ewm®

WE ARE WELDING

BETTER SAFE THAN SORRY!

Work safety – reducing welding fume emissions

www.ewm-group.com/en/

Your health comes first!

Welding can involve many different health risks and it is important to take precautionary measures to mitigate these risks. The fumes created when welding and brazing can be harmful to both the welder's health and the environment. Welding fume emissions contain various mixtures of gases and fine particles which, when breathed in or swallowed, can lead to serious health problems. How serious depends on the composition of the fumes and the period of time for which the welder is exposed to them. In some cases, toxic gases and vapours can soon be detected while working. For example, welders that inhale zinc vapours that have come into contact with galvanised metal often become sick with so-called metal fume fever. The symptoms include night sweats, chills and stomach aches. Other vapours cause mucosal irritation, shortness of breath and headaches. The biggest risk, however, comes from the emissions that are inhaled throughout a welder's career without being detected through immediate illness. The air we breathe is filtered through the nose. This prevents fumes, vapours and grinding dust from infiltrating the body. Smoke particles, however, are so small that they can infiltrate the body through our nose, sinuses and throat and end up in our lungs. Most welders don't even experience any irritation as this happens. The adverse effects on our health of breathing in welding fumes only become apparent a few years later. It not only significantly increases the risk of cancer; the inhalation of fumes also leads to a 10% higher probability of suffering from Parkinson's disease.

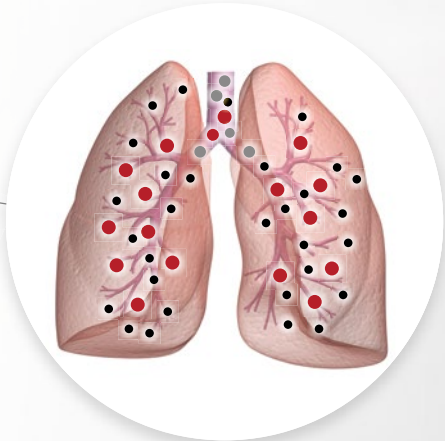
Invisible risk

Ultraviolet radiation is not the only thing that welders must protect themselves from. Dangerous welding fumes created when welding and post-welding can also pose a significant risk to our health: especially so-called respirable dust (RD). This type of dust is so fine that it can penetrate deep into the smallest branches of the lungs. Welding fumes are divided into three categories: ultra-fine dust, inhalable dust PM10 (ID) and respirable dust PM 2.5 (RD).

Ultra-fine dust

Respirable dust
PM 2.5 (RD)

Inhalable dust
PM10 (ID)



Hazardous substances and their health effects

AIRWAY AND LUNG-DAMAGING SUBSTANCES

- **Iron oxide**
  Dust deposits in the lungs (welder's lung or pulmonary siderosis), siderosis (leads to joint problems, diabetes, heart failure or impotence)

- **Aluminium oxide**
  Aluminosis (aluminium dust-induced lung disease, renders functional lung tissue functionless)

- **Magnesium oxide**
  Fever, bouts of sweating, throat irritation, eye and nose mucosal irritation, restricted lung function

- **Titanium dioxide**
  Dust deposits in the lungs, liver, spleen, kidney, heart and brain damage, weakening of the immune system

TOXIC IRRITATIVE SUBSTANCES

- **Manganese oxide**
  Irritative effect on the airways, lung inflammation, damage to the nervous system, Parkinson's disease

- **Zinc oxide**
  Zinc fever (nanoparticles in the lung destroy cells)

- **Copper oxide**
  Nausea, diarrhoea, eye pain, metal fume fever (discomfort with symptoms similar to chills), liver and kidney damage

- **Nitrogen oxide**
  Irritation in the airways and shortness of breath, potentially fatal pulmonary oedema

- **Carbon monoxide**
  Prevents blood from absorbing oxygen and leads to shortage of oxygen for organs, dizziness, faintness, headaches, feebleness, increased pulse rate and heavy breathing, unconsciousness, apnoea, cardiac arrest

- **Carbon dioxide**
  Increased breathing frequency and volume, dizziness, headaches, shortness of breath and unconsciousness

