



A05 Handling acetylene

General information

These IGS safety recommendations describe the properties of acetylene (C_2H_2) that are relevant from a safety technology perspective and give practical advice on how to handle the gas safely. They are intended to supplement mandatory regulations such as the relevant guidelines of the Swiss Association for Welding Technology (SVS) on acetylene rather than replace them.

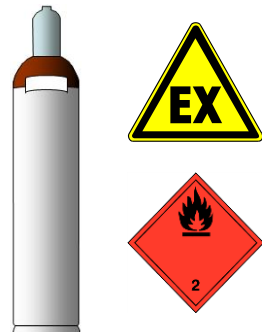
Chemical properties

Explosion hazard

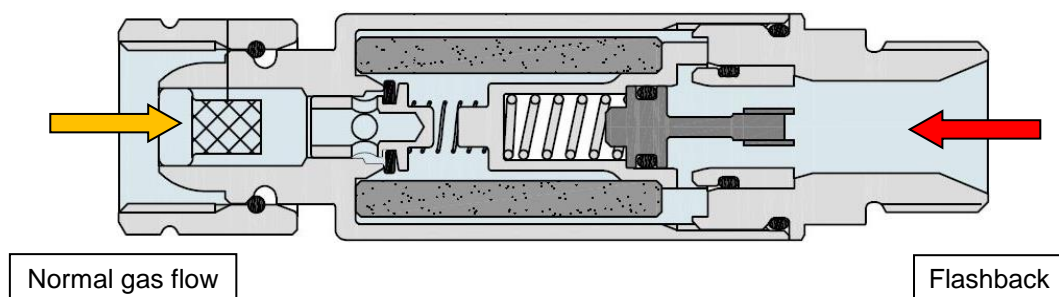
Acetylene forms an explosive mixture with air or oxygen that can be ignited by a spark or another small amount of energy, resulting in a powerful explosion.

This hazard is to be avoided by taking the following safety measures:

- Acetylene plant must be leak-proof from the cylinder connection to the torch.
- Any leaks must be rectified immediately.
- Acetylene hoses must meet the requirements specified in EN ISO 3821.
- Connectors in accordance with SN/EN 560 must be used to connect the hoses to each other and to the devices.
- Hoses are to be protected against damage and replaced in good time.
- Acetylene cylinder valves are to be closed during work breaks.



The pressure regulators for acetylene plant must be equipped with flashback arresters in accordance with EN 730-1 (see illustration) in each case. These safety devices contain a flame arrester, a gas non-return valve and a temperature-controlled cut-off valve. These prevent the formation of an acetylene-oxygen mixture and flashback in the gas cylinder.



Decomposability

Each acetylene molecule is held together by an unstable chemical bond that can be broken when exposed to heat or an exceptional pressure surge. This will break the acetylene molecules down into their components of carbon (soot) and hydrogen. The decomposition reaction can be explosive, develop as a chain reaction and cause major destruction. The higher the pressure and the temperature of the gas, the greater the tendency of the acetylene to decompose.

This hazard is minimised by taking the following safety measures:

- The cylinder cavity is completely filled with a solid porous mass, whose pores contain the acetylene dissolved in a solvent (usually acetone). The protective effect of this system only works if the ratio between the quantity of dissolved acetylene and that of solvent does not exceed certain limits.
- Acetylene cylinders are only filled with gas after they have been inspected and the acetone inside has been topped up if necessary.



Cross-section of a C₂H₂ cylinder

In spite of the above-mentioned safety system, a decomposition reaction can occur inside the cylinder under unfavourable circumstances.

- A **strong blow** to the cylinder body, e.g. as a result of it falling over, can cause damage to the porous filling mass. This can cause the acetylene to decompose. a process that can only be halted by intensively cooling the cylinder.
- Acetylene cylinders are to be protected against **exposure to excessive heat**. Although they can withstand intensive sunlight for long periods of time, direct exposure to a flame can be dangerous. If a fire breaks out in the immediate vicinity of acetylene cylinders, they are to be removed as far as possible from the danger area. If the cylinders are exposed to excessive heat, they are to be intensively cooled with water.
- The sudden opening of a ball valve can cause a **pressure surge** which can trigger acetylene decomposition. Ball valves must therefore be operated slowly as a basic principle.

