IFA
Institut für Arbeitsschutz der
Deutschen Gesetzlichen Unfallversicherung

Nitrogen

IDENTIFICATION

Nitrogen
E 941

ZVG No:	7070
CAS No:	7727-37-9
EC No:	231-783-9

CHARACTERISATION

SUBSTANCE GROUP CODE

139100 Inorganic gases

STATE OF AGGREGATION

The substance is gaseous.

PROPERTIES

compressed gas
colourless
odourless

CHEMICAL CHARACTERISATION

Non-combustible gas.
Poorly reactive.
Only slightly soluble in water.
Expansion of the gas causes formation of cold mist spreading on the ground.
Danger of suffocation at high concentrations due to oxygen displacement.
For nitrogen in cryogenic liquefied form, see data sheet ZVG 7071 "Nitrogen, cryogenic liquefied".

Substance information in Wikipedia

FORMULA

N_2

N≡N

Molar mass: 28,01 g/mol

Conversion factor (gaseous phase) at 1013 mbar and 20 °C:

1 ml/m³ = 1,16 mg/m³

PHYSICAL AND CHEMICAL PROPERTIES

Triple point | Melting point | Boiling point | Critical data | Density | Solubility | Hazardous reactions

TRIPLE POINT

Temperature: -210 °C

Pressure: 0,1246 bar

Reference: 00260

MELTING POINT

Melting point: -210 °C

Reference: 00419 01401 02001

BOILING POINT

Boiling Point: -196 °C

Reference: 01401 01411 02001

CRITICAL DATA

Crit. temperature: -147 °C

Crit. pressure: 33,99 bar

Crit. density: 0,314 g/cm³

Reference: 00440

DENSITY

VAPOUR DENSITY
under standard conditions (0 °C, 1013 mbar)

Value: 1,2504 kg/m³

Reference: 00440

DENSITY OF LIQUID PHASE AT BOILING POINT

Value: 0,8085 kg/l

Reference: 00260

RELATIVE VAPOUR DENSITY
Ratio of the density to dry air at the same temperature and pressure

Value: 0,97

Reference: 01401 01411

VAPOUR DENSITY

Value: 1,1694 kg/m³

Temperature: 15 °C

at 1 bar

Reference: 00260

SOLUBILITY IN WATER

Concentration: 23,8 ml/l

Temperature: 0 °C

Reference: 00260

Concentration: 16,9 ml/l

Temperature: 20 °C

Reference: 00260

HAZARDOUS REACTIONS

Hazardous chemical reactions

Risk of explosion in contact with:
ozone + metal

The substance can react dangerously with:
chromyl chloride
lithium aluminium hydride (rare)
hydrogen (rare)
Formation of explosive nitrides with alkaline/alkaline earth metals.

SAFE HANDLING

Handling | Storage | Fire and explosion protection | Organisational measures | Personal protection | Disposal considerations | Accidental release measures | Fire fighting measures

PRELIMINARY NOTE

The following information refers to nitrogen in compressed gas cylinders. For nitrogen in cryogenic containers see ZVG 7071 "Nitrogen, cryogenic liquefied".

TECHNICAL MEASURES - HANDLING

Workplace
Provision of ventilation in the working area.
Use oxygen detectors if choking gases can be emitted.

Equipment
Provide safety valves in gas installations.
Check the entire gas system for leaks before use and regularly thereafter!
Avoid gas leakage to the atmosphere.
If larger quantities of the gas are released, suction is required at the point of exit or origin.
Label containers and pipelines clearly.

Suitable materials:
All common materials are suitable for cylinders and valves.
Suitable for seals or as nonmetallic materials are:
All usual materials.

Advice on safer handling
Do not store cylinders at the working area.

Protect gas cylinders from mechanical damage; do not pull, roll, push or drop.
Always use a gas cylinder trolley or other suitable equipment to transport gas cylinders.
Transport in elevators together with persons is prohibited.
Tightly screw on the protective caps and blind nuts when transporting.
Do not lift the gas cylinder by the valve protection cap or the valve protection ring.
When changing bottles, always inspect the leak-proof closure of the filled and empty bottles.
Prevent cylinders from falling over.
Do not remove the valve protection cap until the bottle has been placed against a wall or laboratory bench or on a bottle stand and is ready for use.
Open valves slowly to avoid pressure surges, do not force open.
Close valves after each use and after draining.
Replace the caps or nuts and valve protection cap as soon as the container is separated from the system.
Do not allow backfeed of gas into the container.
Avoid backflow of water or other liquids into the gas container.
Never transfer gas from one container to another!
Never use flames or electric heaters to increase pressure in the container!

Cleaning and maintenance

Regular inspection of leak test required!
Keep valve connections of the container clean and free of impurities, especially free of oil and water.
Never attempt to repair valves or safety pressure relief devices on the tank. Damage to these devices must be reported immediately to the supplier.
Consider work permit procedures e.g. for maintenance work.

