Safety Advice. 23 – Working safely with oxygen pressure reducers on cylinders and cylinder bundles.

Oxygen is oxidizing (not combustible!) and can react with combustible substances in the form of a fierce fire.

Not only easily combustible substances such as oil and grease, rubber and plastics but also aluminium, steel and brass can burn in contact with oxygen.

The risk is greatest in systems involving compressed oxygen where it can abruptly flow at high pressure into a low pressure area and is consequently able to compress locally. The heat resulting from this compression can cause combustible materials in contact with oxygen to ignite.

Oxygen containers – cylinders and cylinder bundles – contain the gas at pressures up to 200 or 300 bar.

Since the majority of oxygen applications involve considerably lower pressures, the oxygen is normally removed from the gas cylinders via a pressure reducer where the required working pressure can be set manually by means of a control valve (adjusting screw). (This information does not concern pressure reducers with preset working pressure.)

By opening the valve of an oxygen compressed gas cylinder too fast, the downstream pressure reducer can be subjected to a pressure surge that may cause it to burn out.
Several damage cases as well as a number of accidents involving serious burns have occurred in this way.
Considerable risk is posed in the case of adjustable pressure reducers when the pressure control valve – contrary to operating instructions – is already open while the valve of the gas cylinder is opened.

In this case, the oxygen flows through the control valve and hits unobstructed the most sensitive component of the pressure reducer, i.e. the thin diaphragm, which may be made of rubber, plastic or metal, and the resulting compression heat can be dissipated only to a very limited extent.

Consequently, the diaphragm can catch fire in only a few milliseconds and melt the metal of the pressure reducer which

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is consequently forced outward under high pressure resulting in an extremely dangerous situation.

A necessary safety precondition during initial operation of adjustable pressure reducers is that the control valve is closed when the valve of the compressed gas cylinder is opened.

Even in this case, the oxygen can heat up in the area of the control valve, however, the heat dissipation at this point is so great that ignition cannot occur. Tests conducted with various types of pressure reducer have shown that this measure effectively prevents the diaphragm and the pressure reducer catching fire.

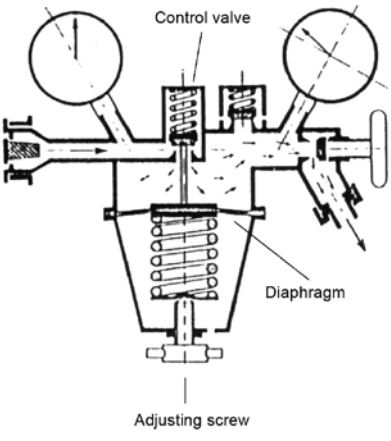
Based on this experience, the German Accident Prevention Regulation BGV D 1 "Welding, cutting and associated processes" stipulates that "prior to opening of the cylinder valve the adjusting screw of the pressure reducer must be turned back until the spring force is relieved" before the cylinder valve is opened "carefully, slowly and not abruptly" and the working pressure is subsequently increased in a controlled manner from zero to the required value.

This effective safety measure is necessary in the case of all adjustable pressure reducers on oxygen cylinders and cylinder bundles also for breathing oxygen.

Immediately after every oxygen application, it is good practice while also serving as a precautionary measure for the next time oxygen is used, to close off the control valve of the pressure reducer by turning back the adjusting screw.

Furthermore, particular care must be taken to ensure that oxygen pressure reducers are not contaminated with easily combustible substances such as oil, grease, medical ointments, plastic particles etc.

If necessary, before use, the pressure reducer should be cleaned with an oil and grease-free solvent.



Note: New standards governing the condition and testing of pressure reducers came into force in the mid-1990s (DIN EN ISO 2503, DIN EN 961, 738-1, 738-2). In accordance with these standards, adjustable oxygen pressure reducers must successfully complete a burn-out test with pressure surges both with the control valve closed as well as with the control valve opened.

Sufficient experience has not yet been gained as to whether pressure reducers that fulfil this standard are also fire-safe in practical applications if the measures described above are not implemented. This question is to be resolved for each type of pressure reducer based on the operating instructions.
In accordance with the specified standards, the manufacturers are obliged to describe in the operating instructions "the risks and precautionary measures in connection with the use of oxygen" and the "risk of fire and explosion posed by oxygen pressure surges".

It is the responsibility of the user to read and observe the operating instructions.

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