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms: Glacial acetic acid  
 Formula: C<sub>2</sub>H<sub>4</sub>O<sub>2</sub>  
 Molecular Weight: 60.05g/mol

Component		Classification	Concentration
Name	Acetic Acid	Flam. Liq. 3; Skin Corr. 1A; Eye Dam. 1 H314, H226, H318 Concentration limits: >= 90 %: Skin Corr. 1A, H314; 25 - < 90 %: Skin Corr. 1B, H314; 10 - < 25 %: Skin Irrit. 2, H315; 10 - < 25 %: Eye Irrit. 2, H319; 10 - < 25 %: Eye Irrit. 2, H319; 10 - < 25 %: Skin Irrit. 2, H315; 25 - < 90 %: Skin Corr. 1B, H314; >= 90 %: Skin Corr. 1A, H314; >= 90 %	< = 100%
CAS-No.	64-19-7		
EC-No.	200-580-7		
Index-No	607-002-00-6		

## SECTION 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

#### If swallowed

After swallowing: make victim drink water (two glasses at most), avoid vomiting (risk of perforation). Call a physician immediately. Do not attempt to neutralise.

#### If skin is exposed

Remove any contaminated clothing immediately. Wash effected area well with plenty of soap and water.

#### If eyes are exposed

Rinse thoroughly with plenty of water or eye wash solution for at least 15 minutes.

#### If inhaled

Move person to fresh air supply. If not breathing give artificial respiration.

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

No data available.

## SECTION 5. FIRE-FIGHTING MEASURES

### 5.1 Extinguishing media

For small fires use extinguishing media such as dry chemical, carbon dioxide or "alcohol" foam. For large fires apply water from as far away as possible, use large amounts of water, applied as mist or spray: solid streams of water may not be as effective. Cool all affected containers with large amounts of water.

## 5.2 Special hazards arising from the substance or mixture

No data available.

## 5.3 Advice for firefighters

Wear self contained breathing apparatus, if necessary. Use water spray to cool unopened containers if near the fire.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Wear personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Unnecessary staff to leave the immediate area of spillage.

### 6.2 Environmental Precautions

Do not let the chemical enter the drains.

### 6.3 Methods and material for containment and cleaning up

Contain the spill and collect with non-combustible absorbent material (such as sand, earth, diatomaceous earth and vermiculite) and place in a container for disposal. Keep in suitable, closed containers when waiting for disposal.

### 6.4 Reference to other sections

See Section 13 for suitable means of disposal of waste.

## SECTION 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid inhalation of vapour or mist. Keep away from any sources of ignition- No smoking. Take measures to prevent electrostatic charge near/in the work area when handling the chemical.

### 7.2 Conditions for safe storage, including any incompatibilities

Store in a cool, dry place. Keep the container tightly closed in a dry and well ventilated place. Containers once opened must be carefully re sealed and kept upright. This chemical is moisture sensitive.

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### ACETIC ACID

CAS-No.	Value	Control Parameters	Update	Basis
64-19-7	TWA	10ppm 25mg/m <sup>3</sup>	1991-07-05	Europe. Commission Directive 91/322/EEC on establishing indicative limit on values.
Remarks	Indicative			

### 8.2 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good laboratory and safety practice. Wash hands when leaving the lab and before entering the laboratory.

#### Personal Protective Equipment

### Eye / face protection

Laboratory Safety Glasses.

### Skin/Body protection

Laboratory Gloves and coat or similar covering over clothes. Gloves to satisfy the specifications of EU directive 89/686/EEC and the standard EN 374 derived from it.

### Respiratory protection

Chemical should be handled when open, under an operational fume hood.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

Appearance	Form: Liquid
	Colour: Colourless
Odour	pungent
pH	2.4 at 60.05g/l
Melting Point	16.2°C
Initial boiling point and boiling range	117-118°C
Flash Point	40.0°C – closed
Evaporation rate	No data available
Flammability	High
Upper/lower explosive limits	Lower = 4% (V)
	Upper = 19.9% (V)
Vapour Pressure	73.3hPa at 50.0°C
	15.2hPa at 20.0°C
Relative Density	1.049g/ml at 25°C
Solubility in water and solvents (mg/l)	Completely miscible
Partition coefficient: n-octanol/water	log Pow: - 0.17
Auto ignition temperature	485°C
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

### 9.2 Other information

No data available

## SECTION 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to Avoid

Heat, flames and sparks

### 10.5 Incompatible materials

Oxidising agents, soluble carbonates and phosphates, Hydroxides, Metals, Peroxides, Permanganates, e.g. Potassium permanganate, Amines, Alcohols.