- **Phosgene**
  Extreme irritation of the airways, pulmonary oedema

CARCINOGENIC SUBSTANCES

- **Chromium (VI) compounds**
  Mucosal irritation and chemical burns of the mucosa
- **Lead oxide**
  Nerve and kidney damage, gastrointestinal disorders, nausea
- **Nickel oxide**
  Carcinogenic in respiratory organs
- **Beryllium oxide**
  Metal fume fever, chronic pneumonia
- **Cadmium oxide**
  Mucosal irritation, hyperinflation of the lungs
- **Cobalt oxide**
  Respiratory organ damage
- **Ozone**
  Mucosal irritation, acute irritant gas intoxication, delayed pulmonary oedema
- **Formaldehyde**
  Extreme mucosal irritation
- **Cadmium oxide**
  Mucosal irritation, hyperinflation of the lungs

Effective work safety for your workplace

Workplaces must be designed to ensure the welder's breathable air remains under the predefined limit. This is particularly important to consider with regard to:

- **Welding procedures**
- **Materials**
- **Operating conditions**

The aim is to keep hazardous substances and gases out of the welder's airways. Over the following pages, you will find three basic measures for effectively protecting your health.

NOTE

Only one combination of all measures outlined offers you the best possible work safety. Get in touch, we'd be happy to help.

1. Preventative measures

Choice of the right welding process/procedure

EWM's innovative procedure variants significantly reduce welding fume emissions, helping to protect welders' health significantly. The heat and energy-reducing EWM welding processes also contribute to sustainability. They save both raw materials and energy. Intelligent control processes require fewer passes, which simultaneously means shorter welding times and reduced welding fume particles. This avoids emissions before they even occur.

Pulse welding

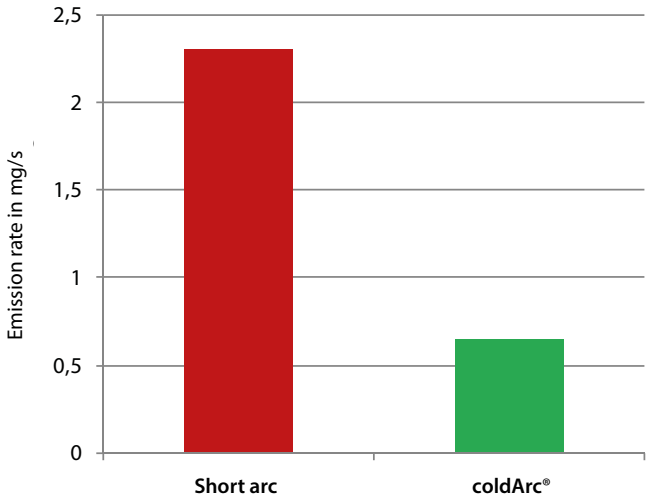
The pulsed arc falls within the transitional area between short and spray arcs meaning fewer corrosion contact points.

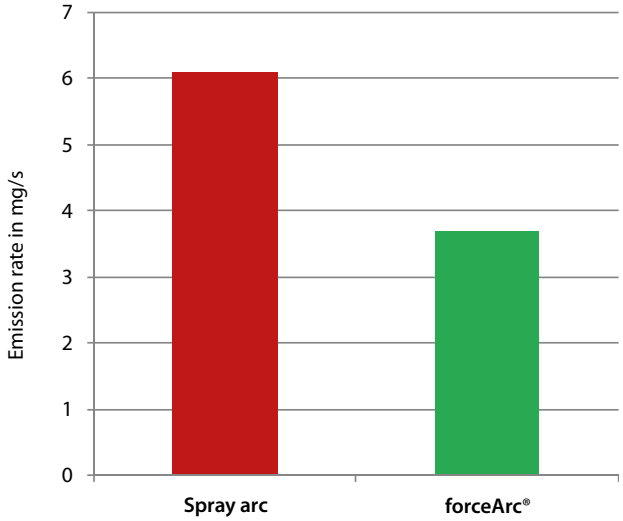
forceArc XQ/forceArc puls XQ

Using **forceArc®** can reduce emissions by up to 40% thanks to the higher welding fume deposition on the workpiece surface. This way, these emissions do not enter the air at all.

coldArc XQ/coldArc puls XQ

The **coldArc®** process generates significantly fewer emissions than the short arc process while delivering the same deposition rate. Welding fume emissions are reduced by up to 75%.





