

**EWA-Technical Committee Flame**  
Oxy-fuel Equipment  
General Recommendations

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**Weld  
and Cut  
well!**



# INTRODUCTION

## **EWA TC Flame - Technical Committee for Gas Equipment**

The major manufacturers of welding and flame cutting equipment participate in the work of this technical committee which was formed in 2014.

At EWA this technical committee deals with technical issues for the "Flame" companies and also collaborates with the Association's other technical committees.

Its scope of application covers all the technologies of the various oxy fuel sectors.

It maintains stable relations with the relevant International Standardization Committees and in particular is linked to ISO TC 44 SC 8 -Equipment for gas welding, cutting and allied processes.

The delegates of the companies directly involved in the manufacture of flame equipment meet periodically to discuss the major technical and regulatory evidence and to transfer the most relevant information to the market.

Its main purpose is to provide the point of view of producers and also aims at enhancing safety levels when using flame equipment.

Since 2014 EWA-TC Flame, has published a series of unbound documents, recommendations and guidelines, as listed here.

## **EWA-European Welding Association**

The European Welding Association (EWA) is an industrial association which comprises national associations and manufacturers of arc welding and cutting equipment, welding consumables, flame welding and cutting equipment and health and safety equipment for welders from across Europe.

EWA was founded in 1987. Its predecessor was the Association of European Manufacturers of Welding Consumables (CEFE) which was founded in 1958. EWA currently has official headquarters in Paris.

### **EWA Duties and Objectives:**

EWA monitors the mutual technical and economic interests of the European welding industry and its customers by :

- Participating in the development and application of all the relevant specifications and standards affecting the welding industry, in cooperation with trade organizations, EU authorities and all other relevant bodies
- Gathering and analysing industry -specific market data
- Promoting the welding industry and welding as a profession.
- Promoting the safe use of the welding and cutting processes








Since 2018 EWA is registered on the EU Transparency Register (id number 711840531940-21)

### **EWA Technical Committees:**

The EWA technical committees work on the details of the technical aspects of welding manufacturing. At present, there are 4 technical committees: EWA TC Equipment (Arc welding/cutting equipment); EWA TC Consumables (welding consumables); and EWA TC H&S (Health and safety equipment for welders) and EWA TC Flame equipment (oxy-fuel)



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## General recommendations for the use of a Flame installation for the professional

These recommendations cover the use of manual flame equipment in oxy-fuel applications such as:

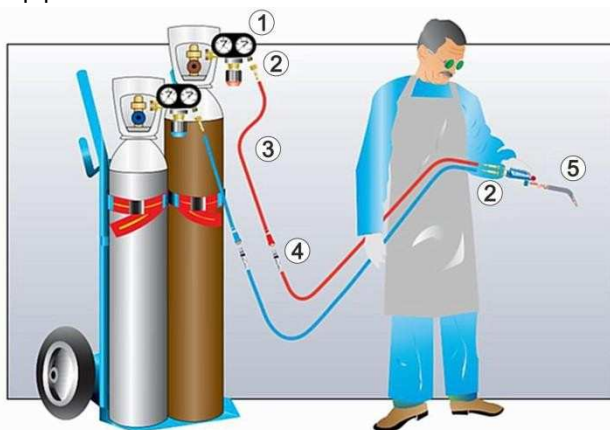
- Welding / Brazing
- Cutting
- Heating
- , and related processes (Gouging, Forming, ...)

These are the main recommendations. The below list is not exhaustive.

### Always follow manufacturers' instructions

#### Description of installation:

a flame installation usually comprises gas cylinders, pressure regulators, hoses, safety devices and a blowpipe.



- A cylinder of oxygen
- A cylinder of fuel gas
- pressure regulator (1)
- Flashback arrestor (2)
- Rubber hose (3)
- Quick connector and/or Flashback arrestor (4)
- A blowpipe (5)

#### Gases used:


Oxy-fuel technology uses the heat combustion of a fuel gas (usually acetylene or propane) mixed with a quantity of an oxidizing gas (oxygen).

In oxy-cutting, the oxygen burns the steel and the slag (iron oxide) is evacuated during the process. Fuel gas and oxygen are available in different cylinder sizes and / or in bundles. Valves are specific to each country, depending on the local standards.

#### Pressure regulator:

Pressure regulators are devices for regulating gas pressures, fitted to the cylinder or situated at the outlet of the distribution pipes in the case of a network.

They reduce the variable gas storage pressure to bring it to a suitable and stable operating pressure. They must comply with standard EN ISO 2503. The inlet connection must be compatible with the cylinder valve and compliant with the local standards.

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The outlet connection should comply to ISO TR 28821 covering the definition of hoses, as well as connections for welding, cutting and related process equipment (list of connections which are standardized).

#### **Commissioning**

- Use only pressure regulators designed for the gas being used. The fittings differ Depending on the gas.
- Check that the inlet connection is complete and clean before fitting and replace the pressureregulator when necessary.
- Take care when attaching the pressure regulator to the cylinder.
- Do not disassemble the regulator inlet fittings.
- When using Oxygen, ensure that all fittings are free from oil and grease.
- After initial commissioning and then at regular intervals, check the complete installation with an aerosol leak detector to eliminate any leakage.

#### **Adjustment:**

- Before opening the cylinder, make sure that the pressure adjusting screw is fully unscrewed.
- Slowly open the cylinder valve and then adjust the pressure by tightening the pressure adjusting screw to the settings recommended by the blowpipe manufacturer.

#### **Safety devices:**

Backfire and flashback can happen. In oxy-fuel processes it is important to use safety devices to provide the operator and his equipment with optimal protection.

#### **Definition of backfire and flashback**

In a backfire the flame burns back into the torch with an explosive sound. Either the flame is extinguished, or it is reignited at the top of the tip.

In a sustained backfire the flame continues back into the torch, often reaching the mixing point of the oxygen and fuel gas. An initial explosion occurs, followed by a whistling sound.

In a flashback, the flame backs up through the torch into one of the supply hoses. The hose can explode. In the worst case, the flame continues its way to the regulator and the cylinder.

#### **Causes of flashback**

A gas mixture in a hose, combined with a backfire when igniting a burner can cause a flashback. The gas mixture in the hose results from backflow, i.e. when gas at high pressure flows into a hose within which the pressure is lower. If there is sufficient gas mixture in the hose the explosion can be so violent that it causes the hose to burst.

#### **Preventive measures**

- to prevent backflow and flashback, safety devices incorporating a check valve and a flashback arrestor must be fitted to the regulators and/or the blowpipe. They are covered by various standards (ISO 5175 & EN ISO 5175-1. best practice methods require the operators to purge the oxy-fuel system prior for lighting.

*See specific EWA recommendations on safety devices.*

#### **Hoses:**

Use rubber hoses complying with EN ISO 3821 "Rubber hoses for welding, cutting and allied processes":

- Red for acetylene and marked 10 bars or 20 bars
- Blue for oxygen and marked 10 bars or 20 bars
- Orange for propane and marked 10 bars or 20 bars
- Red/ Orange for universal fuel gas except fluxed fuel gas and marked 10 bars or 20 bars.

The indications 10 or 20 are indicative of the maximum service pressures in bars.

Hoses can become deteriorated and leak. As a precaution, consider the date of manufacture (clearly marked on rubber hoses) and the conditions of use, and change them regularly.

### **Hose assembly**

For optimal and consistent tightening, the use of an ear collar or ferrule is recommended to avoid:

- Incorrect tightening
- Hose pinching
- faster degradation of the hose



Hose assembly should be compliant with EN 1256 “Specification for hose assemblies of equipment for welding, cutting and allied processes”

### **Quick coupling and coupling:**

Use quick couplings according to EN 561 / ISO 7289 to connect the device to the rubber hoses. They protect the ends of the hoses and prevent leakage in case of unwanted disconnection.

Hoses must be fitted to quick couplings with the same colour. If colours are used.

The standard applies to cases where these couplings are used with hoses according to EN ISO 3821 or threaded unions according to EN560.