TECHNICAL MEASURES - STORAGE

Storage

Keep container tightly closed.
Store container below 50 °C in a well-ventilated place.
Store containers upright and protect against falling over.
A valve protection cage should be provided or the valve protection cap should be fitted.
Check stored cylinders regularly for leaks and correct storage conditions.
The containers should be stored in a place without fire hazard and away from heat and ignition sources.

Keep away from combustible materials.
Protect from exposure to sunlight.
Do not store the containers under conditions that accelerate corrosion.
Do not store in escape routes, work rooms, or in direct proximity to them.
Filling and decanting in storage rooms is prohibited.

Conditions of collocated storage

Storage class 2 A (Gases)
Only substances of the same storage class should be stored together.
Collocated storage with the following substances is prohibited:
- Pharmaceuticals, foods, and animal feeds including additives.
- Infectious, radioactive und explosive materials.
- Flammable liquids of storage class 3.
- Other explosive substances of storage class 4.1A.
- Flammable solid substances or desensitized substances of storage class 4.1B.
- Pyrophoric substances.
- Substances liberating flammable gases in contact with water.
- Strongly oxidizing substances of storage class 5.1A.
- Oxidizing substances of storage class 5.1B.
- Organic peroxides and self reactive substances.

- Combustible and non combustible acutely toxic substances of stora-ge classes 6.1A and 6.1B.
- Combustible toxic or chronically acting substances of storage class 6.1C.
- Noncombustible toxic or chronically acting substances of storage class 6.1D.
- Combustible liquids of storage class 10.

Under certain conditions the collocated storage with the following sub-stances is permitted (For more details see TRGS 510):

- Aerosols (spray bottles).
- Ammonium nitrate and preparations containing ammonium nitrate.
- Combustible corrosive substances of storage class 8A.
- Combustible solids of storage class 11.

Observe special regulations for the combined storage of different gases according toTRGS 510.

TECHNICAL MEASURES - FIRE AND EXPLOSION PROTECTION

Technical, constructive measures

Substance is non-combustible. Select fire and explosion prevention measures according to the other used substances.

Protect from any warming; if necessary provide cooling by water sprinkling.

Precaution on handling

Keep away from open flames and other heat sources.

ORGANISATIONAL MEASURES

Compressed gases may only be handled by experienced and appropriately instructed persons.

Instruction on hazards and protective measures based on the operating instructions (TRGS 555) with signature required.

Instruction must be provided before employment and then at a minimum of once per annum thereafter.

Instruction should include a hint regarding the danger of suffocation.

Observe the restrictions on juvenile employment as defined in the "Jugendarbeitsschutzgesetz".

PERSONAL PROTECTION

Body protection

Use protective boots while handling gas cylinders.

Respiratory protection

Respiratory protection is not normally required.

In exceptional situations (e.g. danger of suffocation in an oxygen-reduced atmosphere due to massive gas release) a self-contained breathing apparatus or a compressed air line with mask must be used. Filter devices are ineffective, danger of suffocation due to lack of oxygen.

Eye protection

Wear safety goggles with side protection.

Hand protection

Work gloves must be worn when handling compressed gas cylinders.

Occupational hygiene

Avoid inhalation of gas.

Do not smoke when handling the gas or pressure vessels.

DISPOSAL CONSIDERATIONS

Hazardous waste according to Waste Catalogue Ordinance (AVV).

Compressed gas cylinders can normally be returned to the supplier. Pressurised cans are non-returnable and must be disposed of.

Do not empty pressure vessels to the point of pressure compensation. Mark empty vessels to avoid confusion with full ones.

ACCIDENTAL RELEASE MEASURES

Provide adequate ventilation.
Evacuate area. Warn affected surroundings.
To eliminate the hazardous condition, the hazardous area may only be entered with a self-contained breathing apparatus unless the harmlessness of the atmosphere is proven.
Use oxygen detectors.
Attempt to stop the gas from escaping. Otherwise place leaky bottles under a suctioning device or put them outdoors.
If gas is released outside, stay on the side facing the wind.

Endangerment of watert:
No hazards to sources of water are to be feared if released into water, drainage, sewer, or the ground.

FIRE FIGHTING MEASURES

Instructions
Substance is incombustible. Select fire fighting measures according to the surrounding conditions.
In the case of fire advise fire fighters on the presence of gas cylinders.
Cool endangered pressure vessels with water spray from a protected position.
If possible, take container out of dangerous zone.
Rise in pressure and risk of bursting when heating.

Special protective equipment
Wear self-contained breathing apparatus.

REGULATIONS

GHS Classification/Labelling | Colour coding of gas cylinders | Workplace labelling | Water hazard class | Transport Regulations | Technical rules | Regulations of accident insurers

EUROPEAN GHS CLASSIFICATION AND LABELLING

Classification
Gases under pressure, compressed gas; H280

Signal Word "Warning"

Hazard Statement - H-phrases
H280: Contains gas under pressure; may explode if heated.

Precautionary Statement - P-phrases
P403: Store in a well-ventilated place.

Other hazards:
Asphyxiant in high concentrations.

