

» Regulations and Legislation about hazardous materials

Guard your employees reliably from harmful emissions



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» Regulations and Legislation



The most important things first:

- » During welding, cutting and allied processes such as thermal spraying or soldering, fumes, gases and particles are released. These emissions are classified as hazardous substances.
- » These particles can be inhaled, in most cases they may even reach the alveoli and, depending on the chemical composition, can cause severe respiratory diseases and even cancer.
- » The emissions also contain a very high number of nanoparticles that can penetrate into human cells and there they may have an as yet unresearched toxicological effect.
- » Primarily for reasons of occupational safety, but also for those of environmental protection, measures for air pollution control are required. In this case, the extraction of the emissions at the source represents the best possible protection.

The most important regulations:

Determining working conditions

- » **End-user's obligation** to take protective measures, to check them regularly and document them.
No work to be started without protection measures.

Particulate hazardous substances

- » Complete **capture at source**, **air recirculation** only after adequate cleaning.
- » Extraction and filter systems must include **state of the art technology** and are to be **checked at least annually** for correct functioning and effectiveness.

Sequence of protection measures to reduce exposure to hazardous substances for employees:

1. Selection of processes and filler metals low in hazardous substances- **substitution**²
2. Ventilation measures - **capturing emissions**
3. Organizational and hygiene measures - **avoiding contact, inhalation**⁴
4. Personal protection - **wearing breathing protection**

Hazard Assessment

Due to the classification of welding fumes as a hazardous substance, a risk assessment must be carried out. This is done in 5 easy steps:

1. Composition of welding fumes affected by:

- » **Base material**
- » **Coatings**
- » **Filler metal and**
- » **Process gases.**

2. Determining the health hazards of welding smoke constituents:

- » **Substances that place strain on respiratory tract and lungs** (eg: iron oxides, aluminium oxide)
- » **Toxic or toxic-irritating substances** (eg: manganese oxide, copper oxide, zinc oxide)
- » **carcinogenic substances** (eg: chromium (VI) compounds, nickel oxide)

3. Determining the hazard class depending on the procedure.

Hazard class of procedures

Procedure	Emission rate (mg/s)	Substances that place strain on respiratory tract and lungs	Toxic or toxicirritating substances	Carcinogenic substances
Submerged arc	< 1	low	low	low
Gas welding (autogenous procedure)	< 1	low	low	-
TIG	< 1	low	medium	medium
Laser welding without filler metal	1 to 2	medium	high	high
MIG/MAG (low-energy gas-shielded welding) Soldering	1 to 4	low	medium	medium to high
Electric arc, MIG (general) MAG (solid wire), fluxcored wire welding with shield gas, laser welding with filler metal	2 to 25	high	high	high
MAG (flux-cored wire); flux-cored wire welding without shield gas Autogenous flame cutting Electric arc spraying	>25	very high	very high	very high

4. Determining working conditions

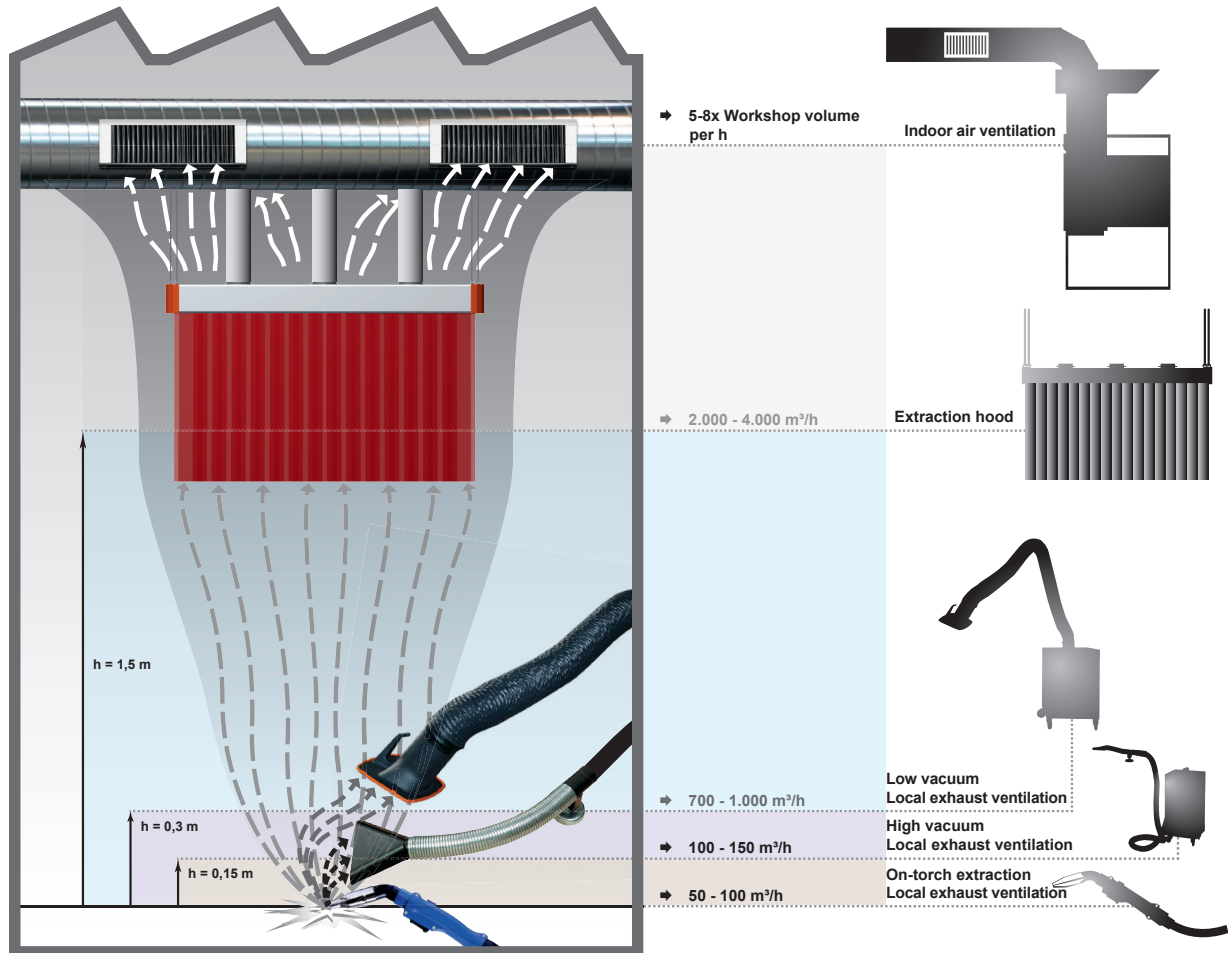
- » **Spatial conditions**
- » **Head and body position in overhead position**
- » **Welding time**