### 10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions (Carbon oxides).

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## SECTION 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral – Rat – 3,310 mg/kg

LC50 Inhalation – Mouse – 1h - 5620ppm

Remarks: Sense Organs and Special Senses (Nose, Eyes, Ears and Taste): Eyes: Conjunctive irritation. Eyes: Other. Blood: Other changes.

LD50 Dermal – Rabbit – 1,112 mg/kg

#### Skin corrosion/irritation

Skin – Rabbit – Mild skin irritation – 24h

#### Serious eye damage/irritation

Eyes – Rabbit – Corrosive to eyes.

#### Respiratory or skin sensitisation

May cause sensitization by skin contact.

#### Germ cell mutagenicity

No data available.

#### Carcinogenicity

IARC: No component of this chemical present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

#### Reproductive toxicity

No data available.

#### STOT-single exposure

No data available.

#### STOT-repeated exposure

No data available.

#### Aspiration hazard.

No data available.

#### Potential Health Hazards

**Inhalation** May be harmful if inhaled. Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract.

**Ingestion** May be harmful if swallowed. Causes severe burns.

**Skin** May be harmful if absorbed through skin. Causes severe skin burns.

**Eyes** Causes severe eye burns.

#### Signs and symptoms of exposure

Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract, eyes and skin, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, burning sensation, cough, wheezing, laryngitis, shortness of breath, headache, nausea, vomiting.

Ingestion or inhalation of concentrated acetic acid causes damage to tissue of the respiratory and digestive tracts. Symptoms include: Hematemesis, bloody diarrhoea, edema and/or perforation of the esophagus and pylorus, pancreatitis, hematuria, anuria, uremia, albuminuria, hemolysis, convulsions, bronchitis, pulmonary edema, pneumonia, cardiovascular collapse, shock and death.

Direct contact or exposure to high concentrations of vapour with skin or eyes can cause: erythema, blisters, tissue destruction with slow healing, skin blacking, hyperkeratosis, fissures, corneal erosion, opacification, iritis, conjunctivitis and possible blindness.  
To the best of our knowledge, the chemical, physical and toxicological properties have not been fully investigated.

### Additional Information

RTECS: AF1225000

## SECTION 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

Toxicity to Fish

LC50 – *Leuciscus idus* (Golden Orfe) – 410.00mg/l – 48h

LC50 – *Cyprinus carpio* (Carp) – 49.00mg/l – 48h

LC50 – *Pimephales promelas* (Fathead minnow) – 79.00 - 88.00mg/l – 96h

LC50 – *Lepomis macrochirus* – 75mg/l – 96h

Toxicity to *Daphnia* and other aquatic invertebrates.

EC50 – *Daphnia magna* (Water flea) – 65.00mg/l – 48h

### 12.2 Persistence and degradability

Biodegradability

Remarks: Expected to be biodegradable.

### 12.3 Bio accumulative potential

No data available

### 12.4. Mobility in soil

No data available

### 12.5. Results of PBT and vPvB assessment

No data available

### 12.6. Other adverse effects

Biochemical Oxygen Demand (BOD) - 880mg/g

## SECTION 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

This chemical is combustible and may be burned in a chemical incinerator equipped with an afterburner and scrubber. If not practical, use a licensed waste disposal service.

### Contaminated packaging

Disposed of the packaging as unused/ waste product.

## SECTION 14. TRANSPORT INFORMATION

### 14.1 UN Number

ADR/RID: 2789

IMDG: 2789

IATA: 2789

### 14.2 UN Proper Shipping Name

ADR/RID: ACETIC ACID, GLACIAL  
ACETIC ACID, GLACIAL

IMDG: ACETIC ACID, GLACIAL

IATA:

### 14.3 Transport hazard class(es)

ADR/RID: 8 (3)

IMDG: 8 (3)

IATA: 8 (3)

### 14.4 Packing group

ADR/RID: II

IMDG: II

IATA: II

**14.5 Environmental hazards**

ADR/RID: -

IMDG Marine pollutant: No

IATA: -

**14.6 Other information**

IMDG: EMS-No: F-E, S-C

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**SECTION 15. REGULATORY INFORMATION**

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

Please note that the label elements, hazard and precautionary statements that used to be Section 15 are now in Section 2.

---

**SECTION 16. OTHER INFORMATION**

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as the descriptive of the compound generally.



## SAFETY DATA SHEET

Version: 1.2

Date written: 05 October 2011

Date reviewed: 10 June 2022

### SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name **dimethyl sulfoxide**

Product Catalogue Name **LT-DMSO-01**

CAS-No. **67-68-5**

Company: Ludger Ltd  
Culham Science Centre  
Abingdon  
Oxford OX14 3EB

Telephone: 01865 408554

Emergency Telephone: 01865 408554

Email: info@ludger.com

### SECTION 2. HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture

##### Classification according to Regulation (EC) No. 1272/2008 [EU-GHS-CLP]

Not a hazardous substance or mixture according to Regulation (EC) No. 1272/2008 [EU-GHS-CLP].

