

# Indoor environment.

## Workplace control with HiQ<sup>®</sup> specialty gases.

### Control of hazardous substances

It is obvious that employees require a safe and healthy working environment. In many types of industries workers are equipped with protective cloths and shoes, and for extremely toxic workplaces, gas masks are used. Protection towards other invisible dangers, like hazardous gases and substances in the working environment, is as important. It is common practice to install gas detection systems to monitor the levels of such dangerous and hazardous substances. Employees rely entirely on these monitors as their ultimate protection. Obviously, proper distribution of the monitors in the working area as well as checking of the monitors with test gases and calibrate them are crucial in securing their safety.

### Recommended exposure limits

In most countries there is a national board of occupational safety and health or likewise, responsible for conducting research and making recommendations for the prevention of work place environment. These federal institutes set the allowed recommended maximum levels of concentrations for hazardous substances you may be subject to during work. The national boards are members of international organizations like CEN (European Committee for Standardization, organization for EU- and EEC-countries), OSHA (Occupational Safety and Health Administration, US department of labor) etc.

There are international programs on chemical safety run by the United Nations Environmental Programme (UNEP), the International Labour Office (ILO) and the World Health Organization (WHO), which harmonize and summarize essential health and safety information.

The recommendations for hazardous substances represent an important tool for risk assessment and management, where the target is to create a safer and healthier working environment. The legal responsibility lies often in the respective country.

Recommended exposure limits are normally based on risk evaluations using human or animal health effect data, and on an assessment of what levels can be feasibly achieved by engineering controls and measured by analytical techniques.

### Exposure Threshold Value

Designations of recommended exposure limit are as many as there are organizations working with this. However, a normal term used in literature as an overall designation is Exposure Threshold Value (ETV). ETV is maximum concentration of a hazardous substance in the breathing air. For gases it is given in ppm or mg/Nm<sup>3</sup> air. ETV covers three different limit values, which are:

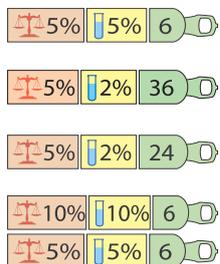
- Time weighted average (TWA): for chemicals that can have hazardous effect on humans who are daily exposed to it over a period of 8 hours (a normal working day). TWA is in some countries expressed as MAC value.
- Ceiling value (C): the concentration that under no circumstances should be exceeded due to very harmful or deadly consequences.
- Short-Term Exposure Limit (STEL): a maximum for exposure over a short time, in most countries 10 minutes. For some very hazardous substances this time limit is shorter.



### Maximum concentration control

Testing the linearity of monitors which continuously measure the concentration of hazardous gases is crucial for the safety at the workplace. In the HiQ® product program, you find test gases especially designed for maximum concentration control for a couple of the most common hazardous gases, like NH<sub>3</sub>, CO<sub>2</sub>, CO and H<sub>2</sub>S (see table below). Normally you test your instrument on a couple of points in the linear area. In the HiQ® program, the gas compositions are 50 % and 100 % of the maximum limit value. Other compositions can be made on request.

### Test gases for monitors



Substance	TWA (ppm)		Test gases — workplace control		
	EU	NIOSH (USA)	Gas mixture	Composition	Product code
NH <sub>3</sub>	25	25	NH <sub>3</sub> maccon 12 ppm	12 ppm NH <sub>3</sub> in N <sub>2</sub>	2488
			NH <sub>3</sub> maccon 25 ppm	25 ppm NH <sub>3</sub> in N <sub>2</sub>	2489
CO <sub>2</sub>	5,000	5,000	CO <sub>2</sub> maccon 2,500 ppm	2,500 ppm CO <sub>2</sub> in N <sub>2</sub>	2482
			CO <sub>2</sub> maccon 5,000 ppm	5,000 ppm CO <sub>2</sub> in N <sub>2</sub>	2483
CO	25	35	CO maccon 12 ppm	12 ppm CO in N <sub>2</sub>	2480
			CO maccon 25 ppm	25 ppm CO in N <sub>2</sub>	2481
H <sub>2</sub> S	10	10	H <sub>2</sub> S maccon 5 ppm	5 ppm H <sub>2</sub> S in N <sub>2</sub>	2486
			H <sub>2</sub> S maccon 10 ppm	10 ppm H <sub>2</sub> S in N <sub>2</sub>	2487

TWA = time weighted average value allowed during a working day of eight hours.

### Other hazardous substances

There is a range of other hazardous substances that are monitored at workplaces. For other mixtures than the ones listed above, please contact your local Linde representative to compose the applicable test gases for your workplace control.

### Recommended cylinder regulator

Maximum mobility is a prerequisite when you are testing and calibrating the monitors at your workplace. Reliable cylinder regulators for the test gas and calibration gas cylinders are a necessity. For test gases, the REDLINE® single stage regulator is recommended. However, calibration of the instrument requires a stable secondary outlet pressure, which the REDLINE® two stage regulator C200/2 will provide. C200 regulators can be plain or equipped with a shut-off valve (type A), a needle valve (type B) or equipped for purging of the high pressure side (type P). For testing and calibration gases for workplace control we recommend:

REDLINE®		Outlet pressure		Product code
		bar	psi	
Single stage	C200/1 A, brass	0.2-3	3-45	3100
Single stage	C200/1 A, brass	0.5-6	8-85	5467
Two stage	C200/2 A, brass	0.2-3	3-45	5482

### More information

If you want more information regarding our test gases for maximum concentration control, please look into our HiQ® catalog 'Indoor & outdoor environment', visit our HiQ® website <http://hiq.linde-gas.com> or contact your local Linde sales representative.

There is a lot of information available regarding recommended exposure limits. National as well as international institutes and organizations publish their recommendations regarding exposure limits, reports and background information on the internet (e.g. [www.cdc.gov/niosh](http://www.cdc.gov/niosh), [www.cenorm.org](http://www.cenorm.org)) and in other media.

-  Blending tolerance
-  Analysis uncertainty
-  Shelf life