Welding and any other fire or excessive heating are prohibited in the following areas:

- within 1 m of individual acetylene cylinders,
- within 3 m of banks of acetylene cylinders

Acetylene can form so-called acetylides with copper, silver or mercury salts under certain conditions. These have properties similar to those of explosives and explode when exposed to heat or mechanical energy. It goes without saying that the explosive transformation of acetylides can trigger the decomposition of acetylene. Copper, copper alloys containing more than 65% copper, silver and silver alloys cannot therefore be used for acetylene plant or fittings. The preferred material for acetylene plant is steel. All materials (including sealants) which come into contact with acetylene must be resistant to acetone and other solvents being used.

Physical properties

Relative density

Acetylene has a relative density of 0.91, making it approximately 10% lighter than air. This means that acetylene easily spreads upwards in the ambient atmosphere. Work areas in which acetylene is handled must be ventilated at a high level within the room in order to prevent the hazardous accumulation of acetylene in the ambient air in the event of leaks. However, this measure will only work as long as a forced air flow does not drive the acetylene in another direction. In other words, rather than rely on this natural ventilation, every effort should be made to prevent leaks in acetylene plant. Leaks are usually found using soapy water or leak detection spray – the typical slightly garlic-like smell of the gas can also serve as an indicator.

When the cylinder valve is opened, acetylene flows out in its gaseous state. Acetone risks being discharged if the maximum extraction quantity is exceeded or if the cylinder being used is not in an upright position.

General handling

The following requirements are to be taken into account:

- Acetylene must only be taken from the cylinder using an approved acetylene pressure reducing valve (in accordance with EN ISO 2503). This limits the pressure in the hose to a maximum of 1.5 bar overpressure.
- Welding torches and hoses must not be hung on acetylene cylinders.
- Decanting acetylene from one cylinder to another is very dangerous and therefore to be avoided.
- Acetylene cylinders are to be handled carefully and not dropped.
- Acetylene cylinders must be kept upright while gas is being extracted and secured in order to prevent them from falling over.



Limited gas extraction quantity

The extraction quantity is limited for technical reasons. For information on the regulations governing temporary and continuous extraction, please contact your gas supplier. While acetylene is being extracted, the temperature in the container decreases sharply and there is a risk of solvent being discharged if a cylinder is overfilled.

Physiological properties

Acetylene is non-toxic and has a slightly narcotic and asphyxiating effect and therefore must not be inhaled.

Risk of exposure to asbestos?

Safety measures do not need to be taken. Certain highly porous masses in acetylene cylinders contain a small amount of asbestos. This is securely enclosed in the mass and also remains in the cylinder while gas is being extracted. Measurements carried out in the extraction flow from acetylene cylinders have clearly shown that the outflow of acetylene is completely free from asbestos. Therefore there is no risk of exposure to asbestos when using acetylene cylinders with porous masses that contain asbestos.

Final remarks

Information on the safety-related properties of the gases can be found in the safety data sheets (SDSs). For further information on handling compressed-gas containers, please contact your gas suppliers.

Compressed-gas containers can be used safely if the specific properties of the gases are taken into account and the safe handling of the compressed-gas containers is ensured.

Scope/Definition

This document replaces the existing IGS safety recommendations entitled "Handling acetylene" IGS-TS-008/07".

The scope of these safety recommendations only covers compressed-gas containers (gas cylinders and bundles).

Further documentation (not exhaustive)

- SUVA publication entitled "Fuel gas/oxygen plant", SBA 128.e
- EIGA Safety Information publication entitled "The safe transport, use and storage of acetylene cylinders", SL 04/10
- EIGA Safety Information publication entitled "Flashback and flame arrestors", SI 05/08
- EIGA Safety Information publication entitled "Code of Practice – Acetylene", DOC 123/13

Do you have any questions?
We hold further documents ready for you.



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