#### 2.2 Label elements

The product does not require to be labelled in accordance with EC directives or respective national laws.

Signal Word: None

Not a hazardous substance or mixture according to Regulation (EC) No 1272/2008.

#### Hazard Statement(s)

None

#### Precautionary Statement(s)

None

#### 2.3 Other hazard information:

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

Rapidly absorbed through skin.

### SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

#### 3. 1 Substances

Synonyms: DMSO  
methyl sulfoxide  
dimethyl sulfoxide

Formula: C<sub>2</sub>H<sub>6</sub>OS

Molecular Weight: 78.13g/mol

Component	Concentration
Name Dimethyl Sulfoxide	< = 100%

CAS-No.	67-68-5	
EC-No.	200-664-3	

---

## SECTION 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

#### If Ingested

After swallowing: make victim drink water (two glasses at most). Consult doctor if feeling unwell

#### If skin is exposed

Wash off with plenty of soap and water.

#### If eyes are exposed

Flush eyes with plenty of water/ eye wash solution as a precaution.

#### If inhaled

Move effect person to fresh air. If not breathing give artificial respiration.

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

Effects due to ingestion may include: Nausea, Fatigue and Headache.

### 4.3 Indication of immediate medical attention and special treatment needed

No data available.

---

## SECTION 5. FIRE-FIGHTING MEASURES

### 5.1 Extinguishing media

Small fires: Use extinguishing media such as "alcohol" foam, dry chemical or carbon dioxide.

Large fires: Use extinguishing media such as water, from a far away distance as possible. Use very large quantities of water as mist or spray to flood the fire and the combustible material. Cool all affected containers with large quantities of water.

### 5.2 Special hazards arising from the substance or mixture

Carbon oxides, Sulphur oxides

### 5.3 Advice for fire fighters

Wear self contained breathing apparatus fir fire fighting if necessary, to spray cool water on any unopened containers near the fire.

---

## SECTION 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Avoid breathing vapours, gas or mist. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

### 6.4 Environmental Precautions

Prevent further leakage or spillage if safe to do so, e.g. with spill mats. Do not let the product enter drains.

### 6.5 Methods and material for containment and cleaning up

Contain the spillage and put the collected material into a suitable container with a secure lid. Wash the area well, do not let run off into the drains, collect as waste.

### 6.4 Reference to other sections



See section 13 for disposal of waste material(s).

---

## SECTION 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid inhalation of vapour or mist. Keep away from sources of ignition- No smoking.  
Take measures to prevent the build up of electrostatic charge.

### 7.2 Conditions for safe storage, including any incompatibilities

Store in a cool place. Keep container closed in a dry well ventilated place.

### 7.3 Specific end uses

No data available

---

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

Components with workplace control parameters.  
Contains no substances with occupational exposure limit values.

### 8.3 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good laboratory hygiene and safety practice. Wash hands before breaks and at the end of the day.

#### Personal Protective Equipment

##### Eye / face protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

##### Skin protection

Handle with gloves, which should be inspected before use. Use proper glove removal technique (removal without the outside of the glove touching the skin) to avoid contact with the skin/chemical. Dispose of contaminated gloves as Laboratory waste in accordance with applicable laws and good laboratory practices. Wash and dry hands.  
Gloves should be of the standard that will stratify the specifications of EU directive 89/696/EEC and the standard EN 374 derived from it.

##### Body Protection

The type of protective clothing must be selected according to the amount of substance at the specific workplace being used. Impervious coats or laboratory coats.

##### Respiratory protection

Use substance in an operation fume hood/ outside venting extraction cupboard. Wear full face respirator if appropriate to use, must be tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

---

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

Appearance	Form: Liquid, clear
	Colour: Colourless
Odour	No data available
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	Melting point/range: 16-19°C
Initial boiling point and boiling range	189°C

Flash Point	87°C – Closed cup
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	Upper explosion limit: 42% (V) Lower explosion limit: 3.5% (V)
Vapour Pressure, Pa at temperature degree C	0.55hPa at 20°C
Relative Density	1.1g/mL
Solubility in water and solvents	Completely miscible
Partition coefficient: n-octanol/water	log Pow: - 2.03
Auto ignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

## 9.2 Other information

No data available

---

## SECTION 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

Forms explosive mixtures with air on intense heating. A range from approx. 15 Kelvin below the flash point is to be rated as critical.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature).

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to Avoid

Heat, flames and sparks

### 10.5 Incompatible materials

Acid chlorides, Phosphorus halides, Strong acids, Strong oxidizing agents and strong reducing agents.