### **Blowpipe:**

There are several types of blowpipes used for welding, cutting and heating, using different types of gas mixes (equal pressure without aspiration, injector with aspiration or nozzle mix).

These blowpipes must be compliant with the EN ISO 5172.

If a heating blowpipe is used with heating power > 33 000 kcal, the recommendation of the ENTR 13259 must be followed.

The operating pressures of oxygen and fuel gas recommended by the manufacturer must be followed during their use.

### **Ignition Process**

#### **Welding blowpipes**

1. Adjust the oxygen and fuel gas pressure on the pressure regulator as per the manufacturer's recommendations for the blowpipe type and size in use.
2. Slightly open the oxygen valve (blue valve)
3. Open the fuel gas valve. (red valve)
4. Light the torch. (do not use a lighter with gas containers)
5. Adjust the two valves in alternation to obtain a correct flame.

### Cutting blowpipes

1. Fit the torch with a cutting nozzle, selected from the table, suited to the thickness of the material to be cut and the fuel gas used.
2. Adjust the oxygen and fuel gas pressure on the pressure regulator according to the manufacturer's recommendations for the blowpipe type and size being used.
3. Slightly open the oxygen valve (blue).
4. Slightly open the fuel gas valve (red).
5. Light the torch.
6. Adjust the two valves in alternation to obtain a correct flame.
7. Make final adjustment after the cutting oxygen valve has been opened.

### Heavy duty blowpipes

1. Adjust the oxygen and fuel gas pressure on pressure regulator as per the manufacturer's recommendations for the blowpipe type and size in use.
2. Fully open the oxygen valve
3. Open the fuel gas valve.
4. Light the torch.
5. Adjust the two valves in alternation to obtain a correct flame.

### shut down process:

1. Close the fuel gas valve (flame off)
2. Close the oxygen valve



### **IMPORTANT SAFETY WARNINGS**

**IN THE CASE OF BACKFIRE OR FLASHBACK, IMMEDIATELY TURN OFF THE BLOWPIPE:**

- 1. IN PRIORITY CLOSE THE OXYGEN BLOWPIPE VALVE**
- 2. CLOSE THE FUEL GAS BLOWPIPE VALVE**
- 3. MAKE SURE TO CHECK ALL THE COMPONENT PARTS, INCLUDING THE SAFETY DEVICES.**

### **End of use:**


1. After use, shutoff the cylinder valves or the tapping point
2. Vent the gases from the hoses by opening the torch valves
3. Shutoff the valves of the torches
4. Fully unscrew the pressure regulator adjusting screw

### **Always follow manufacturers' instructions**

Instructions on how to use the equipment components shall be complied with, including recommendations on the parameters set up to obtain a safe, stabile and efficient flame. Equipment can only be used with the gas type for which it is designed. Comply with the equipment markings.

### **Additional recommendations:**

- Secure the gas cylinders before use, either at the workstation or on a suitable trolley.
- Dangerous fumes are emitted during welding, braze-welding and brazing. Work in an area with efficient fume extraction.

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- Use appropriate personal protective equipment: including goggles, gloves, apron.
- Do not transport gas cylinders in a vehicle that is not purpose-made (ventilated vehicle)
- With the cylinders properly stowed, check that the valves are closed.
- Pay Special attention to fire prevention, fuel gas and oxygen related hazards, and storage and handling of the gas cylinders. Gas should be delivered by authorized and dependable providers in packages that permit safe handling and use.
- Cylinders shall be secured by using either a trolley or a chain to prevent them from falling in the workplace.
- The working area should be placed at a suitable distance to prevent the overheating of the gas cylinders / gas distribution system.
- Comply with Local rules and conditions.

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 <p>European Welding Association</p>	<p><b>Recommendations for maintenance of Flame equipment in oxy-fuel welding, cutting and related processes</b> (heating, brazing, gouging, forming, ...)</p>	<p>Date: 04/2018 Revised TCE flame Pages: 1 / 4</p>
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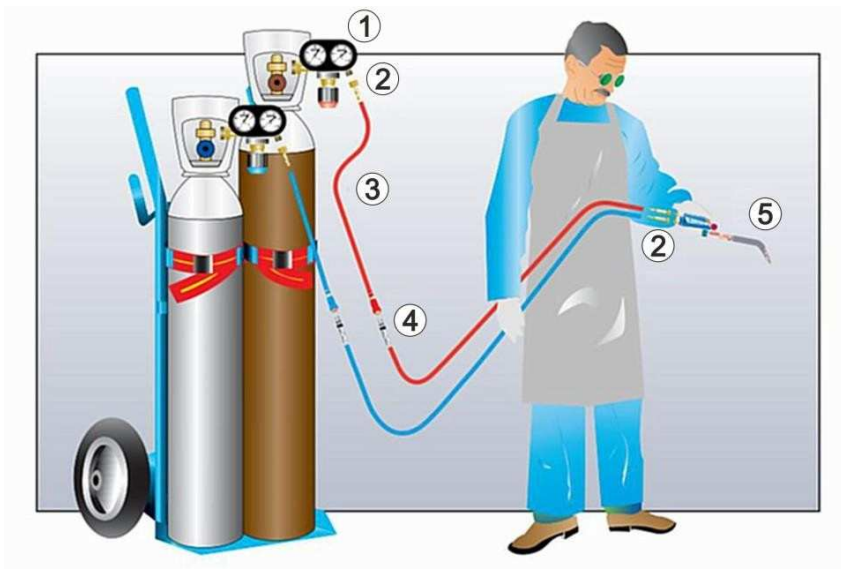
## Recommendations for maintenance of Flame equipment in oxy-fuel welding, cutting and related processes (heating, brazing, gouging, forming, ...)

This document presents the state of the art for the maintenance of the equipment used in the oxy-fuel flame process (commonly used for welding, cutting and related processes). These recommendations refer to manual use, although the primary recommendations for regulators, hoses, coupling devices, flashback arrestors, and blowpipes are also available for automated use.

Typical equipment used by an operator includes:

- an oxygen cylinder
- A gas cylinder
- a pressure regulator (1)
- a Flashback arrestor (2)
- a Rubber hose (3)
- a Quick connector and/or Flashback arrestor (4)
- A blowpipe (5)

Example of equipment



The user and/or the employer must take all necessary steps to guarantee that the working tools used are properly cared for, suitably maintained to ensure that the original level of safety required is maintained.

Always follow manufacturers' instructions.

Proper engineering practice rules recommend systematic replacement, at the latest every five years after commissioning, even in absence of any incidents.

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### 1. Pressure Regulators (1) (B see note below)

- Applicable standard: EN ISO 2503
- Visual test / verification /Tightness Test
- At each replacement of gas cylinder or equipment. Visual test of:
  - good conditions of threads, seals, pressure gauges, inlet/outlet couplings
  - absence of grease or oily residues
  - Tightness test of couplings under operating pressure
- Annually
  - External Tightness test under operating pressure
  - Internal Tightness test
  - Visual test of general conditions like marking, corrosion and damages
  - Revision or replacement – see note below (A) (C)
- It is advisable to replace pressure regulators after no more than 5 years of service, even if they are still operational.

### 2. Hose connections and quick-action couplings (4)

- Applicable standard
  - Hose connections: EN 560
  - Specification for hose assemblies: EN 1256
  - Quick -action couplings: EN 561
- Visual test / Verification / Tightness Test
  - At each replacement of a gas cylinder or device
    - Verification of correct operation of the closing mechanism
    - Tightness test of couplings under operating pressure
  - Annually
    - Tightness test with connected Coupling under operating pressure
    - Tightness test with disconnected Coupling under operating pressure
  - Servicing or replacement (A) (C)
    - Replacement in case of functional failure, or at least every five years

### 3. Hoses (3)

- Applicable standard
  - for rubber hoses: EN ISO 3821
- Visual test / verification / tightness test
  - At each replacement of a gas cylinder or device
    - Verification of hose colours according to gas type (Blue for oxygen, red for acetylene, orange for propane and red/orange for all common fuel gases)
    - Visual test to check the condition of the hoses and ensure that they are fault-free.
    - Tightness testing is required every 3 months.
  - Annually
    - Visual test on bent hoses to check for breaks, cracks, kinks and swollen areas.
  - Revision or replacement (A) (C)
    - Replacement:
      - if the visual test reveals damage

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- The date marked on the hose is the date of manufacture and not the use limit date.
- these hoses should be replaced every 5 years by the manufacturers; however, it is necessary to:
  - Regularly check that the hoses are in serviceable condition and free of leaks.
  - Consider replacing them when they have suffered damage due to an impact or whenever cracks appear; these often appear near the hose connection point. As a general rule, change them as often as the conditions of use require.

