

M3-EN.11 GAS WELDING

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Description of chapter

The specific chapter includes thorough presentation of gas welding processes taking place at particular working posts, considering that special equipment and skills are required.

M3-EN.11.1 Gases used in flame cutting and welding processes

1. Oxygen: Oxygen is considered a hazardous gas, while in case of oxygen enriched atmosphere (more than 20%) it causes acceleration of combustion or even an explosion. If oxygen gets trapped in a welder's uniform, and provided that an open flame is present, he will suffer serious or even fatal burns, (as if he had soaked his clothes in petroleum).

- In metal processing workshops, it is strongly advisable to:
 - Avoid the use of all lubricants, as they are flammable.
 - Perform frequent inspections concerning safety devices and hoses for possible leaks.
 - Shut the equipment oxygen valve off immediately after your work is finished.
 - Never use oxygen instead of compressed air for cleaning purposes.
 - Avoid the use of oxygen in order to dust your clothes.
 - Keep oxygen cylinders in well-ventilated areas.
 - Avoid exposure of gas cylinders to sun or other heat sources.

2. Acetylene:

- Acetylene is the primary gas fuel in metal processing workshops. Its flame can reach about 3500°C. Acetylene is lighter than air, having the characteristic odor of onions. Therefore, it is rather easy to detect. It is extremely explosive when mixed with air in percentages ranging from 2,5% to 100%.

In order to avoid problems of this kind, the following are strongly suggested:

- Check for possible leaks (odor, soap and water without oil, but never with an open flame).
- Avoid exposure of gas cylinders to sunlight.
- Always keep gas cylinders in a vertical upright position.

3. Propane:

- It is used in metal processing workshops for relatively simple constructions.
- It gives off a characteristic fish odor.
- CAUTION: Propane gas is heavier than atmospheric air thus concentrating – in case of a leak – at floor level, constituting an explosion danger (Explosive area 2%-9%). In case someone suspects propane presence in the air at workplace, it is strongly advisable to immediately open doors and windows in order to create an air draught. The use of air extractors not certified as explosion proof devices should definitely be avoided in metal processing workshops.
- Storing propane cylinders in underground areas or in a trench is strictly forbidden.

M3-EN.11.2 Handling of gas cylinders

- Acetylene and oxygen cylinders are made of steel.
- Oxygen is stored under pressure on the order of 150-200Atm, while acetylene at pressure of 16Atm.
- The colour of cylinder or the distinctive line is WHITE for oxygen and YELLOW for acetylene.
- The oxygen cylinder valve has a right internal outlet thread, while acetylene cylinder has a left thread.

The following actions should be taken in a metal processing workshop:

- The gas cylinder supplier should be adequately certified. Moreover, cylinders should always have the appropriate recognition labeling (Identification marks) according to the legislation.
- Gas cylinders should be stored and used in an upright position (or with a slight inclination), ensuring sufficient ventilation conditions. Preferably, they should be placed in a well-ventilated and isolated area, equipped with an explosion proof automatic ventilation system. In that case, fuel gases will be available at any working post through a piping network, so as the user has to operate only pressure regulators and supply valves. If this is not applicable, gas cylinders should be placed on wheeled trolleys, properly fastened and secured to prevent them from falling or being knocked over.
- When a gas cylinder is empty, shut the valve off tightly and place the cover. This way, among other things, dirt and dust entering the cylinder is avoided. Moreover, the thread is protected against mechanical damage.
- A possible gas cylinder valve leak can be detected either by a characteristic fizzle or by odor. If a leak does occur, tighten the nut by means of a suitable wrench (never with a different wrench), and thereafter, check for further leaks using soap water (without oil) or even saliva, but never an open flame. If the cylinder still leaks, it should be returned to the supplier for repair.

M3-EN.11.4 Pressure regulators

The normal operation of the pressure regulator is crucial for the safe use of the welding equipment. Some practical rules are the following:

- Maintain suitable cylinder pressures.
Oxygen pressure gauges:
High pressure approximately 150 Bar
Low pressure approximately 15 Bar
Acetylene pressure gauges
High pressure approximately 16 Bar
Low pressure approximately 4 Bar
- Replace the cylinder (a full cylinder in place of an empty one) keeping the adjusting screw closed.
- Screw the regulator and check whether it is waterproof or not. Unwind the pressure adjusting screw and open the gas cylinder valve fully but not rapidly.
- Check impermeability of inlet and outlet connections, as well as the low and high pressure pressure gauges.
- In case a leak is observed, tighten the thread more, or replace the elastic gasket.
- In case a leak at the outlet of a closed pressure regulator is noticed, the latter needs to be repaired or replaced.

M3-EN.11.4 Flexible hoses

- Minimal length of flexible hose: 5 meters
- Each hose is designed for use with a specific gas and nominal pressure. The acetylene hose is protected against acetone leakage.
- Each gas corresponds to a specific hose color.
- Flexible hoses should never be exposed to greasy substances (oil, lubricants etc).
- Avoid hose winding around gas cylinders
- Maintain flexible hoses in good condition. Avoid folding and rupturing.
- Flexible hoses should not be subject to mechanical stresses or run over by vehicles.

M3-EN.11.5 Safety in welding processes

During welding processes, the use of particular personal protective equipment and welding appliances is required. The operator should use safety footwear as well as a protective shield or safety glass, and a protective lap. The procedure of initiating and finishing a work including welding is considered important.

Before welding:

- 1st Step: Inspect cylinder valves and pressure regulators before use.

- 2nd Step: Bleed flexible hoses starting with acetylene, thereafter continuing with Oxygen.
- 3rd Step: Open acetylene supply and ignite.
- 4th Step: Open oxygen supply valve on the blowpipe and adjust the flame.

After welding:

- 1st Step: Close acetylene / propane valve on the blowpipe
- 2nd Step: Close oxygen valve on the blowpipe
- 3rd Step: Close both valves on the top of the cylinders.
- 4th Step: Bleed the flexible hoses using the blowpipe valves.
- 5th Step: Close pressure regulators on both gas cylinders.

A matter of remarkable importance is the use of flashback arresters. These are protective devices designed to limit the danger of flashbacks and backfires, which introduce the main cause of explosions. It is advisable to install flashback arresters on both flexible hoses (oxygen – propane / acetylene) at a distance approximately 0,7-1 m away from the blowpipe.

CAUTION: An overheated gas cylinder is a strong indication of possible explosion. In case of overheating, the following actions must be taken:

1. Immediate shutting of gas cylinder valve
2. Disconnection of all regulation equipment
3. Immediate cooling by means of large quantities of water, sprayed from a safe distance
8. Immediate calling of the fire brigade
9. Removal of all other gas cylinders from the area