### 10.6 Hazardous decomposition products

Other decomposition products – No data available

---

## SECTION 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - male and female - 28,300 mg/kg (OECD Test Guideline 401)

LC0 Inhalation - Rat - male and female - 4 h - > 5.33 mg/l (OECD Test Guideline 403)

LD50 Dermal - Rat - male and female - 40,000 mg/kg Remarks: (ECHA)

#### Skin corrosion/irritation

Skin - Rabbit Result: slight irritation - 4 h (OECD Test Guideline 404)

#### Serious eye damage/irritation

Eyes - Rabbit Result: slight irritation - 24 h (OECD Test Guideline 405)

#### Respiratory or skin sensitisation

Maximization Test - Guinea pig Result: negative (OECD Test Guideline 406)

Local lymph node assay (LLNA) - Mouse Result: negative (OECD Test Guideline 429)

### **Germ cell mutagenicity**

Ames test Salmonella typhimurium Result: negative sister chromatid exchange assay  
 Chinese hamster ovary cells Result: negative Mutagenicity (mammal cell test): chromosome aberration.

Chinese hamster ovary cells Result: negative OECD Test Guideline 474 Rat - male and female  
 Result: negative

### **Carcinogenicity**

Carcinogenicity – Rat – Oral

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Others: Tumors.

Carcinogenicity – Mouse – Oral

Tumorigenic: Equivocal tumorigenic agent by RTECS criteria. Lukaemia skin and appendages: Other: Tumors.

IARC: No component of this product presents at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

### **Reproductive toxicity**

Reproductive toxicity – Rat – Intraperitoneal

Effects on fertility: Abortion

Reproductive toxicity – Rat – Intraperitoneal

Effects on fertility: Post – implantation mortality (e.g. dead and/or resorbed implants per total number of implants).

Reproductive toxicity – Rat – Subcutaneous

Effects on fertility: Post – implantation mortality (e.g. dead and/or resorbed implants per total number of implants). Effects on fertility: Litter size (e.g. # fetuses per litter; measured before birth).

Reproductive toxicity – Mouse – Oral

Effects on fertility: Pre-implantation mortality (e.g. reduction in number of implants per female; total number of implants per corpora lutea). Effects on Embryo or fetus: Fetotoxicity (except death, e.g. stunted fetus). Specific developmental abnormalities: Musculoskeletal system.

Reproductive toxicity – Mouse – Intraperitoneal

Effects on embryo or fetus: Fetotoxicity (except death, e.g. stunted fetus). Specific developmental abnormalities: Musculoskeletal system.

### **STOT-single exposure**

No data available

### **STOT-repeated exposure**

No data available

### **Aspiration hazard.**

No data available

### **Potential Health Hazards**

**Inhalation**

May be harmful if inhaled. May cause respiratory tract irritation.

**Ingestion**

May be harmful if swallowed.

**Skin**

May be harmful if absorbed through skin. May cause skin irritation.

**Eyes**

May cause eye irritation.

**Aggravated Medical**

**Condition**

Avoid contact with DMSO solutions containing toxic materials or materials with unknown toxicological properties. Dimethyl sulfoxide is readily absorbed through the skin and may carry such materials into the body.



ADR/RID: No

IMDG Marine pollutant: No

IATA: No

**14.6 Special precautions for user**

No data available

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**SECTION 15. REGULATORY INFORMATION**

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

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

No data available

**15.2 Chemical Safety Assessment**

No data available

Please note that the label elements that used to go in Section 15 are now in Section 2.

---

**SECTION 16. OTHER INFORMATION**

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as the descriptive of the compound generally.



## SAFETY DATA SHEET

Version: 2.0

Date written: 17 October 2011

Date reviewed: 29 June 2022

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### SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY / UNDERTAKING

Product Name	<b>2-AB Dye</b>
Product Catalogue Name	<b>LT-2AB-01</b>
CAS-No.	<b>88-68-6</b>
Company:	Ludger Ltd Culham Science Centre Abingdon Oxford OX14 3EB
Telephone:	01865 408554
Emergency Telephone:	01865 408554
Email:	info@ludger.com

---

### SECTION 2. HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture

**Classification according to Regulation (EC) No 1272/2008 [EU-GHS/CLP]**

Skin irritation (Category 2)

Eye irritation (Category 2)

#### 2.2 Label elements



Signal Word: Danger

#### Hazard Statement(s)

H319 Causes serious eye irritation.

#### Precautionary Statement(s)

P264 Wash skin thoroughly after handling.

P280 Wear eye protection/ face protection.

P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

P337 + P313 If eye irritation persists: Get medical advice/ attention.

#### 2.3 Other hazard information:

This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

## SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms:	2-Aminobenzamide Anthranilic Acid Amide Anthranilamide
Formula:	C <sub>7</sub> H <sub>8</sub> N <sub>2</sub> O
Molecular Weight:	136.15g/mol

Component	Classification	Concentration
Name anthranilamide		< = 100%
CAS-No. 88-68-6	Eye Irrit. 2; 319	
EC-No. 201-851-2		

## SECTION 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the physician/ first responder in attendance.

#### If Ingested

Never give anything by mouth to an unconscious person. Rinse mouth well with water.