Manufacturer's specification by Air Liquide

Reference: 01401
State: 2018

Checked: 2020

COLOUR CODING OF GAS CYLINDERS

Shoulder colour:
Black
(Nitrogen)

Shoulder colour:
Black
Cylinder colour: Green
(Nitrogen, alternative)

Shoulder colour:
Black
Cylinder colour: Black
(Nitrogen, alternative)

WORKPLACE LABELLING ACCORDING TO GERMAN ASR A1.3

Warning label

Caution - gas cylinder

Precept label

Use safety goggles

Wear safety shoes

Wear safety gloves

GERMAN WATER HAZARD CLASS

Substance No: 1351

non-hazardous to waters

Classification according to the announcement of the list of substances hazardous to water in the Federal Register of 10.08.2017, last update 24.11.2023

TRANSPORT REGULATIONS

UN Number: 1066
Shipping name: Nitrogen, compressed
Hazard Identification Number: 20
Class: 2.2 (Non-flammable, non-toxic gases)
Packing Group: -
Danger Label: 2.2

Classification code: 1A

Tunnel restrictions:
Passage forbidden through tunnels of category E.

Reference: 07902

TECHNICAL RULES FOR HAZARDOUS SUBSTANCES

TRGS 407
Tätigkeiten mit Gasen - Gefährdungsbeurteilung; Ausgabe Februar 2016, geändert und ergänzt Oktober 2016

TRGS 745/TRBS 3145
Ortsbewegliche Druckgasbehälter - Füllen, Bereithalten, innerbetriebliche Beförderung, Entleeren; Ausgabe Februar 2016

TRGS 746/TRBS 3146
Ortsfeste Druckanlagen für Gase; Ausgabe September 2016

TRGS 510
Lagerung von Gefahrstoffen in ortsbeweglichen Behältern; Ausgabe Dezember 2020

TRGS 500
Schutzmaßnahmen; Ausgabe September 2019

REGULATIONS OF GERMAN ACCIDENT INSURERS

DGUV Regel 112-190
Benutzung von Atemschutzgeräten, Ausgabe November 2021
(in German only)

LINKS

Oxygen depletion – Hazard of asphyxia (in german only)
Oxygen depletion (in german only)
Publications of the IGV (Industriegaseverband e.V.) (in german only)
Hazards of oxygen deficient atmospheres (Doc 44/18)
DGUV Information 213-098: List of substances - lesson in schools (in German only)

REFERENCES

Quelle: 00001
IFA: Erfassungs- und Pflegehandbuch der GESTIS-Stoffdatenbank (nicht öffentlich)
Data acquisition and maintenance manual of the GESTIS substance database (non-public)

Quelle: 00260
1x1 der Gase. Physikalische Daten für Wissenschaft und Praxis. Herausgeber: AIR LIQUIDE Deutschland GmbH, Düsseldorf, 1. Auflage 2005

Quelle: 00419
CHEMINFO - Chemical Profiles Created by CCOHS

Quelle: 00440
Datenbank CHEMSAFE, Version 2016.0, DECHEMA-PTB-BAM

Quelle: 01401
GHS-Sicherheitsdatenblatt, Air Liquide
GHS Material Safety Data Sheet, Air Liquide

Quelle: 01411
GHS-Sicherheitsdatenblatt, Linde
GHS Material Safety Data Sheet, Linde

Quelle: 02001
International Chemical Safety Cards (ICSC)

Quelle: 05200
Kühn-Birett "Merkblätter Gefährliche Arbeitsstoffe" Loseblattsammlung mit Ergänzungslieferungen, ecomed Sicherheit, Landsberg

Quelle: 05300
TRGS 510 "Lagerung von Gefahrstoffen in ortsbeweglichen Behältern" Ausgabe Dezember 2020

Quelle: 06002
L. Roth, U. Weller
"Gefährliche Chemische Reaktionen" Loseblattsammlung mit Ergänzungslieferungen, ecomed-Verlag ("Dangerous chemical reactions" loose-leaf collection with supplement deliveries)

Quelle: 06505
Gasflaschen – Verträglichkeit von Werkstoffen für Gasflaschen und Ventile mit den in Berührung kommenden Gasen – Teil 1: Metallische Werkstoffe (ISO 11114-1:2020); Deutsche Fassung EN ISO 11114-1:2020

Quelle: 06506
Gasflaschen – Verträglichkeit von Flaschen- und Ventilwerkstoffen mit den in Berührung kommenden Gasen – Teil 2: Nichtmetallische Werkstoffe (ISO 11114-2:2013); Deutsche Fassung EN ISO 11114-2:2013

Quelle: 07580
Bekanntmachung der Liste der wassergefährdenden Stoffe im Bundesanzeiger vom 10.08.2017, zuletzt geändert 24.11.2023

Quelle: 07902
BAM: Datenbank Gefahrgut-Schnellinfo

Quelle: 99999
Angabe des Bearbeiters
Indication of the editor

Identification | Characterisation | Formula | Physical and chemical properties | Safe handling | Regulations | Links | Literature register