

# Safety notes for high purity gas equipment

## CONTAMINATION AND PREVENTION

Contamination by air (humidity) when initially using the equipment or after changing a cylinder will be removed by multiple purging with changing pressures (up to 10 bar increase/ relief) using dry Nitrogen or other inert gases. Contamination caused by inappropriate piping material or inappropriate valves and regulators can be avoided by the consequent use of control equipment with metal diaphragms, gases with high purity, the appropriate use of pipe work (electropolished), minimising of dead space, usage of orbital welding techniques with Argon inert gas, regular purging and conservation of the pipe work, avoiding leaks by Helium leakage tests and the use of VCR fittings.

## USE OF AUTOMATIC OR MANUAL CHANGE OVER

Automatic change over is recommended, when a higher gas flow with frequently cylinder changes will be required, an interruption of gas supply should be avoided or when over weekends the gas supply has to be guaranteed without any staff activities.

## SELECTION OF SINGLE OR DUAL STAGE

Dual stage regulators should be used if the operating pressure has to be absolutely stable even if the inlet pressure drops (during discharging of cylinder) or if the pressure has to be reduced from a high pressure level (e.g. 200/ 300 bar) to a very low pressure (e.g. < 1 bar)

When using liquefied gases it is sufficient in nearly all applications (e.g. SF<sub>6</sub>, NH<sub>3</sub>, HCL, CO<sub>2</sub> and others) to use the single stage pressure regulator because the vapour pressure of liquefied gases remains constant until the cylinder is nearly empty.

## CONTROL IN MBAR RANGES

High purity pressure regulator will reach their limits because of the metallic elements (flexibility of the metal diaphragm) inside. For operating pressure below 100 mbar in most of the cases a compromise has to be made between the quality of the gas and the control capabilities of the pressure regulator. For analytical processes metal diaphragm or metal bellows components have to be used.

## GAS PURGING EQUIPMENT

For toxic and corrosive gases or for calibration gases with contents of corrosive ingredients (even in ppm- or ppb areas) a purging device is recommended.

## CENTRALISED OR DECENTRALISED GAS SUPPLY

A decentralized gas supply from single gas cylinders is useful if gas is needed temporarily or for a few hours. If gases are needed continuously it is recommended to use a centralized gas supply system. A centralized gas supply system offers economical advantages if the same gas will be used at different points of use (less cylinders, less handling, less renting costs, less indoor transport, more safety).

# Safety notes for high purity gas equipment

## MATERIAL CHOICE

Stainless Steel is used in processes with toxic or corrosive gases. Furthermore it is recommended to use stainless steel materials for process operating with high purity gases and for calibration gases with corrosive ingredients in the range of ppm or ppb or more. For non corrosive gas qualities up to 5.0 it is sufficient to use copper pipelines or brass materials. For the gas supply for ECD (electron capture detector) applications stainless steel or a special cleaning process is recommended.

## IMPLEMENTING OF CORROSIVE GASES

When applying corrosive gases, the entrance of moisture and atmospheric oxygen should be avoided. The prevention of moisture to the extent of less than 5 ppm demands that the choice of material, purge gas, as well as the purging method should be thoroughly examined.

The pressure gas cylinders are placed in a safety gate with defined air load change.

## RELIEF VALVE FOR PRESSURE REGULATOR

Pressure regulators, used as cylinder or panel regulators, usually have an integrated relief valve with a relief pressure adjusted to the max. outlet pressure. The primary purpose of the relief valve is to protect the pressure regulator. For the protection of especially sensitive processes behind the regulator, a relief valve is necessary.