#### If skin is exposed

Wash area well with soap and water.

#### If eyes are exposed

Rinse well with plenty of water for at 15 minutes.

#### If inhaled

Move the person into fresh air. If not breathing give artificial respiration.

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

To the best of our knowledge, the chemical, physical and toxicological properties have not been thoroughly investigated so cannot be reported.

### 4.3 Indication of immediate medical attention and special treatment needed

No Data available

## SECTION 5. FIRE-FIGHTING MEASURES

### 5.1 Extinguishing media

Use a water spray, alcohol resistant foam, dry chemical or carbon dioxide extinguisher.

### 5.2 Special hazards arising from the substance or mixture

Carbon oxides, nitrogen oxides (NO<sub>x</sub>)

### 5.3 Advice for firefighters

Fire fighters to wear self contained breathing apparatus if necessary.

## SECTION 6. ACCIDENTAL RELEASE MEASURES

### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation in work areas. Evacuate personnel to safe areas to avoid breathing dust.

## 6.6 Environmental Precautions

Do not let the product enter the drains.

## 6.7 Methods and material for containment and cleaning up

Carefully sweep up the spill without creating any dust. Contain the collected material in a sealed suitable container, to await disposal.

## 6.4 Reference to other sections

Please refer to section 13 for disposal of product and spills.

---

## SECTION 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid formation of dust and aerosols. Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for fire prevention protection.

### 7.2 Conditions for safe storage, including any incompatibilities

Store in a cool, dark place. Keep the container tightly closed in a dry well ventilated place.

### 7.3 Specific end uses

No data available

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## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

Contains no substances with occupational exposure limit values.

### 8.4 Exposure controls

#### Appropriate engineering controls

Handle in accordance with good laboratory and safety practice. Wash hands before entering the laboratory and at the end of the workday/ when finished handling the material.

#### Personal Protective Equipment

##### Eye / face protection

Safety glasses. Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166 (EU).

##### Skin protection

Handle wearing gloves. Gloves must be inspected before use. Use proper glove removal technique (without the glove touching the skin) to avoid skin contact with the product. Dispose of contaminated gloves as chemical dry waste in accordance with applicable laws and good laboratory practices. Wash and dry the hands. Gloves must satisfy the specifications of EU directive 89/686/EEC and the standard EN 374 derived from it.

##### Body Protection

Laboratory coat or other types of body covering suitable for use in a laboratory.

##### Respiratory protection

When used under an operational fume hood no special protection is required. If required use respirators and components tested and approved under government standards such as NIOSH (US) or CEN (EU). Required level for nuisance exposure P98 (US) or P1 (EU EN 143), higher levels of protection OV/AG/P99 (US) or ABEK-P2 (EU EN 143).

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## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties



Appearance	Form: Crystalline
	Colour: Beige
Odour	No data available
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	Melting point/range: 111-113°C
	Melting point/range: 111-113°C
Initial boiling point and boiling range	No data available
Flash Point	198°C – closed cup
Evaporation rate	No data available
Flammability	No data available
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	No data available
Solubility in water and solvents (mg/l)	No data available
Partition coefficient: n- Octanol/water	No data available
Auto ignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

## 9.2 Other information

No data available

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## SECTION 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

No data available

### 10.3 Possibility of hazardous reactions

No data available

### 10.4 Conditions to Avoid

No data available

### 10.5 Incompatible materials

Oxidizing agents

### 10.6 Hazardous decomposition products

Other decomposition products - No data available

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## SECTION 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

No data available

#### Skin corrosion/irritation

No data available

#### Serious eye damage/irritation

No data available

**Respiratory or skin sensitisation**

No data available

May cause sensitisation by inhalation.

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

IARC: No components of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

**Reproductive toxicity**

No data available

**STOT-single exposure**

Inhalation – May cause respiratory irritation.

**STOT-repeated exposure**

No data available

**Aspiration hazard.**

No data available

**Potential Health Hazards**

Inhalation            May be harmful if inhaled. Causes respiratory tract irritation.

Ingestion            Harmful if swallowed.

Skin                    May be harmful if absorbed through the skin. Causes skin irritation.

Eyes                    Causes serious eye irritation.

**Signs and symptoms of exposure**

To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated.