#### 4 Flashback arrestors and Check valves (1 and 3)

- Applicable standard: EN ISO 5175-1
- Visual test / verification / tightness test
  - At each replacement of gas cylinder or equipment
    - Verification of:
      - Presence
      - Colors according to gas type
      - Visual test and tightness test for safety device and quick-action couplings
      - Safety devices used with compressed air should never be used with oxygen after.
    - Annually
      - Visual test
      - External tightness test
      - Internal tightness test (non-return valve)
      - Flow rate.
    - Revision or replacement (A) (C)
      - Replacement: in case of no flow because of activated thermal cut-off valve or at least every five years after initial commissioning, depending on severity of use.

#### 5. Blowpipes (5)

- Applicable standard: EN ISO 5172— CEN TR 13259 (other blowpipes)
- Visual test / verification / tightness test
  - At each replacement of gas cylinder or equipment
    - Visual test for serviceable condition of tips and tightness test on connections
    - Check valves to ensure they are leak-tight.
    - Check the condition of the nozzle look for any signs of leakage.
  - Revision or replacement
    - It is advisable to overhaul or replace blowpipes after no more than 5 years of service, even if they are still operating correctly.

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**Nota:**

(A) The equipment shall be revised by the manufacturer or by maintenance/repair technicians authorized by the manufacturer (if there is one). Malfunctioning equipment must be overhauled or replaced.

(B) This does not apply to pressure regulators incorporated into the gas cylinder valve, which must be maintained by the gas supplier.

(C) Contact your local supplier for safety information about gas and materials used. The described equipment is designed for professional use. Use suitable tools for all the operations described above. Some countries may have more specific applicable legislation.

**Some additional recommendations:**

- Ensure the gas cylinders are safe before use, either at the workstation or on a suitable trolley.
- During maintenance, the working area must be equipped with an efficient fume extraction system.
- Use appropriate personal protective equipment including goggles, gloves and apron.
- Do not carry gas cylinders in a vehicle not designed for the purpose (vehicle ventilated, cylinders stowed, valve closure checked...)

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 European Welding Association	<b>Safety devices used in Oxy-Fuel technology</b>	EWA TI 2020 on Safety when using flame equipment EN p FAD 2020 07 24
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## Safety devices used in Oxy-Fuel TECHNOLOGY principles and PREVENTION

### Always follow manufacturers' instructions

#### Basic principle


The Oxy-fuel technology refers to thermal processes such as flame welding, oxygen cutting, brazing, flame straightening and various preheating methods. A Highly intensive and focused flame is needed when operation with oxy-fuel blowpipe. Such flames appear when gas fuels are burned with pure oxygen. various fuel gases can be used: Acetylene, Propane, LPG, Natural gas, Hydrogen, Propylene, Ethylene, Oxygen and the fuel gas are supplied to the blowpipe from gas cylinders of piping systems through pressure regulators and rubber hoses. Further, they are mixed together in the blowpipe or nozzle to an optimal ratio to create highly reactive mixture. When ignited, this mixture is burns, forming a high-energy flame used as a power source for above the above-mentioned technologies. It is one of the primary technologies used in metal fabrication.

The Oxy-fuel technology is a safe and effective process for the high quality fabrication of metals when suitable quality equipment is used, operated with parameters set accordingly to the equipment producer's instructions. Oxygen and fuel gas are fed through the blowpipe and mixed at an optimal ratio to produce a stabile flame at the blowpipe nozzle. Some blowpipes have an injector mixing system frequently used when fast blown oxygen sucks in the right amount of the fuel gas by means of a Venturi effect. The Oxygen pressure is then set higher than fuel gas pressure. When an equal pressure mixing system is used, both gases are set at the same pressure level and create the optimal mixture.

#### Flame -related hazards, backfire and flashback

Four basic phenomena can occur if the equipment is badly handled or the process is wrong and in the event of equipment damage or due to a design or manufacturing defect: gas backflow, backfire, sustained backfire and flashback

- The **gas backflow** can occur if the blowpipe nozzle becomes blocked. This can happen for instance when the nozzle touches the material or if there is a pressure drop in one of the gas channels (no gas supply in the hose, gas supply interrupted). In such a case the higher set pressure is blown and mixed in the channel with the lower pressure. This hazard is due to an explosive mixture being created in the rubber hoses and its propagation to the pressure regulator and gas cylinders.
- A flame burning stability is ensured when the rate of burning is equal to the rate of gas delivery. The burning rate of a particular fuel gas mixed with oxygen is always constant. The Speed of gas flow is influenced by the gas pressure setting, by adjusting the flame at the blowpipe valves or when the nozzle outlet is blocked because of incorrect manipulation. When the burning rate is faster than gas flowrate, the flame can enter the nozzle and blowpipe. This phenomenon is called **backfire**. Backfire is followed by a loud/explosive sound. the backfire is then stopped at the gas mixing point, where the burning rate changes. The Flame is either extinguished at his point or blown away from the nozzle and resumes stable burning.
- However, when the nozzle or blowpipe is overheated and its temperature reaches a level higher than the ignition temperature of the fuel gas–oxygen mixture, it means that the gas is being ignited inside the blowpipe and continues to burn inside it.

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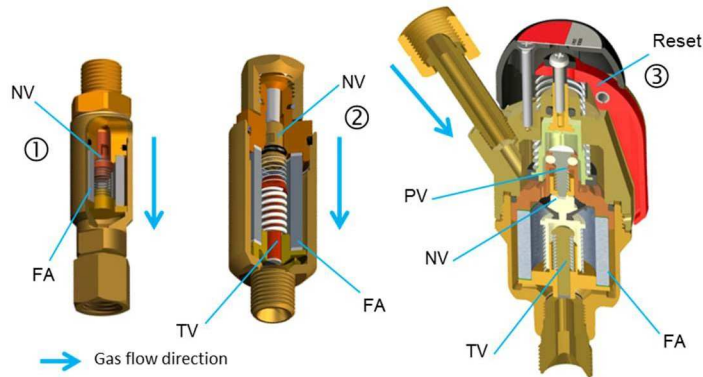
This phenomenon is referred to as a **sustained backfire**. The flame itself is not visible outside the nozzle, just the fumes. Internal burning is followed by whistling sound. This occurs when the blowpipe is overheated either by several backfiring occurrences or by incorrect operation with the blowpipe. In this case, the gas supply must be closed off immediately or there could be a risk of the blowpipe being damaged by melting and in the worst case, of people being injured.

- If the gas delivery is not stopped and the flame is not extinguished, a **flashback** occurs when the flame travels through the blowpipe and gas hoses up to the gas source. A flashback can cause hose explosion when the flame reaches the gas cylinders or the pipeline. it may cause a huge explosion with devastating results.