Welding high-alloy CrNi steels

In its lower power range, the forceArc puls® process achieves the emission rates of a pulsed arc. The advantages of forceArc puls® become increasingly more apparent at higher power rates. At a wire feed speed of 13 m/min, the emission rate of forceArc puls® drops to a rate 4.5 times slower than the pulsed arc process, helping to protect the welder's health significantly.

Welding of unalloyed and low-alloy steels

Scientific studies show that the digitally modified, innovative coldArc®, forceArc® and forceArc puls® processes reduce welding fume emissions significantly and minimise hazards for welders and operators.

2. Technical measures

Choice of the right extraction tools

The right extraction tools depend on the relevant welding task.
This is influenced by the following factors:

- **Location**
- **Component size**
- **Welding procedures**

Seam preparation, tacking, welding or placing spots – all of these are a part of the day-to-day work for many metal-processing companies. Here, a perfect combination of various technical measures are needed to protect the welder.
There are many different technical protective measures. The various effects of these measures can be seen in the diagram below.

Extraction options for optimal conditions

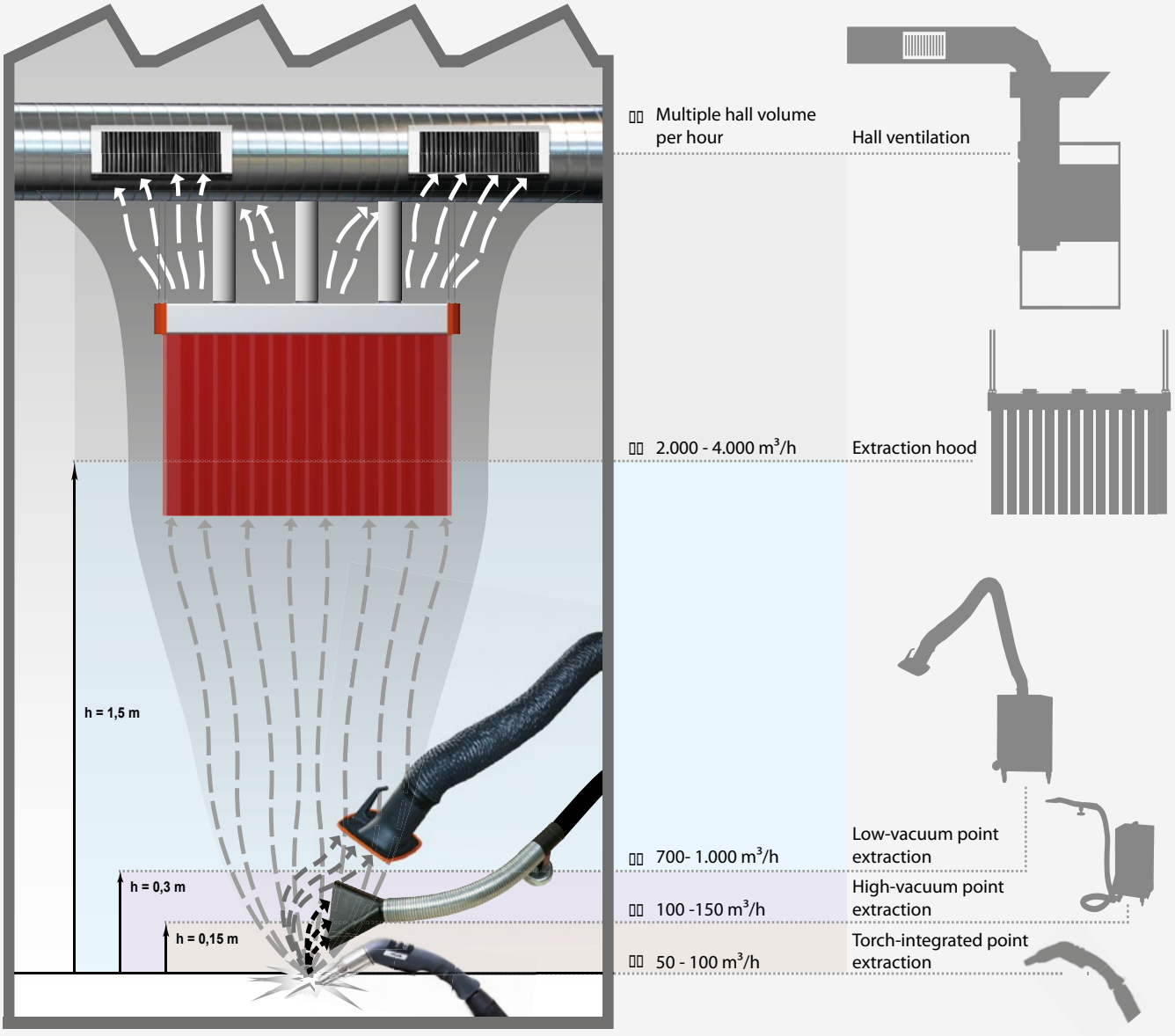


Image source: Kemper

The TRGS 528 provides a wide range of information relating to welding work and outlines numerous ventilation-related measures.

3. Personal measures

Choice of personal protective equipment (PPE)

A large number of workplaces in Germany cannot ensure sufficient health and safety for their employees through technical and/or organisational prevention measures alone. A safe working environment can only be ensured through individual measures, such as the use of personal protective equipment (PPE). When choosing PPE, it's important to make sure that it provides sufficient protection against risks identified as part of the risk assessment. Using PPE, however, can also pose new risks for health and safety. These must be assessed individually by the user and taken into account when choosing PPE.

Equipment for protecting against the inhalation of hazardous substances falls under category 3. This risk group comprises the complex personal protective equipment (complex design) for **protection against mortal danger and irreversible damage to health.** This category includes PPE intended to protect against hazards which the user cannot themselves assess.

You can find more PPE and extraction tool options for your workplace in our online shop

Personal protective equipment options

Powershield 2.5 (TH3) with fresh-air system

Fully automatic welding helmet including fresh-air system with extra bright view in light state (shade level 2.5).
Better concentration and fewer signs of fatigue thanks to constant air flow.