**Additional Information**

RTECS: CU8993000

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**SECTION 12. ECOLOGICAL INFORMATION****12.1 Toxicity**

No data available

**12.2 Persistence and degradability**

No data available

**12.3 Bioaccumulative potential**

No data available

**12.4. Mobility in soil**

No data available

**12.5. Results of PBT and vPvB assessment**

No data available

**12.6. Other adverse effects**

No data available

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**SECTION 13. DISPOSAL CONSIDERATIONS****13.1 Waste treatment methods**

Contact a licensed waste disposal service to collect/dispose of any waste material.

**Contaminated packaging**

Treat as an unopened/ unused product.

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**SECTION 14. TRANSPORT INFORMATION****14.1 UN Number**

ADR/RID: -                      IMDG: -                      IATA: -

**14.2 UN Proper Shipping Name**

ADR/RID: Not dangerous goods

IMDG: Not dangerous goods

IATA: Not dangerous goods

**14.3 Transport hazard class(es)**

ADR/RID: -                      IMDG: -                      IATA: -

**14.4 Packing group**

ADR/RID: -                      IMDG: -                      IATA: -

**14.5 Environmental hazards**

ADR/RID: No                      IMDG Marine pollutant: No                      IATA: No

**14.6 Special precautions for user**

No data available

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**SECTION 15. REGULATORY INFORMATION**

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

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

No data available

**15.2 Chemical Safety Assessment**

No data available

*Note that the label elements, the Risk and Safety phrases (now Hazard and Precautionary statements) that used to be in Section 15 are now in Section 2.*

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**SECTION 16. OTHER INFORMATION**

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre dispensed container. The advice offered is, therefore not all inclusive nor should it be taken as the descriptive of the compound generally.

## SAFETY DATA SHEET

Version: 1.2

Date written: 28 September 2011

Date reviewed: 14 June 2022

### SECTION 1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/ UNDERTAKING

Product Name **sodium cyanoborohydride**

Product Catalogue Name **LT-CYANOB-01**

CAS-No. **25895-60-7**

Company: Ludger Ltd  
Culham Science Centre  
Abingdon  
Oxford OX14 3EB

Telephone: 01865 408554

Emergency Telephone: 01865 408554

Email: info@ludger.com

### SECTION 2. HAZARDS IDENTIFICATION

#### 2.1 Classification of the substance or mixture

**Classification according to the Regulation (EC) No. 1272/2008 [EU-GHS/CLP]**

Flammable solids (category 1)

Substances, which in contact with water emit flammable gases (category 1)

Acute toxicity, Oral (category 2)

Acute toxicity, Inhalation (category 2)

Acute toxicity, Dermal (category 2)

Skin corrosion (category 1B)

Serious eye damage (Category 1)

Acute aquatic toxicity (category 1)

Chronic aquatic toxicity (category 1)

#### 2.2 Label elements



Signal Word: DANGER

Hazard Statement(s)

H228 Flammable solid

H260 In contact with water releases flammable gases which may ignite spontaneously.

H300 Fatal if swallowed.

H310 Fatal in contact with skin.

H314 Causes severe burns and eye damage.

H330 Fatal if inhaled.

H410 Very toxic to aquatic life with long lasting effects.

Precautionary Statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P223 and	Keep away from any possible contact with water, because of violent reaction possible flash fire.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/spray.
P264	Wash hands thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P284	Wear respiratory protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water.
P304 + P340 + P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER/ doctor.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

### 2.3 Other hazard information (EU)

EUH032 Contact with acids liberates very toxic gas.  
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.  
Stench.

## SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.1 Substances

Synonyms: Sodium Cyanotrihydridoborate  
Formula: CH<sub>3</sub>BNNa

Component	Classification	Concentration
Sodium Cyanoborohydride		< = 100%
CAS-No. 25895-60-7		
EC-No. 247-317-2	Flam. Sol. 1; Water-react 1; Acute Tox. 2; Skin Corr. 1B; Eye Dam. 1; Aquatic Acute 1; Aquatic Chronic 1; H228, H260, H300, H330, H310, H314, H318, H400, H410 M-Factor - Aquatic Acute: 10 M-Factor - Aquatic Chronic: 10	

## SECTION 4. FIRST AID MEASURES

### 4.1 Description of first aid measures

#### General Advice

Consult a physician if exposure causes ill effects and if in any doubt. Show this safety data sheet to the doctor/ first responder in attendance.

#### If swallowed

If swallowed: give water to drink (two glasses at most). Seek medical advice immediately. In exceptional cases only, if medical care is not available within one hour, induce vomiting (only in persons who are wide awake and fully conscious), administer activated charcoal (20 - 40 g in a 10% slurry) and consult a doctor as quickly as possible. Do not attempt to neutralise.

#### If skin is exposed

Remove contaminated clothing/shoes immediately. Wash affected area(s) with water and soap.

#### If eyes are exposed

Wash eye(s) with plenty of water for at least 15 minutes, if unsure seek medical advice.

**If inhaled**

Move into a source of fresh air, if not breathing give artificial respiration.