## Prevention

- Pay close attention to fire prevention, to fuel gas and oxygen related hazards, and to storage and manipulation of gas cylinders. Gases should be delivered by authorized and renowned providers in packages that allow safe handling and use. Cylinders must be secure to prevent them from falling at the place of work. The minimal recommended distance between an open oxy-fuel flame and the cylinders shall comply with local rules and conditions. Pressure regulators must conform to EN ISO 2503, flashback arrestors to EN ISO 5175-1, gas hoses to EN ISO 3821 and blowpipes with nozzles to EN ISO 5172. Instructions for the use of all equipment components shall be complied with including those relating to the parameters set up to obtain a safe, stable and efficient flame. Equipment can only be used with the gas type for which it is designed. Comply with the equipment markings.
- **Dual-function FBA** ① integrates a non-return valve (NV) with a flame arrestor (FA). The flame arrestor is a high porosity and small pore size sintered metal element through which the gas passes. When the flame reaches a sintered metal element, it is split into a porous structure and extinguished at that point. It is advisable to install dual-function FBA at the blowpipe stem or between the hoses.
- **Three-function FBA** ② also includes, in addition to the above -mentioned features, a thermal valve (TV). The Thermal valve is activated when the FBA body is heated. heating can be caused either internally by backfire or externally, for example by a fire at the working place. When activated, the thermal valve closes off the gas supply entirely. This stops the flame and the FBA must be exchanged by new one before restarting operation. Three-function FBA should be used at the cylinder regulator or at the outlet-point of the pipe.
- **Four-function FBA** ③ also includes a pressure activated valve (PV). It is actuated by a pressure wave from downstream side. This happens for example in case of flashback. The gas flow is stopped but the FBA can be reset and used repeatedly. The four-function FBA is currently the most sophisticated safety device to protect oxy-fuel operation. It should be installed at the cylinder regulator or at the outlet-point of the pipe.

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### Requirement for standard compliant marking of safety devices as per EN ISO 5175-1

Every manufacturer applying an EN ISO 5175-1 marking to a new product must run a type test according to this standard before launching the product.

A high safety level must be documented by an accredited external testing institute (third party such as BAM, U.L. or APRAGAZ).

#### Production tests

The manufacturer of a safety device should put every flashback arrestor through a flashback test according to the standard. To complete a 100% production test, the function of the non-return valve, the pressure activated valve (only four-function FBA) and the external gas tightness should also be tested.

**Each FBA made in accordance with EN ISO 5175-1 shall be permanently marked with:**

- The number of the International Standard EN ISO 5175-1
- The name or trademark of manufacturer and/or distributor
- The model designation or code number relating to the manufacturer's installation instruction
- the normal gas flow direction (arrow)
- The name of the gas or its abbreviation
- The maximum operating pressure,  $p_{max}$ , expressed in bar
- An Indication of the safety functions incorporated in the device

Manufacturer or distributor name	Model designation	$HPYM - P_{max} = 5 \text{ bar} / 72 \text{ psi}$ $A - P_{max} = 1.5 \text{ bar} / 21 \text{ psi}$	EN ISO 5175-1
	FUEL GAS		FA   NV   PV   TV
NEXT INSPECTION		14 15 16 17 18 19	20
		1 2 3 4 5 6 7 8 9 10 11 12	

Manufacturer or distributor name	Model designation	$O - P_{max} = 10 \text{ bar} / 145 \text{ psi}$	EN ISO 5175-1
	OXYGEN		FA   NV   PV   TV
NEXT INSPECTION		14 15 16 17 18 19	20
		1 2 3 4 5 6 7 8 9 10 11 12	

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## Highest protection level

To achieve the highest possible level of protection a four-function FBA is fitted to the outlet of the regulator and a two-function FBA to the blowpipe inlets. This applies to both the oxygen and the fuel gas supplies. The FBA at the blowpipe inlet stops the flame at the nearest point before its entering into the gas hoses. The four-function FBA at the gas regulator is also the last safety point dealing with the initiation of the flame in the hose by an external ignition source. It also ensures that the gas supply is stopped in the event of a fire at the working place.

## Annual testing of safety devices

To maintain the high level of safety during the life cycle of the device, the safety device (flashback arrestors) should be tested for gas non-return, for gas tightness and for gas flow by a trained and authorized person every year (depending on the country specific regulations). Items that fail to pass the test must be replaced. This can be done by means of a special testing unit (picture 1). The country-specific regulations or recommendations should be applied in terms of maintenance or replacement.



Picture 1

## Aspirated air– fuel gas technology

Aspirated air - fuel gas equipment is not subject to flame return and flashback. This dispenses with the need to use flashback arrestor safety devices\*

In case of an incident, shutoff the fuel gas cylinder valve or apply the fuel gas supply point isolation valve immediately.

\*Except during the:

- Use of acetylene
- Use of Oxy-fuel gas equipment
- Use of Premixed compressed air-fuel gas equipment
- Installation of gas networks in buildings, houses, workshops, training centers, vehicles...

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## Quick-action couplings with shut-off valves for welding, cutting and allied processes

EWA TI 2020 Technical information on quick-action-coupling EN p

FAD 2020/06/24

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## Quick-action couplings with shut-off valves for welding, cutting and allied processes Basics and Prevention

### always follow manufacturers' instructions

#### Basic principle

Oxy-fuel technology refers to thermal processes like flame welding, oxygen cutting, brazing, flame straightening and various pre-heating methods. For such applications, the blowpipes are connected to fuel gas or oxygen tapping points by means of flexible hoses with screw-on connections as per EN 560. Various fuel gases can be used: Acetylene, Propane, LPG, Natural Gas, Hydrogen, Propylene, and Ethylene. An easy and safe alternative is to connect the blowpipes and the tapping points by means of flexible hoses and quick-action couplings with shut-off valves according to EN 561/ ISO7289.

The Oxy-fuel technology is a safe and effective process, used in the metal industry. However, it does call for the use of suitable high quality equipment is used.

#### Potential hazards when using coupling systems


The following basic phenomena can occur in the event of incorrect handling of quick-action couplings: incompatibility, mix-up, leaky connections and wearing.

- **Incompatibility** can occur if **non-standard** coupling systems from different manufacturers are used. This results in leaky coupling connections.
- **Mix-up** of couplings for fuel gas, oxygen or compressed air can occur if coupling systems are used which are not standard-compliant. Such systems do not offer coupling body/couplingpin combinations specifically coded to the respective gas types. It sometimes results in incorrect connection of the fuel gas-oxygen/compressed air hoses.
- **Leaky connections** can occur if the coupling systems used fail to meet the special material requirements according to EN ISO 9539 and do not comply with additional testrequirements of accredited test institutes for certification of metallic and non-metallic materials.
- Increased **wear of the coupling pins** can occur if the coupling pins used do not fulfil the requirements regarding hardness according to EN561 / ISO7289. On the market there are two types of coupling pins according to EN561 / ISO7289: Brass coated coupling pins with hardness of 310HV0,2 and stainless-steel coupling pins with hardness of 270HV10.

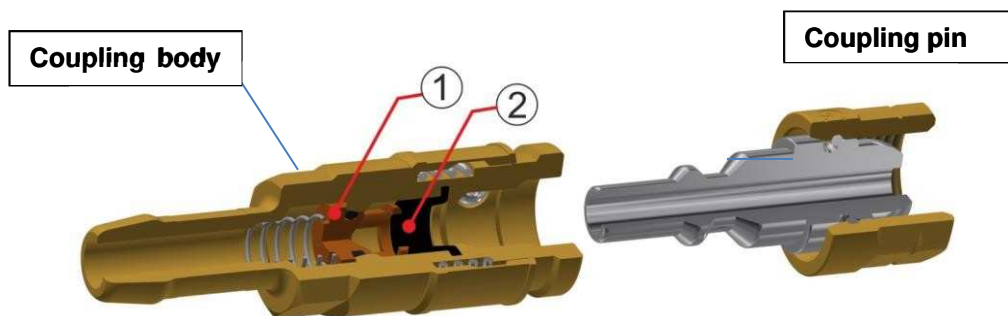
#### Prevention

The most effective way of preventing hazards related with the use of quick-action couplings in oxy-fuel processes is to use quick-action couplings complying with the standard EN 561/ ISO7289 "Quick-action couplings with shut-off valves for welding, cutting and allied processes".

- **Quick-action couplings with shut-off valves** according to EN 561 / ISO 7289 consist of:

 European Welding Association	<b>Quick-action couplings with shut-off valves for welding, cutting and allied processes</b>	EWA TI 2020 Technical information on quick-action-coupling EN p FAD 2020/06/24
EWA \ TC FLAME		

- a **coupling body (female element)** fitted with an automatic shut-off system ① which prevents gas leakage when the quick coupling is uncoupled. The outlet connection of the coupling body is designed to ensure that the elements for the different gas types (such as fuel gas and oxygen) are not interchangeable. The proper sealing ② between coupling pin and coupling body is provided by a molded seal. External tightness must be ensured before the coupling pin opens the shut-off valve and releases the gas flow.
- a **coupling pin (male element)** with standard-compliant dimensions related to the respective gas types (fuel gas, oxygen and other gases specific for welding processes). This kind of coding prevents the mutual connection of two lines containing incompatible gases.



