

## Using Gas Mixtures: Handling, Connection, Special Cases.



Special applications – for example the calibration and adjustment of measuring equipment or scientific experiments – require precisely determined gases. The test and reference gases required may be available for many applications in what are known as standard mixtures. However, for very special applications, individual gas compositions are also often developed.

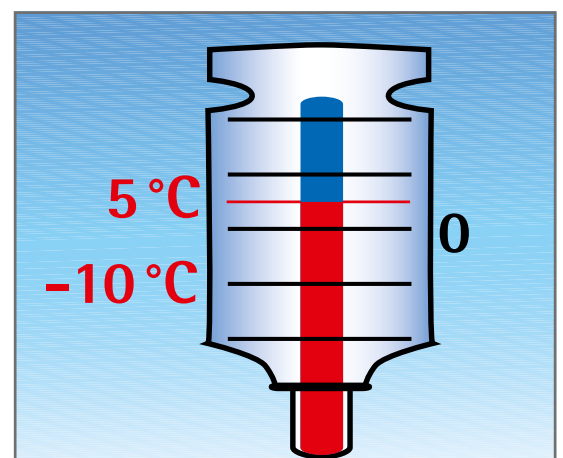
A gas mixture is defined by its basic gas, the admixture(s) and data on concentration or substance amounts.

To ensure user safety, various aspects need to be considered in the handling of gas mixtures:

### Transport and storage.

Individual gas compositions tend to segregate at low temperatures. Accordingly Westfalen certificates state the minimum storage temperature to be observed as from the point of delivery. Adherence to this specification ensures the quality of the gas mixture both during storage and during further internal handling.

*Please observe the minimum storage temperatures: +5 °C when filling in summer, -10 °C when filling in winter.*



#### From gas store to point of use.

Many gas stores are in the open; the containers stored here assume the applicable ambient temperature. However, if the point of use is considerably warmer than the storage area, condensation from moisture in the air may form on the cylinder surface and the cylinder valve. Critical here is the possible build-up of moisture inside the valve:

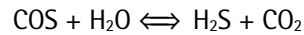
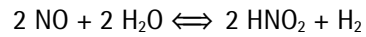
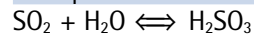
- For inert, non-reactive gases, this moisture is pushed into the pressure regulator and so into the pipe system of the gas supply device – resulting in contamination.

#### Example:

Argon 6.0 (purity 99.9999 % by volume) has a maximum moisture content of 0.5 ppm by volume. Reckoned against the content of a 50 litre cylinder, that results in a permitted moisture content of maximum four milligrams. That corresponds to about one tenth of a drop of water. Were only one drop of condensation water to get into the gas supply device, gas quality would be drastically reduced with regard to moisture content. In order to remedy such contamination, extensive rinsing of the entire supply system is required – in the quoted example using purity 6.0 argon.

- For reactive gas mixtures, interactions occur between the moisture and reactive components of the mixture. That produces a reduction of the desired and certified concentration.

#### Example reactions:



To prevent such interactions, Westfalen as a matter of principle supplies reactive mixtures with cap nuts on the cylinder valves. To avoid condensation inside the valve we recommend removing the cap nut only after the cylinder temperature has equalised to the ambient conditions at the location where it is to be used. Immediately afterward, the pressure regulator should be connected.

After disconnecting the pressure regulator, the cap nut must be re-fitted. Highly concentrated reactive mixtures may otherwise corrode the inside of the valve.

Correct handling of gas mixtures protects against moisture (left) and corrosion (right) within the cylinder valve.





*The pressure regulators employed must be suitable for the gas mixture in use. We would be pleased to advise you.*

#### Tapping of gas mixtures.

To tap gas mixtures, suitable systems – pressure regulator and suitable hoses or pipes – are required:

- Pressure regulators are mostly made of brass or stainless steel. For mixtures in the ppm-range and reactive gas compositions we recommend stainless steel designs. Generally, different pressure regulators should be used for acidic and alkaline mixtures.
- Pressure regulators should be rinsed with inert gas before use and should be dry.
- In the universal use of pressure regulators intensive rinsing between uses is required as applicable. This is particularly the case if acidic and base mixtures are used alternately.

#### Cyclic pressure rinsing.

After connecting the gas cylinder atmospheric air or other unwanted gases will still remain in the pressure regulator, which can be reliably removed using so-called cyclic pressure rinsing. To do this, the cylinder valve is turned with the pressure regulator open, until the gauge displays the current cylinder pressure. By immediately closing the cylinder valve, the impurities now escape. Shortly before the gauge again shows ambient pressure, reopening the cylinder valve again increases the pressure in the equipment and so on ...

To eliminate contamination by impurities we recommend repeating cyclic pressure rinsing up to ten times.

#### Know-how for practitioners.

For further questions on handling gas mixtures or on our product range, Westfalen's Specialty Gases experts are at your disposal at any time. Use our personal consultation!

We would also be happy to send you previous publications in the "Specialty Gases Practice" range:

- Specialty Gases Practice (2) – Gases in the Laboratory: Risk Factor Tube Material.
- Specialty Gases Practice (3) – Accredited Test and Calibration Laboratory: The Westfalen Specialty Gases Centre.
- Specialty Gases Practice (4) – Nuclear Species: Isotopes.
- Specialty Gases Practice (5) – Precious Droplets: Liquid Helium.



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