



Warehousing, storage and handling of compressed gas cylinders

General principles :

Compressed gases (e.g.: nitrogen, helium), as well as liquefied (e.g.: isobutane) and dissolved gases (in a solvent, such as acetylene in acetone or dimethylformamide, phosgene in monochlorobenzene) may explode if they are heated. Some odorless gas (nitrogen, helium, argon, CO, butane) may cause asphyxia in high concentration, risk which is often overlooked. The corresponding hazard statement is H280



H280

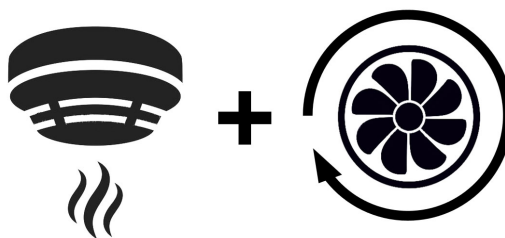


Risk of asphyxiation begins when air oxygen content drops below 19% and becomes severe below 17%. Gas suppliers sometimes also add a danger of suffocation pictogram.

Other compressed gases (hydrogen, isobutane, butane, propane) are also classified as flammable.



It may be necessary to check the oxygen level or the level of the gas itself at the workplace using a specific detector. Adequate ventilation is required in all cases.



Storage Rules :

Storage, warehousing and handling of compressed gas cylinders requires a number of precautions which are listed below.

Compressed gas cylinders may be stored outdoors as well as indoors. It is nevertheless necessary to ensure that:

- Outside (preferred alternative), the stock is protected from heat and weather
- Inside, it is recommended to store gas cylinders in specific safety cabinet (IE 90 and EN 14470-2 standard) suitable for the gas cylinders, in order to limit the risk of explosion in case of fire. Storage rooms and zone must be sufficiently ventilated, naturally or mechanically (consult UniSEP for an expertise). A gas leak detection system may be installed in the room concerned.

Gas cylinders must therefore be protected against any overheating, mechanical damage and all corrosive substances.

Best practices for handling gas cylinders are:

Gas cylinders must always be stored upright and secured with chains or straps. The height of the chain or strap must be $\frac{2}{3}$ of the height of the gas cylinder, in order to ensure proper support.



The presence of gas in a laboratory must be indicated by the pictogram of warning on the front door of the laboratory

Transport of compressed gas cylinders:

- Before the transport, ensure that the valve of the cylinder is closed and it does not leak
- Protect the valve of the cylinder with a cap or a protection casing
- Use a specific trolley equipped with chains
- Remove all gas regulator or other connection from the cylinder, which may represent a fragility point in case of fall



Caps must be in place and screwed when the cylinders are not connected (and therefore stored) or when they must be moved.

Empty cylinders should be identified as such and stored separately from full cylinders. Their valve must always remain closed.



Fuel gas cylinders must be located at least 2,5 m from oxygen cylinders and other oxidizers

For very dangerous gases (e.g.: HCN, HF, H₂S, Cl₂, NH₃, CO, COCl₂, HCl), additional precautionary measures apply:

- Gas cylinders shall be stored in safe cabinets properly and permanently ventilated
- Each work area shall be equipped with a specific detector and an emergency stop button to stop the gas supply. The handling of such gases may be done in a ventilated enclosure only

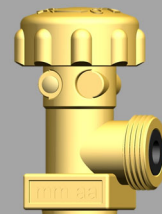


Grease is particularly dangerous in the presence of pure oxygen, because it may burn spontaneously and with explosive violence!

Never use grease to lubricate oxygen or enriched air equipment!


















O₂







The nature of the gas must be clearly stated on the cylinder.

Gas pipes, gauges and pumps must state the nature of the gas (name or color code) and indicate its direction of flow.
The distinctive colors of gas cylinders are (according to standard EN 1089-3):

Industrial gases			
Acetylene	 Dark brown	Oxygen	 White
Asphyxiating (inert) E.g.: Krypton, Xenon, Neon, compressed air	 Light green	Argon	 Dark green
Nitrogen	 Black	Carbon dioxide	 Gray
Helium	 Light brown	Hydrogen	 Red

Gas and medical gas mixtures (body of the cylinder : white)			
Oxygen	 White	Breathing air	 White/Black
Nitrous oxide	 Blue/Purple	Helium/Oxygen	 White/Light brown
Carbon dioxide	 Gray	Carbon dioxide/Oxygen	 White/Gray
Nitrogen monoxide mixture E.g.: Nitrogen + nitrogen monoxide (< 100ppm)	 Turquoise blue		

Industrial gas mixtures			
Inert E.g.: Argon/carbon dioxide Nitrogen/carbon dioxide	 Light green	Flammable/Inert E.g.: Hydrogen/Argon Methane/Nitrogen	 Red
Oxidizert E.g.: Oxygen/carbon dioxide	 Light blue		

Toxic gas	
Toxic/corrosive E.g.: Ammonia, chlorine	 Yellow

Sources and links for more information :

- PanGas website (www.pangas.ch)
- Carbagas website (www.carbagas.ch)
- Linde website (www.linde-gas.fr)
- SUVA Document - "Gas cylinders - Warehouses, ramps, gas distribution systems" and "Characteristics of liquids and gas" (SUVA ref. 66122 and 1469)
- FCOS directive No. 6507 and 6517 concerning ammonia and liquefied gases



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