Classification in accordance with EN 12941 (European safety standard for fan filter units with helmet or hood) TH3.

Design options:
► Prepared for TH3 fan respiratory protection system
► Includes ActiveVent TH3 fan respiratory protection system

The EN 12941 standard outlines three protection classes (TH1, TH2, TH3). This standard applies for complete systems.
The numbers define the level of performance based on the amount of inward leakage.
The maximum permitted inward leakage for each class is as follows:
TH1 = 10% | TH2 = 2% | TH3 = 0.2%

Respirator mask

All breathing masks are tested and certified in compliance with European standard EN 149:2001 + A1:2009 "Respiratory protective devices – filtering half masks to protect against particles".

Classification of protection classes:

FFP 1 – For fine dust particles that are neither toxic nor fibrogenic.
Can be used for up to 4x the respective limit value (OEL*).
FFP 2 – For non-hazardous and/or low-hazard dust, vapours and fumes; filter for solid and liquid particles with moderate retention capicity. Can be used for up to 10x the respective limit value (OEL*).
FFP 3 – For toxic dusts, vapours and fumes; filter for solid and liquid aerosols with high retention capacity. Can be used for up to 30x the respective limit value (OEL*).

*Occupational exposure limits (OEL) of hazardous substances are set by a committee on hazardous substances. They are published by the Federal Ministry of Labour and Social Affairs in TRGS 900.

WELDING FUME E

Every welding task, regardless of the material and type, generates substances harmful to the welder and surrounding environment. These can lead to health risks and even have long-term effects such as cancer or Alzheimer's disease. Clean air in the workplace not only improves the health of employees, but it also increases productivity. To achieve this, welding emissions are extracted at the source, directly at the arc, using welding fume extraction torches. The new MT welding fume extraction torch ensures compliance with the **EN ISO 21904** standard. Cylindrical and conical welding fume extraction nozzles are available for better accessibility, particularly for confined components. Adapted construction also makes the torches much easier to handle when welding. The built-in ball joint allows for an optimal range of movement and comfortable working due to reduced strain. The streamlining of the torch neck also allows for an improved extraction performance.

XTRACTION TORCH

Welding fume extraction kit

Thanks to our newly developed welding fume extraction torch kit, many of these problems are now a thing of the past.
It can be mounted on any EWM PM and MT welding torch in just a few simple steps.

Other versions of welding fume extraction torches are available in our online shop.

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