5. The overall risk assessment is based on the hazard class (step 3) and working conditions (step 4):

- » The hazard may be increased, for example, if welding time is long and/or welding is carried out in an overhead position
- » On the other hand, with short welding times, or welding work outdoors, the hazard may be reduced.

Measures

There are different possible ways of capturing harmful emissions



1. Source extraction integrated into the welding torch

- » Integration into the system
- » Low air flow
- » Good to very good capture rate

2. High vacuum - source extraction system

- » Efficient source extraction through suction nozzles
- » Good capture rate up to a distance of 150 mm
- » Simple connection to the extraction system by hoses

3. Low vacuum - Source extraction system

- » Easy to use with flexible extraction arms with ease of movement
- » Freely positionable hoods
- » High capture rate at up to 400 mm away

4. Exhaust hood

- » Adjustment of the exhaust hood to the respective work area
- » Capture of the entire thermal flow from the weld area
- » Very low negative pressure required

5. General ventilation systems

- » Two methods: Displacement ventilation (layered ventilation) or mixed air ventilation
- » Extraction is carried out at a height of 4-6 m
- » To complement the methods already mentioned or if other methods cannot be used

Effectiveness check

The effectiveness of the protective measures taken is to be checked, if necessary to be rectified and the result to be documented.

1. Measurement of the concentration of hazardous substances in air at the workplace
 - » Welding work stations: Alveolar dust fraction relevant
 - » Mixed work stations: Respirable dust fraction relevant
 - » Cancer-causing compounds require separate calculation
2. Exposure data to be compared with occupational exposure limit values (local regulations)
 - » If exceeded: take further or appropriate protective measures and carry out hazard assessment again
3. Document the results

General dust limit value (ASGW), Germany

- » New occupational exposure limit for dust since 2014
 - 1.25 mg/m³ Alveolar dust fraction relevant
 - 10 mg/m³ Respirable dust fraction relevant

Occupational exposure limit values

The occupational exposure limit values that apply depend on the materials used

- » Iron, aluminum, magnesium, titanium oxide
 - General dust limit value as per local regulations
- » Substances with particularly toxic properties
 - Substance-specific limit values as per local regulations
- » Carcinogenic substances such as chromium-IV compounds or nickel oxides
 - Excluded or minimum use

This means:

When the occupational exposure limits are exceeded, at least one protective measure is ALWAYS required!

» internationally represented optimal consulting worldwide

Deutschland (HQ)

KEMPER GmbH

Von-Siemens-Str. 20
D-48691 Vreden
Tel. +49(0) 25 64 68-0
Fax +49(0) 25 64 68-120
mail@kemper.eu
www.kemper.eu

United Kingdom

KEMPER (U.K.) Ltd.

Venture Court
2 Debdale Road
Wellingborough Northamptonshire
NN8 5AA
Tel. +44(0) 8081 7827 40
Fax +44(0) 8081 7827 42
mail@kemper.co.uk
www.kemper.co.uk

France

KEMPER sàrl

7 Avenue de l'Europe
F-67300 Schiltigheim
Si vous appelez de France
Tél. +33(0) 800 91 18 32
Fax +33(0) 800 91 90 89
De Belgique ou de l'étranger
Tél. +49(0) 25 64 68-135
Fax +49(0) 25 64 68-40 135
mail@kemper.fr
www.kemper.fr

Česká Republika

KEMPER spol. s r.o.

Pyšelská 393
CZ-257 21 Poříčí nad Sázavou
Tel. +420 317 798-000
Fax +420 317 798-888
mail@kemper.cz
www.kemper.cz

United States

KEMPER America, Inc.

5910 Shiloh Road East
Suite 114
Alpharetta, GA 30005
Tel. +1 770 416 7070
Tel. US 800 756 5367
Fax +1 770 828 0643
info@kemperamerica.com
www.kemperamerica.com

Nederland

KEMPER B.V.

Grevelingenweg 10
NL-3249 AE Herkingen
Verkoopkantoor
Tel. +49(0) 25 64 68-137
Fax +49(0) 25 64 68-120
mail@kemper.eu
www.kemper.eu

España

KEMPER IBÉRICA, S.L.

Av. Riera Principal, 8
E-08328 Alella / Barcelona
Tel. +34 902 109-454
Fax +34 902 109-456
mail@kemper.es
www.kemper.es

India

KEMPER India

55, Ground Floor, MP Mall
MP Block, Pitam Pura
New Delhi -110034
Tel. +91.11.42651472
mail@kemper-india.com
www.kemper-india.com