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

Burning sensation, coughing, wheezing, laryngitis, shortness of breath, head ache, nausea, vomiting. To the best of our knowledge the chemical, physical and toxicological properties have not been thoroughly investigated. Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed two to four hours or longer.

**4.3 Indication of immediate medical attention and special treatment needed**

No Data available

---

**SECTION 5. FIRE-FIGHTING MEASURES****5.1 Extinguishing media****Suitable extinguishing media**

Carbon dioxide (CO<sub>2</sub>) Dry powder

**Unsuitable extinguishing media**

Foam Water

**5.2 Special hazards arising from the substance or mixture**

Carbon oxides, Nitrogen oxides, Hydrogen cyanide (Hydrocyanic acid), Borane/boron oxides.

**5.3 Advice for firefighters**

Stay in danger area only with self-contained breathing apparatus. Prevent skin contact by keeping a safe distance or by wearing suitable protective clothing.

---

**SECTION 6. ACCIDENTAL RELEASE MEASURES****6.1 Personal precautions, protective equipment and emergency procedures.**

Wear respiratory protection; gently sweep up to avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation, remove all sources of ignition. Evacuate personnel to a safe area; avoid breathing in dust/gas or mist.

**6.2 Environmental Precautions**

Prevent further leakage or spillage if safe to do so. Do not let the chemical enter the drainage system and further discharge into the environment must be avoided.

**6.3 Methods and material for containment and cleaning up**

Contain the spill with matting if necessary and then collect using either an electrically protected vacuum cleaner or by damp brushing (not wet) and putting the collected waste into a secure dry container, do not flush with water. Dispose according to local regulations.

**6.4 Reference to other sections**

For disposal regulations see section 13.

**SECTION 7. HANDLING AND STORAGE****7.1 Precautions for safe handling**

Avoid contact with skin and eyes, avoid formation of dust when handling. Provide appropriate exhaust ventilation in work areas where dust could be formed. Keep away from sources of ignition (No Smoking) and take measures to prevent the build up of electrostatic charge.

**7.2 Conditions for safe storage, including any incompatibilities**

Store in a cool place. Keep the container tightly closed in a dry and well ventilated place. Never allow the product to get into contact with water during storage as it is moisture sensitive. Do not store near acids. Handle and open the container with care. Hygroscopic. Handle when open under an inert gas.

### 7.3 Specific end uses

No data available

## SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

Component	CAS No	Value	Control parameters	Basis
Sodium Cyanoborohydride	25895-60-7	TWA	5 mg/mL	UK. EH40 WEL Workplace Exposure Limits
	Remarks	Can be absorbed through the skin. The assigned substances are those for which there are concerns that dermal absorption will lead to systemic toxicity.		

### 8.2 Exposure controls

#### Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

#### Personal protective equipment

##### Eye/Face protection

Safety glasses to be worn following good laboratory practice. Eye protection should be tested and approved under appropriate government standards such as EN 166 (EU) or NIOSH (US).

##### Skin protection

Handle with gloves at all times following good laboratory practice. Gloves must be inspected before use and to be removed in proper glove removal technique (without touching the gloves outer surface) to avoid skin contact. Dispose of contaminated gloves after use as contaminated waste, in accordance with local regulations. Wash and dry hands.

Gloves to be within the specifications of EU directive 89/686/EEC and the standard EN 374 derived from it.

##### Body protection

Laboratory coat or other protective laboratory clothing should be worn when handling the product.

##### Respiratory protection

Use extraction unit/fume hood when using the product.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

Appearance	Form: Powder
	Colour: Beige
Odour	No data available
Odour threshold	No data available
pH	No data available
Freezing/Melting Point	Melting point/range :> 242°C
Initial boiling point and boiling range	No data available
Flash Point	No data available
Evaporation rate	No data available

Flammability (solids and gases)	The substance or mixture is a flammable solid with the subcategory 1.
Upper/lower flammability or explosive limits	No data available
Vapour Pressure	No data available
Relative Density	No data available
Solubility in water and solvents	No data available
Partition coefficient	No data available
Autoignition temperature	No data available
Decomposition temperature	No data available
Viscosity	No data available
Explosive properties	No data available
Oxidising properties	No data available

## 9.2 Other information

None available

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## SECTION 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

Forms explosive mixtures with air on intense heating. A range from approx. 15 Kelvin below the flash point is to be rated as critical. The following applies in general to flammable organic substances and mixtures: in correspondingly fine distribution, when whirled up a dust explosion potential may generally be assumed. Contact with acids liberates very toxic gas.

### 10.2 Chemical stability

The product is chemically stable under standard ambient conditions (room temperature).

### 10.3 Possibility of hazardous reactions

Reacts violently with water.

### 10.4 Conditions to Avoid

Do not allow water to enter container because of violent reaction.

