

## Technical Information

### **OXYGEN CLEANING OF DIVING CYLINDERS T003** **Guidance on the cleaning of dive cylinders for oxygen use**

There is guidance regarding the cleaning of breathing gas cylinders that are to be used with a higher-than-normal Oxygen content. It has been agreed with the HSE and other agencies that with any mixture of breathing gas, that contains Oxygen more than 23% of the total, needs to be treated with extreme care. There should be no hydrocarbons present at all. When a cylinder is cleaned it must be stated on the cylinder that it has undergone Oxygen cleaning. The label should say that


#### **THIS CYLINDER AND VALVE ARE RATED FOR OXYGEN SERVICE**

Inspection, cleaning and preparation has been carried out for oxygen compatibility and cleanliness

**(PUNCH OUT DATE IN BOX)**

**VALID FOR UP TO 15 MONTHS PROVIDED HANDLED AND FILLED IN ACCORDANCE WITH HYDROCARBON-FREE OXYGEN SAFE PRACTISES**

This cylinder and valve are rated for Oxygen Service   
Inspection, cleaning and preparation has been carried out for oxygen compatibility and cleanliness  
**VALID FOR UP TO 15 MONTHS PROVIDED HANDLED AND FILLED IN ACCORDANCE WITH HYDROCARBON-FREE OXYGEN SAFE PRACTISES**

Valid From:		IDEST Centre: 					
Jan	Feb	Mar	Apr	May	Jun		
Jul	Aug	Sep	Oct	Nov	Dec		
2026	2027	2028	2029	2030	2031		
2032	2033	2034	2035	2036	2037		

It is not just the user who is at risk by using an elevated level of Oxygen in a non-O<sub>2</sub> cleaned cylinder, the filler who is "at work" is also at risk.

The **European Industrial Gas Association** quotes

Oxygen is not flammable in itself but supports combustion. Oxygen can react with most materials. The higher the oxygen content and/or pressure in a system:

- the more vigorous the combustion up to explosive level
- the lower the ignition temperature, up to ignition, of materials that normally do not burn in air
- the higher the flame temperature and combustion velocity

Care must be taken in the selection of equipment and materials, which need to be oxygen compatible and free from contaminants. The main contaminants to be avoided and/or eliminated are hydrocarbon oils and greases, which are easily combustible, and particulate matter which can easily ignite or cause ignition.

Recognition of oxygen's reactivity led to stringent requirements regarding cleanliness of equipment in oxygen service.

The first edition of this AEIG document issued 1986, recommended procedures and agents to clean and maintain the cleanliness of surfaces in contact with oxygen, inspection methods, and acceptance criteria as well as practical examples.

Cleaning with solvents (*as a main procedure at that time in the oxygen industry*) was recommended in most examples. The increasingly stringent environment regulations of the last years, regulations including the phasing out of most chlorofluorocarbons (CFC's), restrictions in the use and the banning of some volatile organic compounds (VOC's) led to the necessity to develop alternatives.

We have photographs of compressors, pipework, and buildings that have been destroyed by oxygen being filled through and into pipework of equipment that is contaminated with a high level of hydrocarbon. They are not a pretty sight!

Remember if an incident occurs the HSE aim to visit immediately and will be looking for reasons why there was an incident. If it is found to be caused by not following best practice, there **will** be court action.

Some areas of thought are that if the cylinder has been Oxygen cleaned and it is being filled from a "nitrox compressor" at a gradual rate there can be a minimum risk of incident.

This assumption is **incorrect**- Oxygen is still at a higher percentage than 23% and is still dangerous.

It cannot be guaranteed that there are no Hydrocarbons passed on whilst filling, and cylinders should be cleaned as recommended.

**There are some guidance documents, for example:**

- **CGA G-4.1, 2018, Cleaning of Equipment for Oxygen Service**
- **EIGA Doc 33, Cleaning of Equipment for Oxygen Service**
- **ASTM G93, Standard Practice for Cleaning Methods and Cleanliness Levels for Material and Equipment Used in Oxygen-Enriched Environments**