### Requirement for standard-compliant marking of quick-action couplings according to EN 561/ ISO 7289

Every manufacturer applying an EN 561/ ISO 7289 marking to a new product must do a type test according to this standard before launching the product.

The high safety level can be documented by an accredited external testing institute (third party such as BAM, U.L. or APRAGAZ).


#### Production tests

The manufacturer of a quick-action coupling shall subject each unit to a gas tightness test in the uncoupled position (to test the gas shut-off valve) as well as in coupled position (to test the tightness of the connection between coupling body and coupling pin).

### Quick-action couplings according to EN 561/ ISO 7289 shall be marked lastingly with the following information

- Number of standard EN 561 / ISO 7289
- Type of coupling (i.e. "O" for oxygen, "F" for fuel gas and "N" for other gases specific for welding processes)
- Name or trademark of the manufacturer / distributor
- An arrow indicating the direction of gas flow



 European Welding Association	<b>Quick-action couplings with shut-off valves for welding, cutting and allied processes</b>	EWA TI 2020 Technical information on quick-action-coupling EN p FAD 2020/06/24
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## Maintenance


Perform a visual examination of the coupling and the coupling pin and replace in case of shock or deformation.

Indicate that the coupling or the coupling pin must be replaced in case of difficulty in handling them.

## Annual test of quick-action couplings

To maintain the high level of safety during the life cycle of the device, the quick-action coupling should be tested every year under working pressure for gas tightness (in the coupled and uncoupled position) by a trained and authorized person (depending on the country-specific regulations). Items which do not pass the test have to be replaced. The country-specific regulations or recommendations should apply in terms of maintenance and replacement.

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 European Welding Association	<b>RECOMMENDATIONS FOR          MAINTENANCE OF GAS MANIFOLD          SYSTEMS</b>	
EWA \ TC FLAME		

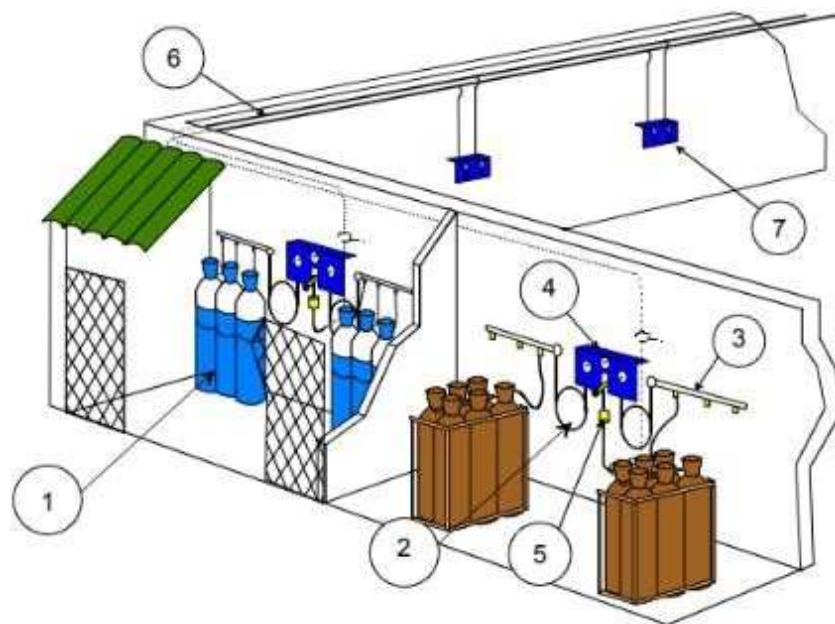
### Scope:


The scope of these recommendations concerns the gas manifold systems for the distribution of gas for welding, cutting and allied processes on customer site. These gases are stored either in cylinders or in bundles (assemblies of cylinders joined together) in the form of:

- Compressed gases,
- Gases which dissolve under pressure (only acetylene),
- Liquefied gases (except butane and propane to which specific provisions apply).

gases stored in cryogenic vessels are not within the scope of this document.

### Description of installation:



 European Welding Association	<b>RECOMMENDATIONS FOR          MAINTENANCE OF GAS MANIFOLD          SYSTEMS</b>	
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### 1. Cylinders or bundles:

- Check the condition of bottle attachment to prevent them from falling,
- Check the tightness of the connection at each change of cylinders or bundles, with a product leak detector (specific foaming liquid, for example),
- The floor on which cylinders or bundles stand must be flat and clear to allow rapid access to the valves in an emergency,
- The storage area must be kept clean and tidy with regular cleaning to prevent the accumulation of combustible materials (paper, cardboard, falling leaves ...).
- If combustible gas bundles are used, check for the presence and the condition of the bundle earth connection cables.

### 2. Flexible hoses, coiled metal pipes (pigtailes) and articulated tubing connections:

*Applicable standard:*

*EN ISO 14113: Gas welding equipment -- Rubber and plastic hose and hose assemblies for use with industrial gases up to 450 bar (45 MPa)*

*ISO 16964 . 16964 Gas cylinders — Flexible hose assemblies — Specification and testing*


**WARNING:** the Checks mentioned below must be carried out without pressure:

- Check that the flexible safety cables are attached correctly to prevent whiplash in case of a break,
- For flexible hoses, when changing a cylinder visual inspection of the state of the braid is necessary to ensure that there are no breaks, no ruptured braids, corrosion points, and check the condition of theseal,
- Even if visual inspection is satisfactory, we recommend changing the hose at least every five years, per the reference date affixed to the hose,
- Check the condition of coiled metal pipe (pigtail) and articulated tubing connection. When in doubt, it is recommended to replace them with flexible hoses.

### 3. Collecting manifolds:

*Applicable standards:*

*EN ISO 14114: Gas welding equipment -- Acetylene manifold systems for welding, cutting and allied processes -- General requirements*

 <p>European Welding Association</p>	<b>RECOMMENDATIONS FOR MAINTENANCE OF GAS MANIFOLD SYSTEMS</b>	
EWA \ TC FLAME		

*EN ISO 15615: Gas welding equipment. Acetylene manifold systems for welding, cutting and allied processes. Safety requirements in high-pressure devices*

- Check at least once a year the external sealing under gas at the operating pressure by a check using leak detector,
- once a year check, have the proper functioning of equipment manifolds checked according to the manufacturer's instructions, by trained and authorized personnel.

#### **4. Manifold systems and change-over units:**

*Applicable standards:*

*EN ISO 14114: Gas welding equipment -- Acetylene manifold systems for welding, cutting and allied processes -- General requirements*

*EN ISO 15615: Gas welding equipment. Acetylene manifold systems for welding, cutting and allied processes. Safety requirements in high-pressure devices*

##### **4.1 Gauges:**

*Applicable standard: EN ISO 5171: Gas welding equipment - Pressure gauges used in welding, cutting and allied processes (Replace EN 562)*

- Visually check that all pressure gauges are in good condition and give correct information readings, for example maximum pressure and zero.

##### **4.2 Regulators:**

*Applicable standard: EN ISO 7291: Gas welding equipment - Pressure regulators for manifold systems used in welding, cutting and allied processes up to 30 MPa (300 bar)*

- Check at least once every year for external sealing by using a leak detector. The high-pressure side of the manifold should be tested by cylinder filling pressure. The Low pressure side should be tested for at least the preset pressure of the regulator.

- Check at least once a year by an external leak test with the gas at maximal operating pressure, using a leak detector.


- once a year have a check run on the manifold system / change-over unit (filter, valve diaphragm, valve, check valves and purge) according to the manufacturer's instructions, by trained and authorized personnel.

##### **4.3 Signalling system:**

- Check once a year, the smooth operation of remote signalling system, if there is one.