Heat, flames and sparks. Extremes of temperature and direct sunlight. Exposure to sunlight.

### 10.5 Incompatible materials

Do not store near acids, oxidising agents.

### 10.6 Hazardous decomposition products

Reacts with water to form: - Hydrogen gas

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## SECTION 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

Acute toxicity estimate Oral - 5.1 mg/kg (Expert judgment)

Acute toxicity estimate Oral - 5.1 mg/kg (Expert judgment)

Acute toxicity estimate Inhalation - 4 h - 0.051 mg/l (Expert judgment)

Acute toxicity estimate Inhalation - 4 h - 0.051 mg/l (Expert judgment)

Acute toxicity estimate Dermal - 50.1 mg/kg (Expert judgment)

Acute toxicity estimate Dermal - 50.1 mg/kg (Expert judgment)

#### Skin corrosion/irritation

Causes skin burns.

#### Serious eye damage/irritation

Causes serious eye damage. Risk of blindness!

#### Respiratory or skin sensitisation



No data available

#### **Germ cell mutagenicity**

No data available

Test Type: Ames test Test system: Escherichia coli/Salmonella typhimurium

Metabolic activation: with and without metabolic activation

Method: OECD Test Guideline 471 Result: negative

#### **Carcinogenicity**

**IARC:** No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or conformed human carcinogen by IARC.

#### **Reproductive toxicity**

No data available

#### **STOT (specific target organ toxicity) -single exposure**

No data available

#### **STOT (specific target organ toxicity) -repeated exposure**

No data available

#### **Aspiration hazard.**

No data available

#### **Potential health effects**

##### **Inhalation**

of the

May be fatal if inhaled. Material is extremely destructive to the tissue of the mucus membranes and upper respiratory tract.

##### **Ingestion**

May be fatal if swallowed. Causes burns.

##### **Skin**

May be fatal if absorbed through the skin. Causes skin burns.

##### **Eyes**

Causes burns to the eyes.

As there is less than 10mg per vial, complete toxicological information is not available.

#### **11.2 Additional Information**

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, spasm, inflammation and edema of the larynx, spasm, inflammation and edema of the bronchi, pneumonitis, pulmonary edema, Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. The following applies to boron compounds in general: resorption is followed by nausea and vomiting, agitation, spasms, CNS disorders, cardiovascular disorders. The following applies to cyanogen compounds/ nitriles in general: utmost caution! Release of hydrocyanic acid is possible - blockade of cellular respiration. Cardiovascular disorders, dyspnoea, unconsciousness. Other dangerous properties can not be excluded. Handle in accordance with good industrial hygiene and safety practice..

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## **SECTION 12. ECOLOGICAL INFORMATION**

### **12.1 Toxicity**

No data available

### **12.2 Persistence and degradability**

No data available

### **12.3 Bioaccumulative potential**

No data available

### **12.4. Mobility in soil**

No data available

### 12.5. Results of PBT and vPvB assessment

No data available

### 12.6. Other adverse effects

Very toxic to aquatic life with long lasting effects.

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## SECTION 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

Product or/and collected waste from spillage.

Burn in a chemical incinerator equipped with an afterburner and scrubber but take extra precautions when igniting as this material is highly flammable. Or to contact a licensed disposal company and arrange disposal, inform the company of the nature of the waste.

### Contaminated packaging

Dispose of as the unused product, with a licensed disposal company.

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## SECTION 14. TRANSPORT INFORMATION

### 14.1 UN Number

ADR/RID: 3179

IMDG: 3179

IATA: 3179

### 14.2 UN Proper Shipping Name

ADR/RID: FLAMMABLE SOILD, TOXIC, INORGANIC, N.O.S. (Sodium cyanotrihydroborate)

IMDG: FLAMMABLE SOILD, TOXIC, INORGANIC, N.O.S. (Sodium cyanotrihydroborate)

IATA: Flammable solid, toxic, inorganic, n.o.s. (Sodium cyanotrihydroborate)

### 14.3 Transport hazard class (es)

ADR/RID: 4.1 (6.1)

IMDG: 4.1 (6.1)

IATA: 4.1 (6.1)

### 14.4 Packing group

ADR/RID: II

IMDG: II

IATA: II

### 14.5 Environmental hazards

ADR/RID: No

IMDG Marine pollutant: No

IATA: No

### 14.6 Special precautions for user

No data available

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## SECTION 15. REGULATORY INFORMATION

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

No data available

### 15.2 Chemical Safety Assessment

No data available

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## SECTION 16. OTHER INFORMATION

The advice offered is derived from the current available information on the hazardous materials in this product and its component(s). Consideration has been made regarding the quantities offered in the pre-dispensed container. The advice offered is, therefore, not all-inclusive nor should it be taken as the descriptive of the compound generally.