#### **5. Acetylene safety devices.**

*Applicable standard: EN ISO 5175-1 Gas welding equipment — Safety devices — Part 1: Devices incorporating a flame (flashback) arrestor.*

 <p>European Welding Association</p>	<b>RECOMMENDATIONS FOR MAINTENANCE OF GAS MANIFOLD SYSTEMS</b>	
EWA \ TC FLAME		

- Flashback arrestors and other safety devices installed within acetylene manifold unit, must be serviced annually according to the manufacturer's instructions, by trained and authorized personnel.
- If there is a bursting disc, carry out outside visual inspection to ensure it is free from deterioration,
- A complete audit must also be carried out after each incident.

If necessary, equipment will be changed according to the manufacturer's instructions.

## 6. Pipework:

**WARNING:** The disassembly of equipment and purge plugs can cause a potential risk of explosion (case of fuel gases). This operation must be performed according to the manufacturer's instructions, by trained and authorized personnel.

Follow local rules and instructions for Use. perform the following inspections at least once a year.

- Perform a visual inspection to check for external corrosion and damage,
- Ensure the presence and continuity of the effective electrical grounding of the pipe,
- Perform tightness test under gas, connected components, using a leak detector,
- Check the correct identification of the pipe relative to the gas transported,
- For buried pipes, check for any subsidence of the ground.

## 7. Point of Use:

*Applicable standard: EN ISO 5175-1 Gas welding equipment — Safety devices — Part 1: Devices incorporating a flame (flashback) arrestor.*


Perform once a year:

- An external leak test under gas, using a leak detector,
- A visual inspection to ensure the serviceable external condition of the pressure gauges, flow meters, valves and regulators.

## Additional recommendations:

For other equipment please refer to the EWA document:

*TI-2018-04-Technical-information-on-maintenance-of-flame-equipment*

 European Welding Association	GENERAL STATEMENT ON FAKE PRODUCTS - FLAME  <b>FOCUS ON FLASHBACK ARRESTORS</b>	FOCUS ON FLASHBACK ARRESTORS 2021 28 09
EWA \ TC FLAME		

## GENERAL STATEMENT ON FAKE PRODUCTS


EWA is a European professional association which brings together manufacturers of equipment and consumables for flame and electric arc welding (Electrodes, MIG, TIG). Each member of EWA is a producer with a factory in Europe. These European manufacturers comply with European directives and standards that ensure the safety of equipment.

The purpose of this document is to inform you about counterfeits. Counterfeits are products which are copied without permission from the original products and are most often sold at lower prices. The globalization of trade, e-commerce and the development of freight facilitates their marketing. Their uncontrolled quality can be dangerous for the health and safety of users. Their impact on the economy affects intellectual property rights, business markets and employment.

The products of European industrial manufacturers are marked. We can therefore identify and find the manufacturer in the event of difficulties or problems, which is not generally the case with counterfeit manufacturers leaving you alone to face the difficulties and security risks for users. This marking of the producer (and distributor) identification is important to ensure that the products meet quality and safety standards.

The position paper of EWA "Importer's liabilities" recalls the obligations of importers of products which are not manufactured in the EEC:

<https://european-welding.org/wp-content/uploads/2016/10/Importers-liabilities-Reviewed-in-March-2016.pdf>

 European Welding Association	GENERAL STATEMENT ON FAKE PRODUCTS - FLAME  <b>FOCUS ON FLASHBACK ARRESTORS</b>	FOCUS ON FLASHBACK ARRESTORS 2021 28 09
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## FOCUS ON FLASHBACK ARRESTORS

Safety devices for oxy-fuel are the protection against gas reserve flow, flashback and burnback. As the quality of an oxy-fuel safety device cannot be directly ascertained by the user the buyer/user it is important to refer to the appropriate Standards and to the good name and reputation of the manufacturer that will be able to provide the corresponding declaration of conformity.

All safety devices shall be marked according to EN ISO 5175 and both on the product and the packaging/label. All the following information shall be reported in legible and durable way:

- |   |   |  |
|---|---|--|
| <ol style="list-style-type: none"> <li>1. Standard</li> <li>2. Manufacturer / Distributor</li> <li>3. Model designation</li> <li>4. Flow direction</li> </ol> |  | <ol style="list-style-type: none"> <li>5. Type of gas</li> <li>6. Operational pressure</li> <li>7. Safety functions</li> </ol> |
|---|---|--|

1. The number of the standard: EN ISO 5175-1
2. The name or trademark of the manufacturer and/or distributor
3. The model designation or code number relating to the manufacturer's installation instructions
4. The direction of normal gas flow (arrow)
5. The name of the gas or its abbreviation
6. The maximum operational pressure, "pmax" in bar
7. The indication of the safety functions incorporated in the device


 European Welding Association	GENERAL STATEMENT ON FAKE PRODUCTS - FLAME  <b>FOCUS ON FLASHBACK ARRESTORS</b>	FOCUS ON FLASHBACK ARRESTORS 2021 28 09
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Always refer to the manufacturers' / suppliers' instructions for the correct and safe use of all equipment and materials used. All equipment should conform to appropriate standards.

According to the EN ISO 5175-1 the instructions shall contain at least these elements:

- The function of the safety device
- The operational and performance data
- The permissible types of gas
- An explanation of the abbreviations marked on the device
- Instruction for installation of equipment
- The procedures to be carried out prior to operation
- The procedures for safe operation
- The instruction in case of malfunction

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 European Welding Association	GENERAL STATEMENT ON FAKE PRODUCTS - FLAME  <b>FOCUS ON PRESSURE REGULATORS</b>	FOCUS ON PRESSURE REGULATORS 2021 09 28
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EWA \ TC FLAME		

## FOCUS ON CYLINDER PRESSURE REGULATORS

Regulators are high pressure devices to reduce relatively high pressurized gas in the cylinder (inlet pressure) – up to 300bar – to the desired service pressure (outlet pressure) and to keep it as stable as possible for the respective applications. When a cylinder pressure regulator does not fulfil its function, it may cause a serious safety hazard. This is related to high pressure, property of different gases and to dangerous rise of the secondary pressure in the downstream pipes and components. As a result, not only the quality of the application is no longer guaranteed, but there is the possibility of safety issue as a fire, explosion, ejection of the parts or asphyxiation. This can lead to financial losses but also to human injuries.




For decades, producers of cylinder pressure regulators based in Europe have been standing for recognized quality. Their products take all safety aspects into consideration. This is guaranteed by long-term market experiences and by the well-established quality management system, which of course reflects the current state of both international and local technical regulations. Valid certificates confirm the quality management's efficiency. Maintenance recommendations, operation and service training offers, and spare part specifications are part of the scope of delivery. Regular checks, examination of complaints, in factory tests and test programs follow the life cycle of the products.

Counterfeit or fraudulent cylinder pressure regulators usually contain labels suggesting that they have been manufactured according to valid safety standards that guarantee their proper operation. But they very often do not meet common safety rules. Users are often not aware which product markings are required and/or they do not know their significance in detail.

Quality and safe cylinder pressure regulator should be marked according to ISO 2503 as follows:

- Number of this international standard
- Name or trademark of the manufacturer and/or distributor

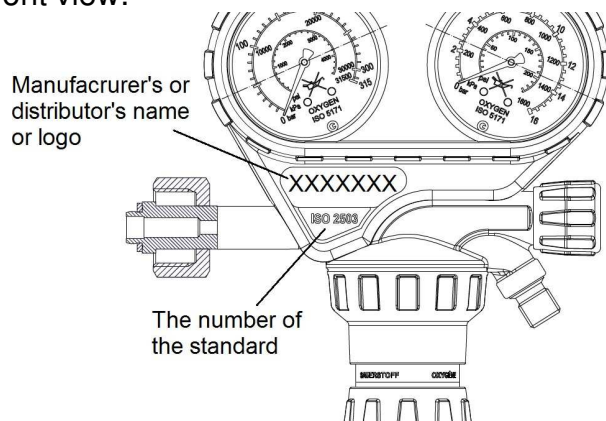
 European Welding Association	GENERAL STATEMENT ON FAKE PRODUCTS - FLAME  <b>FOCUS ON PRESSURE REGULATORS</b>	FOCUS ON PRESSURE REGULATORS 2021 09 28
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- Pressure regulator class or accuracy class or nominal outlet pressure and nominal discharge
- Nominal inlet pressure, determined by the manufacturer
- Type of gas used

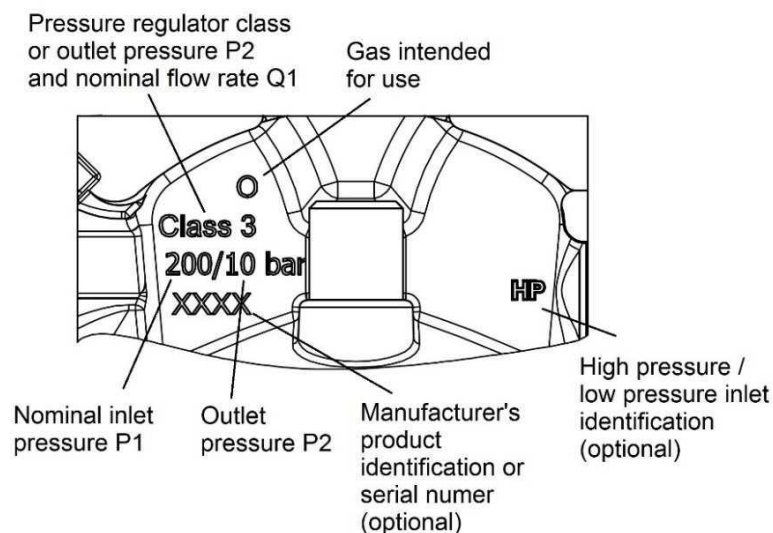
This information must be clearly visible on the pressure regulator body or cover or on a label permanently fixed to the pressure regulator. In addition, the supplier shall be able to provide the conformity of his product with all safety requirements defined in ISO 2503. This includes the confirmation of a successful type testing conducted by an accredited laboratory.

Example of the correct product marking:


Front view:



Rear view:



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 European Welding Association	GENERAL STATEMENT ON FAKE PRODUCTS - FLAME  <b>FOCUS ON TORCHES</b>	FOCUS ON Torches 2021 09 28
EWA \ TC FLAME		

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 European Welding Association	GENERAL STATEMENT ON FAKE PRODUCTS - FLAME  <b>FOCUS ON TORCHES</b>	FOCUS ON Torches 2021 09 28
EWA \ TC FLAME		

## FOCUS ON TORCHES

Blowpipes are used for cutting, welding and heating processes. There are several types of blowpipes on the market which differ in the type of the gas mixing system.

These torches must be compliant with EN ISO 5172.

When deciding on an oxy-fuel burner, the purchase price is not the only consideration. Working with fuel gases and oxygen basically requires high quality equipment. Anyone neglecting this point not only put their health at risk but also the safety of the production facility and the quality of their work.

The use of high-quality equipment is a way of warranting safe and successful operation. The issue here is that the user can often only determine during actual operation whether a burner can be operated safely.


With these devices, the danger does not always come directly from the devices themselves, but from individual wear parts. Primary risk-prone items are welding, heating and cutting nozzles.

It is precisely these nozzles that are often copied and sold. It is very likely that burners are operated with nozzles that are not original parts.

If the copied replacement part is not of the same quality as the original part, this can lead to flashbacks, sometimes back into the gas hoses. This puts the user in danger and leads to burner defects ahead of schedule and thus to frequent repairs. As a result, the decision to procure a cheap copy can turn out to be the more expensive investment compared to the original parts.

Despite the dangers often entailing the use of low-quality copies, such copies are continually on offer.

Their purchase is often because many end users are unaware of the details of the required product labelling.

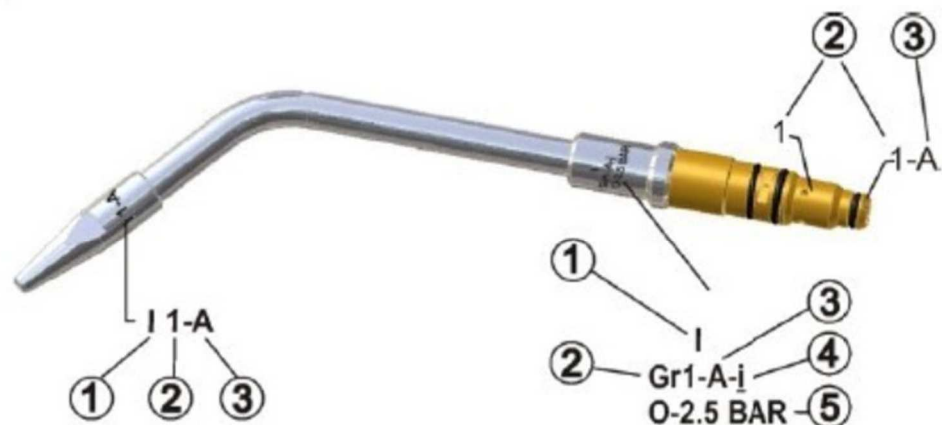
 European Welding Association	GENERAL STATEMENT ON FAKE PRODUCTS - FLAME  <b>FOCUS ON TORCHES</b>	FOCUS ON Torches 2021 09 28
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EN ISO 5172 specifies the requirements for tests for oxy-fuel torches for welding, cutting and heating. Depending on the design, the torches and nozzles must:

- Correspond to the gases used.
- Be Gas tight.
- Be designed so that fuel gas and oxygen are fed to the torch in separate lines.
- Be backfire-proof.
- Be clearly identifiable and permanently marked on the nozzle with the gas type and on the mixing nozzle with the mixing system.

**Example for the marking of a welding insert**

**Labeling  
EN ISO 5172**



- |   |   |
|---|---|
| 1 | Manufacturer  |
| 2 | Size  |
| 3 | Gas type  |
|   | A = Acetylen  |
| 4 | Mixture system:   |
|   | i = gas-return safe mixture with suction<br>(injector burner) — |
| 5 | Oxygenpressure  |
|   | O = Oxygen  |

Brand manufacturers stand by their products for recognized safety and quality. This not only includes the burner construction that complies with the standards, but it is also important to choose the right high -quality material according to EN ISO 9539.

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 European Welding Association	<b>Personal Protective Equipment using Flame Equipment</b>	December 2022
<b>EWA \ TC FLAME</b>		

## Personal Protective Equipment using Flame Equipment

### Introduction

Statistics on fatal and major work accidents underline the importance of protection and prevention, for which personal protective equipment plays an important role.

The practice in good conditions of welding, cutting or heating with flame processes generates risks associated with:

- Welding Fumes
- Fire (use of flames, pressurized gas)
- Radiation (UV)
- Projections / Sparks
- Heat
- Falling objects
- Noise



In order to prevent these risks of flame process uses, collective protection has to be privileged, and the Personal Protective Equipment (PPE) shall be used when collective protection measures prove to be inadequate, impossible to implement or not economically viable.

For protective clothing, since 21 April 2018, the Directive 89/686 / EEC on PPE has been replaced by the new Regulation (EU) 2016/425. Why?

The new legislation favors the improvement of the safety of PPE on the market to ensure that all PPE marketed on the European market complies with the Regulation (EU)

Major changes from 21/04/2018

- Classification changes for some product categories
- EC declaration of conformity to be provided (or an Internet link).
- 5 -year validity / expiry date for new CE certificates.
- Mailing address of the manufacturer on the label
- Each PPE must be delivered with the Instruction of use translated for all countries.

 European Welding Association <b>EWA \ TC FLAME</b>	<b>Personal Protective Equipment using Flame Equipment</b>	<b>December 2022</b>
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## The risks / the solutions

### THE RISKS

#### FACE & EYES

90% of all workplace eye injuries are preventable with the use of proper safety eyewear, welding goggles.  
Only 1% of approximately 770 workers suffering face injuries were wearing face protection.

#### BODY

Every day, people are admitted to burn centers with severe burns.

#### HAND AND FOREARM

25% of all work place accidents involved hands and fingers.

#### LEGS

Risks of clothes catching fire from welding spatter and molten metal.

#### FEET

Risks are perforations, falling object, burns and slipping.

#### FUME

Health and safety risks: Inhalation of toxic substances and/or fine particles. Increased concentrations of nitrogen oxides and carbon monoxide, especially when working with the flame in confined spaces.



### THE SOLUTIONS

#### SAFETY GLASSES

Goggles are mainly used to protect the eyes against the light produced by flame welding or cutting or against mechanical particles (grinding for example).

#### WELDING JACKET

Welding jacket of flame-retardant material of leather to protect the upper body, against welding spatters, grinding particles which permit to avoid burns.

#### GLOVES

The choice of welding gloves will depend on the welding application in order to offer the right protection and comfort.

#### TROUSERS

Trousers of flame-retardant material to protect the lower body against welding spatters, grinding particles and molten metal.

#### SHOES

Safety shoes permits to protect completely the bottom of the leg.

#### FUME

Use appropriate Extraction Systems to eliminate the fumes and gases produced. Ensure sufficient fresh air supply to dilute gaseous hazardous substances. Where Extraction Systems alone does not adequately control exposure, it should be supplemented by adequate and suitable respiratory protective equipment to protect against the residual fume.

 European Welding Association	<b>Personal Protective Equipment using Flame Equipment</b>	December 2022
<b>EWA \ TC FLAME</b>		

## Protection against radiation, heat and burns: Goggles

Goggles are mainly used to protect the eyes against the light produced by flame welding or cutting or against mechanical particles (grinding for example).

Reg. (EU) 2016/425

Make sure that the product is suitable for the intended use and conforms with Reg. (EU) 2016/425 and Standards by fields of use - [Lens Marking]:

- ◆ EN 166:2001 for basic conditions
- ◆ EN 169:2002 for welding filters
- ◆ EN 170:2002 for UV filters
- ◆ EN 171:2002 for IR filters
- ◆ EN 172:1994+A1:2000+A2:2001 for sunglasses filters
- ◆ EN 175:1997 for personal eye-protection during welding



Specification according to EN175:1997


This standard applies to PPE for eye and face protection during welding and related procedures. The conforming PPE is designed to include protection filters with or without protective/reinforced lenses, certified in conformity to EN166:2001 and to EN169:2002.

Furthermore, to select the right welding filters (shade) on the goggle, the EN 169 gives recommendation of use depending on the flow of acetylene for brazing/welding or cutting process

Welding scale				
q = acetylene flow rate l/h				
	q ≤ 70	70 < q ≤ 200	200 < q ≤ 800	q > 800
Flame welding Brazing and soldering	4	5	6	7
q = acetylene flow rate l/h				
	900 ≤ q ≤ 2 000	2 000 < q ≤ 4 000	4 000 < q ≤ 8 000	
Oxy-cutting	4	6	7	

Table from EN 169

For applications with higher flow rates, in particular for heating or flame cutting applications of large thicknesses, it is necessary to use a welding helmet in order to protect yourself. Operators working nearby must wear glasses with suitable shades: From shade 3 for aids to a shade equivalent to that of the operator. Warning: in most cases, these attacks have a cumulative effect.

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## Protection against radiation, heat and burns: Leather clothes

The use of protective leather clothing that complies with current standards makes it possible to aim for the highest level of protection for users of flame processes.

These clothes will protect the operator against burns, projections, radiation. These clothes must also offer low combustibility to limit inflammation.

Main EN Standards for leather clothes are:

- European Regulation on Personal Protective Equipment EU) 2016/425
- EN ISO 13688:2013: (general requirements for innocuousness, ergonomics and sizes),
- UNI EN ISO 11611:2015: (use in welding operations and related procedures)

Clothes that can be used in flame process are:

- Jackets
- Trousers
- Apron
- Sleeves
- Gaiters

These clothes for welders in Class 2 are suitable for use during manual welding techniques in which major drops and splatters are formed.

**Warning: in the presence of oxygen, clothes soiled with grease can be ignited; they must be clean**

## Protection against radiation, heat and burns: Gloves

Gloves must be made from leather that has undergone specific tests against the thermal risks associated with welding.

European Directive (UE) 2016/425: harmonization of member states' PPE legislation.

EN 21420 Protective gloves - general requirements

EN 388:2019 Protective gloves against mechanical risks

EN 407:2004 Protective gloves against thermal risk

EN 12477:2001+(A1:2005) Protective gloves for welders

A mechanical performance score as well as a thermal performance score will be awarded according to the standard EN 388 and EN 407.

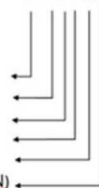
### Mechanical hazards

#### TEST

- Abrasion resistance (1-4)
- Resistance to cutting with a blade (1-5)
- TDM Resistance to cutting with a blade (A-F)
- Resistance to tearing (1-4)
- Resistance to perforation (1-4)
- Attenuation of impact on knuckles ( $\geq 9$  kN/ $\geq 7$  kN)



4 1 3 4 x x



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## Protection against radiation, heat and burns: Shoes

European directive UE 2016/425 9 March 2016 stipulates that wearing safety shoes is compulsory for workshop work. Furthermore, the use of suitable safety shoes protects feet from the risk of falling objects but also from the specific risks of flame processes, like hot projections or liquid metal in the cutting process.

The EN ISO 20345 standard describes several levels of protection:

Safety level	Protective Shell	Shockproof sole	Anti-static sole	Anti-perforation sole	Water-repellent shoe
SPB	✓			✓	
S1	✓	✓	✓		
S2	✓	✓	✓		✓
S1P	✓	✓	✓	✓	
S3	✓	✓	✓	✓	✓



The criteria of choice are:

- 1 - The level of protection according to the standard EN ISO 20345 :2011
- 2 - High or low shoes
- 3 - Upper in:
  - full-grain leather (water resistant)
  - split leather
  - fabric (no water resistant),
  - pigmented split leather.
- 4 - Outsole:
  - PU+PU (dual density polyurethane lightweight),
  - PU+TPU (lightness and flexibility + more strength of the thermoplastic polyurethane),
  - PU + nitrile rubber for extreme temperatures (up to 300 °C).
- 5 - Antipuncture midsole:
  - in steel
  - no metallic for more comfort.
- 6 - Toe protection:
  - steel
  - aluminium (30% lighter),
  - fiberplast (extra lightweight).

The EN ISO 20349-1:2017 specifies requirements and test methods for footwear protecting users against risks, such as those encountered in foundries.

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## Protection against fume: Fume extraction System

With at-source extraction the welder is more protected and accumulation of welding fumes in the workshop decreases. Source capture methods are preferably integrated in the workspace. The new legislation favors the improvement of safety for suction systems. Regulatory references:

EN ISO 21904-1 Health and safety in welding and allied processes — Equipment for capture and separation of welding fumes — Part 1 (4): General requirements

EN ISO 21904-2 Health and safety in welding and allied processes — Equipment for capture and separation of welding fumes —Part 2: Requirements for testing and marking of separation efficiency

EN ISO 21904-4 Health and safety in welding and allied processes — Equipment for capture and separation of welding fumes —Part 4: Determination of the minimum air volume flow rate of capture devices

Where Extraction Systems alone does not adequately control exposure, it should be supplemented by adequate and suitable respiratory protective equipment to protect against the residual fumes. Regulatory references:

- EN 12941 Respiratory protective devices - Powered filtering devices incorporating a helmet or a hood
- EN 14594 Respiratory protective devices - Continuous flow compressed air line breathing devices.

Note: In 2018 IARC has classified welding fumes and UV radiation from welding as Group 1 carcinogens

## Protection against noise: Hearing protection

Noise can be harmful for the health: it does not only lead to hearing damage but can also cause other unwanted, and long lasting, negative effects (psychological and social problems, fatigue, cardiovascular problems...).

The European standards are grouped under two series:

The three parts of the EN 13819 series 'Hearing protectors – Testing' series

The ten parts of the EN 352 series 'Hearing protectors – Safety requirements' series

## Important note: for all kind of protection always refer to the National Regulations in addition

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